ORMISTON SWB ACADEMY

Knowledge Organiser

Autumn Term 2024 – Year 10

Name: _____

Form: _____

Please remember to bring this into school everyday

Regular retrieval throughout a scheme of learning (daily, weekly and monthly) has been proven to reduce the rate of forgetting, supporting you to **retain more in long term memory**- making assessments/ exams way easier! The challenge for you as a student is to **make sure you use your knowledge organiser for each subject properly** to help you to know more and remember more over time. **We've created this walk through to support you** in using your knowledge organiser- for more support speak to your subject teachers

Using your Knowledge Organiser

You will use your knowledge organisers during lessons to engage and support with securing essential knowledge.
We expect you to use your knowledge organisers at home to support with independent study. Below you will find a step-by-step guide of 4 different revision strategies you can use at home. QR codes can be found at the back of this booklet which will link you to videos of these strategies in action.

Strategy 1- Look, cover, write, check – A really simple but effective way to use your knowledge organiser. Focus on a specific area of your knowledge organiser

1	2	3	4	5
Look	**Cover**	**Write**	**Check**	**Repeat**
Start with a **small section of knowledge** that you want to remember e.g *Henry VIII's wives in History.* Read through this section of the knowledge organiser (a couple of times if it helps)	Now **cover up this section** of your knowledge organiser with a post it note or scrap paper.	**Self quiz- what can you remember** and rewrite? Make sure you do this without looking back at your knowledge organiser.	**Remove the post it and check for accuracy**- did you get the key terminology? Was it spelt correctly? Was the order correct? If you drew a diagram, how much of this did you get correct? Most importantly- what did you miss out? Make your corrections in green pen.	After a short break away from your knowledge organiser repeat the look, cover, write, check **until you can recall all of the facts correctly without prompts.** This process can be used for any new knowledge that you want to acquire. It is good idea to do this on a regular basis, once a week.

Strategy 2-Self-Quizzing – You might try this after a few weeks of using your knowledge organiser. Get someone (or yourself) to set you 10 questions using your knowledge orgainser. These could be spellings, key words, equations etc to see how much you can remember! Record your score and see if you can beat your personal best each half term

1	2	3	4	5
Select topic	**Prepare the quiz**	**Answer it**	**Self check**	**Repeat**
Decide **which area you want to be quizzed** on (this might build up over time)	**Create 9 questions on that topic** or, ask somebody else to prepare 10 random questions for you.	**Set a time limit** (depending on the number of questions) and answer the questions without looking at your KO.	Now look at your KO to **self-check**- make a note of your score. Celebrate your successes and make a note of anything you missed or got incorrect.	**Return to this section** in 2/3 weeks- see if you can improve your score! Re-do those questions that you missed or got incorrect.

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Strategy 3- Mind-Maps- Mind maps provide a structured way to capture and organize ideas and information. Use your knowledge organisers (and other resources) to produce your own detailed mind-maps.

1	2	3	4	5
Select a topic	**Identify the key concepts/ideas**	**Add your visuals**	**Unpack the content**	**Test**
Choose a topic from your knowledge organsier/subject	Identify 3-5 key points that you need to remember for this topic and add these branches to your mind-map. You should colour code the different branches so you can visually identify the different concepts.	Add images/icons where appropriate to help you identify and remember key information.	Under each branch (key point), ensure you summarise the key information you need e.g. key dates, facts, beliefs, impact or influence. This will depend on the individual subject.	Once these are complete, you could use the look, cover, write, check method to test your knowledge.

Strategy 4- Flash Cards- Flashcards are small note cards used for testing and improving memory through practiced information retrieval. Flashcards are typically two-sided, with the prompt on one side and the information about the prompt on the other.

1	2	3	4	5
Select a topic	**Identify the key concepts/ideas**	**Add your visuals**	**Unpack the content**	**Test**
Choose a topic from your knowledge organsier/subject which you wish to summarise	On one side of your flash card add the concept or title e.g. Equality or, a question you need to know the answer to e.g. State three ways in which women have been treated unequally to men in the past	Add images/icons where appropriate to help you identify and remember key information.	On the reverse of the flash card add the essential knowledge needed for the concept or write to the answer to the question you have written. This will make it easier to revise from or, for others to ask you questions.	Once these are completed, see how much you can remember for each question/concept by writing it down on a separate piece of paper before you check your answers or, ask somebody to test you. Keep doing this until you can recall all of the information.

Contents Page

Year 10 – English – A Christmas Carol Plot and Key Quotations

Stave 1: "Marley's Ghost"

1. The ***narrator*** informs the reader that Jacob Marley (former business partner) died 7 years ago.
2. Scrooge described as mean and ***miserly*** (d).
3. Harsh weather and harsh conditions towards Bob Cratchit.
4. Scrooge is mean towards Fred, his nephew.
5. He refuses to donate money to the Portly gentleman.
6. He sees the face of Jacob Marley in his door knocker.
7. He is visited by Jacob Marley (***bound in chains***) who informs him that he will be visited by three spirits.

'His ***sole executor (b), his sole*** administrator…his ***sole*** friend and ***sole mourner.***'

…'solitary (c) as an oyster.'

'…***wound*** about him like a ***tail.***'

'Hard and sharp as flint.'

Stave 2: "The First of the Three Spirits"

1. ***The Ghost of Christmas Past*** visits Scrooge.
2. Scrooge his taken back to his childhood and sees his former self alone at school.
3. We are introduced to his sister – Fan and the poor relationship with his father.
4. Scrooge is then taken to ***Fezziwig*** where we see him enjoying himself at a party. He interacts with people.
5. Scrooge is then shown his former fiancée ***Belle*** and how they split. He becomes upset when he sees ***Belle*** and her family in another vision.
6. He demands to be taken home.

'Another ***idol*** has ***displaced*** me….a ***golden one***.'

'A ***solitary child, neglected*** by his friends, is left there.'

'The happiness he gives is as great as if it cost a fortune.'

Stave 3: "The Second of the Three Spirits"

1. ***The Ghost of Christmas Present*** visits Scrooge.
2. He takes him to see Bob Cratchit and his family. Scrooge is surprised at how little the family have.
3. He is then taken to his nephew, Fred's house. Fred and his guests mock Scrooge and his ***miserly (d)*** ways.
4. He is then taken to a poor part of the city and introduced to ***Ignorance (f)*** and ***Want.***
5. The spirit becomes frustrated and leaves him there.

'A ***vacant*** seat…and a crutch without an owner.'

''The boy is ***Ignorance (f),*** The girl is ***Want.***'

'As good as gold.'

Stave 4: "The Last of the Spirits"

1. ***The Ghost of Yet To Come is shrouded in darkness***: silent and scary.
2. He is taken to the city and instructed to listen to a group of businessmen who are discussing the recent death of a man who was not very well-liked.
3. He is taken to ***Old Joe's shop*** where a dead man's belongings are being pawned.
4. He is then taken to a bedroom where he sees a corpse (h).
5. Scrooge demands to see ***tenderness*** surrounding the death. He is then taken to the Cratchit's and learns the death of ***Tiny Tim.***
6. Scrooge wants to identify the dead man and he is taken to his grave.

'I hope to live to be another man from what I was.'

'***Shrouded (g)*** in a deep ***black*** garment.'

'…legs trembled beneath him.'

Stave 5: "The End of It"

1. Scrooge awakes ***disorientated*** and worries he has missed Christmas.
2. He is ***joyful*** when he learns he hasn't.
3. He orders and pays for the biggest turkey to be delivered to the Cratchit family.
4. He apologises and ***donates*** a healthy sum of money to the portly gentleman, to give to the poor.
5. He visits Fred and his wife and asks to join them for dinner.
6. He is ***jovial*** next day, playing a trick on a terrified Bob, who arrives late to work.
7. He gives Bob a pay rise and pays for treatment for Tiny Tim.
8. Scrooge is ***reformed***! A complete ***contras*** to Stave One.

'Scrooge regarded ***everyone with a delighted smile.***'

'I am as ***light as a feather,*** I am as ***happy as an angel,*** I am as ***merry as a school boy.***'

'A merry Christmas to everybody.'

Year 10 – English – A Christmas Carol Context, Theme and Characters

Christmas

Decline of Christmas

At the beginning of the Victorian period, the celebration of Christmas was in decline. The **Industrial Revolution,** in full swing in Dickens' time, allowed workers little time for the celebration of Christmas.

Dickens *describes the holidays as "a good time: a kind,* ***forgiving, charitable,*** *pleasant time: the only time I know of in the long calendar of the year, when men and women seem by one consent to open their shut-up* ***hearts freely,*** *and to think of other people below them as if they really were fellow-passengers to the grave, and not another race of creatures bound on other journeys."*

Christian Values

Family

The role of the Family

The **Victorian** family was considered to be a very valuable part of the everyday life throughout the era. By today's standards, families were often considered to be very large. In 1870, you would find that the average household family contained five or six children.

Scenes of ***family harmony (m)*** *and cosy firesides in many of Charles Dickens' stories seem in stark contrast to his own family life. Later Dickens' own family was marked by strife as his relationship with his wife deteriorated and his sons seemed to have inherited their paternal grandfather's trouble handling finances.*

Reflection of Dickens' life

Responsibility

1834 Poor Law

Victorian society ignored the **poverty (e)** of its poorest. On the one hand were the rich who enjoyed comfort and feasting at Christmas, and on the other were children forced to live in dreadful conditions in **workhouses**.

Dickens uses the novel to present his feelings that the ***rich*** *must help the* ***poor*** *in order for the world to be* ***improved****, and that it is the* ***rich's responsibility*** *to help the* ***poorest*** *in society. He exposes the unfair treatment of the poor, and shows that the* ***stereotypes*** *that the poor are lazy are untrue, which he does by using the Cratchit's, six children.*

Stereotyping poorer citizens (J)

Redemption (i)

Role of religion

The Victorians were **religious** Many believe that the novella (a) should be seen as an allegory (n) of the Christian concept of redemption (i). **Redemption** is the idea of being saved from sin or evil.

Because Dickens ***experienced*** *life living in* ***poverty*** *and* ***wealth*** *he wanted the* ***moral*** *message of the* ***novella*** *(a)to be that all human beings have the opportunity to behave in* ***kinder*** *ways towards each other. He wanted people to see the joy* ***redemption*** *(i) brings.*

Performing kind deeds

Characters

Fezziwig
Scrooge's former boss who was nice and hosted parties for his workers.

→ **Employs(S.2)** → **Scrooge**
A rich Victorian misanthrope (k).

→ **Employs** → **Bob Cratchit**
Scrooge's clerk

Emily Cratchit
Bob's wife who hates Scrooge.

Martha Cratchit
The eldest Cratchit child.

Belinda Cratchit
The second eldest Cratchit child.

Peter Cratchit
The third eldest Cratchit child.

Tiny Tim
Bob's disabled son.

The twins
The youngest Cratchit children.

Belle
Scrooge's old girlfriend who he rejected in favour of money. He sees a vision of her future with a family.

Fan
Scrooge's younger sister..

Fred
Scrooge's nephew who invites him to Christmas dinner.

Jacob Marley
Scrooge's old business partner who comes back as a ghost to warn him. He is ***wrapped in a chain.***

Shows a vision of (S.2):

Ghost of Christmas Past
A shapeshifting ghost with a ***candle on top*** of its head. It shows Scrooge the past.

Ghost of Christmas Present
A jolly ghost who looks ***like Santa Claus***, only dressed in green. **He shows Scrooge the present and introduces him to two starving children,** ***Ignorance (i)*** and ***Want.***

Ghost of Christmas Yet to Come
A ghost dressed in black who ***looks like the Grim Reaper.*** This ghost does not speak and shows Scrooge what could happen in the future if he does not change.

	Key Terms	Definition
A	Novella	A **novella** or short **novel** is a work of narrative prose fiction, longer than a short story but shorter than a **novel.**
B	Executor	Someone responsible for following through on a task or duty.
C	Solitary	Existing alone.
D	Miserly	Reluctant to spend.
E	Poverty	Not having enough material possessions or income for a person's needs.
F	Ignorance	Lack of knowledge or information.
G	Shrouded	Cover or envelop so as to conceal from view.
H	Corpse	A dead body
I	Redemption	The action of saving or being saved from sin, error, or evil.
J	Citizens	A person of that country.
K	Misanthrope	Someone who hates other humans.
L	Clerk	Someone who keeps records.
M	Harmony	Things working well together.
N	Allegory	A story which is about one thing but has a hidden meaning.

Year 10 – English – Language Paper 1 Section A

Start of the exam

- ✓ .Use the context box to infer (e) information about what the text is about and make predictions

Top Tips

- ✓ Use the **What/How/Why** paragraph structure,
- ✓ On questions 2 and 4, **zoom in** on words from text,
- ✓ Refer to the **steer of the question throughout** and
- ✓ Keep quotes to 5-10 words long.

1: The '4 things' Question

– List four things from a specific (a) part of the source.

You should: Select appropriate (b) evidence from text in response to the statement.

4 marks

2: The 'Language' Question

How does the writer use language to…? based on a specific part of the source e.g. lines 8-18.

You should: Explain or analyse the effect of language.

8 marks

3 The 'Structure' Question

How has the writer structured the text to…? Based on the whole text.

You should: Explain or analyse the effect or how structure interests the reader.

8 marks

Question	marks	% of paper	% of GCSE
1	4	10	5
2	8	20	10
3	8	20	10
4	20	50	25

4: The 'Agree' Question

20 marks

To what extent do you agree with the statement provided? Based on a specific part of the source.

You should:

- ❑ .Judge the effect(s) on the reader,
- ❑ Understand the writer's methods(d),
- ❑ . Use a range of textual references and quotes and
- ❑ Keep a relevant focus on the question throughout.

Active Verbs (similar to" shows")

- Connotes
- Depicts
- Demonstrates
- Illustrates
- Portrays
- Reflects
- Conveys
- Exhibits
- Emphasises
- Implies
- Presents
- Suggests

The writer _(active verb)___ the…

	Key terms	Definition
A	Specific	Clearly identified or marked out
B	Appropriate	Suitable for the focus of the question
C	Structure	The way a text is put together, whether through paragraphs, subheading or flashbacks (f) etc.
D	Methods	The way something has been achieved.
E	Infer	To work out from the information available in the text.

Year 10 – English – Language Paper 1 Section B

Section B: Question 5

AO	marks	% of paper	% of GCSE
5	24	30	15
6	16	20	10

Start of the exam

- ✓ 5 minute plan with question in mind.

Top Tips

- ✓ Keep your tone consistent (g) throughout: do not use words which suggest a light and playful atmosphere (b) after you have just spent 15 minutes making the scene sound scary.
- ✓ Use a variety of structural (e) features: flashbacks (f),
- ✓ Keep to one or two characters and
- ✓ 5 minutes' of checking SPaG, including paragraphing.

Punctuation to use

Question Mark	?	Exclamation Mark	!
Comma	,	Full stop	.
Semi-Colon	;	Speech Marks	" "
Colon	:	Apostrophe	'

5: The 'Writing for a purpose' question.

Question 5: Writing a narrative or description AO5/AO6

You will produce a story or description based on a picture or a sentence detailing your task.

*Your local newspaper is running a creative writing competition and the best entries will be published. **Either** write a story about time travel as suggested by this picture or write a story entitled 'Stranded'.*

Key skills:

AO5: You should:

Ensure the story or description is **clear.**

AO6: You should:

Use **varied and accurate** sentence structures.

Key language devices to use:

Simile

Where you compare two things by saying they're like something else:

"He was as timid as an urban fox."

Metaphor

Where you compare two things by saying something is something else when it clearly is not.

"She was a night owl."

Pathetic fallacy

Where you use the weather to set the atmosphere (b).

"The sky became cloudy and darkness fell."

Sensory Language

Where you use vocabulary to describe the character's five senses.

"I could taste blood streaming from my lip."

Overview of each paragraph

P1: Always begin with the weather and describe the scene or setting– decide if it's positive or negative.

P2: Character focus – introduce character – show but not tell then lead in to a flashback. Use a symbol, item or even to trigger the shift in time.

P3: Come back to present moment, developing the character in more detail. Keep something withheld!

P4: Describe the setting – zoom out to change focus. Include a motif (d).

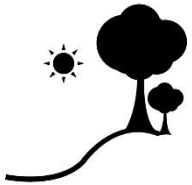
P5: Cyclical (a) development – back to weather/scene/setting – change from positive to negative or vice versa (c).

Great sentence openers

Connective	Unless, although.
Adverb	Regretfully, sadly.
Simile	Like a mouse…
Metaphor	Brave lions, they…
Feeling	Jealous, she tore up his clothes.
Verb 'ing' clause	Giggling and laughing, they ran to school.

	Key terms	Definition
A	Cyclical	Returning back to a previous point like a cycle.
B	Atmosphere	The tone or mood.
C	Vice versa	The two items can be switched around or reversed.
D	Motif	An object which is repeated and has importance to the events. E.g. a raven for death.
E	Structural	The way a text is put together, whether through paragraphs, subheading or flashbacks (f) etc.
F	Flashback	When the text goes back in time.
G	Consistent	Keeping something the same.

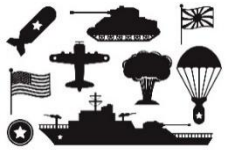
Year 10 – English – Power and Conflict Poetry Context



Romantic era (g)

Imperialism (d)

Global Conflict



Global Conflict

Global Displacement (e)

1792 → 1854 → 1914-18 → 1939-45 → 1969 onwards

Poems:
1. **London**
2. **Extracts from the Prelude**
3. **Ozymandias**

Key ideas:
- Poems are not about love. Poems are about personal growth and
- appreciating nature during the industrial revolution (f).
- Poets sometimes fought back against what they thought were tyrannical (a) rulers who oppressed (c)normal people.
- This made them considered radical (b).

Poems:
4. **My Last Duchess**
5. **Charge of the Light Brigade**

Key ideas:
- 1 in 5 people in the world called Queen Victoria of Great Britain their governor (j).
- People were very poor.
- People lacked rights.
- The social hierarchy (h) still defined who had power.

Poems:
6. **Exposure**
7. **Bayonet Charge**

Key ideas:
- In the First World War:
- 20 million people died.
- It was fought from trenches (holes in the ground) in Europe.

Poems:
11. Kamikaze

Key ideas:
- In the Second World War:
- 75 million people died.
- It was fought across the globe.
- Pearl Harbour in the USA was attacked in December 1941. Japanese pilots were trained to bomb ships by flying into them. This meant they committed suicide for their country.
- Following this, America came into the war on Britain's side, changing which side had the upper hand in the war.

Poems:

8. **Storm on the Island**
9. **War Photographer**
10. **The Emigree**
12. **Tissue**
13. **Checkin' Out Me History**
14. **Remains**
15. **Poppies**

Key ideas
- Wars were often fought against smaller countries to stop tyrants (a) or terrorists (i).
- Locals thought Western countries invaded for oil and other resources.
- Many locals were still loyal to the tyrants (a).

	Keyword	Definition
A	Tyrannical	Being cruel with power.
B	Radical	A person who wants to change society.
C	Oppressed	Being treated harshly, often by rulers.
D	Imperialism	Pushing your country's ideas on others.
E	Displace	Taking over the place or role.
F	Industrial Revolution	The use of machines in factories.
G	Romantic era	Poems about nature and its impact in a changing industrial (f) word.
H	Hierarchy	A system where people or items are ranked by status or power.
I	Terrorists	A person or group who uses violence to achieve their goals to change world.
J	Governor	The person in charge.

Year 10 – English – Power and Conflict Poetry – Language Analysis AO2

War and Conflict

7 1957

"He lugged a rifle numb as a smashed arm."

The simile (k) of the rifle being like a broken limb, slowing him down, shows how the army weighs heavily.

9 1985

"A hundred agonies in black and white."

The juxtaposition (n) of agony as a fairly plain image shows the contrast between the victims and speaker.

5 1854

"…into the jaws of death/ into the mouth of hell."

The personification (l) of death having 'jaws' shows it can kill like wild animals.

6 1917

"Tonight this frost will fasten on this mud and us."

The metaphor (j) 'fasten' shows how the weather has power to hold them down.

Power of nature

8 1966

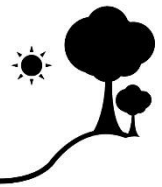
"We are bombarded by the empty air."

The air is personified (l) as being like a bomber plane.

2 1799

"A huge peak, black and huge… upreared its head."

The peak personified (l) as rising its 'huge' head shows how powerful nature appears, scaring the speaker.



Power of the individual / authority

4 1842

"I choose never to stoop."

The personal pronoun (m) 'I' shows how the Duke feels he is always central and most important.

3 1817

"My name is **Ozymandias**, king of kings."

The metaphor (j) 'king of kings' implies the tyrant (a) feels he is more powerful than all other rulers.

Effects of war

14 2008

"…his blood shadow stays on the street."

The imagery (o) of the blood being a shadow could imply it's following him, like his memories.

15 2009

"I traced the inscriptions on the war memorial."

The grieving speaker is visualising how her child could have joined the war-dead with the verb 'traced'.

11 2000s

"A shaven head full of powerful incantations."

The word 'incantations' implies the kamikaze pilot is under a spell and being controlled against their will.

Power of the state

1 1792

"I wander through each chartered street."

'Chartered' implies even the street is owned by the state.

13 2005

"Dem tell me wha dem want to tell me."

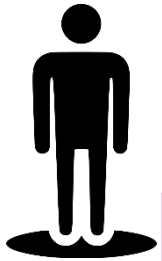
The repetition (p) of 'dem tell me' shows the control the state has to control what the speaker knows.

10 1993

"There once was a country… I left it as a child."

The war between tyrants (a) has forced the Émigré (q) to leave, making their country in the past tense.

Power of humans



12 2000s

"Fine slips from grocery shops… might fly our lives like paper kites."

The simile (k) of 'paper kites' shows how fragile our lives truly are being controlled by outside forces.

Keyword	Definition
J Metaphor	Comparing two unlike things by saying something is something else.
K Simile	Comparing two things by saying something is like something else.
L Personification	Giving non-human things human qualities.
M Personal pronouns	Words which replace names: I, you, he, she, it, we, they, me, him, her, us, and them .
N Juxtaposition	Where two things are placed together solely to compare them.
O Imagery	Descriptive language which helps to create an image for the reader.
P Repetition	Where a word or idea is reused often for a particular meaning.
Q Émigré	A person who has left their country for another. Often, they have been forced out.

Number on context page. 12 2000s

When written Quote: "blood shadow stays on the street"

Analysis of quote: The metaphor (j) 'king of kings' implies the tyrant feels he is above all of rulers.

Year 10 Maths KO

Year 10 – Maths – Unit A1 – Introduction to Algebraic Thinking

This tile represents the number 1:

This tile represents any number:

We can think of it as representing an *unknown number that can change its value*.
We call this a variable number or variable for short.

When we hold the tile, or work with it on-screen, it won't change size, but we know that its value can change.

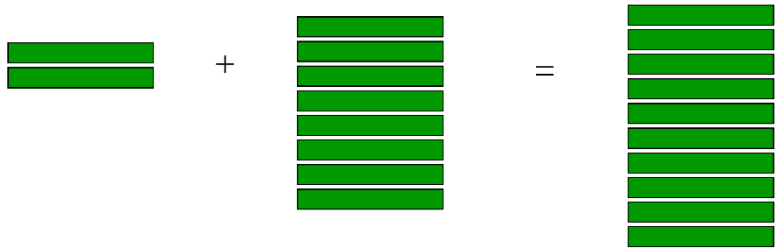
My mathematical journey

What do I need to remember from before?	What will I learn about in this unit?	Where does this lead?
Directed numbers (NP6)	Variable unknowns Algebraic expressions Substitution Equations	Simplifying expressions (A2) Multiplying expressions (A3) Linear equations (A4) Formulae (A5)

Generalising with tiles

The variable tile helps us to picture that

2 lots of a number + 8 lots of the same number = 10 lots of that number



2 + 8 = 10

Generalising with symbols

2 lots of a number + 8 lots of the same number = 10 lots of that number

2 · number + 8 · number = 10 · number

This is an awkward, long sentence to write. Let's shorten it.

$2 \cdot n + 8 \cdot n = 10 \cdot n$

Let's write n instead of 'number'.

$2n + 8n = 10n$

Let's not worry about writing the multiplication symbol.

2 + 8 = 10

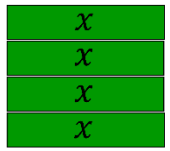
Key information

Remember, the letters stand for *unknown variable numbers* – numbers that we don't know and that can change their value.

x

These unknown variable numbers are called variables.
Any known, fixed numbers are called constants.

constant → $4x$ ← variable



So now we can say that an expression contains variables, constants and operations.

constant → $4x$ ← variable

operation of multiplication

Remember, $4x$ means "4 lots of a number", so we could write $4 \times x$ or $4 \cdot x$ but we don't write any symbol.

Everyone in mathematics knows not to write the multiplication symbol when working in algebra, so it doesn't get confusing.

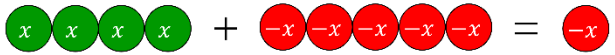
Keyword/ Skill	Definition/Tips
Variable	A number that can change its value, represented by a letter such as x or a green tile when we do not know its value.
Constant	A number that does not change, is fixed.
Operation	Something that takes input numbers and turns them into output numbers, such as =, -, x, and ÷, exponentiation and roots.
Term	The parts of an expression separated by + or -.
Expression	A mathematical statement written using symbols, numbers or letters.
Simplifying	Collect 'like terms'.
Substitution	In algebra it means replacing letters with numbers.
Equation	A statement showing that two expressions are equal.

Year 10 – Maths – Unit A1 – Introduction to Algebraic Thinking

Simplifying Expressions:

Sometimes it's easier to draw circle tiles.
Here how our last example looks with circle tiles.

$$4x - 5x = -x$$

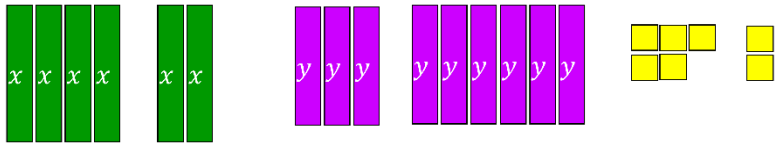


Notice how whenever we have one x we just write x, never $1x$.
This is the same with negatives. We don't write $-1x$, just $-x$.

Like terms:

To simplify expressions, we collect the like terms and simplify them.

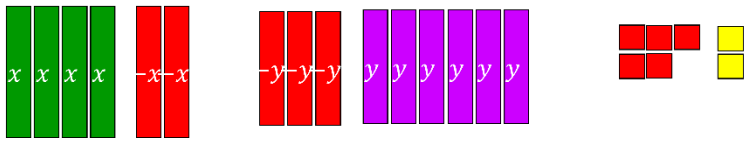
$$4x + 3y + 2x + 5 + 6y + 2$$



$$= 6x + 9y + 7$$

We always represent the negative of a number or variable with a red tile.
This means we have to remember to identify which terms are like terms without thinking about colour because all negative terms will be red.

$$4x - 3y - 2x - 5 + 6y + 2$$



$$= 2x + 3y - 3$$

Substitution:

When we substitute a number for x, we can picture the expression, then assign x that number.

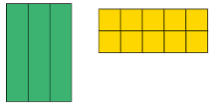
$2x + 5$ 

When $x = 4$, $2x + 5$ looks like this  and its value is 13.

When $x = 10$, $2x + 5$ looks like this  and its value is 25.

Let's evaluate $3x + 10$ when $x = 4$.

We have two ways of writing the working out.



$3x + 10$ when $x = 4$

$= 3 \cdot 4 + 10$
$= 12 + 10$
$= 22$

$= 3(4) + 10$
$= 12 + 10$
$= 22$

Let's evaluate $3x + 10$ when $x = -4$.

$3x + 10$ when $x = -4$

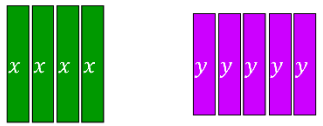
$= 3 \cdot -4 + 10$
$= 12 + 10$
$= 22$

$= 3(-4) + 10$
$= 12 + 10$
$= 22$

When x is substituted for a negative number, it's clearer to write a bracket around it.

When we have an expression with more than one variable, we can substitute different numbers for each.

$$4x + 5y$$



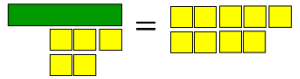
When $x = 2$ and $y = 1$, $4x + 5y = 4 \cdot 2 + 5 \cdot 1 = 13$
When $x = 8$ and $y = 10$, $4x + 5y = 4 \cdot 8 + 5 \cdot 10 = 82$
When $x = 5$ and $y = 5$, $4x + 5y = 4 \cdot 5 + 5 \cdot 5 = 45$

Solving Equations:

If we have an equation like

$$x + 5 = 9$$

we can work out what value of x makes it true. In this case $x = 4$.
We call this solving the equation. We say $x = 4$ is the solution to the equation.

$x + 5 = 9$ 

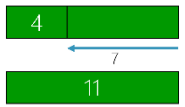
$$x + 5 = 4 + 5$$

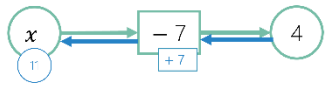
Comparing both sides of the equals sign, we see that $x = 4$ for this equation.

Some equations can be solved by thinking about fact families and inverse operations. We can use function machines to help us.
Here is an equation

$$x - 7 = 4$$

We can read it as "Take an unknown number, subtract 7, and we reach 4."





Inverse operations tell us to start at 4, add 7, and we'll reach x.

Every time we solve an equation, we double-check the solution by substituting it for x.

Our equation was $x - 7 = 4$.
We said the solution was $x = 11$.

We check by substituting 11 for x:

$$x - 7 = 4$$
$$11 - 7 = 4 \quad \checkmark$$

This quick check guarantees we've got the correct solution.

Year 10 – Maths – Unit A2 – Manipulating and simplifying expressions 1

ORMISTON SWB ACADEMY

This tile represents the number 1:

This tile represents any number:

We can think of it as representing an *unknown number that can change its value*.
We call this a variable number or variable for short.

When we hold the tile, or work with it on-screen, it won't change size, but we know that its value can change.

My mathematical journey

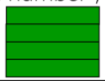
What do I need to remember from before?	What will I learn about in this unit?	Where does this lead?
Exponents (NP4) Directed numbers (NP6) Expressions (A1)	Adding and subtracting expressions Multiplying and dividing expressions Index laws Forming expressions	Expanding and factorising brackets (A3) Solving equations (A4) Quadratic expressions (A11)

Information to recall from unit A1

We learnt about expressions, which contain variables, constants and operations.

$4x$ — constant; variable; operation of multiplication

Remember, $4x$ means "4 lots of a number", so we could write $4 \times x$ or $4 \cdot x$ but we don't write any symbol.



Everyone in mathematics knows not to write the multiplication symbol when working in algebra, so it doesn't get confusing.

We learnt about terms.

$6x + 8y$ These are terms. They are separated by the + operator.

$\frac{a}{2} - 3$ These are terms. They are separated by the – operator.

$6x + 8y$ These are both positive terms. The terms are $6x$ and $8y$.

$\frac{a}{2} - 3$

$\frac{a}{2}$ is a positive term.

3 is a negative term, because subtracting 3 is the same as adding ⁻3.

The terms are $\frac{a}{2}$ and -3.

We learnt about like terms and unlike terms.

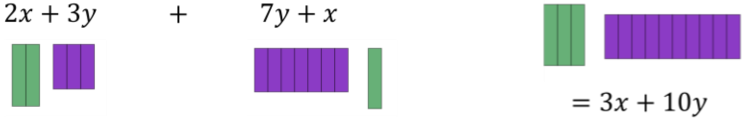
$4x + 3y + 2x + 5 + 6y + 2$

green is like green	green is unlike yellow
pink is like pink	yellow is unlike pink
yellow is like yellow	pink is unlike green

Adding and subtracting expressions

We can add expressions.

$2x + 3y \quad + \quad 7y + x$



$= 3x + 10y$

If you see a bracket around an expression, it can help you to think of it separately to everything else.

$$(2x + 3y) + (7y + x) = 3x + 10y$$

Expression 1 — Expression 2 — their sum

We can subtract expressions.

$(2x + 3y) \quad - \quad (7y + x)$

Remember that subtraction is the same as adding the inverse.

$(2x + 3y) \quad + \quad (-7y - x)$

$= x - 4y$

Keyword/ Skill	Definition/Tips
Variable	A number that can change its value, represented by a letter such as x or a green tile when we do not know its value.
Constant	A number that does not change, is fixed.
Operation	Something that takes input numbers and turns them into output numbers, such as +,-,x and ÷
Expression	A collection of constants, variables and operations.
Term	The parts of an expression separated by + or -.
Exponent	Is a count of how many variables to multiply together. Usually, they are written as x^n.

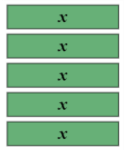
Year 10 – Maths – Unit A2 – Manipulating and simplifying expressions 1

Multiplying expressions:

We can multiply variables by constants.

$5 \times x$

$5 \cdot x$

5 lots of x →  → $5x$

$$5 \times x = 5x$$

Multiplication is commutative.

$$x \times 5 = 5 \times x$$

$$5x$$

We always write the constant before the variable.

$5 \times x \times 2$

$= 10x$

$3y \times 4$

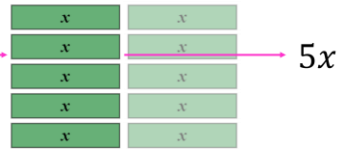
$= 12y$

Dividing Expressions:

We can divide variables by constants.

$10x \div 2$

$\frac{10x}{2}$

Half of $10x$ →  → $5x$

$$\frac{10x}{2} = 5x$$

Repeated multiplication and index notation (exponents):

We learnt in NP4 that we can use index notation to write repeated multiplication. $2 \times 2 \times 2 \times 2 \times 2 = 2^5$

We can also use index notation with variables. $x \cdot x \cdot x \cdot x \cdot x = x^5$

Multiplication index law

$x^2 \times x^3 = x^5$ means we have a total count of 5 xs multiplied together.

$y^4 \times y^5 = y^9$ means we have a total count of 9 xs multiplied together.

When we multiply powers with the same base, we can add their exponents.

Repeated multiplication

$(x^3)^6 = x^{18}$ means we had a count of three xs multiplied together and we repeated six times, to give a count of eighteen xs multiplied together.

$(y^4)^3 = y^{12}$ means we had a count of four ys multiplied together and we repeated three times, to give a count of twelve ys multiplied together.

When we find a power of a power, we can multiply the exponents together.

Division index law

$\frac{x^3}{x^2} = x$ means we had a count of three xs multiplied together, but we 'undid' two of them, leaving only one.

$\frac{y^7}{y^4} = y^3$ means we had a count of seven ys multiplied together, but we 'undid' four of them, leaving three.

When we divide powers with the same base, we can subtract their exponents.

Simplifying expressions with more complex terms

Now we can multiply two expressions together.

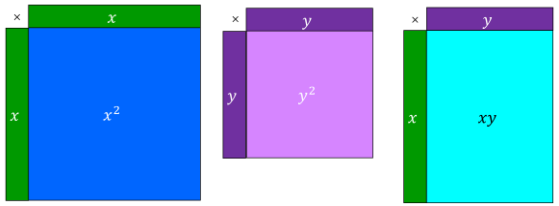
$2x \times 3y = 2 \cdot x \cdot 3 \cdot y = 6xy$

$2x \times 3x = 2 \cdot x \cdot 3 \cdot x = 6x^2$

$2x \times 3x \times y = 2 \cdot x \cdot 3 \cdot x \cdot y = 6x^2y$

Simplifying more complex expressions:

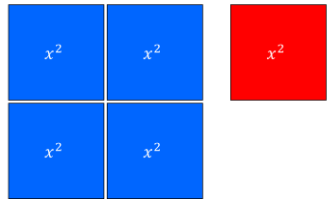
We can use algebra tiles to see other expressions.



All of these expressions, x^2, y^2 and xy are unlike and cannot be collected.

Zero pairs still work.

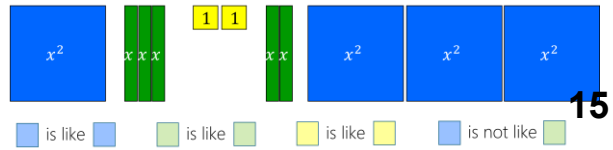
$4x^2 - x^2 = 3x^2$



We can use the x^2 tile to help us simplify more complex expressions.

We know that we can only add together like terms.

$x^2 + 3x + 2 + 2x + 3x^2 = 4x^2 + 5x + 2$



Forming expressions:

Whenever we do not know the value of a number, we can write a letter in its place.

We call this letter an unknown.

Writing unknowns works in the same way as writing numbers.

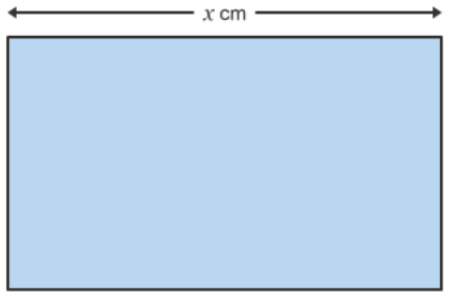
Example 1

Pens are sold in packs of 6 and rulers are sold in boxes of 10.
A teacher buys *p* packs of pens and *r* boxes of rulers.
Write an expression for the total number of pens and rulers bought.

There are 6 pens in each pack, so the number of pens bought is $6\times p$ which is $6p$.
There are 10 rulers in each box, so the number of rulers bought is $10\times r$ which is $10r$.
The number of pens and rulers bought is $6p + 10r$

Example 2

A rectangle has a width of x cm.
The height is 3 cm less than the width.
Write an expression for the perimeter of the rectangle.



The perimeter is found by adding together the lengths of the sides of a shape.
The width of the rectangle is given as x cm.
The height of the rectangle is 3 less than the width: $x-3$ cm
Perimeter = $x+x+(x-3)+(x-3)$
Perimeter = $(4x-6)$ cm

Example 3

Abi is x years old.
Bob is twice as old as Abi.
Cam is 3 years older than Bob.
Form an expression for Bob and Cam's ages in terms of x.

Bob → $2 \times x$
$2x$

Cam → Bob $+3$
$2x + 3$

Year 10 Maths – Unit A3 – Expanding & Factorising

Algebraic Notation

Each square represents the value of a
When we have 2 squares, we have **2 lots of a**
We write this as $2a$ and it is called a **term**.

If we add another amount of a, we write this as $2a + 5a$
This is called an **expression**.

When we work out the answer to this addition, the expression becomes an **equation**. $2a + 5a = 7a$

When terms are multiplied, they become squared.
We show this with a power/index of 2:

$$a \times a = a^2$$

Simplifying Expressions

Simplify:

$4r - 5s + 2rs - 8s - 3r$ Highlight the **like terms**.

$4r - 5s + 2rs - 8s - 3r$ Include the operation in front!

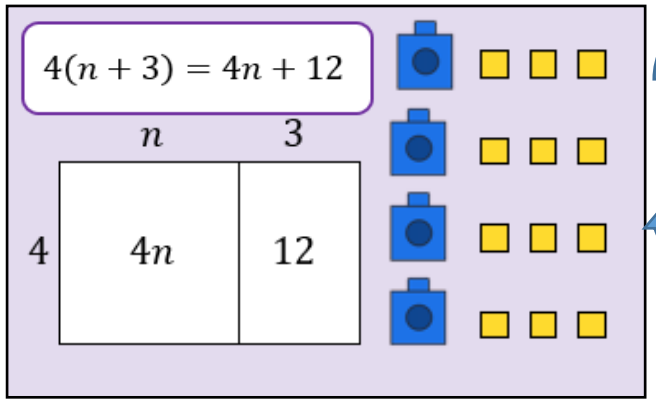
$4r - 3r - 5s - 8s + 2rs$ Collect the like terms together and add or subtract them to **simplify**.

$1r - 13s + 2rs$

Final answer is **r – 13s + 2rs**
(we don't write the 1)

Expanding brackets

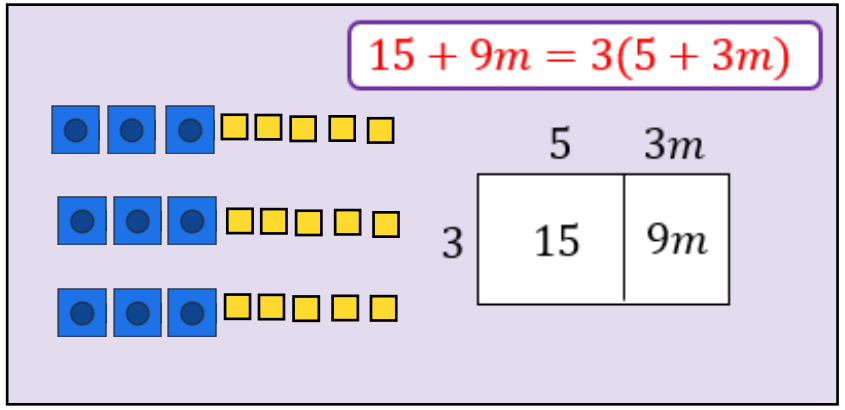
We can use the **distributive property** to expand brackets.



Factorising is the **inverse** of expanding

Factorising

We can **factorise** a number or expression by writing it as a product of two or more **factors**.



Other Topics/Units this could appear in:

- Expressions & substituting into simple formulae
- Expand and simplify
- Factorising
- Solving Equations
- Subject of
- Inequalities

Keyword/Skill	Definition/Tips
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Factorise	The **inverse** of **expand**. When we divide an **expression** by all **common factors** or **terms**, e.g. 6g + 4 = 2(3g + 2) and $a^2 - 2a = a(a - 2)$

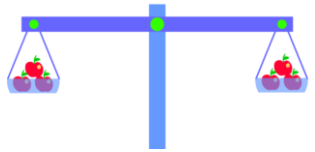
Year 10 Maths – Unit A4 – Linear Equations

Solving Equations

When we are solving equations, we need to figure out the value of the variable (usually a letter) in the equation.

Variable

$4x - 7 = 5$

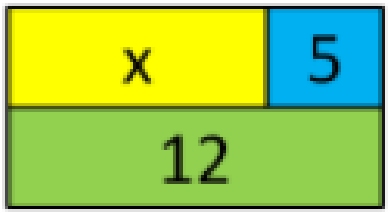


Equations work like a weighing scale; it must always be balanced/equal. If I remove something from one side, I need to remove the same from the other side to keep it balanced/equal.

One-Step Equations

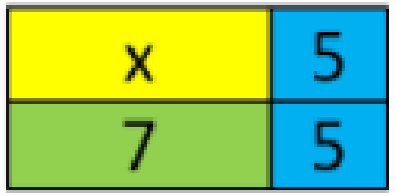
$x + 5 = 12$

This is a one-step equation. There is only one thing happening to the variable (add 5).



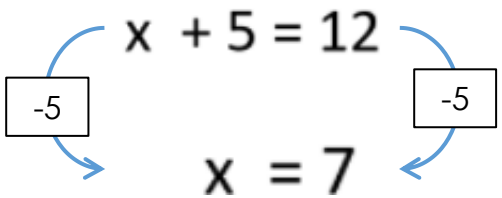
We can turn this into a bar model to help us solve it:

This shows that x+5 is equal to (the same as) 12.



If we take the 5 away from both bars we can see that x must be 7.

$x = 7$



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Factorise	The **inverse** of **expand**. When we divide an **expression** by all **common factors** or **terms**, e.g. 6g + 4 = 2(3g + 2) and $a^2 - 2a = a(a - 2)$

Year 10 Maths – Unit A4 – Linear Equations

Two-Step Equations

$2x + 12 = 28$

This is a one-step equation. There are two things happening to the variable (multiply by 2 and add 12).

This shows that 2x+12 is equal to (the same as) 28.

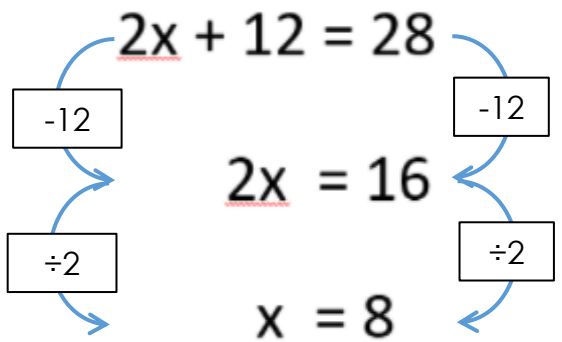
Take the 12 away from both bars.

We can now see that 2 x's are equal (the same as) to 16.

$2x = 16$

I have 2 x's so I divide 16 by 2 to work out the value of 1 x.

$x = 8$



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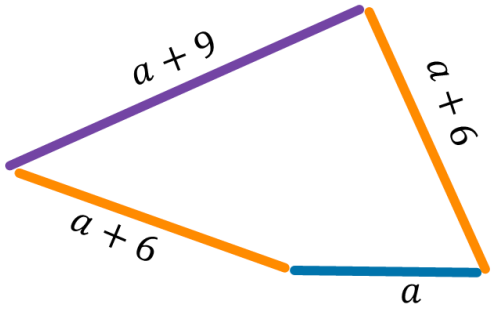
Year 10 Maths – Unit A4 – Linear Equations

Forming and Solving Equations (challenge)

Here is a four sided shape. The sides are labelled algebraically. We can find an expression for the perimeter by adding up the sides (like we do when finding the perimeter with numbered sides).



Here are my sides laid out next to each other ready to add together (you don't have to draw the sides, it's the labels that are important).

$$a + (a + 6) + (a + 9) + (a + 6)$$

= 4a + 21 (simplified)

I may then be told that the perimeter of my shape is actually 60cm. I can use this information to form an equation

$$4a + 21 = 60$$

This is a two-step equation that you can then solve (use the section on 'two-step equations' on the previous page).

Other Topics/Units this could appear in:

- Expressions & substituting into simple formulae
- Expand and simplify
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Keyword/Skill	**Definition/Tips**
Variable	A symbol for a number we do not know yet, it is usually a letter.
Term	Either a single number or a **variable,** such as 4 or n or 3a or 6y.
Expression	A mathematical statement written using **symbols**, **numbers** or **letters**.
Equation	A statement showing that **two expressions are equal.**
Formula	Shows the **relationship** between **two or more variables.**
Simplifying Expressions	**Collect 'like terms'.** Be careful with negatives. x^2 and x are not like terms.
Substitute	In algebra it means replacing letters with numbers.
Expand	When we **multiply** a **term** across a bracket, e.g. 3(a + 2) = 3a + 6
Factorise	The **inverse** of **expand**. When we divide an **expression** by all **common factors** or **terms**, e.g. 6g + 4 = 2(3g + 2) and $a^2 - 2a = a(a - 2)$

Year 10 Maths – Unit A5 - Formulae

Simplify:

$4r - 5s + 2rs - 8s - 3r$

Highlight the **like terms**.

Include the operation in front!

$4r - 5s + 2rs - 8s - 3r$

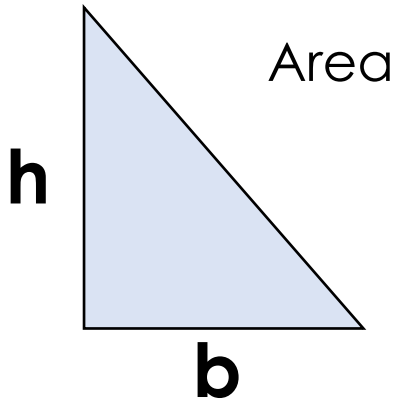
Collect the like terms together and add or subtract them to **simplify**.

$4r - 3r - 5s - 8s + 2rs$

$1r - 13s + 2rs$

Final answer is **r – 13s + 2rs** (we don't write the 1)

Example of formulae:



Area of a triangle:

$$\frac{b \times h}{2}$$

Keyword/Skill	Definition/Tips
Expression	One or a group of symbols representing a number or a value. Can contain numbers, variables & operations
Equation	Statement using an equals sign, to show two **expressions** are equal. 
Function	A mathematical relationship between two values
Operations	The four basic operations in maths: addition, subtraction, multiplication & division
Inverse Operations	The **operation** that reverses the effect of another operation. **Addition & subtraction are inverse operations** **Multiplication & division are inverse operations** 
Simplify	To remove unnecessary terms and numbers
Formula	A rule or fact written using mathematical symbols
Solve	To find the answer/value of something
Rearranging Formulae	Use inverse operations on both sides of the formula until you find the expression/equation for the letter you need.
'Subject of'	A certain variable needs to be by itself on one side of the equal sign Example: x = 4y + 10 x is the subject of this formula

Making the 'Subject of' (Rearranging Formulae)

In these types of questions, it will ask you to make a certain variable the 'subject of' the equation or formula. What this means is you need to use the solving equation method to isolate the variable it is asking for:

Ex1 Make y the subject of this formula:

$y + 81 = x + 100$

-81 -81

Here y is the variable we want to isolate (have by itself on one side of the equals sign).

$y = x + 19$

Ex2 Make x the subject of this formula:

$C = 4x + 5y$

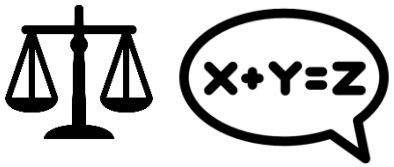
-5y -5y

$C - 5y = 4x$

÷4 ÷4

When you are dividing an expression, just write it as a fraction

$$\frac{C-5y}{4} = x$$



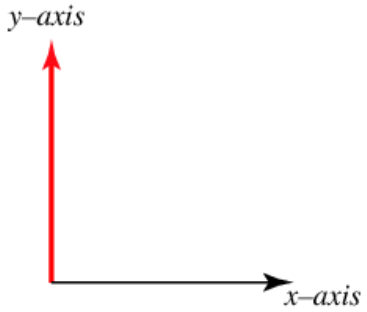
Other Topics/Units this could appear in:

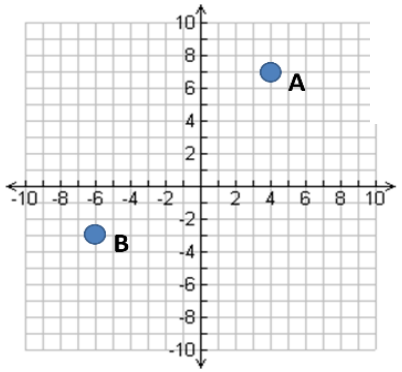
- Forming and Solving Equations
- Expanding and Factorising
- Simultaneous Equations
- Algebraic Fractions
- Algebraic Proof
- Rearranging Equations

Year 10 Maths – Unit A6 – The Cartesian Grid

Coordinates

The y axis is the vertical line and the x axis is the horizontal line

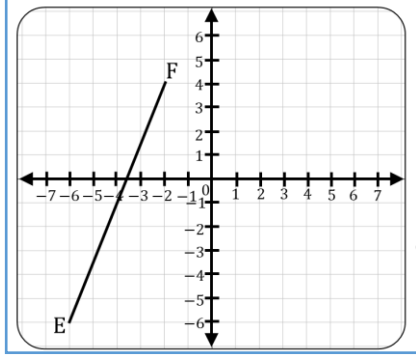




Written in **pairs as (x, y)**. The **first** term is the **x-coordinate** (movement **left or right**). The **second** term is the **y-coordinate** (movement **up or down**)

A (4, 7) B (-6, -3)

Line Segment



A **line segment** is the portion of a line that connects two points.

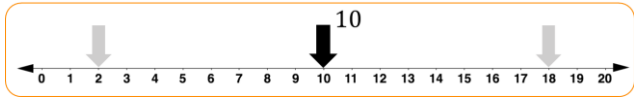
e.g. here the line segment is between E and F

Other Topics/Units this could appear in:

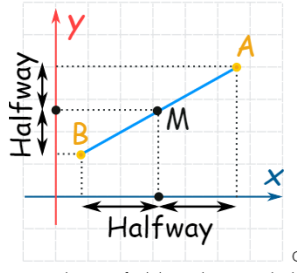
- Straight-line Graphs
- Transformations
- Similarity and Congruence in 2D
- Coordinate Geometry

Midpoint

The midpoint of a line is the coordinate **halfway** along the line segment

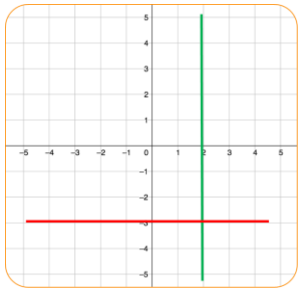


To find the midpoint of a number line, you can count halfway.



To find the midpoint of the line segment, you can find half way along the y axis and half way along the x axis.

Equation of a Line



Every point on the **red** line has a x-coordinate of -3.
The line has the equation $x = -3$

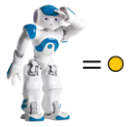
Every point on the **green** line has a y-coordinate of 2.
The line has the equation $y = 2$

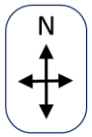
Directional Code in 2D

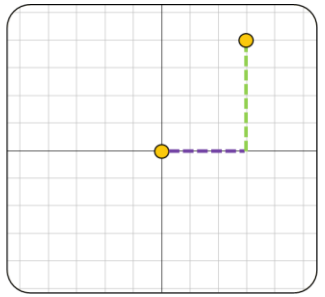
A robot can been coded using **two pieces** of code from the list of four:

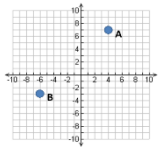
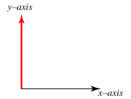
<north( )> <south( )> <east( )> <west( )>

<east(3)> <north(4)>



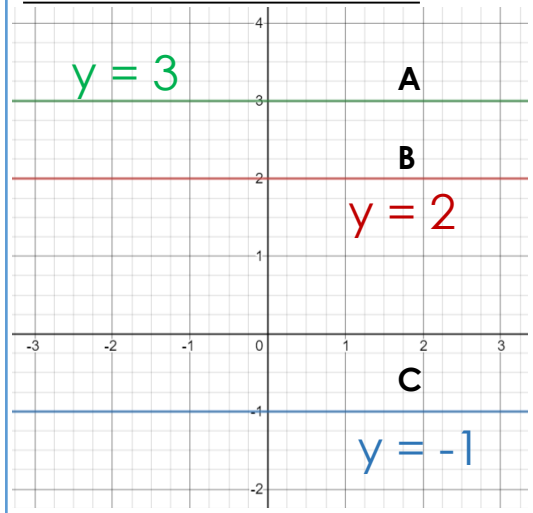




Keyword/Skill	Definition/Tips
Coordinate 	Written in **pairs** as (x, y). The **first** term is the **x-coordinate** (movement **left or right**). The **second** term is the **y-coordinate** (movement **up or down**)
Axis/Axes 	The lines that make up a graph. The y axis is the vertical line. The x axis is the horizontal line.
X-coordinate	This is the first term written in a coordinate, it represents where the coordinate is on the x axis (x, y)
Y-coordinate	This is the second term written in a coordinate, it represents where the coordinate is on the y axis (x, y)
Origin	The very middle of a graph, the coordinate of (0,0)
Line segment	A **line segment** is the portion of a line that connects two points.
Midpoint	The coordinate or point that is exactly in the middle of a line or line segment.
Directional 2D code	A set of directions for a robot, going from one point to another.
Equidistant	Equal distance i.e. two lines or points can be equidistant (an equal distance) from the origin.

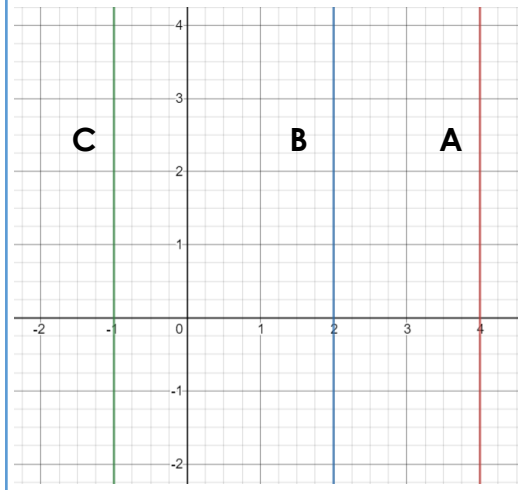
Year 10 Maths – Unit A6 – The Cartesian Grid

Horizontal & Vertical Lines



Horizontal line example:

Looking at the coordinates for line A
(-2,3) (-1,3) (0,3) (1,3) (2,3)
Every y-coordinate equals 3! Therefore the equation of line A is y = 3



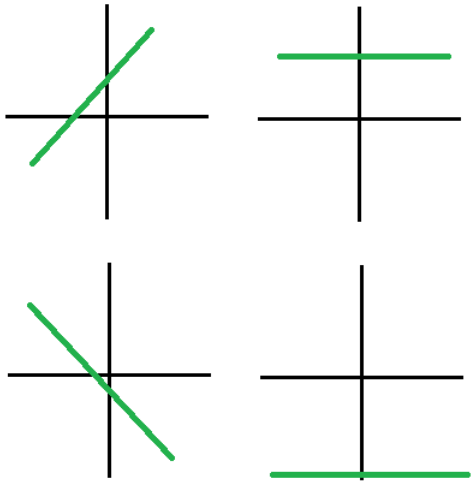
Vertical line example:

Looking at the coordinates for line A
(4,-1) (4,0) (4,1) (4,2) (4,3)
Every x-coordinate equals 4! Therefore the equation of line A is x = 4

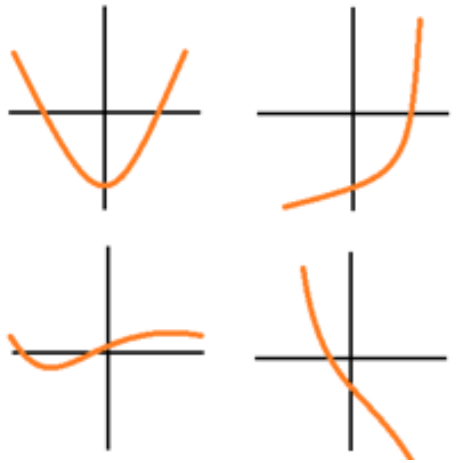
x = -1 x = 2 x = 4

Linear & Non-Linear Graphs

Linear Graphs



Non-Linear Graphs



Keyword/Skill	**Definition/Tips**
Coordinate	Written in **pairs** as (x, y). The **first** term is the **x-coordinate** (movement **left or right**). The **second** term is the **y-coordinate** (movement **up or down**)
Axis/Axes	The lines that make up a graph. The y axis is the vertical line. The x axis is the horizontal line.
X-coordinate	This is the first term written in a coordinate, it represents where the coordinate is on the x axis (x, y)
Y-coordinate	This is the second term written in a coordinate, it represents where the coordinate is on the y axis (x, y)
Linear Graph	A group of coordinates that form a straight line
Origin	The very middle of a graph, the coordinate of (0,0)
Region	The area of a graph that satisfies an inequality
Gradient	How steep a line is
Y-Intercept	The point where a line or a curve crosses the y-axis of a graph
Satisfy	A value (or values) that solve an equation or fits an inequality
Plane	A flat, two-dimensional surface
Horizontal	Going from side to side
Vertical	Going in an up-down direction

Other Topics/Units this could appear in:

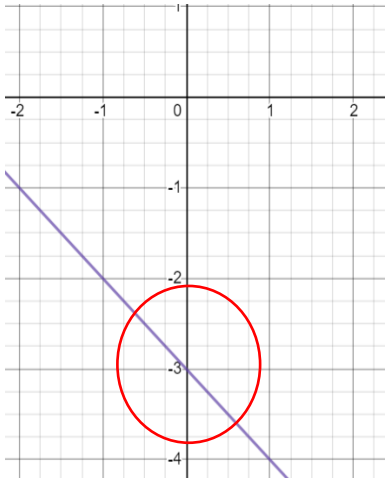
- Straight-line Graphs
- Transformations
- Similarity and Congruence in 2D
- Coordinate Geometry

Year 10 Maths – Unit A6 – The Cartesian Grid

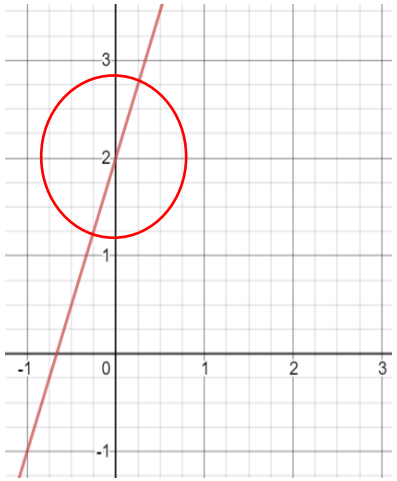
The Y-Intercept

The y-intercept is where the graph crosses the y-axis.
The x-coordinate where a graph crosses the y-axis is always 0.

The graph here crosses the y-axis at -3. The coordinate would be (0,-3)
That means the **y-intercept is -3.**

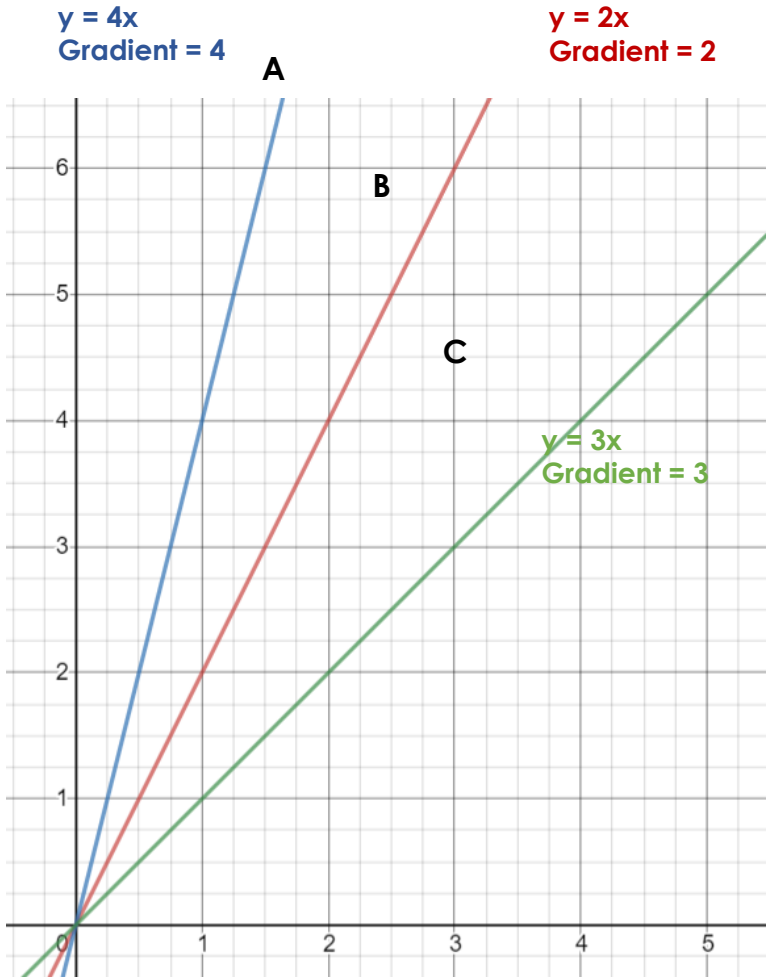


The graph here crosses the y-axis at 2. The coordinate would be (0,2)
That means the **y-intercept is 2.**



Gradient of a Line

The gradient is the rate of change of y with respect to x. It tells us how much y increases or decreases when x is increased by 1



Line A represents the relationship y = 4x
When x increases by **1**, y increases by **4**. That means the gradient of Line A is **4**.

Keyword/Skill	**Definition/Tips**
Coordinate	Written in **pairs** as (x, y). The **first** term is the **x-coordinate** (movement **left or right**). The **second** term is the **y-coordinate** (movement **up or down**)
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Satisfy	A value (or values) that solve an equation or fits an inequality
Plane	A flat, two-dimensional surface
Horizontal	Going from side to side
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Other Topics/Units this could appear in:

- Straight-line Graphs
- Transformations
- Similarity and Congruence in 2D
- Coordinate Geometry

Year 10 Maths – Unit A6 – The Cartesian Grid

Finding the Equation of the Graph/Line

We can find the equation of the graph by looking for the gradient and the y-intercept of the line.

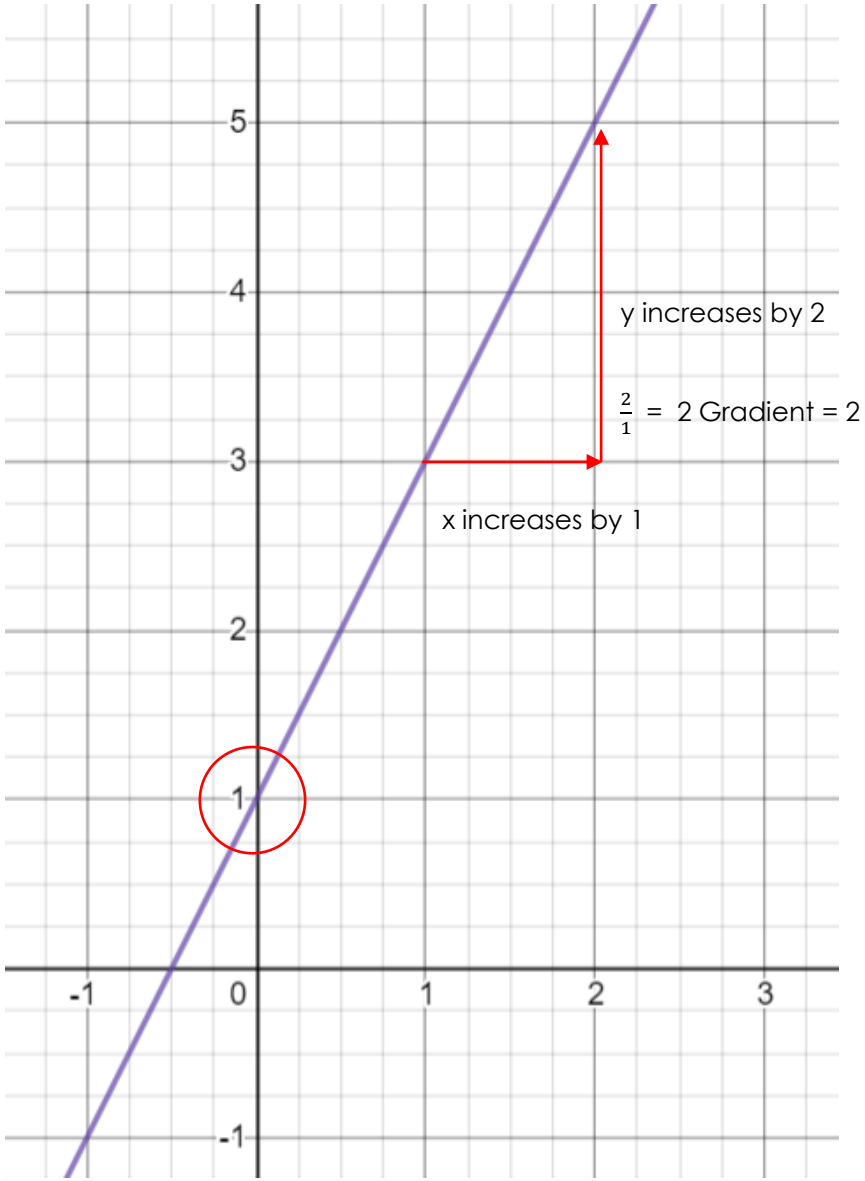
When x increases by 1, y increases by 2. That means the gradient of the line is 2.
Looking where the graph crosses the y-axis (when the x-coordinate equals 0) then we can see the y-intercept is 1.

We can represent this as:
y = 2x + 1

Gradient = +2

Y intercept = +1

What this equation means, is you take the x-coordinate and multiply it by 2 (the gradient) then add 1 to get the y-coordinate.
E.g. x = 1 (2 x 1) + 1 = 3 y = 3 (1,3)



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Other Topics/Units this could appear in:
- Straight-line Graphs
- Transformations
- Similarity and Congruence in 2D
- Coordinate Geometry

Year 10 – Maths – Unit A7 – Sequences

Finding Missing Terms

A sequence follows a pattern. Once you recognise that pattern you can find missing terms, or the next terms in the sequence.

Example:
1, 5, 9, 13, 17, … , …

If we want to find the next two terms, we can see the pattern/rule here is adding 4. So, the next two terms will be 21 and 25.

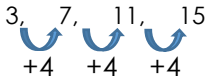
When there is more than one gap between terms in a linear sequence you can think about how much two 'jumps' are worth to find the common difference.
Example
4, … , 16, … , 28,

Two jumps is worth 12. One jump must be 6. The difference between each term is 6. The missing terms will then be 10 and 22.

Term to Term Rule

2, 6, 10, 14… This sequence follows the rule "add 4"
81, 27, 9, 3… This sequence follows the rule "divide by 3"
5, 8, 14, 23… This sequence follows the rule "add 3, add 6, add 9…"

You may be given the starting number then the rule.
Example Start at 3 add 4 each time



Position to Term Rule (Using the nth Term)

The nth term can be used to find any term in a sequence. To use the nth term you substitute in the value of the position you need.

Example
If the nth term is $3n - 5$ and you need to find the 10th term:

Substitute $n = 10$ into the nth term

$(3 \times 10) - 5 = 25$

10th Term = 25

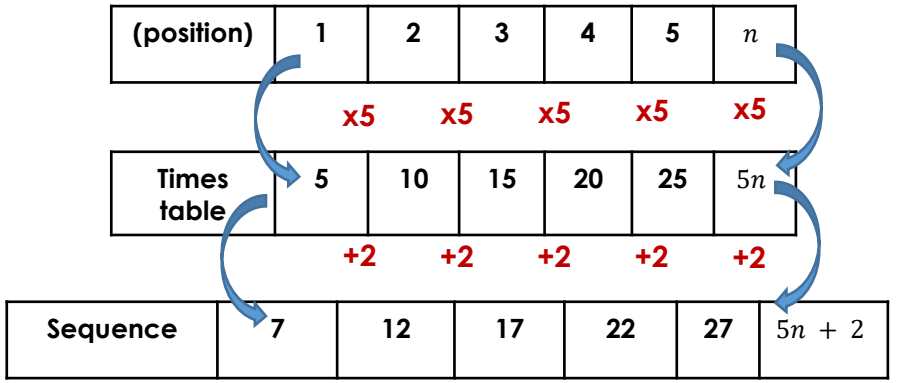
Finding the nth term

To find the nth term of a sequence, you first start by finding the difference of each term.

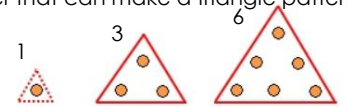
7, 12, 17, 22, 27, 32, 37, …

+5 +5 +5 +5 +5 +5

The difference between each term is 5. That means the sequence has something to do with the 5 times table, we can call this $\mathbf{5n}$
Then see what you need to do from the 5 times table to get to the number in the sequence



Therefore, the nth term of the sequence = $\mathbf{5n + 2}$

Keyword/Skill	Definition/Tips
Sequence	An ordered list of numbers or objects arranged according to a rule
Term	One of the numbers/objects in a sequence
Arithmetic/ Linear Sequence	A **sequence** made by adding or subtracting the same value
Geometric Sequence	A **sequence** made by multiplying by the same value each time.
Term to term rule	A rule that allows you to find the next **term** in a sequence if you know the previous term
nth term	The rule for finding any value in the sequence. Also called the Position to Term rule
Triangular Number	A number that can make a triangle pattern. E.g. 
Fibonacci Sequences	A sequence where the next number is found by adding up the previous two terms
Function	A special relationship where each input has a single output
Coefficient	A number used to multiply a variable 

Other topics/units this could appear in:

- Rearranging Equations
- Quadratic Sequences
- A Level Topics

Exam!

All sequences are not linear. If a sequence is going up by a different number each time, it can still be a sequence, it means it's just not linear.

Year 10 – Maths – Unit A7 – Sequences

Using the Nth Term

You can determine if a number is a term in a sequence by making it equal to the nth term and then solving the equation.
If the answer is an integer, then it is part of the sequence. If the answer is a decimal/fraction it is not part of the sequence.

Is 811 part of the sequence $8n - 5$?

$8n - 5 = 811$

$+5 \quad +5$

$8n = 816$

$\div 8 \quad \div 8$

$n = 102$ **Yes!**

Is 689 part of the sequence $5n + 6$?

$5n + 6 = 689$

$-6 \quad -6$

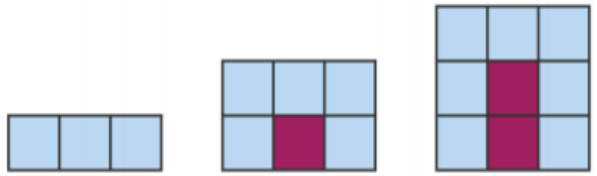
$5n = 683$

$\div 5 \quad \div 5$

$n = 136.6$ **No!**

Recognising Patterns from Diagrams

A number pattern in a diagram often requires counting shapes to find the rule. Look at how the pattern grows from one term to the next.



Pattern 1
0 purple
3 blue
3 in total

Pattern 2
1 purple
5 blue
6 in total

Pattern 3
2 purple
7 blue
9 in total

You can now predict that in pattern 4 there will be:
3 purple, 9 blue and 12 in total.

Special Sequences

There are some sequences you will need to recognise that aren't linear sequences.

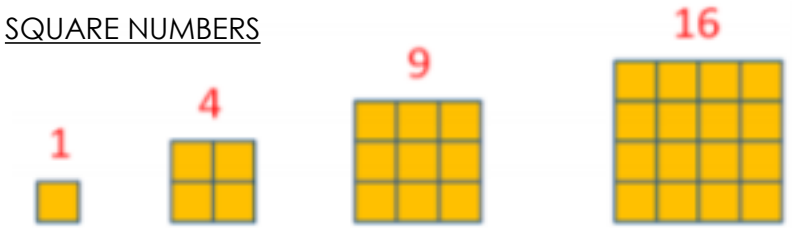
Square numbers – 1, 4, 9, 16, 25, 36, …

Cube Numbers – 1, 8, 27, 64, 125, 216, …

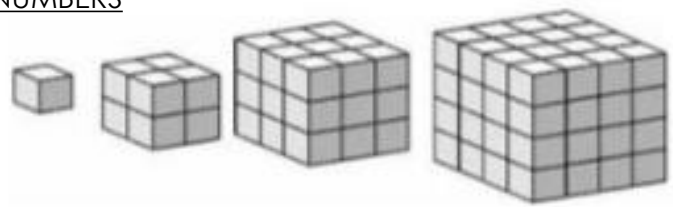
Triangle Numbers – 1, 3, 6, 10, 15, 21, 28, …

A Fibonacci Sequence – 1, 1, 2, 3, 5, 8, 13, 21, …

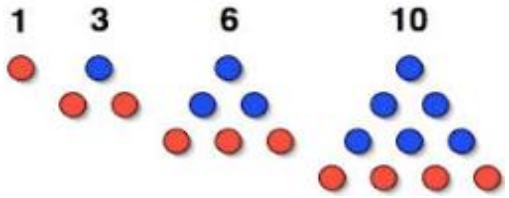
SQUARE NUMBERS



CUBE NUMBERS



TRIANGULAR NUMBERS



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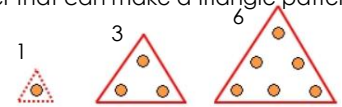
Arithmetic/ Linear Sequence	A **sequence** made by adding or subtracting the same value
Geometric Sequence	A **sequence** made by multiplying by the same value each time.
Term to term rule	A rule that allows you to find the next **term** in a sequence if you know the previous term
nth term	The rule for finding any value in the sequence. Also called the Position to Term rule
Triangular Number	A number that can make a triangle pattern. E.g. 
Fibonacci Sequences	A sequence where the next number is found by adding up the previous two terms
Function	A special relationship where each input has a single output
Coefficient	A number used to multiply a variable 

Other topics/units this could appear in:

- Rearranging Equations
- Quadratic Sequences
- A Level Topics

Exam!

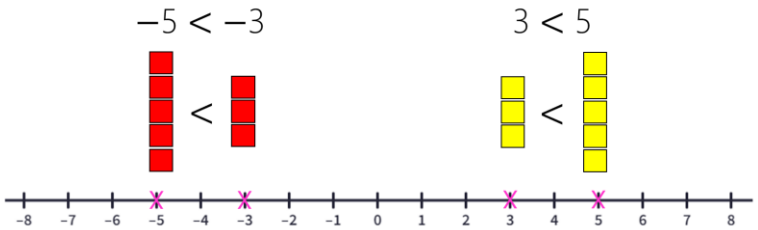
All sequences are not linear. If a sequence is going up by a different number each time, it can still be a sequence, it means it's just not linear.

Year 10 – Maths – Unit A8 – Linear Inequalities

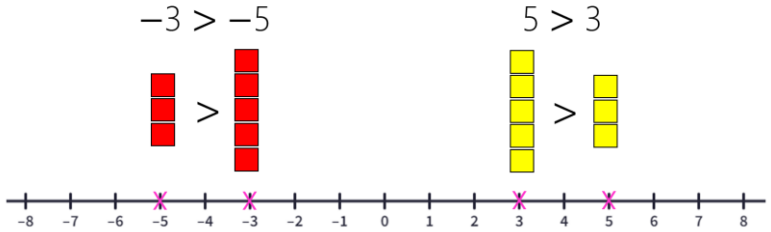
Inequality Symbols

$<$ - Less than $>$ Greater than
$\leq$ - Less than or equal to $\geq$ Greater than or equal to

$x < 2$ means x is less than 2
$x \leq 2$ means x is less than or equal to 2
$x > 2$ means x is more than 2
$x \geq 2$ means x is more than or equal to 2



Less than means to the left on the number line.
Sometimes this is smaller in magnitude, sometimes it is not.



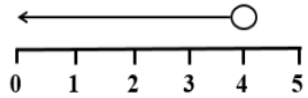
Greater than means to the right on the number line.
Sometimes this is bigger in magnitude, sometimes it is not.

Representing inequalities on a number line

Symbol	Circle	Direction of Arrow
<	Open ○	Left
>	Open ○	Right
≤	Closed ●	Left
≥	Closed ●	Right

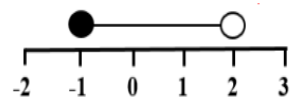
We use open and/or closed circles to represent inequalities on a number line. A closed circle means that the number **is** included in the represented group of values. An open circle means that the number **is not** included in the represented group of values.

The inequality $x < 4$, would be represented like this.



We call this a comparative inequality. That is because there are an infinite amount of numbers less than 4 that we are comparing to our inequality.

$-1 \leq x < 2$ would look like this.



This is a restrictive inequality as we have a lower and upper limit for the inequality. It is either equal to or greater than -1 and it is less than 2.

Keyword/Skill	Definition/Tips
Integer	Whole number including 0 and negative numbers. No fractions or decimals.
Inequality	Compares two values showing if one is less than, greater than or not equal.
Greater than	One number is BIGGER than another number.
Less than	One number is SMALLER than another number.
Equal to	Two things have the SAME value.
Equation	Says that two things are equal. (1 + 1 = 2).
Satisfy	A value that solves an equation. E.g. 2x + 1 = 9 x =4 so x=4 satisfies the equation.
Variable	A symbol for a number we don't know yet, usually a letter.
Coefficient	A number used to multiply a variable. E.g. 6y = 6 x y . y is the variable and 6 is the coefficient.
Inverse	Opposite of (i.e. x and ÷, + and -)
Comparative Inequality	An inequality with one limit. Comparing a number to other values.
Restrictive Inequality	An inequality with an upper and lower limit.

Year 10 – Maths – Unit A8 – Linear Inequalities

Solving Inequalities

We can solve inequalities the same way that we solve equations.

Example 1:

$2x + 1 \leq 9$
$(-1) \quad (-1)$

$2x \leq 8$
$(\div 2) \quad (\div 2)$

$x \leq 4$

You may get asked to represent your solution on a number line

Unlike equations, with inequalities we get a set of many solutions.

Example 2:

$4x + 3 > 12 + x$
$(-x) \quad (-x)$

$3x + 3 > 12$
$(-3) \quad (-3)$

$3x > 9$
$(\div 3) \quad (\div 3)$
$x > 3$

We can solve restrictive inequalities the same way but treat them as two separate inequalities.

Example:

$-3 \leq 2x + 3 < 10$

$-3 \leq 2x + 3$ and $2x + 3 < 10$
$(-3) \quad (-3)$ and $(-3) \quad (-3)$

$-6 \leq 2x$ and $2x < 7$
$(\div 2) \quad (\div 2)$ and $(\div 2) \quad (\div 2)$

$-3 \leq x$ and $x < 3.5$

$-3 \leq x < 3.5$

When we multiply or divide both sides of an inequality by a negative number, we must rotate the inequality sign to keep a true statement.

$x > 2$ Some values of x: 3, 4, 5, ...
$(\times -1)$ $(\times -1)$
$-x < -2$ Some values of $-x$: $-3, -4, -5$

Example:

$4 - 3x > 12$
$(-4) \quad (-4)$

$-3x > 9$
$(\div (-3)) \quad (\div (-3))$

$x < -3$

Whenever we solve an inequality (or an equation) we want to have the positive x not the negative x.

Keyword/Skill	Definition/Tips
Integer	Whole number including 0 and negative numbers. No fractions or decimals.
Inequality	Compares two values showing if one is less than, greater than or not equal.
Greater than	One number is BIGGER than another number.
Less than	One number is SMALLER than another number.
Equal to	Two things have the SAME value.
Equation	Says that two things are equal. (1 + 1 = 2).
Satisfy	A value that solves an equation. E.g. 2x + 1 = 9 x =4 so x=4 satisfies the equation.
Variable	A symbol for a number we don't know yet, usually a letter.
Coefficient	A number used to multiply a variable. E.g. 6y = 6 x y . y is the variable and 6 is the coefficient.
Inverse	Opposite of (i.e. x and ÷, + and -)
Comparative Inequality	An inequality with one limit. Comparing a number to other values.
Restrictive Inequality	An inequality with an upper and lower limit.

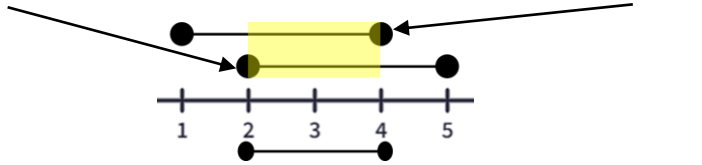
Year 10 – Maths – Unit A8 – Linear Inequalities

Solving Systems of Linear Inequalities

Sarah will be at the park from 2 p.m. until 5 p.m.

Joanna will be at the park between 1 p.m. and 4 p.m.

$2 \leq x \leq 5$ $\quad$ $1 \leq x \leq 4$



They will be at the park together from 2 p.m. until 4 p.m.

$2 \leq x \leq 4$

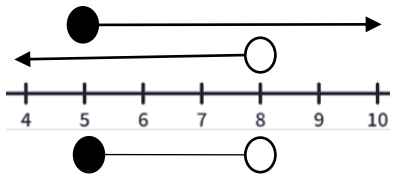
This is solving systems of linear inequalities. It is when we find values that satisfy two (or more) inequalities.
You may need to solve inequalities before you do this.

Example:
Find the set of numbers that satisfy both inequalities and draw a number line to represent it:

$2x \geq 10$
$x + 1 < 9$

$2x \geq 10$
$(\div 2) \quad (\div 2)$
$x \geq 5$

$x + 1 < 9$
$(-1) \quad (-1)$
$x < 8$

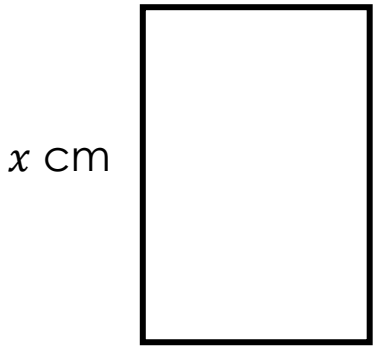


$5 \leq x < 8$

Inequalities in Context

We can form and solve an inequality when we see phrases like, "less than," "greater than," "at least," "at most" and more.

Example:
The width of a rectangle is 4cm and its height is unknown.
The area is at least 24cm^2
What can we say about its height?



$A \geq 24cm^2$

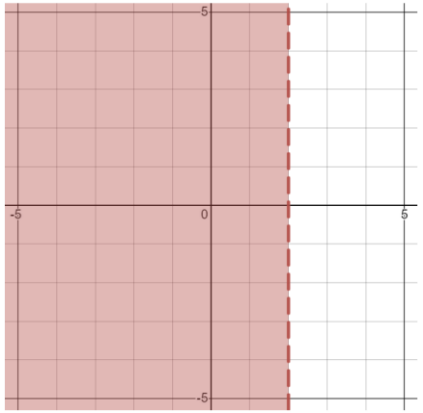
$4x \geq 24cm^2$
$(\div 4) \quad (\div 4)$
$x \geq 6cm$

The height is at least 6cm

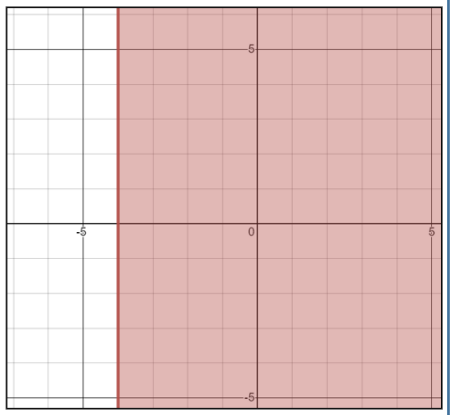
Representing Inequalities on a Graph

We can represent inequalities on a graph by shading the correct region. When the inequality uses ≤ or ≥ then we use a solid line. We use a dotted line when it involves < or >.
Shade the correct region based on the inequality.

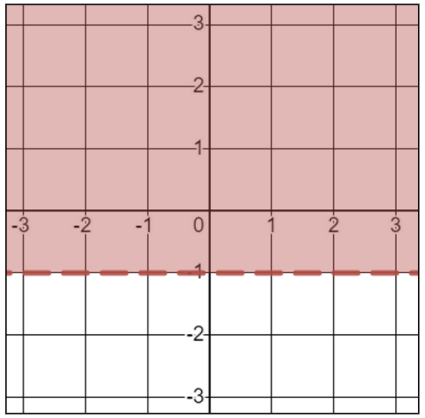
This is the region $x < 2$.



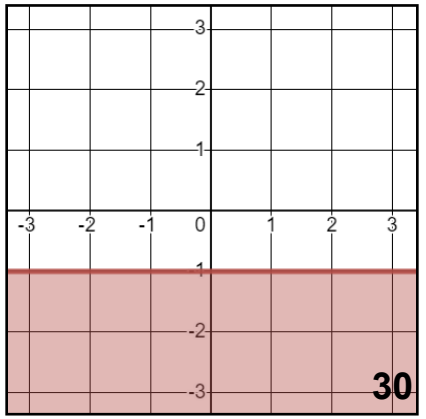
This is the region $x \geq -4$.



This is the region $y > -1$.



This is the region $y \leq -1$.



Year 10 – Maths – Unit A11 – Manipulating & Simplifying Expressions 2

Multiplication Law

$a^m \times a^n = a^{m+n}$ Ex1: $5^4 \times 5^9 = 5^{4+9} = 5^{13}$

Ex2: $3a^5 \times 4a^6 = (3 \times 4) \times a^{5+6} = 12a^{11}$

Division Law

$a^m \div a^n = a^{m-n}$ Ex1: $8^{12} \div 8^7 = 8^{12-7} = 8^5$

Ex2: $12a^{18} \div 6a^{10} = (12 \div 6) \times a^{18-10} = 2a^8$

Brackets Law

$(a^m)^n = a^{m \times n}$ Ex1: $(10^2)^4 = 10^{2\times4} = 10^8$

Ex2: $(5a^8)^2 = 5^2 \times a^{8\times2} = 25a^{16}$

Power of Zero

Anything to the power of zero is equal to 1.

$a^0 = 1$ $8^0 = 1$ $129487893^0 = 1$

Keyword/Skill	Definition/Tips
Index (Plural-Indices)	A small number placed to the upper-right of a number. It shows the number of times the base number is multiplied by itself.
Base	The number the index is acting upon. 3 is the base and 2 is the index. 3^2
Index Form	Writing numbers in terms of powers E.g. 6 x 6 x 6 x 6 = 6^4 <- This is in index form
Index Laws	A collection of rules we use for simplifying expressions
Notation	A system of symbols used to represent something

Other Topics/Units this could appear in:

- Negative & Fractional Index Laws
- Surds including rationalising
- Algebraic Fractions
- Algebraic Proof
- Standard Form
- Expanding & Simplifying
- A-Level – Core – Algebra & Functions

It is only possible to use each of these laws when the base is the same.
Sometimes, we can manipulate the base to ensure this is the case.

Ex: $8^3 \times 4^2 \times 2^5$

8 and 4 can both be written as powers of 2, $8 = 2^3$ and $4 = 2^2$

Therefore, we can rewrite this question with all terms having the same base.

$(2^3)^3 \times (2^2)^2 \times 2^5$ This can now be simplified using the laws from above

$2^9 \times 2^4 \times 2^5 = 2^{9+4+5}$

$= 2^{18}$

Year 10 – Maths – Unit A11 – Manipulating & Simplifying Expressions 2

Expanding Single Brackets

When you are expanding brackets you need to multiply all the terms inside the bracket by the term on the outside.
The grid method is useful when we are expanding brackets.

Example: Expand y(3y - 5)

y(3y - 5)

x	3y	- 5
y	$3y^2$	- 5y

= **$3y^2$ - 5y**

Expanding Pairs of Single Brackets

Example: Expand & Simplify 4(a – 2) + 3(2a + 5)
Expand each bracket separately and then simplify your answer:

4(a – 2)

x	a	- 2
4	4a	- 8

4a – 8

3(2a + 5)

x	2a	+ 5
3	6a	15

6a + 15

Then simplify: 4a – 8 + 6a + 15 = **10a + 7**

Expanding Triple Brackets

Example 1: Expand and simplify: $(x + 3)(x - 2)(x + 1)$
When expanding triple brackets expand the first pair of brackets:

$(x + 3)(x - 2)$

x	x	+ 3
x	x^2	$3x$
-2	$-2x$	-6

$x^2 + 3x - 2x - 6 = x^2 - x - 6$

Then we are left with: $(x^2 - x - 6)(x + 1)$
We now expand these brackets, making sure to multiply every term in the first bracket by everything in the second bracket

$(x^2 - x - 6)(x + 1)$

x	x^2	$-x$	-6
x	x^3	$-x^2$	$-6x$
+1	x^2	$-x$	-6

Finally, simplify your answer:

$$x^3 + x^2 - x^2 - x - 6x - 6 = \mathbf{x^3 - 7x - 6}$$

Expanding Double Brackets

When expanding double brackets, we can still use grid method to help us. You then need to simplify your answer at the end
Ex1: Expand (a + 4)(a + 5)

(a + 4)(a + 5)

x	a	+ 4
a	a^2	4a
+5	5a	20

= a^2 + 4a + 5a + 20

= **a^2 + 9a + 20**

Be careful when simplifying your answer if negatives are involved.
Ex2: Expand (y + 3)(y – 6)

(a + 4)(a + 5)

x	y	-6
y	y^2	-6y
+3	3y	-18

= y^2 – 6y + 3y -18

= **y^2 – 3y - 18**

Keyword/Skill	Definition/Tips
Expression	One or a group of symbols representing a number or a value. Can contain numbers, variables & operations
Variable	A symbol for a number we do not know yet
Simplify	To reduce an expression to the smallest number of terms.
Expand	To multiply out terms to remove the brackets () (Opposite of **factorise**)
Coefficient	A number used to multiply a variable 
Factorise	Write an expression as a product of its factors. (Opposite of **expanding**)
Power/Index	The number of times a number is multiplied by itself. E.g. 10^3 <-This means multiply 10 by itself 3 times -> 10 x 10 x 10
Quadratic	An expression where the highest power is 2 Ex: x^2
Cubic	An expression where the highest power is 3 Ex: x^3
Term	A single number or a variable

Other Topics/Units this could appear in:

- Forming and Solving Equations
- Quadratics
- Expanding & Factorising (Working Above)
- Algebraic Fractions
- Algebraic Proof
- Simultaneous Equations

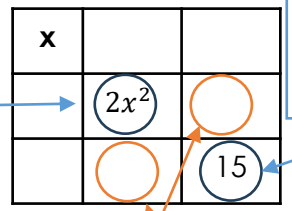
Year 10 – Maths – Unit A11 – Manipulating & Simplifying Expressions 2

Factorising a Quadratic with a Coefficient of x^2 greater than 1

Example: Factorise: $2x^2 + 11x + 15$

We can start this in the same way by filling in a multiplication grid.

We know from expanding that the x^2 term will come from here



And the constant 15 will come from here

We also know, that the terms in the two empty boxes need to sum to make $11x$.

In order to decide on the terms that go in these boxes, we need 2 numbers that will sum to make $11x$, but their coefficients need to multiply to make 30.
30 comes from multiplying the 2 from $2x^2$ and 15 together.
This is so that they share a factor with $2x^2$ and 15 to help with factorising.
Pairs of factors of 30 are

1 and 30 3 and 10
2 and 15 5 and 6

So the numbers we need are 5 and 6.

x		
	$2x^2$	$5x$
	$6x$	15

Now we need to factorise each row to find what has been expanded to get this quadratic expression.

x	2x	5
x	$2x^2$	$5x$
3	$6x$	15

Therefore

$$2x^2 + 11x + 15 = (2x + 5)(x + 3)$$

General quadratic expression: **a**x² + **b**x + **c**
(where **a**, **b** and **c** are number values) **a ≠ 0**

Changing the subject of a formula when a subject appears twice

Example Make x the subject $3x + 5 = y - ax$

Get any term involving the variable you want on one side of the equals sign.

$$3x + 5 = y - ax$$

$+ax$ $+ax$

$$3x + ax + 5 = y$$

-5 -5

$$3x + ax = y - 5$$

Now we factorise out x:

$$x(3 + a) = y - 5$$

Finally divide by the factor $(3 + a)$ to isolate x.

$$x = \frac{y - 5}{3 + a}$$

Simplifying an expression by factorising out a bracket

You may need to simplify an expression that looks like this

$$5(x^2 - 1) + 2(x + 1)$$

You could solve this by expanding both sets of brackets and then simplifying and factorising.

However, it may sometimes be quicker to fatorise straightaway.

$x^2 - 1$ is an example of difference of two squares, so can be factorised as $(x + 1)(x - 1)$. So,

$$5(x^2 - 1) + 2(x + 1) = 5(x + 1)(x - 1) + 2(x - 1)$$

Both of these terms now share a factor $(x - 1)$. Therefore,

$$= (x - 1)(5(x + 1) + 2)$$
$$= (x - 1)(5x + 5 + 2)$$
$$(x - 1)(5x + 7)$$

Keyword/Skill	Definition/Tips
Expression	One or a group of symbols representing a number or a value. Can contain numbers, variables & operations
Identity	An equation that is true no matter what values are chosen
Variable	A symbol for a number we do not know yet
Simplify	To remove unnecessary terms and numbers
Expand	To multiply out terms to remove the brackets () (Opposite of **factorise**)
Coefficient	A number used to multiply a variable Coefficient Variable 4x
Factor	An integer that divides the number exactly leaving no remainder
Factorise	Write an expression as a product of its factors. (Opposite of **expanding**)
Power/Index	The number of times a number is multiplied by itself. E.g. 10^3 <-This means multiply 10 by itself 3 times -> 10 x 10 x 10
Quadratic	An expression where the highest power is 2 Ex: x^2
Term	A single number or a variable
Highest Common Factor (HCF)	The highest number or variable that divides exactly into two or more numbers or variables
Difference of two squares	Two terms that are squared and separated by a subtraction sign E.g. $a^2 - b^2$

Other Topics/Units this could appear in:

- Forming and Solving Equations
- Quadratics
- Algebraic Fractions
- Algebraic Proof
- Simultaneous Equations
- A Level Topics

Year 10 – Maths – Unit A11 – Manipulating & Simplifying Expressions 2

Simplifying Algebraic Fractions

To simplify any fraction you need to find a common factor of the **numerator** and the **denominator.**
This isn't always just a number, with algebraic fractions it can be letters too.

Example 1: Simplify: $\frac{45abc}{60a}$

Here 15a is a common factor so we can divide by $\frac{15a}{15a}$

$$= \frac{45abc}{60a} \div \frac{15a}{15a}$$

$$= \frac{3bc}{4}$$

Example 2: Simplify: $\frac{(x+3)(x+6)}{x+3}$

Here(x + 3) is a common factor so we can divide by $\frac{(x+3)}{x+3}$

$$\frac{x+6}{1} = x + 6$$

Example: Simplify: $\frac{x^2+5x+4}{x^2+4x+3}$

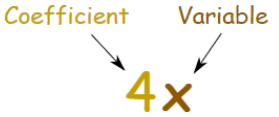
Here there is not obvious common factor of the numerator and denominator. So we need to factorise them.

Factorise: $x^2 + 5x + 4$
$= (x + 4)(x + 1)$
Factorise: $x^2 + 4x + 3$
$= (x + 3)(x + 1)$

$$\frac{(x + 4)(x + 1)}{(x + 3)(x + 1)} \div \frac{x + 1}{x + 1}$$

Now (x + 1) is a common factor, so we can divide by $\frac{x+1}{x+1}$

$$= \frac{x+4}{x+3}$$

Keyword/Skill	Definition/Tips
Expression	One or a group of symbols representing a number or a value. Can contain numbers, variables & operations
Identity	An equation that is true no matter what values are chosen
Variable	A symbol for a number we do not know yet
Numerator	How many parts of a whole. The top number/variable in a fraction.
Denominator	How many parts the whole is split into. The bottom number/variable in a fraction.
Common Denominator	When two or more fractions have the same denominator
Simplify Expression	To remove unnecessary terms and numbers
Simplify Fraction	To reduce a fraction to make it as simple as possible
Expand	To multiply out terms to remove the brackets () (Opposite of **factorise**)
Coefficient	A number used to multiply a variable 
Factor	An integer that divides the number exactly leaving no remainder
Factorise	Write an expression as a product of its factors. (Opposite of **expanding**)
Term	A single number or a variable
Highest Common Factor (HCF)	The highest number or variable that divides exactly into two or more numbers or variables

Other Topics/Units this could appear in:

- Core – Algebra & Functions

Year 10 – Maths – Unit NP1 – Place Value & Number Line

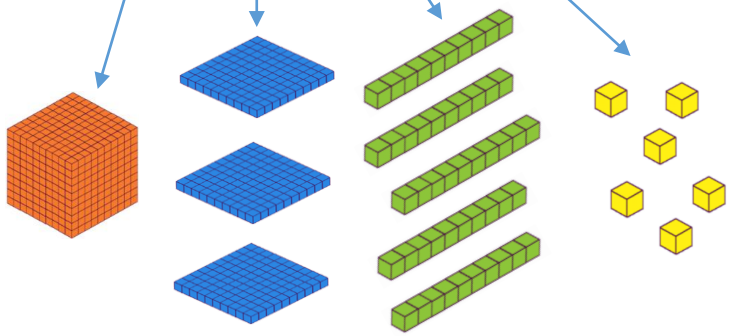
Place value

This is the number system we use every day.

Base 10 **place value** has a relationship of × 10 between columns, moving from right to left.

We can use a place value chart to help us read and write numbers in base 10.

Th Thousands	H Hundreds	T Tens	U Units	•	$\frac{1}{10}$ Tenths	$\frac{1}{100}$ Hundredths
1	3	5	6			



100,000	10,000	1,000	100	10	1	•	0.1	0.01	0.001	0.000 1	0.000 01
Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones	•	tenths	hundredths	thousandths	ten-thousandths	hundred-thousandths
3	5	4	9	4	3	•					

This number is written as
three hundred and fifty-four thousand, nine hundred and forty-three.

Reading and Writing Numbers

0 – Zero
1 – One
2 – Two
3 – Three
4 – Four
5 – Five
6 – Six
7 – Seven
8 – Eight
9 – Nine

10 – Ten
11 – Eleven
12 – Twelve
13 – Thirteen
14 – Fourteen
15 – Fifteen
16 – Sixteen
17 – Seventeen
18 – Eighteen
19 – Nineteen

20 – Twenty
30 – Thirty
40 – Fourty
50 – Fifty
60 – Sixty
70 – Seventy
80 – Eighty
90 – Ninety

Midpoints and medians

The midpoint of two numbers is exactly halfway between them. To find it quickly, we add together the endpoints and the halve the answer.

When we are given a list of numbers, in order, the middle number in the list is called the median.
If our list contains an even number of numbers, then there will be two numbers in the middle. The median is the midpoint of these two (which isn't actually in the list!)

Positive and negative integers

We can still draw vectors to represent negative numbers.

This is the number 4. Its sign is positive.
This is the number -4 ("negative 4"). Its sign is negative.
What is the same about them? What is different about them?

My mathematical journey

What do I need to remember from before?
- Place value of numbers up to 10 000 000 (KS2)
- Rounding numbers to the nearest 10, 100, 1000, 10 000 and 100 000 (KS2)
- Rounding decimals to 1, 2 or 3 decimal places (KS2)
- Ordering negative numbers on a number line (KS2)
- Multiplying and dividing numbers by 10, 100 and 1000

What will I learn about in this unit?
- Writing integers and decimals in expanded form and words
- Ordering numbers
- Rounding to decimal places and to significant figures
- Converting metric units
- Finding the midpoint of two numbers
- Finding the median of discrete data

Where does this lead?
- Addition & subtraction (NP2)
- Multiplication & division (NP3)
- Percentages, fractions & decimals (NP8)
- Estimation (NP9)
- Analysing discrete data (SP1)
- Using units of measure (all GM units and many SP units)
- Standard form (NP12)
- Indices & surds (NP15)

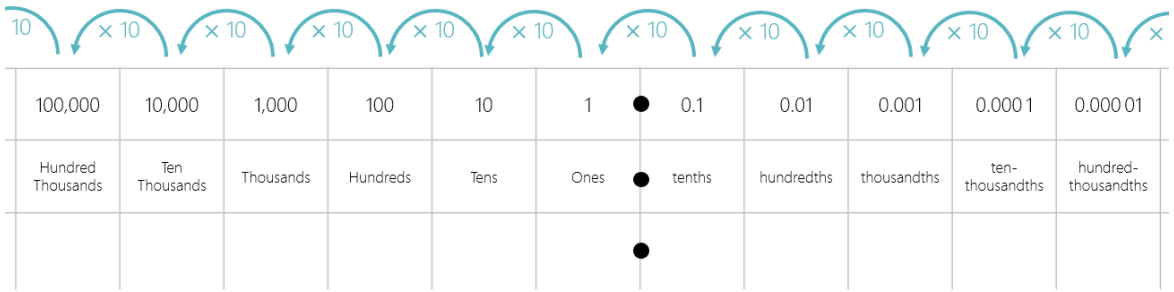
Key words & symbols

Word	Explanation
number	a value or a quantity used to count or measure
digit	a symbol we use to make numbers, such as "0" or "9"
numeral	a number written with digits, such as "213" or "0.5"
integer	a "whole" number (with no decimal part), such as 15 or 510, but not 2.5
base 10	our numeral system, where each column is worth a different power of 10
decimal	means "base 10" but more often used for non-integers written like this: 2.5 or 38.7
less than	numbers further left on the number line
greater than	numbers further right on the number line
ascending	going up
descending	going down

Symbol	How to read it
<	is less than
>	is greater than
≤	is less than or equal to
≥	is greater than or equal to
=	is equal to
≠	is not equal to
≈	is approximately equal to

Year 10 – Maths – Unit NP1 – Place Value & Number Line

Multiplying and dividing by 10, 100, 1000, etc



Every column is ten times greater than the one before it.

This means when we × 10, all digits move one place to the left.

If we × 100, they move two places left, × 1000 moves three places left, etc.

Common metric units

Some common ones. (modern)

Quantity to measure	Metric units
length	millimetre (mm) centimetre (cm) metre (m) kilometre (km)
mass	gram (g) kilogram (kg)
capacity	millilitre (ml) litre (l)

mm	cm	m
1000	100	1

m	km
1000	1

s	min	hrs
3600	60	1

mg	g	Kg
1000	100	1

ml	c l	l
1000	100	1

hrs	day
24	1

The metric units are part of the **système international (SI)** of units.

Convert:

5 m to cm

5m = 500cm

3500 g to kg

3500 g = 3.5 kg

900 ml to l

900 ml = 0.9l

20 km to m

20 km = 20 000 m

Rounding: nearest 10, 100, 1000, etc

What is 36 458 to the nearest 1000?

36 458 → 37 000 / 36 000

36 458 ≈ 36 000

What is 36 458 to the nearest 100?

36 458 → 36 500 / 36 400

36 458 ≈ 36 500

Rounding: to decimal places

What is 0.77 to one decimal place?

0.77 → 0.8 / 0.7

0.77 ≈ 0.8

What is 0.638 to two decimal places?

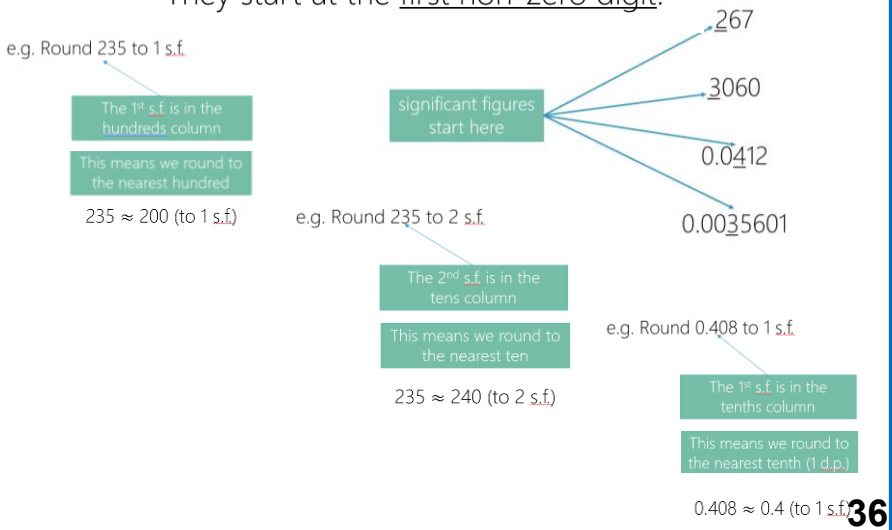
0.638 → 0.64 / 0.63

0.638 ≈ 0.64

Rounding: to significant figures

Significant figures are digits in a number.

They start at the first non-zero digit.



Year 10 – Maths – Unit NP2 – Addition & Subtraction

$5 + 8 = 13$

summand + summand = sum

summand, summand, sum

$8 - 5 = 3$

minuend – subtrahend = difference

minuend, subtrahend, difference

Additive Inverses

The numbers in a zero pair are called additive inverses of each other.

$5 + (-5) = 0$

Additive Inverse of 5 is -5

Column method for addition and subtraction

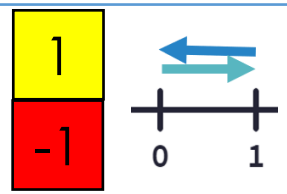
$$\begin{array}{r} 429 \\ \underline{283} \; - \end{array}$$

Make sure you line up digits using their place values.

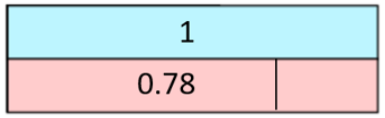
$$\begin{array}{r} 4.29 \\ \underline{0.283} \; + \end{array}$$

Zero Pairs

1 and -1 are called a zero pair because their sum is 0.



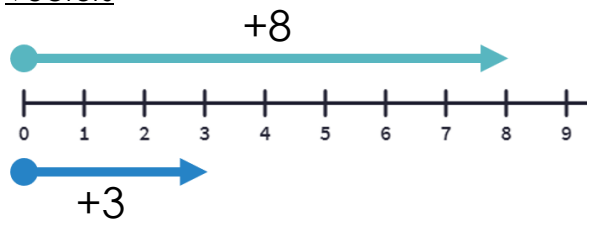
Number Bonds



Knowledge of number bonds helps with quick addition and subtraction.

Make all the digits after the decimal point up to 9, but make the last up to 10.

Vectors



Vectors represent the magnitude (size) of a number on a number line.

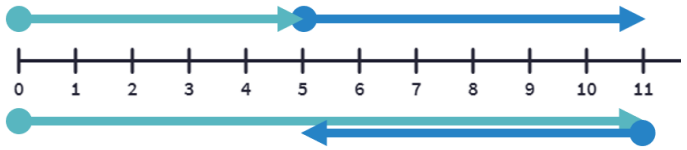
When we add or subtract numbers along a number line, we place then end to end.

Inverse Operations

Inverse operations are the opposite of one another, so they undo one another.

$5 + 6 = 11$

$11 - 6 = 5$



My mathematical journey

What do I need to remember from before?

- Place value (NP1)
- Vectors on a number line (NP1)
- Adding and subtracting whole numbers with pen and paper and mentally (KS2)
- Using rounding to check answers to calculations (KS2)

What will I learn about in this unit?

- Addition and subtraction with integers and decimals
- Commutativity & mental methods with integers and decimals
- Number bonds, complements, working with decimals
- Vectors, inverse operations, equality and zero pairs
- Perimeter
- Angle facts
- Mean and range

Where does this lead?

- Order of operations (NP5)
- Directed numbers (NP6)
- Simplifying expressions (A1)
- Adding & subtracting fractions (NP7)
- Solving linear equations (A2)
- Adding & subtracting numbers in standard form (NP12)
- Adding and subtracting surds (NP15)

Keyword/Skill	Definition/Tips
Integer	Whole number including 0 and negative numbers. No fractions or decimals.
Place Value	Hundreds, Tens, Ones, Tenths, Hundredths…
Negative numbers	Number less than zero. Can be integer, decimal or fraction, e.g. -2, -4.7, $-\frac{1}{2}$
Positive numbers	Numbers bigger than zero. Can be integer, decimal or fraction, e.g. 5, 3.6, $\frac{2}{5}$
Summand	The summands are the numbers being added
Sum	The answer when summands are added together
Zero pair	Two values with equal magnitude (size) but opposite signs, so they give a sum of 0, e.g. 2 + - 2 = 0
Complement	The complement of a decimal is the number you add to get to 1.
Difference	Answer after subtraction of two values
Column Addition	Standard written method of addition
Minuend	When we subtract, the starting/first number is the minuend
Subtrahend	When we subtract, the amount to be subtracted is the subtrahend

Year 10 – Maths – Unit NP2 – Addition & Subtraction

Commutativity

An operation is commutative if it can be applied to two numbers in **any order**

Examples

3 x 4 = 12 is the same as 4 x 3 = 12

2 + 5 = 7 is the same as 5 + 2 = 7

Addition and multiplication are commutative

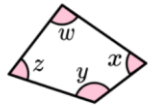
Non - Examples

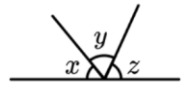
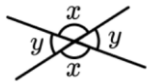
15 ÷ 5 is not the same as 5 ÷ 15

10 - 3 is not the same as 3 – 10

Division and subtraction are not commutative

Basic Angle Facts

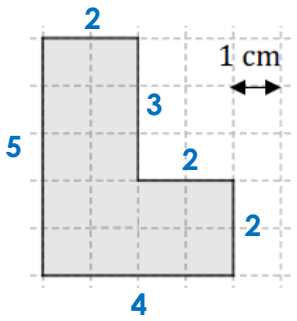
Angle Rule	Description	Diagram
Angles in a triangle	The sum of angles in a triangle is 180°. $x + y + z = 180$	
Angles in a quadrilateral	The sum of angles in a quadrilateral is 360°. $w + x + y + z = 360$	

Angle Rule	Description	Diagram
Angles on a straight line	The sum of angles on a straight line is 180°. $x + y + z = 180$	
Angles at a point	The sum of angles at a point is 360°. $w + x + y + z = 360$	
Vertically opposite angles	Vertically opposite angles are equal in size.	

Perimeter

Perimeter is the **distance** all the way around the **edge** of a shape.

By **counting edges** of **squares** along the **sides** of a shape on a grid, we can work out the perimeter of that shape.



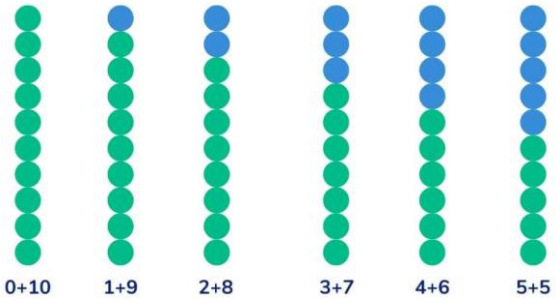
The perimeter of this L shape is 2 + 3 + 2 + 2 + 4 + 5 = 18 cm

Number Bonds

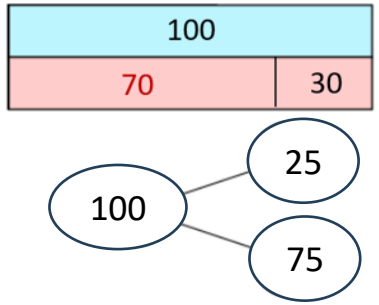
Number bonds are pairs of numbers that can be added together to make another number, like 10, 100, 1000 etc.

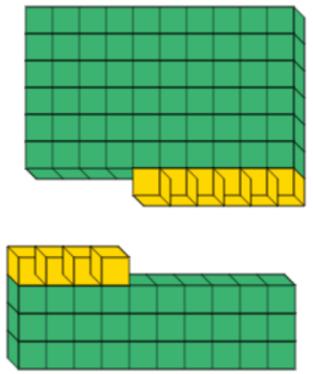
We can also have pairs of decimal numbers that add to make 1. This is called the **complement of a decimal.**

Number Bonds to 10

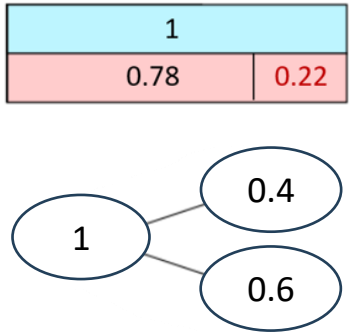


Number Bonds to 100





Complement of a Decimal/Number Bonds to 1



Keyword/Skill	Definition/Tips
Commutative	An operation that, in any order, gives the same result, e.g. 4 x 2 = 8 and 2 x 4 = 8, 5 + 2 = 7 and 2 + 5 = 7
Perimeter	The distance around a shape.
Number bonds	Pairs of numbers that add to make another given number.
Angle	The measure of a turn
Complement of a decimal	The decimal number you would add to another decimal number to make 1.

Year 10 – Maths – Unit NP3 – Multiplying & Dividing

My mathematical journey

What do I need to remember from before?	What will I learn about in this unit?	Where does this lead?
Place value (NP1)	Multiplication and division with integers and decimals	Powers, roots and primes (NP4)
Vectors on a number line (NP1)	Area models for multiplication	Order of operations (NP5)
Multiplying and dividing on paper and mentally (KS2)	Multiples and factors	Directed numbers (NP6)
Using rounding to check answers to calculations (KS2)	Multiplying to stretch	Fractions (NP7)
	Area and volume	Percentages (NP8)
		Proportional reasoning (NP10)

Commutativity

An operation is commutative if it can be applied to two numbers in **any order**

Example

$3 \times 4 = 12$ is the same as $4 \times 3 = 12$

$2 + 5 = 7$ is the same as $5 + 2 = 7$

Addition and multiplication are commutative

Non - Example

$15 \div 5$ is not the same as $5 \div 15$

$10 - 3$ is not the same as $3 - 10$

Division and subtraction are not commutative

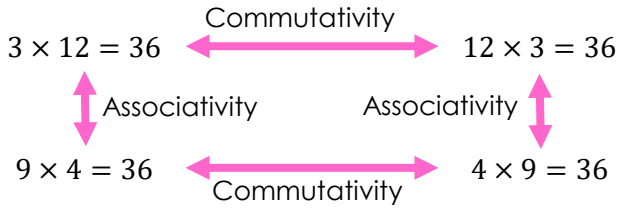
Associativity

Multiplication is associative. This means you can 'split up' parts of it and join the numbers in different ways. We call it decomposing and recomposing.

$3 \times 12 = 36$

$3 \times 3 \times 4 = 36$

$9 \times 4 = 36$



This shows us that 3×12 and 9×4 are the same calculation.

Keyword/Skill	Definition/Tips
Integer	Whole number including 0 and negative numbers. No fractions or decimals.
Associativity	Getting the same result regardless of the grouping. E.g. 2 x 3 x 4 = 24 4 x 3 x 2 = 24
Commutative	An operation that, in any order, gives the same result, e.g. 4x2=8 and 2x4=8, 5+2=7 and 2+5=7
Product	Multiply

Multiplying – Grid Method

When multiplying two integers, a grid method is way to multiply which helps limit our mistakes.

Example:

35×748

Make sure you align your place value columns correctly!

×	700	40	8
30	21000	1200	240
5	3500	200	40

21000
3500
1200
240
200
40
26180

$$35 \times 748 = 26180$$

Multiplying Decimals

When we multiply decimals, we can first make an easier, related calculation without decimals, then reverse our changes to get the final answer.

Example:

$$0.5 \times 0.6$$

$\times 10$ $\times 10$

$$5 \times 6 = 30$$

$\div 100$

$$0.5 \times 0.6 = 0.3$$

As we have multiplied by 10 twice, we need to divide by 100 (same as dividing by 10 twice).

You will sometimes need to use grid method

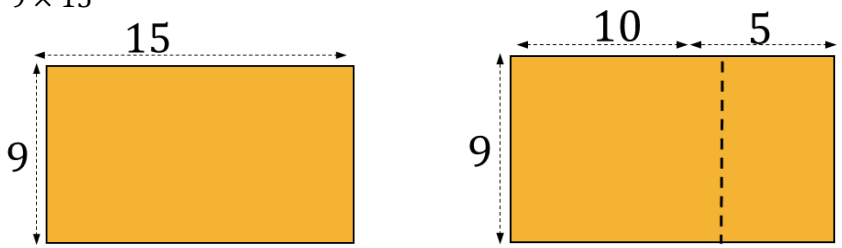
Year 10 – Maths – Unit NP3 – Multiplying & Dividing

Distributive Property

A way of splitting up a calculation to make it more manageable

Example:

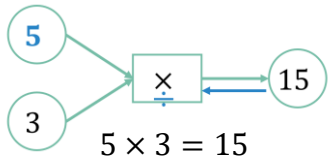
9×15



$$9 \times (10 + 5) = 9 \times 10 + 9 \times 5$$
$$= 90 + 45$$
$$= 135$$

Fact Families

From this diagram, we can see a family of facts.



$5 \times 3 = 15$

$3 \times 5 = 15$

$15 \div 3 = 5$

$15 \div 5 = 3$

Multiples & Lowest Common Multiple

Multiples can be thought of as numbers in a times table.

e.g. The multiples of 5 are the numbers in the 5 times table.

Multiples of 5: 5, 10, 15, 20, 25, 30, 35, …

Numbers have common multiples; these are multiples they share.

Multiples of 5: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, …

Multiples of 4: 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, …

The common multiples are: 20, 40, 60, …

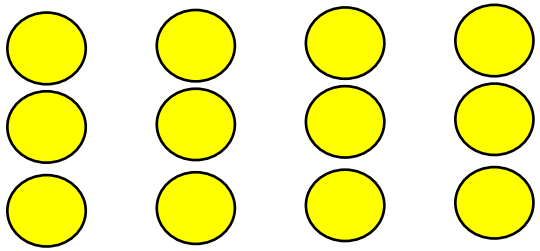
Questions usually ask what the lowest common multiple is.

Example:
What is the lowest common multiple of 12 and 16.
Multiples of 12: 12, 24, 36, 48, 60, 72, 84, 96, …
Multiples of 16: 16, 32, 48, 64, 80, 96, 112, 128, …
The lowest common multiple is 48. Make sure you check the list carefully.
96 is a common multiple but not the **lowest** common multiple.

Repeated Addition & Scaling

Multiplication can be represented in two ways, repeated addition & scaling

Repeated Addition



$3 + 3 + 3 + 3$

$= 4 \times 3 = 12$

There are 4 lots of 3

Scaling

We want 4 lots of 3

$= 4 \times 3 = 12$

There are 4 lots of 3

Year 10 – Maths – Unit NP3 – Multiplying & Dividing

Division

We are going to focus on using short division. The best method to use is bus stop.

Example:

$$471 \div 3 = \frac{471}{3}$$

$$3 \overline{)\,4\;7\;1}$$

How many 3's go into 4?

$$3 \overline{)\,4^{1}7\;1} \quad 1$$

4 remainder 1

How many 3's go into 17?

$$3 \overline{)\,4^{1}7^{2}1} \quad 1\;5$$

5 remainder 2

You don't need to write separate bus stops. It would all go in the same one like this.

How many 3's go into 17?

$$3 \overline{)\,4^{1}7^{2}1} \quad 1\;5\;7$$

7

$$471 \div 3 = 157$$

Dividing Decimals

When the divisor is integer, we can use our knowledge of multiplication or short division.

$$8.36 \div 4 =$$

$$4 \overline{)\,8.3^{3}6} \quad 2.0\;9$$

Make sure you keep the decimal in the correct place!

When the divisor is not an integer, we first make an easier calculation that has the same answer.

$$12 \div 0.3 = \frac{12}{0.3}$$

$$= \frac{12 \times 10}{0.3 \times 10}$$

$$= \frac{120}{3}$$

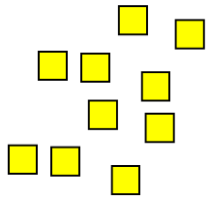
$$= 40$$

As we haven't changed the value of the fraction the answers are equivalent!

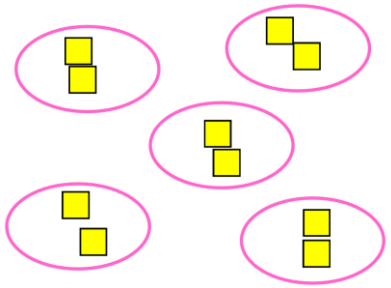
Representations of Division

There are three ways we can think of representing division. These are sharing, grouping & repeated subtraction. We will see the representations for $10 \div 5$

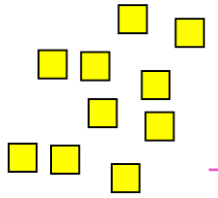
Sharing - $10 \div 5$



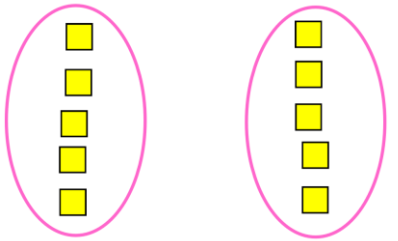
Think of this as 10 shared into 5 parts.



Grouping - $10 \div 5$



Think of this as the number 10 split into groups of size 5. The answer is the number of groups split into 5.



Scaling

We can instead think of this as the number of times we must subtract 5 from 10 to get to 0. The answer (2) is the number of times we subtract 5 to get to 0.

Year 10 – Maths – Unit NP3 – Multiplying & Dividing

Factors & Highest Common Factor

Factors can be thought of as the integers which multiply to make another.
e.g. 7 and 11 are factors of 77, because 7 × 11 = 77.
When writing the list of factors, make sure to be logical and list pairs until you have them all.
Example:
List all the factors of 24:
1, 24
2, 12
3, 8
4, 6
We can write them as an ordered list to check we have them all:
1, 2, 3, 4, 6, 8, 12, 24

Any numbers that are factors of two or more numbers are said to be **common factors** of those numbers.

Factors of 12:

1 x 12
2 x 6
3 x 4

} All the ways of making a product of 12.

1, 2, 3, 4, 6, and 12 are all the factors of 12.

Factors of 20:

1 x 20
2 x 10
4 x 5

} All the ways of making a product of 20.

1, 2, 4, 5, and 20 are all the factors of 12.

Both lists of factors here have 1, 2 and 4 included. Therefore, 1, 2 and 4 are common factors of 12 and 20.
You are usually asked what the highest common factor is. In this case the highest common factor of 12 and 20 is 4.
Make sure you check your list to get the highest common factor.

Factors & Highest Common Factor

Sometimes we solve problems by multiplying or dividing. We need to look for clues that tell us to multiply or divide.

If we are looking for "lots of" something, that often means *multiply*.
If we are looking to share something out, that often means *divide*.

In a train there are eight coaches each with 44 seats. How many seats are there on the train?

Here this would be a multiplication problem as there are 8 coaches with 44 seats which would be 8 'lots of' 44.

45 sweets are shared equally between 9 children. How many do they each get?

Here this would be a division problem as you are 'sharing' things out into groups.

Other Topics/Units this could appear in:

- Numbers, powers, rots, decimals and rounding
- Product of prime factors
- Multiples in context
- Factorising

Keyword/Skill	**Definition/Tips**
Integer	Whole number including 0 and negative numbers. No fractions or decimals.
Product	Multiply
Factor	Numbers we can multiply together to get another number.
Distributive Law	Multiplying a number by a group of numbers added together is the same as doing each multiplication.
Multiples	The result of multiplying a number by an integer (comes up in its timetable)
Common multiples	A number that is a multiple of two numbers
LCM	Smallest whole number that is a multiple of two numbers
Factors	An integer that divides the number exactly leaving no remainder
Factor pairs	A set of numbers that multiply to equal the number
HCF	The highest common factor (HCF) of two or more numbers is the largest number that is a factor of all of the given numbers.

Year 10 – Maths – Unit NP4 – Powers, Roots & Primes

Square Numbers

1, 4, 9, 16, 25, 36, 49, 64, …

These are called the square numbers because their area models are squares.
When we multiply a number by itself, we call this squaring the number.

Cube Numbers

1, 8, 27, 64, 125, 216, 343, …

These are called the cube numbers because their volume models are cubes.
When we multiply a number by itself, and then again, we call this cubing the number.

Using a Calculator

Some powers/roots will take too long to calculate so you will need to be confident using a calculator. You will need these buttons below.

Prime Numbers

A prime number is any positive integer that has exactly two different factors.
These factors are always itself and 1.

2 3 5 7 11 13 17
19 23 29 31 37 41
43 47 53 59 61 67
71 73 79 83 89 97

Index Notation

Index form is writing numbers in terms of their powers. It shows repeated multiplication.
Example:

$$2 \times 2 \times 2 \times 2 \times 2 = 2^5$$

The inverse of an exponent is called a root. We show it with this symbol:

$$\sqrt{}$$

The inverse of squaring is called the square root, $\sqrt[2]{}$
The inverse of cubing is called the cube root, $\sqrt[3]{}$

Keyword/Skill	Definition/Tips
Product	Means multiply
Prime number	A number that has exactly two factors
Square number	A number multiplied by itself i.e. $3^2 = 9$
Cube number	The result of multiplying an integer by itself three times i.e. $2 \times 2 \times 2 = 2^3 = 8$
Index Form	Writing numbers in terms of powers E.g. $6 \times 6 \times 6 \times 6 = 6^4$ <- This is in index form
Prime Factor	A factor of a number that is also a prime number
Prime Factor Decomposition /Prime Factorisation	To write a number as a product of prime numbers Every number has a unique prime factorisation
Exponent	Another word for power. How many times you multiply a number by itself.
Root	The inverse of exponent.

My mathematical journey

What do I need to remember from before?

Multiplication and division (NP3)

Multiplying by composing and decomposing (NP3)

Multiples and factors (NP3)

What will I learn about in this unit?

Repeated multiplication

Powers and roots

Prime numbers

Composing and decomposing primes

Where does this lead?

Order of operations (NP5)

Directed numbers (NP6)

Quadratics (A11)

Index laws (NP15)

Exponential growth (NP16)

Year 10 – Maths – Unit NP4 – Powers, Roots & Primes

Index Laws

When we are multiplying numbers written in index form, and they have the same base, we can add the exponents. The reason we do this is shown here:

$$5^2 \times 5^4$$

We could write it out in full.

$$5^2 \times 5^4 = 5 \times 5 \times 5 \times 5 \times 5 \times 5$$
$$= 5 \times 5 \times 5 \times 5 \times 5 \times 5$$
$$= 5^6$$

Example:

$$7^6 \times 7 \times 7^{10} = 7^{6+1+10} = 7^{17}$$

Since division is the inverse of multiplication, the law can be inverted too.
When we are dividing numbers written in index form, and they have the same base, we can subtract the exponents.

Example:

$$\frac{9^{10}}{9^4} = \frac{9 \times 9 \times 9 \times 9 \times 9 \times 9 \times 9 \times 9 \times 9 \times 9}{9 \times 9 \times 9 \times 9}$$

$$= 9^6$$

Prime Factor Decomposition

Any number can be written as a **product of prime factors**. It is also called **Prime Factorisation** or **Prime Factor Decomposition.**

1) Start with the number at the top and split it into **factors** as shown.
2) Then do the same with the factors you have written.
3) If the number is a **prime number**, you can't break it down any further.
4) Keep going until you can't go any further (i.e. you are just left with prime numbers
5) Write these prime numbers out as a **product**.
6) If there is more than one of the same factor, you can write them as powers (**index form**).

No matter what numbers you choose for each step, you'll find the product of primes is exactly the same.

Example:
Express 420 as a product of its prime factors.

420 = 42 x 10

420 = 42 x 5 x 2

420 = 6 x 7 x 5 x 2

420 = 2 x 3 x 7 x 5 x 2

420 = 2 x 2 x 3 x 5 x 7

420 = 2^2 x 3 x 5 x 7

Keyword/Skill	Definition/Tips
Product	Means multiply
Prime number	A number that has exactly two factors
Square number	A number multiplied by itself i.e. $3^2 = 9$
Cube number	The result of multiplying an integer by itself three times i.e. 2 x 2 x 2 = 2^3 = 8
Index Form	Writing numbers in terms of powers E.g. 6 x 6 x 6 x 6 = 6^4 <- This is in index form
Prime Factor	A factor of a number that is also a prime number
Prime Factor Decomposition /Prime Factorisation	To write a number as a product of prime numbers Every number has a unique prime factorisation
Exponent	Another word for power. How many times you multiply a number by itself.
Root	The inverse of exponent.

Other Topics/Units this could appear in:

- Numbers, powers, roots, decimals and rounding
- Product of prime factors
- Multiples in context
- Index Laws
- Standard Index Form

Year 10 – Maths – Unit NP5 – Order of Operations

My mathematical journey

What do I need to remember from before?

Addition and subtraction (NP2)

Multiplication and division (NP3)

Exponents and roots (NP4)

What will I learn about in this unit?

Flexible calculating

The order of operations

Using visible and invisible brackets to break the order of operations

Where does this lead?

Directed numbers (NP6)

Substitution (A1, A2, A5)

Linear equations (A4)

Which Operations are Commutative?

				Commutative?
Multiplication	Multiplication	$2 \times 3 = 6$	$2 \times 3 = 3 \times 2$	YES
	Division	$\frac{6}{3} = 2$	$\frac{6}{3} \neq \frac{3}{6}$	NO
Addition	Addition	$2 + 3 = 5$	$2 + 3 = 3 + 2$	YES
	Subtraction	$5 - 3 = 2$	$5 - 3 \neq 3 - 5$	NO
Exponentiation	Exponents	$2^3 = 8$	$2^3 \neq 3^2$	NO
	Roots	$\sqrt[3]{8} = 2$	$\sqrt[3]{8} \neq \sqrt[8]{3}$	NO

The Operations

	Multiplication	Addition	Exponentiation
Operation	$2 \times 3 = 6$ $2 \cdot 3 = 6$	$2 + 3 = 5$	$2^3 = 8$
Inverse Operation	$6 \div 3 = 2$ $\frac{6}{3} = 2$	$5 - 3 = 2$	$\sqrt[3]{8} = 2$

Moving Numbers Around

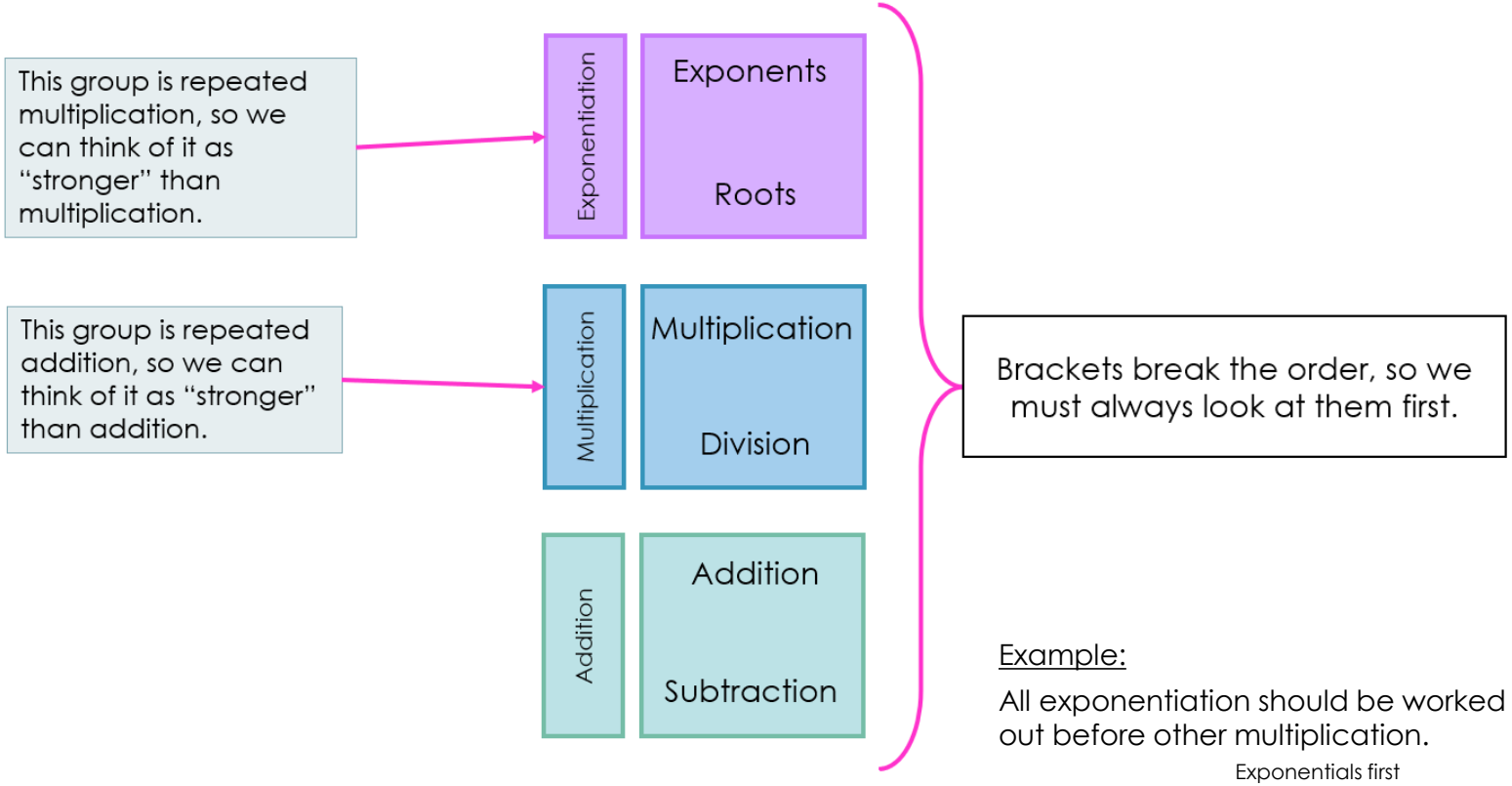
As addition and multiplication are commutative. We can move numbers around the operations and get the same answer. Subtraction and division are not commutative so when we move them around, we get a different answer.

Addition	Subtraction	Multiplication	Division
$12 + 3 + 5 = 12 + 5 + 3$	$12 - 3 - 5 = 12 - 5 - 3$	$3 \times 4 \times 5 = 3 \times 5 \times 4$	$24 \div 3 \div 2 = 24 \div 2 \div 3$
and	but	and	but
$12 + 3 + 5 = 5 + 3 + 12$	$12 - 3 - 5 \neq 5 - 3 - 12$	$3 \times 4 \times 5 = 5 \times 3 \times 4$	$24 \div 3 \div 2 \neq 2 \div 3 \div 24$
and	and	and	and
$12 + 3 + 5 = 3 + 12 + 5$	$12 - 3 - 5 \neq 3 - 12 - 5$	$3 \times 4 \times 5 = 4 \times 5 \times 3$	$24 \div 3 \div 2 \neq 3 \div 24 \div 2$

Keyword/Skill	**Definition/Tips**
Priority	The order of importance of a list of things. Higher priority means this must be done first.
Operation	A process in which a number, quantity, expression, etc., is altered according to set formal rules, such as those of addition, multiplication, and division.
Distributivity	A way of splitting up a calculation to make it more manageable.
Commutativity	An operation is commutative if it can be applied to two numbers in any order.
Exponentiation	Another word for power. This will include the inverse as well in roots.
Equivalent	Equal in value.
Variable	A symbol for a number we do not know yet

Year 10 – Maths – Unit NP5 – Order of Operations

We now know the order in which we calculate.



Example:

$3 \times 5 \times 2 + 12 \div 3$

When we solve calculations, we look for the multiplication groups first (if there are no exponents or brackets)

$= 30 + 4$

$= 34$

Example:

All exponentiation should be worked out before other multiplication.

Exponentials first

$3 \times 2^3 + 5 \times 3$

Multiplication groups next

$3 \times 8 + 5 \times 3$

Addition groups last

$= 24 + 15$

$= 39$

Keyword/Skill	Definition/Tips
Priority	The order of importance of a list of things. Higher priority means this must be done first.
Operation	A process in which a number, quantity, expression, etc., is altered according to set formal rules, such as those of addition, multiplication, and division.
Distributivity	A way of splitting up a calculation to make it more manageable.
Commutativity	An operation is commutative if it can be applied to two numbers in any order.
Exponentiation	Another word for power. This will include the inverse as well in roots.
Equivalent	Equal in value.
Variable	A symbol for a number we do not know yet.

Example:

Brackets break the order. So, if we wanted to add before we multiply, we would put brackets around the addition calculation.

$3 \times 9 + 5$

No brackets here, so multiply first.

$27 + 5$

32

$3 \times (9 + 5)$

Do the calculation inside the brackets first

3×14

42

Different answers!

Year 10 – Maths – Unit NP6 – Directed Number

Comparing Positive and Negative Numbers

-4 is to the left of 4.
We say -4 is *less than* 4 and write $-4 < 4$.

4 is to the right of -4.
We say 4 is *greater than* -4 and write $4 > -4$.

Don't confuse *less than* with *smaller than*.
These two numbers have the same magnitude (size).

Don't confuse *greater than* with *bigger than*.
These two numbers have the same magnitude (size).

Number	What we write	What we say
6	6, +6, $^{+}6$	"six" "positive six"
−6	−6, $^{-}6$, (−6)	"negative six"

Lots of people say "minus six", but we will try to avoid this

Example

Write the numbers in order from least to greatest

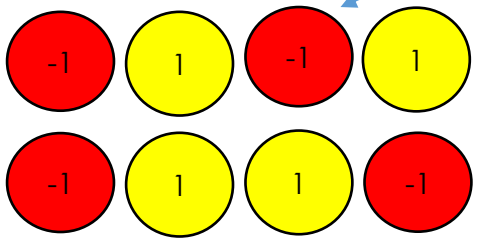
3, −5, 1, 0, −2, 4

The number with the lowest value is the biggest negative number (−5).
The number with the greatest value is the biggest positive number (4).

Ordered list:

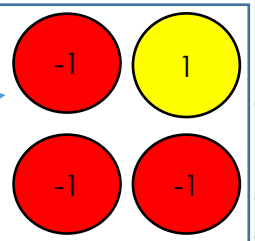
−5, −2, 0, 1, 3, 4

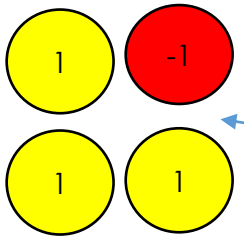
Zero Pairs and More



This set of numbers make a zero pair, as there are the same amount of positives as negatives.
The additive inverse of 4 is -4. That is what these counters show.

This number would be negative as there are more negative counters than positive counters. The overall value would be −2.





This number would be positive as there are more positive counters than negative counters. The overall value would be 2.

My mathematical journey

What do I need to remember from before?

- Addition and subtraction with integers and decimals (NP2)
- Multiplication and division with integers and decimals (NP3)
- Exponents and roots (NP4)
- Order of operations (NP5)

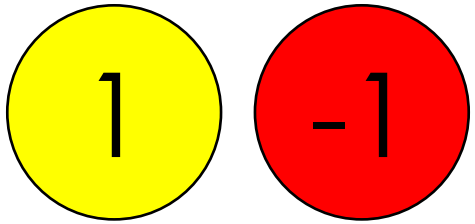
What will I learn about in this unit?

- Direction of numbers
- Using negative numbers
- Calculating with negative numbers

Where does this lead?

- Algebraic expressions (A2, A3)
- Linear equations (A4)
- Formulae (A5)
- Quadratic expressions (A11)

Look back at NP2 for more help with zero pairs.
You will see these double-sided counters a lot in this unit too:



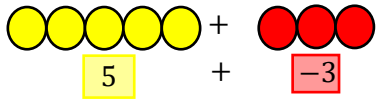
Keyword/Skill	Definition/Tips
Integer	Whole number including 0 and negative numbers. No fractions or decimals.
Negative numbers	Number less than zero. Can be integer, decimal or fraction, e.g. -2, -4.7, $-\frac{1}{2}$
Positive numbers	Numbers bigger than zero. Cam be integer, decimal or fraction, e.g. 5, 3.6, $\frac{2}{5}$
Multiple	A multiple of a number is all the numbers in that times table
Commutative	An operation that, in any order, gives the same result, e.g. 4x2=8 and 2x4=8, 5+2=7 and 2+5=7
Equal pairs	Two sums that have the same answer, e.g. -5+-2=-7 and -5-2=-7, 5- $^{-}$2=7 and 5+2=7
Solution	Answer to a problem
Sum	Total of a series of numbers
Product	Multiply
Difference	Answer after subtraction of two value

Year 10 – Maths – Unit NP6 – Directed Number

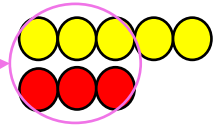
Adding Directed Number

We can use the tiles to help us add directed numbers

$5 + -3$



Adding is grouping them together. When we group them together we would make two zero pairs.

Zero Pairs 

This means we would be left with 2 

$5 + -3 = 2$

We use the tiles to help as a representation of the sum.

You need to grow to not use the tiles but still use the ideas they represent.

Example:

$8 + -10$

I know I would have 8 zero pairs as we are grouping together 8 and -10.

We would be left over with -2.

$8 + -10 = -2$

Example:

$-3 + -6$

Here we would have no zero pairs as both numbers are negative.

$-3 + -6 = -9$

Subtracting Directed Number

$7 - 5$ is the same as $7 + -5$

$9 - 6$ is the same as $9 + -6$

$3 - 8$ is the same as $3 + -8$

$2 - -1$ is the same as $2 + 1$

$-4 - 3$ is the same as $-4 + -3$

Subtracting is the same as adding the inverse.

As with adding directed number, the counters help us as a representation of the subtraction.

We need to grow to not use the tiles but still use the ideas they represent.

Example:

$9 - -10$

Subtracting is the same as adding the inverse.

$9 + 10$

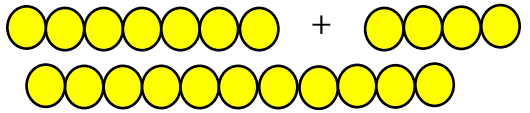
No zero pairs so group together.

$9 - -10 = 9 + 10 = 19$

Example:

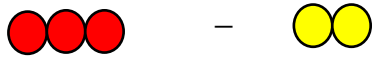
$7 - -4$ 

Subtracting is the same as adding the inverse.

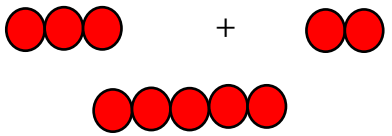


$7 - -4 = 11$

Example:

$-3 - 2$ 

Subtracting is the same as adding the inverse.



$-3 - 2 = -5$

Example:

$-15 - -4$

Subtracting is the same as adding the inverse.

$-15 + 4$

There will be 4 zero pairs here.

$-15 - -4 = -15 + 4 = -11$

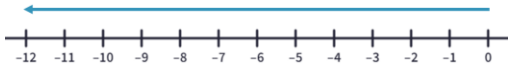
Year 10 – Maths – Unit NP6 – Directed Number

Multiplying Negative Numbers

In NP3 we thought about multiplication as a stretch of a vector We can apply this to negative numbers.

Example: -3×4

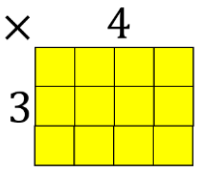
-3 stretched by a scale factor of 4.



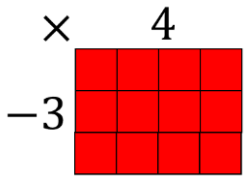
We also thought about multiplication as an area model. We will focus on this one now.

For -3×4

Set up 3×4 with tiles first



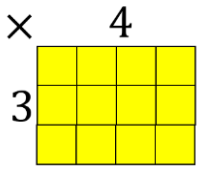
As there is one negative number, we flip the tiles once.



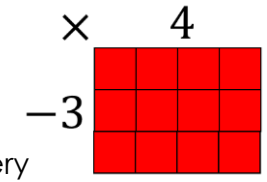
$$-3 \times 4 = -12$$

Now lets look at -3×-4

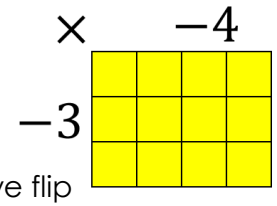
Set up 3×4 with tiles first



For every negative we flip the tiles once. So we flip for -3



Now we flip again for -4



Therefore, $-3 \times -4 = 12$

Just like with adding and subtracting, we use the tiles to help us represent it, but we want to grow to calculate it without the tiles.

Example:

$$-9 \times 12$$

Think of 9×12

$$9 \times 12 = 108$$

There is one negative number, so we 'flip' once.

$$-9 \times 12 = -108$$

Example:

$$-8 \times -7$$

Think of 8×7

$$8 \times 12 = 108$$

There is one negative number, so we 'flip' once.

$$-9 \times 12 = -108$$

Year 10 – Maths – Unit NP7 – Fractions

My mathematical journey

What do I need to remember from before?

- Addition and subtraction (NP2)
- Multiplication and division (NP3)
- Exponents and roots (NP4)
- Order of operations (NP5)
- Directed numbers (NP6)

What will I learn about in this unit?

- Representing fractions with pictures and numerals
- Calculating with fractions
- Finding fractions and wholes

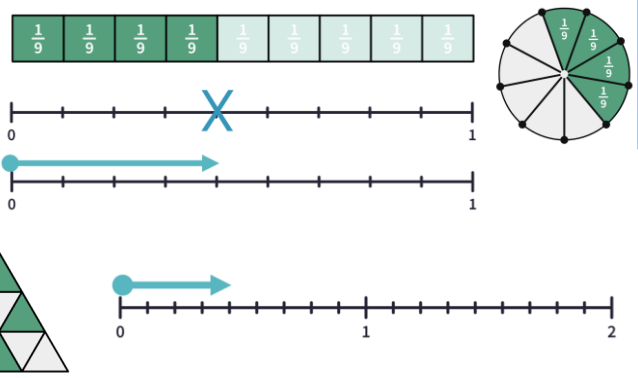
Where does this lead?

- Percentages, decimals and fractions (NP8)
- Proportional reasoning (NP10)
- Ratio (NP11)
- Linear equations (A4)
- Algebraic fractions (A17)

Representations of Fractions

We can represent the same fraction in different ways.

$\frac{4}{9}$



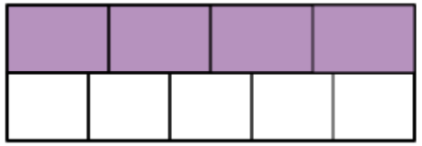
What is a Fraction?

numerator → $\frac{4}{9}$ ← We have 4 out of the 9 equal parts

fraction bar (vinculum) →

denominator → $\frac{4}{9}$ ← Each whole one is split into 9 equal parts

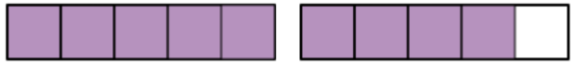
The diagram below does not represent $\frac{4}{9}$ because the parts are not all equal.



Improper Fractions & Mixed Numbers

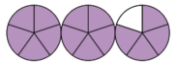
Improper Fractions

Each whole one is split into 5 equal parts. → $\frac{9}{5}$ ← We have 9 of those equal parts.



Example:

Convert $2\frac{4}{5}$ into an improper fraction.



We have 2 full whole ones. Each whole one is split into 5 equal parts.

$$2\frac{4}{5} = \frac{5}{5} + \frac{5}{5} + \frac{4}{5} = \frac{14}{5}$$

Mixed Numbers

We have 1 full whole one. → $1\frac{4}{5}$ ← We have another 4 of those equal parts.

Each whole one is split into 5 equal parts. →

Example:

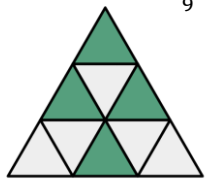
Convert $\frac{19}{5}$ into a mixed number.

Every $\frac{5}{5}$ is a whole one. We need to see how many groups of $\frac{5}{5}$ there are, and how many are left.

$$\frac{19}{5} = \frac{5}{5} + \frac{5}{5} + \frac{5}{5} + \frac{4}{5} = 3\frac{4}{5}$$

Complement of a Fraction

Shaded = $\frac{4}{9}$



Unshaded = $\frac{5}{9}$

The **complement** is the fraction needed to sum to 1.

Example:

Which symbol goes in the box < = >?

$$\frac{19}{3} \square 7\frac{1}{3}$$

Numbers need to be in the same type to compare.

$$\frac{19}{3} = 6\frac{1}{3}$$

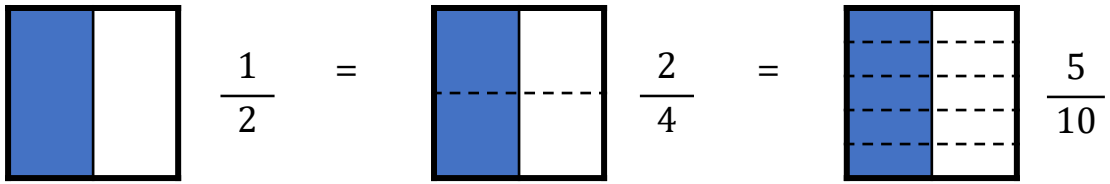
$$6\frac{1}{3} < 7\frac{1}{3}$$

Keyword/Skill	Definition/Tips
Equal parts	Fractions can only be described using equal parts of whole shapes.
Numerator	How many equal parts of a whole. The top number in a fraction.
Denominator	How many equal parts the whole is split into. The bottom number in a fraction.
Improper Fraction	A fraction where the **numerator** is bigger than the **denominator**.
Mixed Number	A number made from an integer and a fraction.
Equivalent Fractions	Two or more fractions that are equal in value.
Simplify	To cancel down a fraction to its lowest terms by dividing by all common factors.
Common Denominator	When two or more fractions have the same denominator.
Ascending Order	Order the numbers from the least value up to the greatest value.
Descending Order	Order the numbers from the greatest value to the least value.

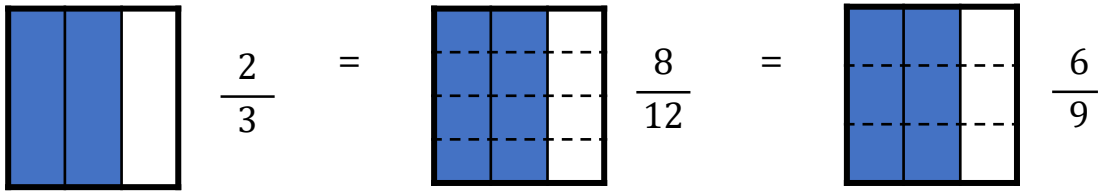
Year 10 – Maths – Unit NP7 – Fractions

Equivalent Fractions

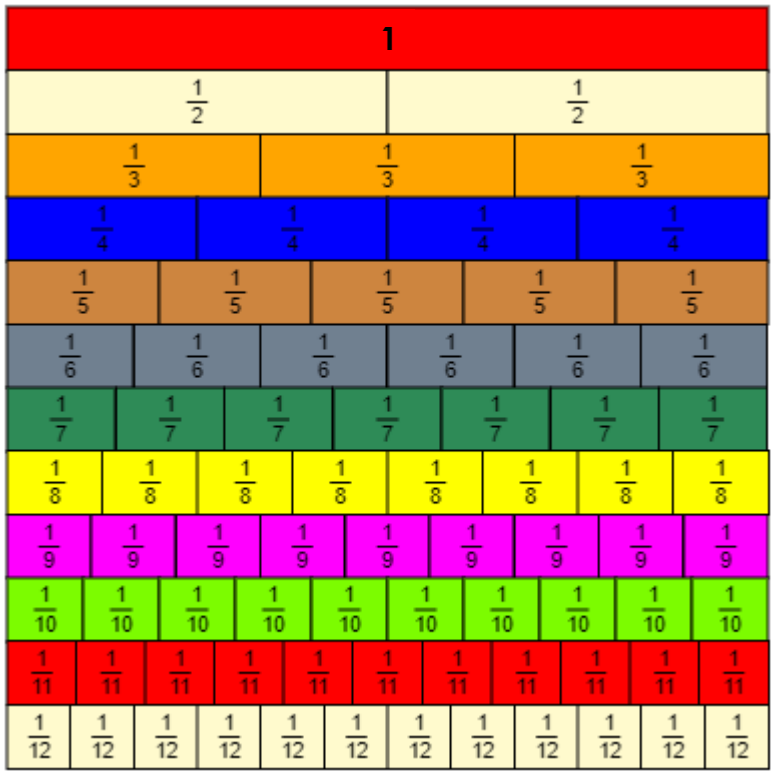
We can see that these fractions are **equivalent**.



$\frac{1}{2} = \frac{2}{4} = \frac{5}{10}$



$\frac{2}{3} = \frac{8}{12} = \frac{6}{9}$



A fraction wall is a useful way of finding fractions that are **equivalent**.

We can see that

$$\frac{1}{4} = \frac{2}{8} = \frac{3}{12}$$

because they are the same size on the fraction wall.

Can you spot any patterns in the numbers that also shows why they are equivalent?

Sneaky One

It is also helpful to recognise fractions equal to 1.

$\frac{4}{5} < 1$

$\frac{5}{5} = 1$

$\frac{6}{5} > 1$

'Sneaky One'

A fraction is equal to 1 if the numerator and denominator have the same value.

More examples: $\frac{10}{10}$ $\frac{3}{3}$ $\frac{120}{120}$

Using this can help us find equivalent fractions.

$\frac{1}{2} \times \frac{5}{5} = \frac{5}{10}$

$\frac{1}{2} = \frac{5}{10}$

Here are more examples of fractions equivalent to $\frac{1}{2}$

$\frac{1}{2} \times \frac{4}{4} = \frac{4}{8}$

$\frac{1}{2} \times \frac{2}{2} = \frac{2}{4}$

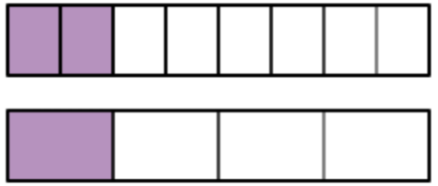
$\frac{1}{2} \times \frac{3}{3} = \frac{3}{6}$

Simplifying Fractions

We can also divide by a 'sneaky one' without changing the value of the fraction. We call this simplifying.

$\frac{2}{8} \div \frac{2}{2} = \frac{1}{4}$

$\frac{2}{8} = \frac{1}{4}$



$\frac{1}{4}$ is the simplest form of $\frac{2}{8}$

You can always simplify in steps, but to simplify fully your 'sneaky one' needs to be the highest common factor of the numerator and denominator.

Example:

$$\frac{12}{18} \div \frac{2}{2} = \frac{6}{9} \div \frac{3}{3} = \frac{2}{3}$$

Using the HCF, we can do this in one step

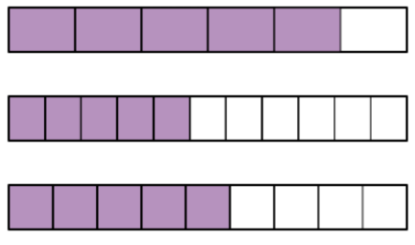
$$\frac{12}{18} \div \frac{6}{6} = \frac{2}{3}$$

Year 10 – Maths – Unit NP7 – Fractions

Ordering Fractions

To compare fractions there is a few things that can happen.
If the numerators are the same, we can compare the denominators.

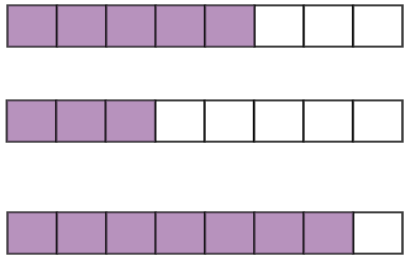
$\frac{5}{6}$
$\frac{5}{11}$
$\frac{5}{9}$



$$\frac{5}{11} < \frac{5}{9} < \frac{5}{6}$$

We can compare the numerators, if the denominators are the same.

$\frac{5}{8}$
$\frac{3}{8}$
$\frac{7}{8}$



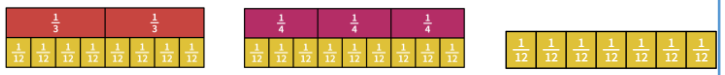
$$\frac{3}{8} < \frac{5}{8} < \frac{7}{8}$$

We can use equivalent fractions to help us compare sizes. This is the method you will have to use the most.

$$\frac{2}{3} \quad \frac{3}{4} \quad \frac{7}{12}$$

We can write $\frac{2}{3}$ and $\frac{3}{4}$ as twelfths (as 12 is the lowest common multiple of 3, 4 and 12. You can use any common multiple though).

$$\frac{2}{3} \times \frac{4}{4} = \frac{8}{12} \qquad \frac{3}{4} \times \frac{3}{3} = \frac{9}{12} \qquad \frac{7}{12}$$



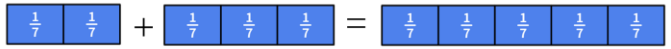
Now we can see that $\frac{7}{12} < \frac{2}{3} < \frac{3}{4}$

Example:

Adding & Subtracting Fractions

We can add fractions of the same type together by adding the numerators.

$$\frac{2}{7} + \frac{3}{7} = \frac{5}{7}$$



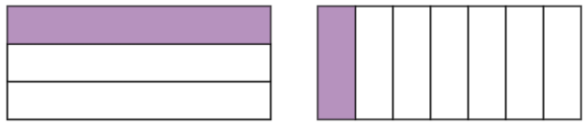
We can subtract fractions of the same type by subtracting the numerators.

$$\frac{3}{7} - \frac{1}{7} = \frac{2}{7}$$

If the denominators are different, we need to find a common denominator before adding or subtracting.

Example:

$\frac{1}{3} + \frac{1}{7}$



21 is the lowest common denominator here, as 21 is the lowest common multiple.

$\frac{7}{21} + \frac{3}{21} = \frac{10}{21}$

$$\frac{1}{3} + \frac{1}{7} = \frac{10}{21}$$

This method is the exact same for subtracting fractions (except you subtract the numerators, once you have a common denominator.

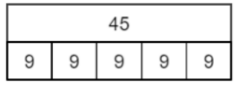
Year 10 – Maths – Unit NP7 – Fractions

Fraction of an Amount

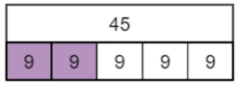
Let's find $\frac{2}{5}$ of 45

This means split 45 into five equal parts then find two of those parts

$\frac{1}{5}$ of 45 is 9



$\frac{2}{5}$ of 45 are 18



$\frac{2}{5}$ of 45 is found by $45 \div 5 \times 2 = 18$

split into five equal parts

find two of those parts

We can also find fractions of amounts when the fraction is greater than 1.

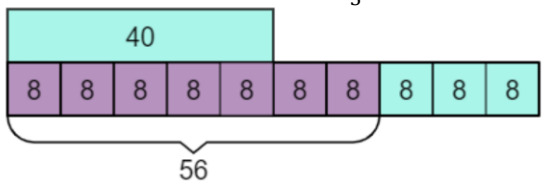
Example:

Calculate $\frac{7}{5}$ of 40

One whole is worth 40

$\frac{1}{5}$ of 40 is 8

$\frac{7}{5}$ of 40 = 56

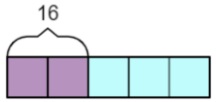


$\frac{7}{5}$ of 40 are 56

We can also find the whole amount of a number, given a fraction of it.

Example:

If $\frac{2}{5}$ of a number is 16, what is $\frac{1}{5}$ of the number?



If we know $\frac{2}{5}$ of the mount is 16, we can find one amount by dividing by 2.

$\frac{1}{5}$ of the amount will be $16 \div 2 = 8$

We now know 1 part of the 5 parts is 18.

Therefore, 5 parts (the whole amount) will be $5 \times 8 = 40$

40 is the whole amount!

Example:

If $\frac{3}{4}$ of an amount is £36, what is the full amount.

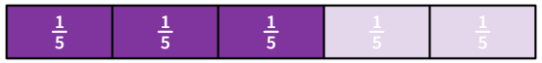
Divide by 3 to get one part: $36 \div 3 = 12$

Multiply by 4 to get the whole amount $12 \times 4 = 48$

The whole amount is £48.

Multiplying a Fraction by an Integer

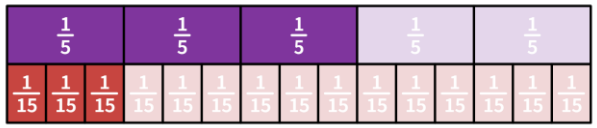
If we look at $\frac{1}{5} \times 3$. We can think of multiplication as 'lots of', so we have 3 lots of $\frac{1}{5}$.



$$3 \times \frac{1}{5} = \frac{3}{5}$$

We can see by this model here that we only need to multiply the numerator by the integer.

The model below shows why we don't multiply the denominator as well.



If we multiply the denominator as well, the value doesn't change.

Example:

$$\frac{1}{7} \times 3$$

$$3 \; lots \; of \; \frac{1}{7}$$

$$\frac{1}{7} \times 3 = \frac{3}{7}$$

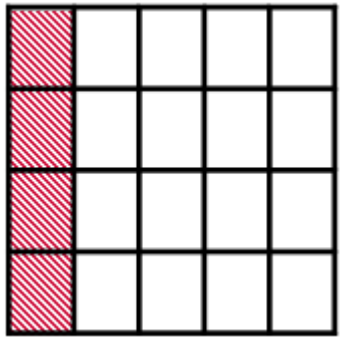
Year 10 – Maths – Unit NP7 – Fractions

Multiplying Fractions

When multiplying fractions, we can use a model to represent what happens.

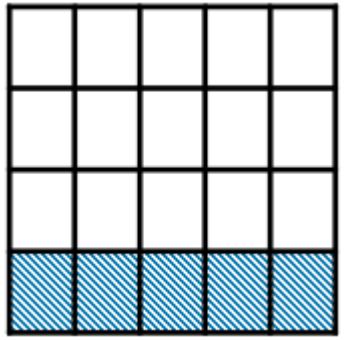
Example: We want to model $\frac{1}{4} \times \frac{1}{5}$

The red rectangle is $\frac{1}{5}$.



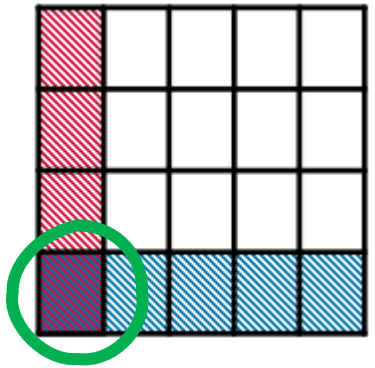
$\times$

The blue rectangle is $\frac{1}{4}$.



$=$

We can then combine the two diagrams



The crossover section is the answer.
It represents $\frac{1}{4}$ of $\frac{1}{5}$ **or** $\frac{1}{5}$ of $\frac{1}{4}$
Therefore, $\frac{1}{4} \times \frac{1}{5} = \frac{1}{20}$

This shows that when we multiply fractions, we multiply the numerators together and multiply the denominators together.

Example:

$$\frac{2}{7} \times \frac{3}{4}$$

$$\frac{2 \times 3}{7 \times 4} = \frac{6}{28}$$

Always check if you can simplify your answer.

$$\frac{6}{28} \div \frac{2}{2} = \frac{6 \div 2}{28 \div 2} = \frac{3}{14}$$

$$\frac{2}{7} \times \frac{3}{4} = \frac{3}{14}$$

Multiplying Mixed Numbers

Before we multiply with mixed numbers. We need to convert the mixed numbers into improper fractions.

Example:

$2\frac{2}{5} \times 3\frac{1}{4}$ We need to convert both numbers into improper fractions. $2\frac{2}{5} = \frac{12}{5}$ and $3\frac{1}{4} = \frac{13}{4}$

Once they are improper fractions we can use the same method.

$$\frac{12}{5} \times \frac{13}{4} = \frac{12 \times 13}{5 \times 4} = \frac{156}{20}$$

As usual, always check if your answer can simplify. You can do this in steps if you need to.

$$\frac{156}{20} \div \frac{2}{2} = \frac{78}{10} \div \frac{2}{2} = \frac{39}{5}$$

It will usually ask you to convert your answer back into a mixed number.

How many $\frac{5}{5}$ can we get out of $\frac{39}{5}$: 7 with 4 left over.

$$\frac{39}{5} = 7\frac{4}{5}$$

Reciprocal

The reciprocal of a number is the multiplicative inverse: the number you multiply it by to make 1.
A number and its reciprocal have a product of 1.

$$\frac{1}{2} \times 2 = \frac{2}{2} = 1$$

2 is the reciprocal of $\frac{1}{2}$

$\frac{1}{2}$ is the reciprocal of 2.

Another example: $\frac{3}{5}$ is the reciprocal of $\frac{5}{3}$

Dividing a Fraction by an Integer

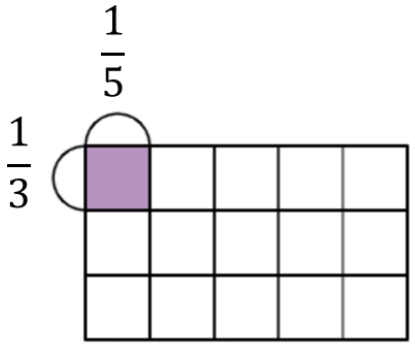
$$\frac{1}{5} \div 3$$

We can take $\frac{1}{5}$ and split it into 3 equal parts.

We can see that the answers is $\frac{1}{15}$

This is the same as $\frac{1}{5} \times \frac{1}{3}$

Dividing by 3 is the same as multiplying by $\frac{1}{3}$



Dividing by a number or a fraction, is the same as multiplying by the reciprocal

Dividing an Integer by a Fraction

$$6 \div \frac{2}{3}$$

We can see how many $\frac{2}{3}$ go into 6.
We can show this by splitting it into thirds and then alternating the colours.

There are 9 groups of $\frac{2}{3}$, so $6 \div \frac{2}{3} = 9$

You can always multiply by the reciprocal for this too.

$$6 \div \frac{2}{3}$$

Reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$

$$6 \times \frac{3}{2} = \frac{18}{2} = 9$$

Dividing Fractions

$$\frac{8}{9} \div \frac{2}{3}$$

We always come back to **dividing by a fraction is the same as multiplying by the reciprocal.**

$$\frac{8}{9} \times \frac{3}{2} = \frac{24}{18}$$

$$\frac{24 \div 6}{18 \div 6} = \frac{4}{3} = 1\frac{1}{3}$$

Same with multiplying mixed numbers, convert them into improper fractions before dividing.
Example:

$$2\frac{1}{3} \div 1\frac{1}{2}$$

$2\frac{1}{2} = \frac{7}{3}$ and $1\frac{1}{2} = \frac{3}{2}$

$$\frac{7}{3} \div \frac{3}{2} = \frac{7}{3} \times \frac{2}{3} = \frac{14}{9}$$

$$\frac{14}{9} = 1\frac{5}{9}$$

Year 10 Maths – Unit NP8 – Fractions, Decimals, & Percentages

Per cent means 'per 100'. If 70 per cent of the population own a pet, this means that 70 out of every hundred people own a pet. The symbol % means 'per cent'.

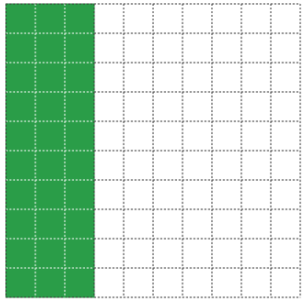
What are percentages?

- 1 per cent is **one hundredth**, or 0.01 as a decimal. Per cent is represented by the **%** symbol.
- A simple way to think of a percentage as a decimal is to imagine pennies in the pound. Just as 1p can be written £0.01, 1% can be written 0.01. So 2% is 0.02 or 2p, 25% is 0.25 or 25p and so on.

£1 equals 100 × 1p coins

Percentage

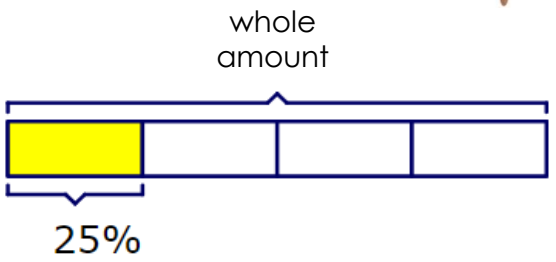
In this diagram, **30** out of **100** squares have been shaded. So, **30%** has been shaded.



Finding a percentage of a quantity

It's often useful to be able to find a percentage of a quantity.

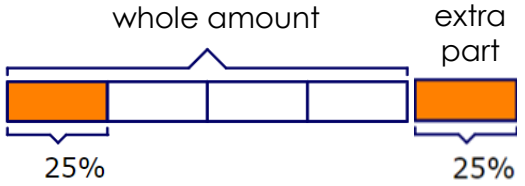
For example, you might be told that **25%** of children prefer strawberry ice cream.



If the whole amount of children is 60, then 25% of that amount is 60 ÷ 4 = 15.
So 15 children prefer strawberry ice cream.

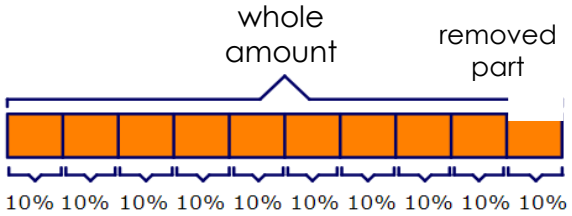
Percentage Increase

A bar of chocolate has a special offer of **25%** extra for the same price.

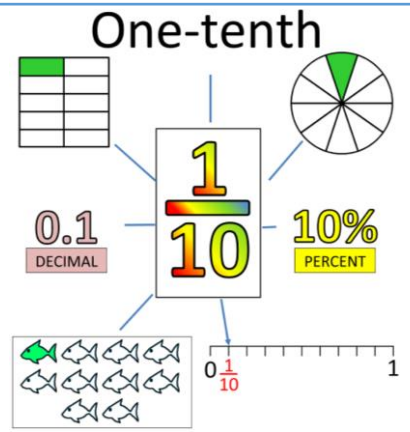


If the whole amount of chocolate is 40g, then 25% of that amount is 40 ÷ 4 = 10.
So 10g extra is added on and the special offer bar has 50g of chocolate.

Percentage Decrease



If the whole amount is 90, then 10% of that amount is 90 ÷ 10 = 9. 90 – 9 = 81
So 10% less would mean 81 is left.



Keyword/Skill	Definition/Tips
Decimal	"Decimal number" is a number that uses a decimal point followed by digits that show a value smaller than one.
Percentage	Parts per 100. The symbol is %. Example: 25% means 25 per 100.
Inverse	Opposite in effect. The reverse of. The inverse of adding 9 is subtracting 9.
Fractions	The top number (the numerator) says how many parts we have. The bottom number (the denominator) says how many equal parts the whole is divided into.
Mixed	A whole number and a fraction combined into one "mixed" number.
Increase	Make something bigger in size.
Decrease	Make something smaller in size.
Improper	A fraction where the numerator (the top number) is greater than the denominator (the bottom number).
Recurring	A decimal number with a digit (or group of digits) that repeats forever.
Integer	A number with no fractional part (no decimals). A whole number.
Terminating	A decimal number that has digits that end. Example: 0.25 (it has two decimal digits)
VAT	Value-added tax (VAT) is a tax added onto the cost of goods by the government.
Multiplier	The number that you are multiplying by.
Profit	Income minus all expenses.
Loss	A loss occurs when an item is sold for less than it cost.
Tenths	One part in ten equal parts. Example: one tenth of 50 is 5
Hundredths	One part in a hundred equal parts. Example: 1 cent is a hundredth of 1 dollar
Thousandths	One part in a thousand equal parts: Example: 1 meter is a thousandth of 1 kilometre.

Other Topics/Units this could appear in:

Working Towards:
Unit 4 – Fractions and Percentages
Crossover:
Unit 10 – Percentage of an Amount
Unit 11 – Interest and Growth/Depreciation
Unit 13 – Reverse Percentages
Unit 39 – Pie Charts
Unit 40 - Probability
Working Above
Unit 12 – Sampling, Cumulative Frequency, Box Plots & Histograms

Year 10 Maths – Unit NP8 – Fractions, Decimals, & Percentages

Converting between FDP

Here is a table of conversions that you should memorise:

Fraction	Decimal	Percentage
$\frac{1}{2}$	0.5	50%
$\frac{1}{4}$	0.25	25%
$\frac{1}{10}$	0.1	10%
$\frac{1}{100}$	0.01	1%
$\frac{1}{3}$	$0.\dot{3}$ = 0.333…	$33.\dot{3}\%$

Make an equivalent fraction with the denominator as 100. The numerator will be the percentage

E.g. Convert $\frac{9}{20}$ into a percentage

$\frac{9}{20} = \frac{45}{100} = 45\%$

Percent means per 100, so make your percentage out of 100

E.g. 30% = $\frac{30}{100} = \frac{3}{10}$

FDP & PERCENTAGES OF AMOUNTS

Divide the percentage by 100 and remove the % sign.

E.g. Convert 46% into a decimal

46 ÷ 100 = 0.46

Multiply the decimal by 100.

E.g. Convert 0.87 into a percentage.

0.87 x 100 = 87

0.87 = 87%

Keyword/Skill	Definition/Tips
Percentage	A number expressed as a fraction of 100. Percent literally means 'out of 100' Written using the '%' sign.
Increase	An amount has gone up in value by a given **percentage**
Decrease	An amount has gone down in value by a given **percentage**
Convert	A change in the form of a measurement or different unit, without the change in size or amount. E.g. Convert a **percentage** into a **fraction**
Equivalent	Equal in value, amount etc.
Sale	If there is a sale, the price will **decrease** in value by the stated **percentage**
FDP	Just shorthand for fractions, decimals and percentages

Finding Percentages of Amounts (Non-Calc)

- To find a percentage of an amount I can use these four main rules:

- **To find 50% I divide by 2**
- **To find 25% I divide by 4**
- **To find 10% I divide by 10**
- **To find 1% I divide by 100**

- Use these percentages to find any other percentage of an amount.

- Ex 1: Find 10% of 250
  250 ÷10 = 25
  10% of 250 = 25

- Ex 2 : Find 12% of 300
  10% = 300 ÷10 = 30
  1% = 300 ÷ 100 = 3
  1% = 300 ÷ 100 = 3
  Add them all together 30 + 3 + 3 = 36
  12% of 300 = 36

- There may be more than one way to get your percentage. Whatever way works for you will be fine!

- Ex 3: Find 29% of 800m
  10% of 800m = 800m ÷10 = 80m
  I need 3 lots of that for 30 % so
  80m x 3 = 240m
  1% of 800m = 800m ÷ 100 = 8m
  30% - 1% = 29% so 240m – 8m = 232m
  29% of 800m = 232m

Ordering FDP

- When you are asked to order FDP, it is best to convert them to the same measurement e.g. convert them all into fractions etc..

- Ex 1: Put the following in descending order: 60%, $\frac{1}{2}$, 0.3, 0.45, 53%, $\frac{3}{4}$
  It is up to you to decide which you think the easiest conversion will be.
  60% and 53% are already percentages.

  0.3 x 100 = 30 = 30%

- 0.45 x 100 = 45 = 45%

  $\frac{1}{2}$ = 50% (This is one you should know)

  $\frac{3}{4}$ 4 x 25 = 100 so 3 x 25 = 75 so $\frac{75}{100}$ = 75%

- Now I can order them in descending order:
  Answer = $\frac{3}{4}$, 60%, 53%, $\frac{1}{2}$, 0.45, 0.3

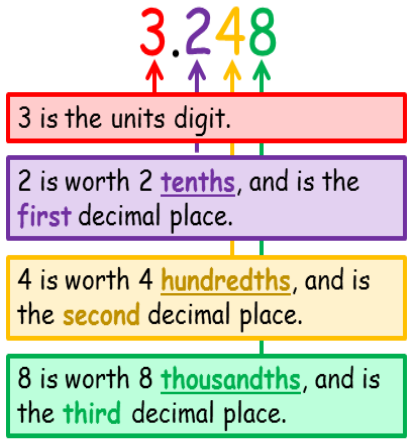
Other Topics/Units this could come up in:

- More Complex Percentages of Amounts
- Interest & Growth
- Depreciation & Decay
- Reverse Percentages
- Fraction Calculations
- Recurring Fractions
- Surds including Rationalising

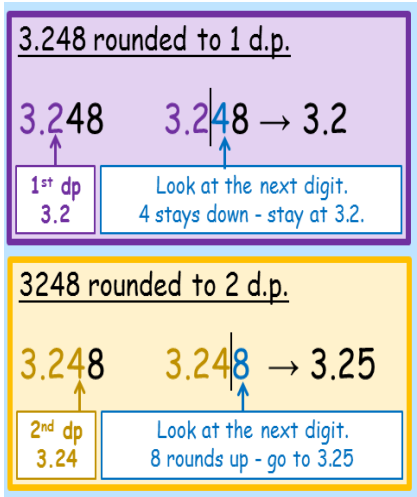
Year 10 Maths – Unit NP9 – Estimation & Use of Calculator

Rounding – Decimal Places

- You need to be able to round a number to a given number of **decimal places.**



You will sometimes see "decimal place" shortened to "d.p."



Error Intervals

You need to be able to use inequality notation to specify error intervals.

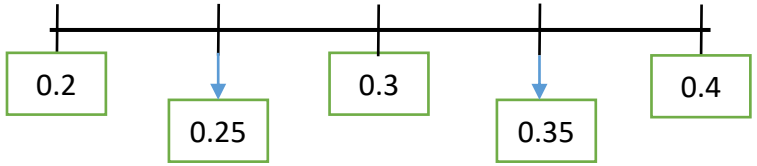
Example:

0.3 has been rounded to 1 decimal place. Write the error interval.

0.2 is the decimal place below 0.3 and 0.4 is the decimal place above 0.4.

My lower bound is halfway between 0.2 & 0.3

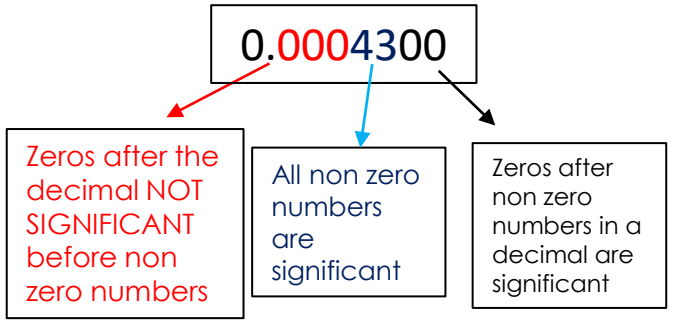
My upper bound is halfway between 0.3 & 0.4



Therefore, my error interval = $0.25 \leq x < 0.35$

Rounding- Significant Figures

- You need to be able to round a number to a given number of **significant figures.**



Example 1

Round 524 to **one** significant figure.

Check 1st significant digit value = 500

Round to the nearest 100 = 500

Example 2

Round 0.006832 to **two** significant figures.

Check 2nd significant digit value = 8/10,000 (8 ten thousandths)

Round to the nearest 10,000th = 0.0068

Keyword/Skill	Definition/tip
Integer	A whole number - can be positive or negative or zero.
Number	Describes a quantity or value. Can be a word or figure or symbol.
Digit	A symbol used to show a number.
Decimal	A number system based on the number 10
Decimal place	The position of a digit to the right of a decimal point.
Significant Figure	Numbers beginning with the left non zero digit OR beginning with the first non zero digit after the decimal point if there are zero digits.
Rounding	Change a number to a more convenient but less accurate value.
Inequality	'Not equal to' Inequality symbols ≠ not equal to, ≥ greater than or equal to, ≤ less than or equal to, > greater than, < less than, = equal to.
Error interval	A range of values that could be taken before rounding/truncating.

Exams!

- Rounding to decimal places and significant figures can appear as 1 mark questions.
- You may be asked to round an answer at the end of a 3, 4, 5 mark question.
- A 'bog standard' error interval question (as shown) will be worth 2 marks.

Other topics/Units this could appear in:

Upper and lower bounds

Area & Volume

Sampling

Year 10 Maths – Unit NP9 – Estimation & Use of Calculator

Estimation

You need to be able to estimate answers to calculations by rounding to 1 significant figure or an appropriate level of rounding.

Example 1

Estimate the value of 2.9 x 403

Round both to 1 sig fig

2.9 rounds to 3
403 rounds to 400

3 x 400 =1200

Example 2

Bob buys 72 packets of crisps at 19p each.
Estimate the total cost.

Round both to 1 sig fig

72 = 70
19 = 20p
70 x 20 = 1400p = £14.00

Example 3

You will need to be able to say whether an answer is an overestimate or an underestimate.

a) Paul organised an event for charity.
Each ticket cost £19.95.
Paul sold 395 tickets.
Paul paid costs of £6000.
Work out an estimate for how much money Paul gave to charity. (3)

Round to 1 sig fig

£19.95 = £20
395 = 400
20 x 400 = £8000
Take away costs = 8000 – 6000 =2000
= £2000

b) Is your answer to part (a) an overestimate or an underestimate? Give a reason.

My answer is an overestimate because I have rounded both £19.95 and 395 up, therefore £8000 is more than the actual amount and £2000 is more than the actual amount given to charity.

Keyword/Skill	Definition/tip
Decimal place	The position of a digit to the right of a decimal point.
Significant Figure	Numbers beginning with the left non zero digit OR beginning with the first non zero digit after the decimal point if there are zero digits.
Rounding	Change a number to a more convenient but less accurate value.
Estimation/ estimate	To make an approximate or rough calculation based on rounding.

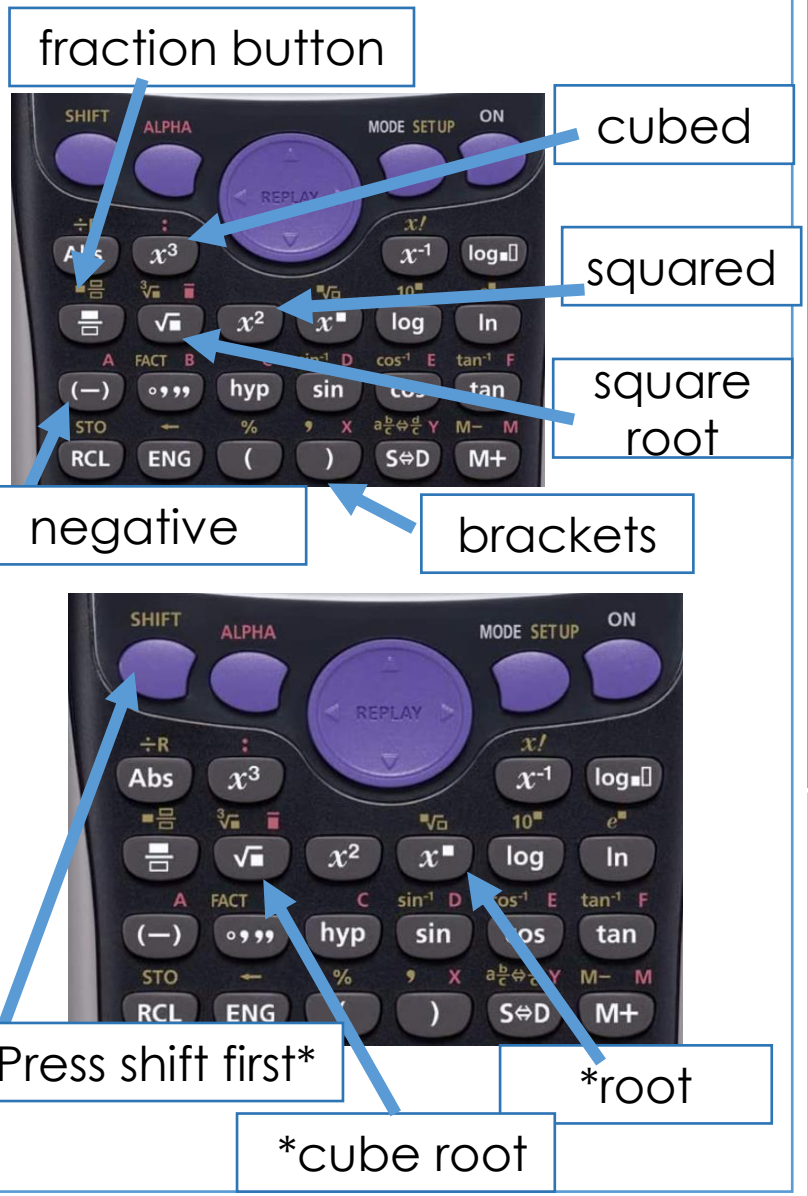
Other topics/Units this could appear in:
Upper and lower bounds
Area & Volume
Sampling

Exams!
- Estimation questions can appear on calculator papers but often will be found **on non-calculator** paper
- You will gain no marks if you work out the exact answer
- You must include the rounded values in your working
- You will gain a mark for correctly rounding in a 3 mark question

Year 10 Maths – Unit NP9 – Estimation & Use of Calculator

1. Calculators

- You will need to make sure that you are familiar with the keys on the calculator



2. Calculations

- Use the buttons to correctly enter the calculations.

Example 1

Work out the reciprocal of 1.25

Reciprocal means $\frac{1}{n}$ so enter $\frac{1}{1.25} = 0.8$

So the final answer is: 0.8

Example 2

Use your calculator to work out: $\frac{\sqrt{7056}}{0.35 \times 12.8}$

Use the cursor to move down

Write down all of the figures of your display

So the final answer is: 18.75

Example 3

Work out the value of: $\frac{\sqrt{30}}{2.5^2} = 0.876356092$

Give your answer to 3 decimal places

So the final answer is: 0.876

3. Percentage of an Amount (with a calculator)

Here we can use **percentage multipliers**.

First of all you need to find the decimal equivalent of the percentage you need.

50%	=	0.5
75%	=	0.75
30%	=	0.3
2%	=	0.02

You need to use these decimals as percentage multipliers.

Example

Find 48% of £250

48% = 0.48 (this is the percentage multiplier)

250 x 0.48 = 120

So, 48% of £250 is £120

Keyword/Skill	Definition/Tips
Powers	The power (or exponent) of a number says how many times to use the number in a multiplication. Example $8^2 = 8 \times 8 = 64$ (exponent (or index, or power); base)
Square Root	A square root of a number is a value that, when multiplied by itself, gives the number.
Root	*The root of a number x is another number, which when multiplied by itself a given number of times, equals x.* **For example, the third root (also called the cube root) of 64 is 4, because if you multiply three fours together you get 64:**
Brackets	Symbols used in pairs to group things together
Square	The result of multiplying an integer by itself
Cube	The result of using a whole number in a multiplication three times.
Order of operations (BIDMAS)	The **order** you should do calculations in. **'Brackets, Indices, Division, Multiplication, Addition and Subtraction'.**
Reciprocal	The reciprocal of a number is: 1 divided by the number (8 → 1/8; Number; Its Reciprocal)

Other Topics/Units this could appear in:

- All units on calculator papers
- Circles
- A 'level Units

Year 10 – Maths – Unit NP10 – Proportional Reasoning

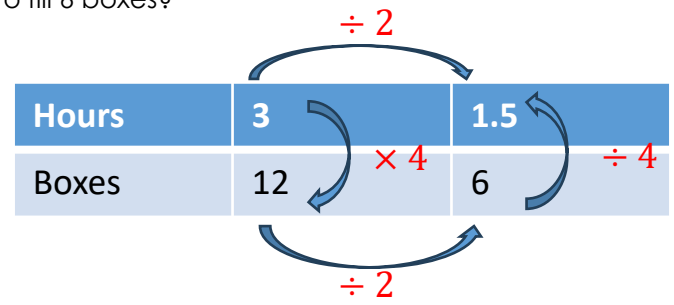
My mathematical journey

What do I need to remember from before?	What will I learn about in this unit?	Where does this lead?
Multiplicative reasoning (NP3)	Direct and inverse proportion	Ratio (NP11)
Fractions (NP7)	Proportional reasoning in various contexts	Advanced proportion and rates of change (NP13)
Double number lines and ratio tables (NP8)	Percentage changes and decimal multipliers	Contextual graphs (A9)
Percentages (NP8)		Probability (SP3)

Direct Proportion means as one quantity increases or decreases, so does the other one. Example: The more hours you work, the more you will earn.

Example 1 – solving numerically using ratio tables

It takes 3 hours to fill 12 boxes with food. How long does it take to fill 6 boxes?

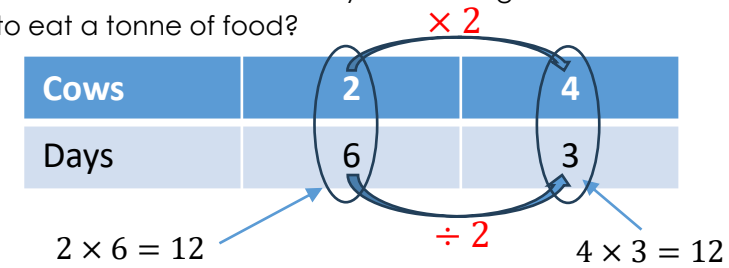


You can use any of the relationships shown in the table above to find the answer, 1.5 hours.

Inverse Proportion means as one quantity increases, the other decreases.
Example: If one quantity doubles the other is halved. If it takes 4 people 5 hours to dig a hole, it would take 8 people 2.5 hours.

Example 1 – solving numerically using ratio tables

2 cows eat a tonne of food in 6 days. How long would it take 4 cows to eat a tonne of food?



You can use any of the relationships shown in the table above to find the answer, 3 days.

Using proportion to scale up/down

In the table below is a recipe to make 10 flapjacks.

	10
Oats	80g
Butter	60g
Syrup	30ml
Sugar	36g

We can use proportion to scale this recipe up or down to make more or less flapjacks

To make 5

÷ 2

	10	5
Oats	80g	40g
Butter	60g	30g
Syrup	30ml	15ml
Sugar	36g	18g

To make 60

× 6

	10	60
Oats	80g	480g
Butter	60g	360g
Syrup	30ml	180ml
Sugar	36g	216g

To make 15

÷ 2 × 3

	10	5	15
Oats	80g	40g	120g
Butter	60g	30g	90g
Syrup	30ml	15ml	45ml
Sugar	36g	18g	54g

Year 10 – Maths – Unit NP10 – Proportional Reasoning

Best Buys

Proportional reasoning can be used to compare prices and work out which items are the best value for money.

Example

In the table below you can see two offers for footballs.

In order to compare these two deals, we need a common factor or multiple of items in each deal.

Offer A	Offer B
3 footballs	7 footballs
£12	£35

The only common factor of 3 and 7 is 1, so we can work out how much 1 football is worth in each deal

OR

A common multiple of 7 and 3 is 21, so we could work out how much it would cost to buy 21 footballs with each offer , and decide which one is the best value.

In both cases you can see that Offer A is the best value

Keyword/Skill	Definition/Tips
Best Buy	The cheapest price per item/unit OR the highest number of units/price .
Direct Proportion	2 variables change at the same rate
Unitary Method	Finding the cost of a single unit OR finding the amount of units per eg. £1
Exchange Rate	The price of one currency in terms of another currency. Eg. £1 = $1.25 For each pound I have to spend I can buy $1.25
Increase	To make something bigger in size or amount.
Decrease	To make something smaller in size or amount.

Exchange Rates and Currency Conversion

An **exchange rate** is the rate at which the money of one country can be exchanged for the money of another country.

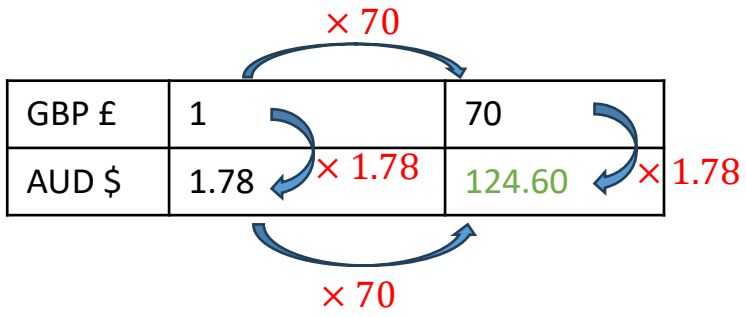
In the United Kingdom, our currency is the **British pound** and is referred to as **GBP.** The table below shows some other common abbreviations

Symbol	Country	Currency
USD	United States	Dollar
EUR	Euro Zone	Euro
GBP	Great Britain	Pound
JPY	Japan	Yen
CHF	Switzerland	Franc
AUD	Australia	Dollar
NZD	New Zealand	Dollar
CAD	Canada	Dollar

Again, we can use ratio tables to convert between currencies.

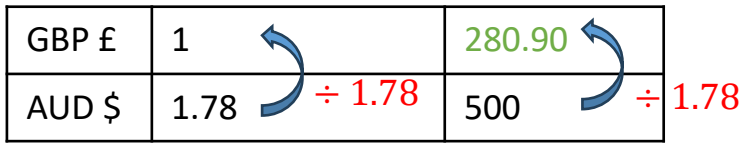
Example 1

Given the exchange rate between GBP and AUD is £1=$1.87, convert £70 into AUD.



Example 2

Given the exchange rate between GBP and AUD is £1=$1.87, convert $500 into GBP.



Answers rounded to 2 decimal places as it is currency.

Year 10 – Maths – Unit NP10 – Proportional Reasoning

Percentage Increase and Decrease

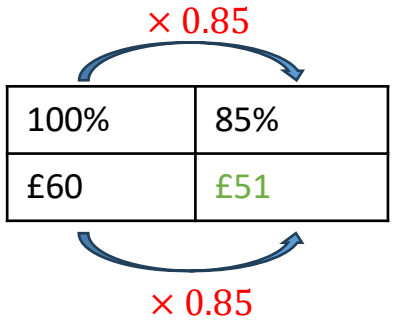
Ratio tables can also be used to help calculate percentage increases and decreases.

Example 1

Increase £60 by 15%

Example 2

Decrease £60 by 15%



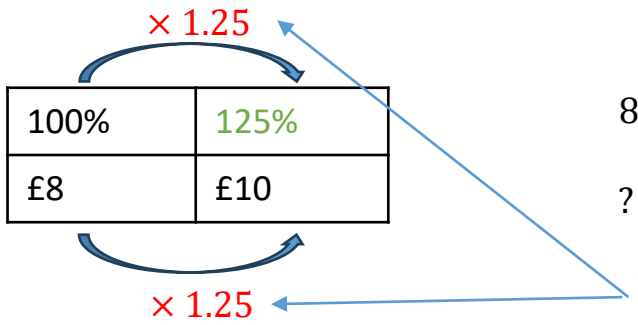
Keyword/Skill	Definition/Tips
Best Buy	The cheapest price per item/unit OR the highest number of units/price .
Direct Proportion	2 variables change at the same rate
Unitary Method	Finding the cost of a single unit OR finding the amount of units per eg. £1
Exchange Rate	The price of one currency in terms of another currency. Eg. £1 = $1.25 For each pound I have to spend I can buy $1.25
Increase	To make something bigger in size or amount.
Decrease	To make something smaller in size or amount.

Percentage Change

Using the same ratio tables, we can calculate the percentage change that has taken place.

Example 1

Joe has had a pay rise. Before the pay rise he earned £8 per hour, he now earns £10 per hour.
What is the percentage increase?



$8 \times ? = 10$

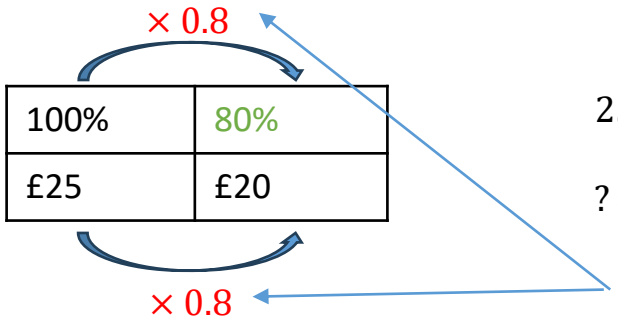
$? = 10 \div 8$

$? = 1.25$

This means there has been a 25% increase.

Example 2

In a sale a pair of shoes costs £20. Before the sale they cost £25.
What is the percentage change?



$25 \times ? = 20$

$? = 20 \div 25$

$? = 0.8$

This means there has been a 20% decrease.

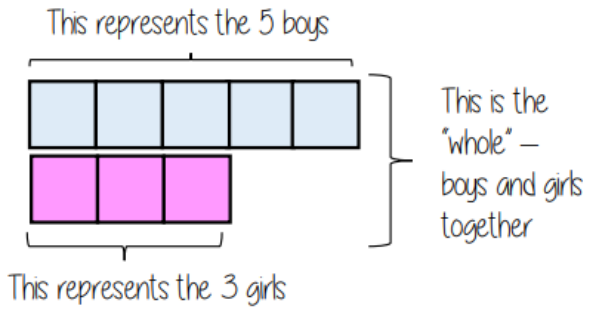
Year 10 Maths – Unit NP11 – Ratio

Ratio Notation

A ratio is a relationship between two or more quantities. They are written in the form $a:b$, which is said "a to b".

For example, in a class, the ratio of boys to girls is $5:3$.

The bar model to the right is one way we can visualise this information.



My mathematical journey

What do I need to remember from before?

- Multiplication and division; multiples and factors (NP3)
- Writing values as a fraction; equivalent fractions (NP7)
- Ratio tables (NP10)

What will I learn about in this unit?

- Using ratio notation
- Equivalent ratios and simplifying
- Ratios and fractions
- Finding values from parts or the whole

Where does this lead?

- Combining ratios (NP13)
- Similar area and volume (GM8)
- Geometric sequences (A13)
- Advanced ratio (NP16)
- Vectors (GM10)

Simplifying Ratios and Equivalent Ratios

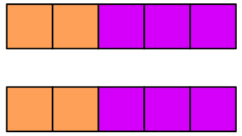
We can scale ratios up and down to make equivalent ratios or to simplify them.

O 

P 

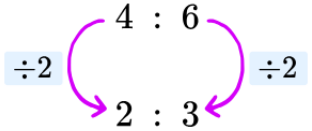
Here we have some orange and purple tiles. They are in the ratio of $4:6$.

We can regroup these tiles into two equal groups of 2 orange tiles and 3 purple tiles.



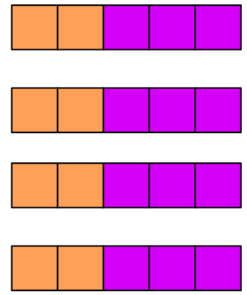
So, for every 2 orange tiles there are 2 purple tiles.

This can be written as the ratio $2:3$



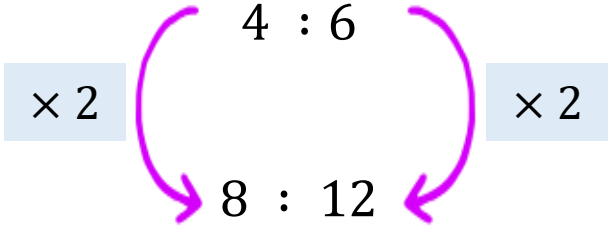
We can produce the same result without the bar model, by identifying the HFC of the two parts of the ratio.

We could also make an equivalent ratio by repeating the pattern of orange and purple tiles.



We now have 8 orange tiles there are 12 purple tiles.

This can be written as the ratio $8:12$



We can produce the same result without the bar model, by multiplying both parts of the ratio by the same value

Year 10 Maths – Unit NP11 – Ratio

Unit Ratios

You may be asked to express a ratio in the form $1:n$ or $n:1$.
These means you need to find an equivalent ratio where one of the parts is 1.

Example 1

Write the ratio $12:4$ in the form $n:1$

$$12:4 \xrightarrow{\div 4} 3:1$$

In order to get the second number in the ratio down to 1, you would need to divide it by 4.
Therefore, we need to do the same thing to the first part of the ratio.

Example 2

Write the ratio $4:6$ in the form $1:n$

$$4:6 \xrightarrow{\div 4} 1:1.5$$

This time we need the first number in the ratio to become 1, in order to do this you would need to divide it by 4.
Therefore, we need to do the same thing to the second part of the ratio.

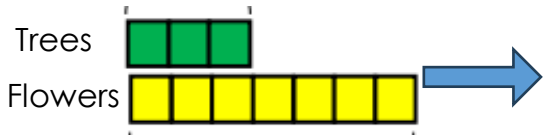
In this example, our result is no longer an integer, this is ok when we are asked to write it in the for $1:n$ or $n:1$.

Ratios as Fractions

You may also be asked to express a ratio as a fraction.

Example

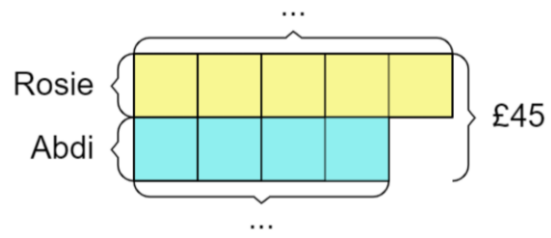
The ratio of trees to flowers is $3:7$. Express this as a fraction.



As a fraction

$$\frac{number\ of\ parts\ in\ group}{total\ number\ of\ parts} = \frac{3}{10}$$

Finding the Value of Parts of a Ratio



Finding parts of a ratio, give the whole

Rosie and Abdi share £45 in the ratio 5 : 4.
We could use a bar model to find how much each of them receives.

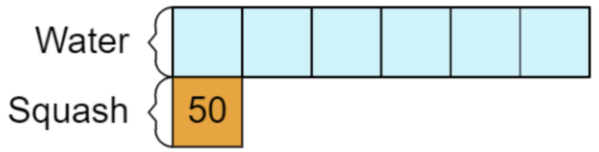
There are 9 parts in the ratio in total, so £45 needs to e shared equally into the bar model.

$$45 \div 9 = 5$$

Therefore, each box is worth £5.
So, Rosie get $5 \times 5 = £25$ and
Abdi gets $4 \times 5 = £20$

Finding parts of a ratio, given another part

Jamal is making orange squash.
He needs to mix squash : water in the ratio 1 : 6.
He has already poured 50ml of squash into his glass.
How much water should he use?
In this diagram we can see one box is worth 50ml, this means every box must be worth 50ml.
So, we need $6 \times 5 = 30$ml of water.



Finding parts of a ratio, given the difference

Zainab and Omar are sharing some sweets in the ratio of their ages, 7 : 9.
Omar receives 4 more sweets than Zainab.
We could use a bar model to help us find how many sweets each of them receives.

In this example, you can see that the two extra boxes in Omar's row are worth 4 in total.
Therefore, each box must be worth 2.
Which means, Zainab has $7 \times 2 = 14$ sweets
And Omar has $9 \times 2 = 18$ sweets.

Year 10 – Maths – Unit NP14 – Number Theory

You may remember from **Unit NP4**, **a**ny number can be written as a **product of prime factors**. It is also called **Prime Factorisation** or **Prime Factor Decomposition.**

Example

Write 120 as a product of its prime factors

You gradually break the number into smaller factors until all you have left are prime numbers.

10 and 12 are not prime numbers so can both be broken down further.

3, 5 and 2 are all prime numbers, so cannot be decomposed any further, but 4 can.

$120 = 12 \times 10$

$120 = 3 \times 4 \times 5 \times 2$

$120 = 3 \times 2 \times 2 \times 5 \times 2$

No matter what numbers you choose for each step, you'll find the product of primes is exactly the same!

We now have 120 written as a **product of prime factors** this can also be simplified using indices

$120 = 2^3 \times 3 \times 5$

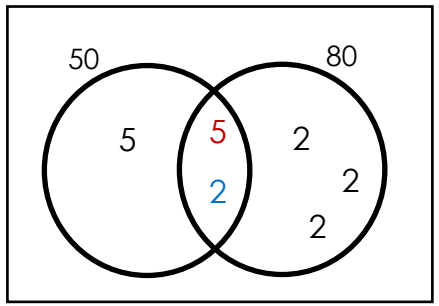
Using Product of Prime Factors to find HCF

Example: What is the HCF of 50 and 80

Using the method above, write 50 and 80 as a product of their prime factors.

$50 = 2 \times 5 \times 5$ $\qquad$ $80 = 2 \times 2 \times 2 \times 2 \times 5$

Then sort the factors into a Venn diagram, with the prime factors they have in common in the middle…



To get the HCF, multiply the numbers in the middle.

$5 \times 2 = 10$

The Highest Common Factor of 50 and 80 is 10.

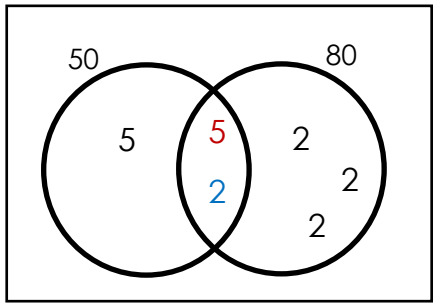
Using Product of Prime Factors to find LCM

Example: What is the LCM of 50 and 80

Using the method above, write 50 and 80 as a product of their prime factors.

$50 = 2 \times 5 \times 5$ $\qquad$ $80 = 2 \times 2 \times 2 \times 2 \times 5$

Then sort the factors into a Venn diagram, with the prime factors they have in common in the middle…



To get the LCM, multiply all of the numbers in the Venn diagram.

$5 \times 5 \times 2 \times 2 \times 2 \times 2 = 400$

The Lowest Common Multiple of 50 and 80 is 400.

Keyword/Skill	Definition/Tips
Product	Means multiply
Prime number	A number that has exactly two **factors**
Factor	An integer that divides the number exactly leaving no remainder
Multiples	Multiples of 4 is anything in the 4 times table E.g. 4, 8, 12, 16, 20, 24, 28, …
Index Form	Writing numbers in terms of powers E.g. 6 x 6 x 6 x 6 = 6^4 <- This is in index form
Prime Factor	A **factor** of a number that is also a **prime number**
Prime Factor Decomposition/ Prime Factorisation	To write a number as a **product** of **prime numbers** Every number has a unique **prime factorisation**
Highest Common Factor (HCF)	The highest number that can be divided exactly into each of two or more numbers.
Lowest Common Multiple (LCM)	The lowest quantity that is a multiple of two or more given quantities.

Other Topics/Units this could appear in:

- Factorising
- Use of Calculator
- Algebraic Proof

Exams!

- In an exam you will get the first mark for correctly writing a number as a product of its prime factors. So try and do that if you are unsure how to go any further.

Year 10 – Maths – Unit NP14 – Number Theory

Error Intervals

An error interval shows the range of values a number could have taken before being rounded or truncated.
An error interval is written using inequalities, with a **lower and upper bound**. Note that the lower bound can be "equal to" but the upper bound is not.
2.5 has been rounded to 1d.p. so the error interval is

$$2.45 \leq x < 2.55$$

If you need help with this, you may find it useful to look back at the **Crossover Unit 8 – Rounding and Error Intervals** knowledge organiser.

Appropriate Accuracy

This is the level of accuracy when both the upper bound and lower bound are rounded in the same way and give the same value.
For example, if UB = 12.3512 and LB = 12.3475
Rounded to 1dp: UB = 12.4, LB = 12.3
Rounded to 2dp: UB = 12.35, LB = 12.35
Rounded to 3dp: UB = 12.351, LB = 12.348
So the appropriate accuracy is 2dp

Truncation

Approximating a decimal number by dropping all decimal places past a certain point without rounding.
For example, 3.14159265... Can be truncated to 3.1415. If this had been rounded to 4dp it would be 3.1416

1. Using Bounds with Addition or Multiplication

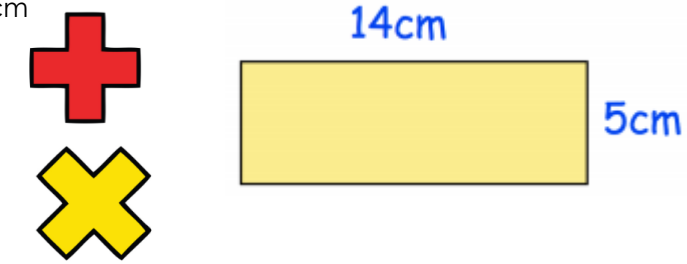
This may come in the form of a question talking about perimeter (adding lengths) area (multiplying lengths) or working out total weights, costs or number of items. For this you would use the lower bounds (LB's) and upper bounds (UB's) as you would expect.

Example

A rectangle has a length 14cm and width 5cm to the nearest cm

a) What is the minimum perimeter of the rectangle?
Here we need the LB's for the length and width.
LB of 14cm = 13.5cm. LB of 5cm = 4.5cm
Therefore, the minimum perimeter is 13.5+13.5+4.5+4.5 = 36cm

b) What is the maximum area of the rectangle?
Here we need the UB's for the length and width.
UB of 14cm = 14.5cm. UB of 5cm = 5.5cm
Therefore, the maximum area is 14.5 x 5.5 = 79.75cm²



2. Using Bounds with Subtraction and Division

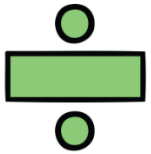
It is very common to see these questions as substitution questions. It is not as obvious which LB's or UB's you need for these, so you need to think about it carefully.

Example 1 – Subtraction

a = b – c
b = 30 to the nearest 10
LB = 25 UB = 35
c = 8 to 1s.f.
LB = 7.5 UB = 8.5
Minimum value of a
a = 25 – 8.5 = 16.5
Maximum value of a
a = 35 – 7.5 = 26.5

Example 2 – Division

a = b ÷ c
b = 55 to 2 s.f.
LB = 54.5 UB = 55.5
c = 2.5 to 1d.p.
LB = 2.45 UB = 2.55
Minimum value of a
a = 54.5 ÷ 2.55 = 21.373 (3dp)
Maximum value of a
a = 55.5 ÷ 2.45 = 22.653 (3dp)



Keyword/Skill	Definition/Tips
Integer	A positive or negative whole number, or zero.
Rounding	To change a number to a more convenient value, by making it bigger or smaller
Decimal place	The number of decimal places is the number of digits after the decimal point, including zero. 3.205, has three decimal places
Significant figures	All of the digits in a number starting with the first non-zero digit. 3.205, has 4 significant figures 0.205, has 3 significant figures 0.005, has 1 significant figure.
Lower bound	The smallest value that would round up to the estimated value.
Upper bound	The smallest value that would round up to the next estimated value.
Underestimate	An estimate that is less than the actual answer.
Overestimate	An estimate that is more than the actual answer.
Degree of accuracy	A measure of how close an estimate is to the actual answer. The more decimal places or significant figures you include, the higher the degree of accuracy.
Substitute	To replace letters with numbers
Truncate	To cut a number short with no rounding.

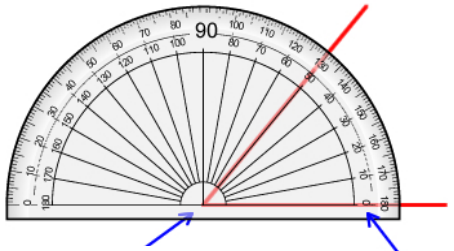
Other Topics/Units this could appear in:
- A-level Units

Year 10 Maths – Unit GM1 – Drawing, Measuring & Constructing

Measuring an angle

- Accurate
- **Use** a protractor
- Use **pencil** and a ruler

Line up the bottom of the protractor with bottom line of the angle.



Make sure the vertex (corner) of the angle is lined up with the center of the protractor.

Start at zero and read up.

Estimating an Angle

- Is an educated guess!
- **Do not use** a protractor
- Consider the **angle properties**, is it acute (therefore smaller than 90°) or obtuse (bigger than 90° but smaller than 180°).

My mathematical journey

What do I need to remember from before?

Lines and angles (KS2)

Measuring (KS2)

What will I learn about in this unit?

Labelling lines and angles

Drawing and measuring lines and angles

Using compasses and a protractor

Constructions and loci

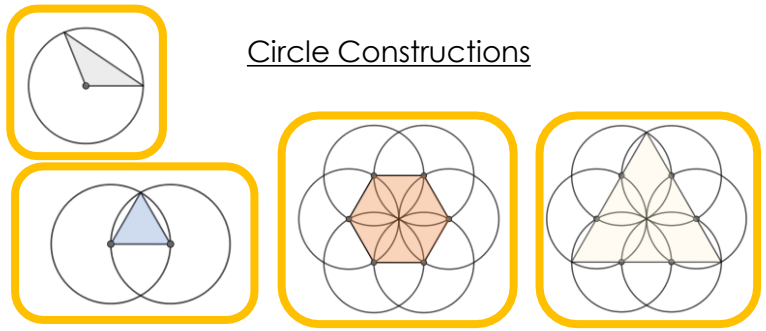
Where does this lead?

Polygons and angles (GM2)

Congruence and similarity (GM4)

Advanced drawing, measuring and constructing (GM7)

Circle Constructions



By drawing circles, you can **construct** various **polygons**.

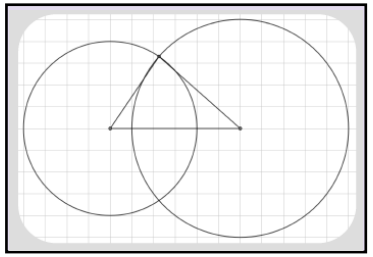
Acute	Right	Obtuse
$0° < \theta < 90°$	$90° = \theta$	$90° < \theta < 180°$

Straight	Reflex	Full turn
$180° = \theta$	$180° < \theta < 360°$	$360° = \theta$

Constructing Triangles – given 3 side lengths

Using **ruler** and **compasses**, you can **construct** any triangle, given its three side lengths.

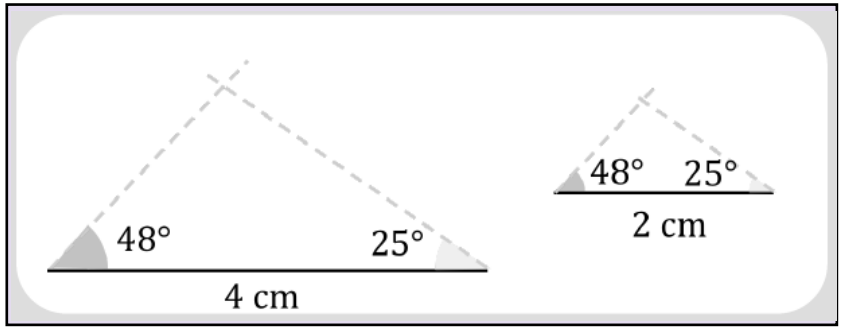
This triangle has side lengths 6cm, 5cm and 4 cm.
The 6cm line was drawn with a ruler. Then circles with radii 5cm and 4cm were constructed at either end of the 6cm line.
The intersection points show where the other vertex should be.



Using **ruler** and **protractor**, you can **construct** any triangle, given two of its angles.

These triangles both have interior angles of 48° and 25° but the side lengths are different.
Draw the side in between the two angles first; sometimes this is given to you in the question. Then measure the angles from each end of the line – make sure the protractor is lined up correctly! Extend your construction lines until they intersect (but don't rub them out – the examiner will want to see them).
The intersection points show where the other vertex should be.

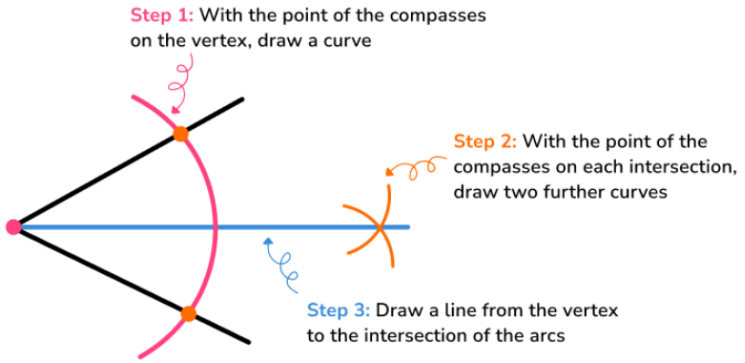
Constructing Triangles – given 2 angles



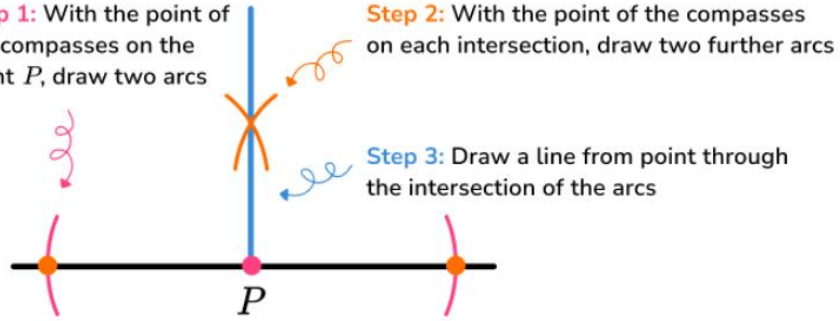
Year 10 Maths – Unit GM1 – Drawing, Measuring & Constructing

Constructions

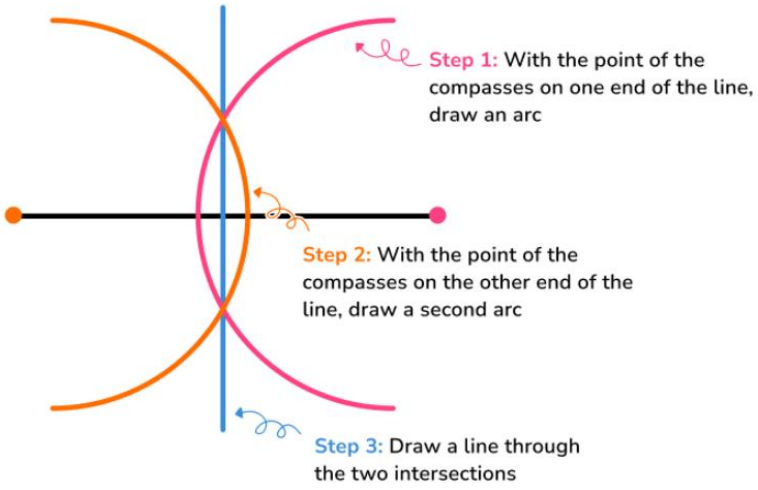
Angle bisector



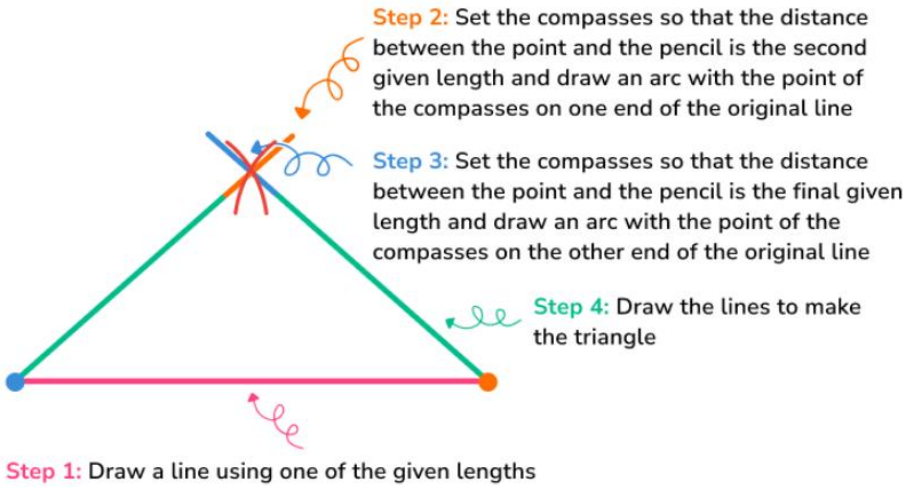
Perpendicular from a point on a line



Perpendicular bisector



Triangle given all three sides



Keyword/Skill	Definition/Tips
Mensuration	The act or process of measuring
Pair of Compasses	A mathematical instrument that is used to draw circles and **arcs**
Point	A point has no length or width (it exists in no dimensions, or 0D)
Line	A line has infinite length ad no width (it exists in one dimension, or 1D) We use arrows to show its infinity in both directions.
Ray	A ray is a section of a line with a starting point that continues infinitely in one direction. We use an arrow to show its infinity in one direction.
Line segment	A line segment is a section of a line with a starting point and an end point
Construct	We construct when we only use compasses and a straight edge (ruler)
Bisector	Bisect means to cut in half, in to two equal pieces.
Perpendicular	Lines that meet at a right angle.
Equidistant	Equal distance from two points or lines.
Locus (plural – loci)	The path of all points that fit a condition

Year 10 Maths – Unit GM2 – Angles & Polygons

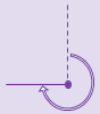
Measuring Turn

One way that we can interpret an angle is as a measure of **turn**.
How many degrees has the line segment turned through in each case?

360°
(a full turn anticlockwise)

90°
(A quarter turn anti-clockwise)

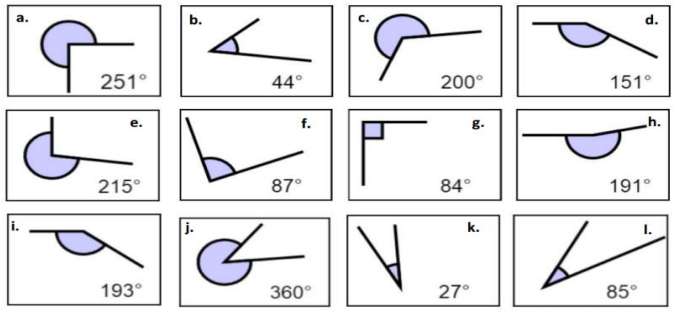
180°
a half turn clockwise



270°
clockwise
(Three quarters of a turn clockwise)

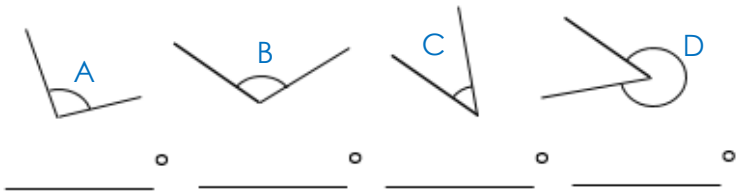
incorrectly estimated?

Which of these angles have been incorrectly estimated?



Write the incorrect estimations here: ___ ___ ___ ___ ___ ___

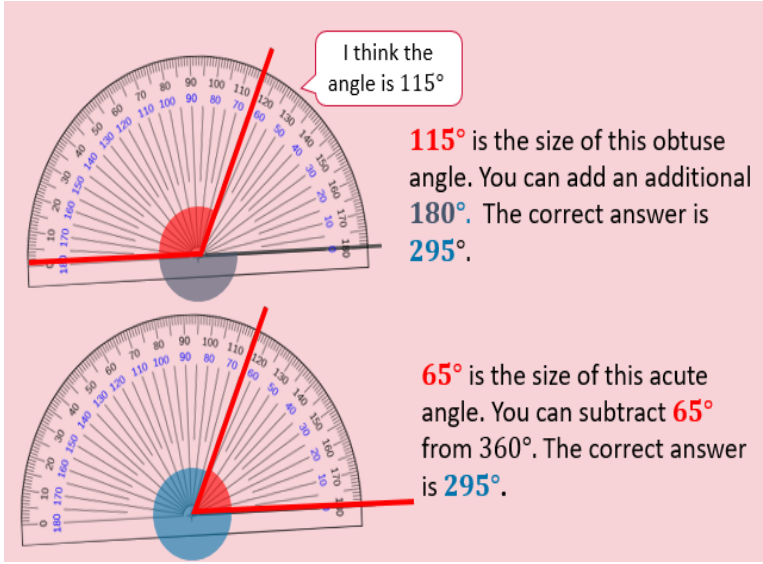
Comparing Angles



Estimate the size of each angle.
What type of angle is each?
Which is the smallest angle?
Place them in order of size.

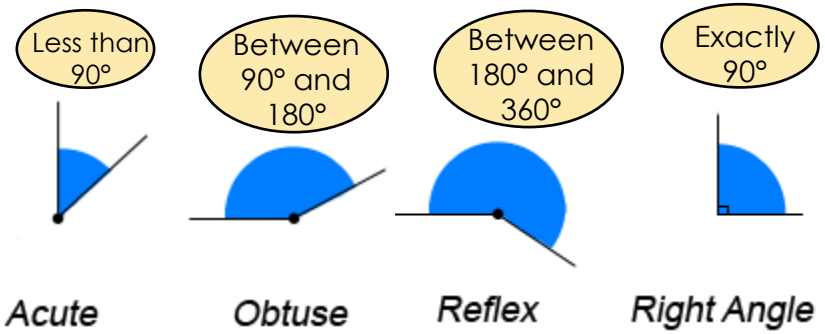
Measurement Mistakes

Take care when measuring angles with a **protractor** - make sure you read the scale starting at zero.



Types of Angles

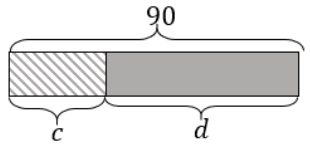
Deciding which type of angle you have helps when estimating its size and also helps you make sure you measured it correctly.

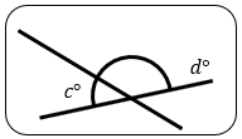


Partitioning known angles

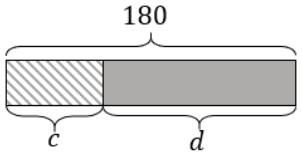
Connect each equation to the bar model and image.

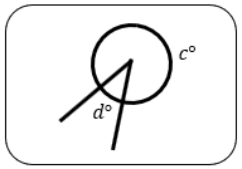
$c + d = 360$



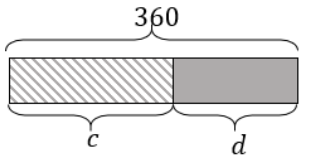


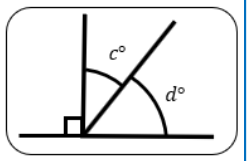
$90 - c = d$





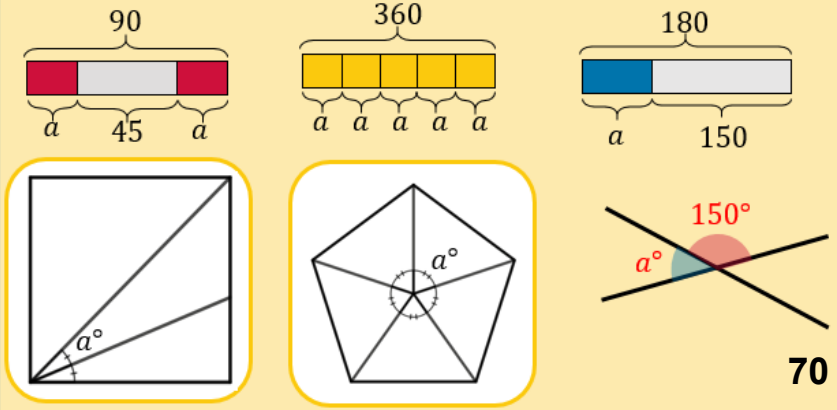
$180 = c + d$





You need to know that:
Angles that meet on a straight line sum to 180 °
Angles that meet at a point sum to 360 °

Making connections



Year 10 Maths – Unit GM2 – Angles & Polygons

parallel lines

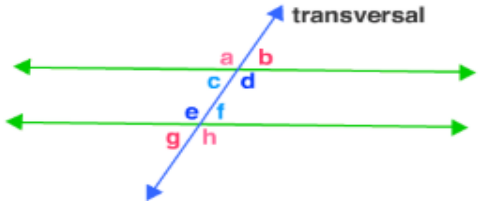
- lines that are always an equal distance apart.
- coplanar lines that do not intersect.

EXAMPLES:

parallel lines

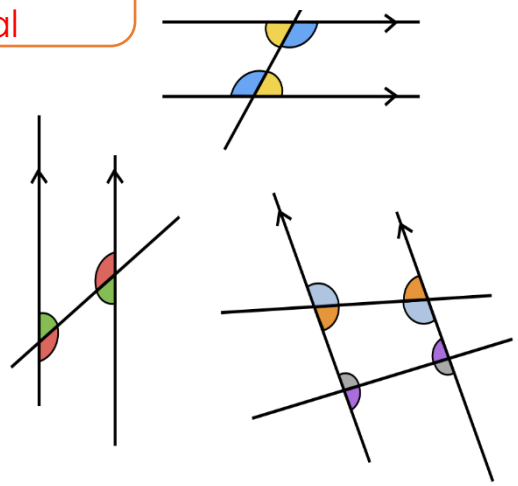
Parallel lines are equidistant, always the same distance apart … never touching

angles created by a transversal intersecting parallel lines



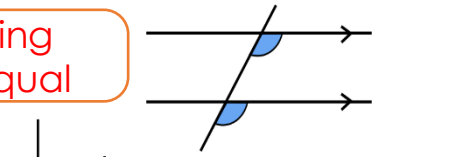
Intersection Points

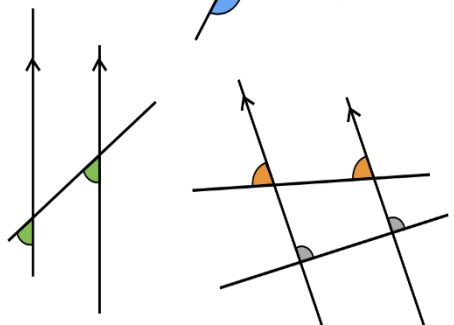
Alternate angles are equal



Pairs of alternate angles are shown in the same colour.

Corresponding angles are equal

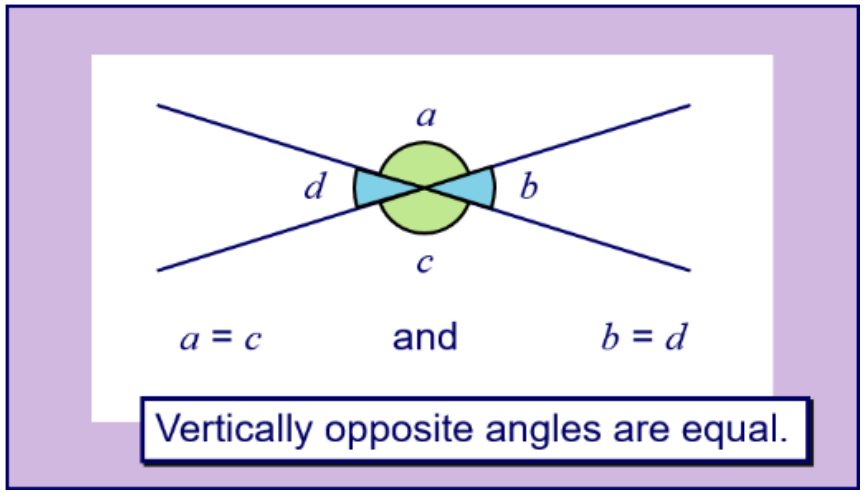




Pairs of corresponding angles are shown in the same colour.

Vertically Opposite Angles

When two straight lines intersect, two pairs of vertically opposite angles are formed.

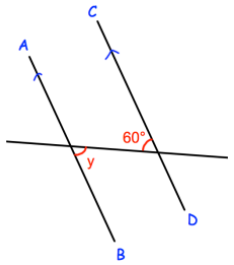


Keyword/Skill	Definition/Tips
Angle	The amount of turn between two rays called arms meeting at a common point called vertex.
Vertically opposite	Pair of angles directly opposite to each other, formed by intersection of straight lines.
Reflex	Any angle that measures more than 180 degrees but less than 360 degrees.
Parallel	Equidistant lines, that is, exactly the same distance apart and never touching.
Partitioning	A strategy that splits numbers into smaller addends, factors or place value to make calculation easier.
Perpendicular	Meeting or crossing at a right angle.
Protractor	An instrument used to measure angles in degrees.
Adjacent Angles	Angles immediately next to each other.
Degrees	The unit of measuring the size of an angle.
Acute	Any angle that measures less than 90 degrees.
Obtuse	Any angle that measures between 90 degrees and 180 degrees.
Right angle	Any angle that measures exactly 90 degrees.

Year 10 Maths – Unit GM2 – Angles & Polygons

Alternate Angles

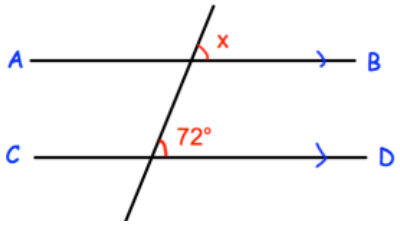
You need to know that alternate angles are equal.



Example
AB is parallel to CD
Q-work out angle y
A- 60°
Q-Give a reason for your answer.
A- Alternate angles are equal.

Corresponding Angles

You need to know that corresponding angles are equal.

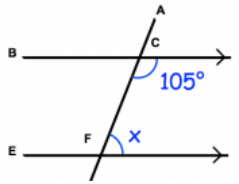


Example
AB is parallel to CD
Q-work out angle x
A- 72°
Q-Give a reason for your answer.
A- Corresponding angles are equal.

Co-Interior Angles

Co-interior angles add up to180°

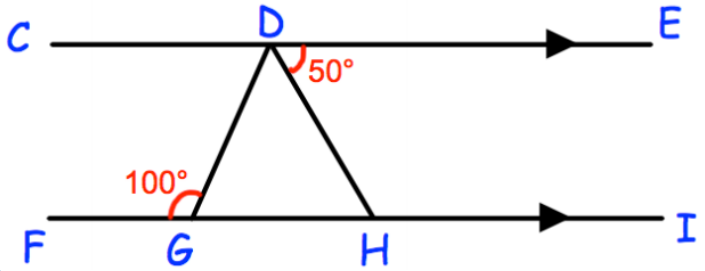
Q-Work out x
A- 180- 105 = 75°



Applying other known angle facts

You need to be able to apply a range of angle facts to more complex angle questions

Example
CE and FI are parallel lines.
Angle EDH = 50°
Angle DGF = 100°



Show, giving reasons that triangle DGH is isosceles.

Angle facts to use
DHG = 50° –alternate angles are equal.
DGH = 80° –angles on a straight line = 180°
GDH = 180-80-50 = 50° - angles in a triangle sum to 180°
Triangle DGH is isosceles as it has 2 equal angles of 50°.

Exams!
- Use a highlighter or a different colour to highlight angle facts on any diagram given.
- Always show your method and give reasons.

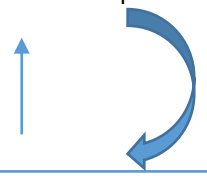
Keyword/Skill	Definition/tip
Angle	The amount of turning between two lines meeting at a point.
Alternate angles	Two angles that are formed when a line (transversal) crosses a pair of parallel lines. These angles are equal. 
Corresponding angles	Angles that share the same relative position when a transversal crosses a pair of parallel lines. These angles are equal. 
Parallel Lines	Lines that are always the same distance apart. (Like train tracks)
Transversal	A line that crosses two other lines. (Red) 

Other topics/Units this could appear in:
- Trigonometry
- Vectors
- Bearings
- Coordinate geometry

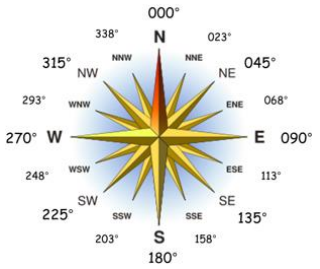
Year 10 Maths – Unit GM2 – Angles & Polygons

Bearings are used to specify direction and are used to navigate ships and aeroplanes.
The key point to remember are:

1. Bearings are measured starting from North.
2. Bearings are always measured in a clockwise direction.
3. Bearings are always written in 3 figures (45° becomes 045°).



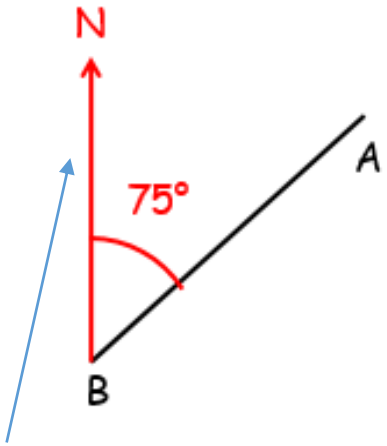
Compass Points



Keyword/Skill	Definition/Tips
Bearing	The angle measured in degrees clockwise from North.
Degree	A measure for angles. There are 360 in a full turn.
Perpendicular	A line that is at a right angle, 90°, from another line
North line 	A line facing North that all bearings are measured from.
Clockwise 	Moving in the direction of the hands of a clock.
Angle 	The amount of turn between two lines about their common point.
Bisect 	To divide something into two equal parts.
Protractor	An instrument used to draw or measure angles.

Measuring Bearings

Find the bearing of A from B.



Mark the North line at B. (You can draw this in if there isn't one).

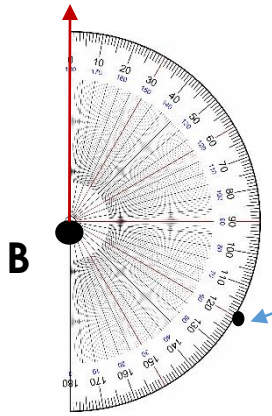
Measure the angle, clockwise from the North line to A.

Give the answer as a three figure bearing.

075°

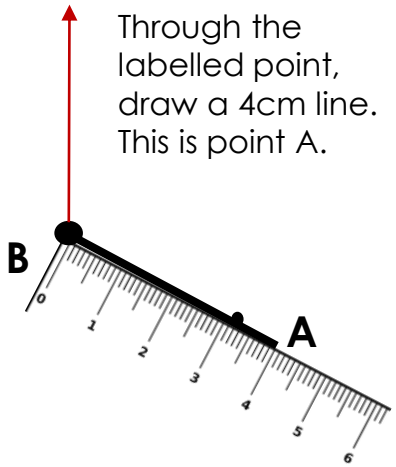
Drawing Bearings

B is on a bearing of 120° from A and a distance of 4cm.



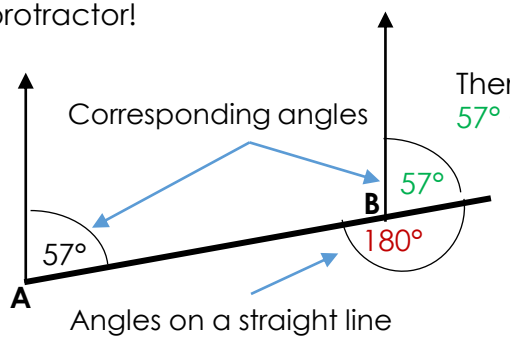
From point B, measure an angle of 120°. Label it so you don't forget where it is.

Through the labelled point, draw a 4cm line. This is point A.



Calculating Bearings

Find the bearing of A from B.
You need to remember some angle facts to calculate these without a protractor!



Therefore, the bearing of A from B is:
57° + 180° = 237°

Look at **Crossover U36 - Alternate and Corresponding Angles/Angle Facts** if you need help with the angle facts used here.

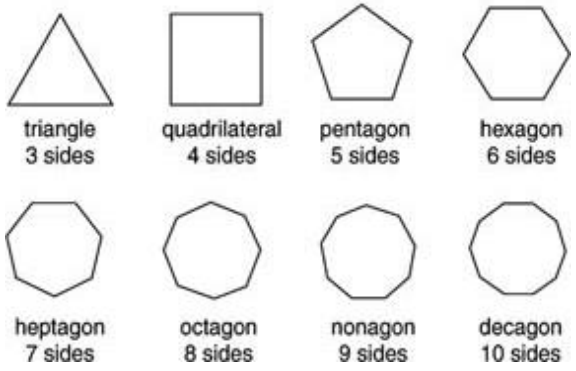
Other Topics/Units this could appear in:

- Properties of Shapes
- Angle Facts
- Mensuration

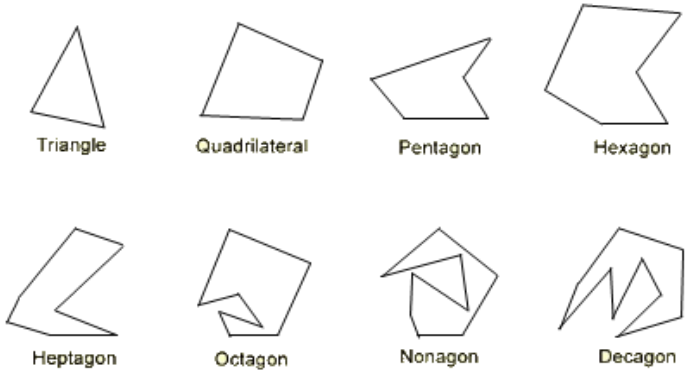
Year 10 Maths – Unit GM2 – Angles & Polygons

Name of Quadrilateral	Properties of the Shape	Example
Square	1. All of its sides are the same length. 2. 2. All of its angles are equal-90° 3. 3. It has 2 pairs of parallel sides	
Rectangle	1. Opposite sides are the same length 2. All of its angles are equal-90° 3. It has 2 pairs of parallel sides	
Rhombus	1. All sides are the same length 2. None of its angles are 90° 3. It has 2 pairs of parallel sides	
Parallelogram	1. Opposite sides are the same length 2. None of its angles are 90° 3. It has 2 pairs of parallel sides	
Kite	1. Adjacent sides are the same length 2. 1 pair of opposite angles are equal 3. It has 0 pairs of parallel lines	
Trapezium	1. It has 1 pairs of parallel lines 2. In the special case of an isosceles trapezium it has 1 pair of opposite sides of equal length	

Regular Polygons



Irregular Polygons

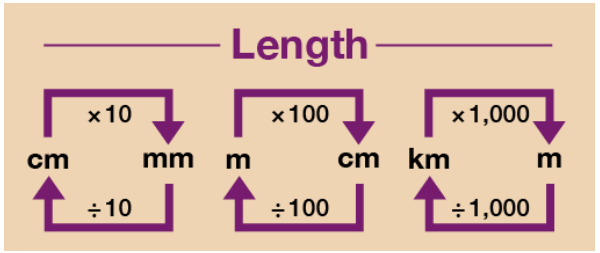


Units & Measurements

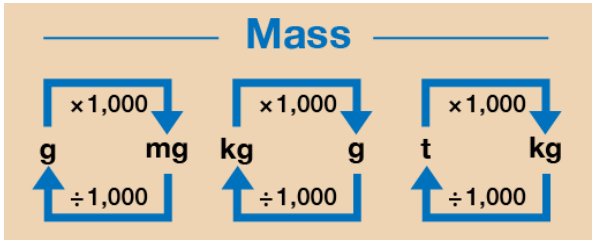
What lengths are measured in. These can include:
mm – millimetre
cm – centimetre
m – metre
km – kilometre
ft – foot/feet
yds – yards

Some units you may see in volume and capacity:
mg – milligrams
g – grams
kg – kilograms
ml – millilitres
l - litres

Converting Units (Lengths)



Converting Units (Mass)



Other Topics/Units this could appear in:

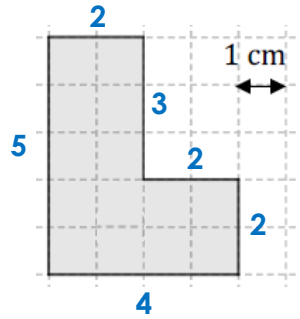
- Circles, Arcs and Sectors Bearings
- Plans and elevations
- Constructions
- Surface Area & Volume – cylinders, cones, spheres & frustums
- Similarity in 2D & 3D
- Circle Geometry
- Circle Theorems

Year 10 Maths – Unit GM3 – Area

Perimeter

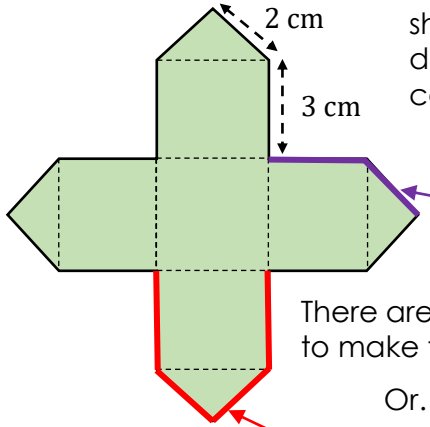
Perimeter is the **distance** all the way around the **edge** of a shape.

By **counting edges** of **squares** along the **sides** of a shape on a grid, we can work out the perimeter of that shape.



The perimeter of this L shape is 2 + 3 + 2 + 2 + 4 + 5 = 18 cm

For more complicated shapes, we can use different strategies to calculate the perimeter.



$8 \times (2 + 3)$ cm

There are 8 lots of 2cm + 3cm to make the whole perimeter.

Or…

$4 \times (2 + 2 + 3 + 3)$ cm

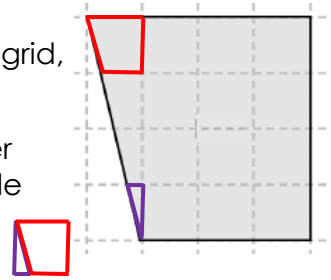
There are 4 lots of 2cm + 2cm + 3cm + 3cm to make the whole perimeter.

Area – counting squares

Area is the amount of **space** inside a shape.

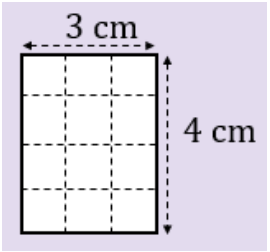
By **counting squares inside** a shape on a grid, we can work out the **area** of that shape.

For part squares, we can put these together to create whole squares. The purple triangle can be counted with the red trapezium to form a whole square.



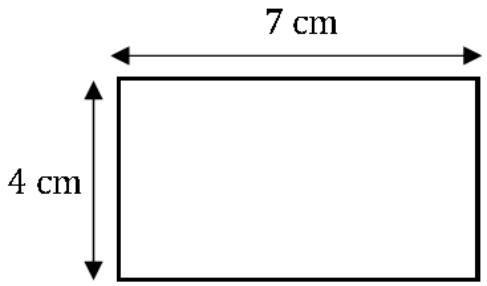
Area of a rectangle

We can calculate the area of a rectangle by multiplying:



There are four rows, with three squares in each row. $4 \times 3 = 12$ so the area is 12 cm^2

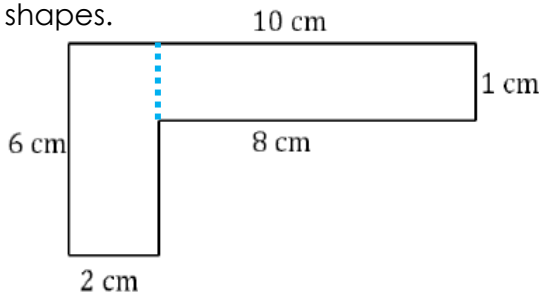
There are four rows, with seven squares in each row. $4 \times 7 = 28$ so the area is 28 cm^2



Compound Shapes

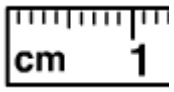
By splitting compound shapes into simple shapes, we can find the total area by adding the areas of the simple shapes.

There are two rectangles: 8 x 1 and 2 x 6, so the total area is 8 + 12 = 20 cm^2



Other Topics/Units this could appear in:

- Perimeter and Area
- Plans and Elevations
- Surface Area and Volume

Keyword/Skill	Definition/Tips
Perimeter	Distance around the edge of a shape. Start and finish at the same point.
Area	The amount of space inside a shape. Measured in square units, such as cm^2, mm^2, m^2 …
Compound	Where more than one shape have been stuck together to form a new shape.
Centimetre 	Metric unit of measurement for lengths.
Millimetre 	Smaller unit of measurement than centimetres. 1cm = 10mm
Metre	Larger unit of measurement than centimetres. A door is about 2m tall. 100cm = 1m
Kilometre	Larger unit of measurement, usually used for distances between towns and cities in Europe. (The UK uses miles) 1000m = 1km

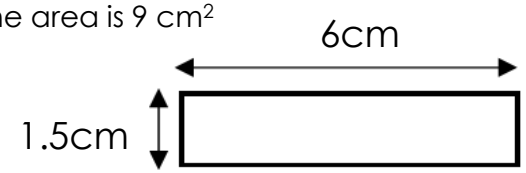
Year 10 Maths – Unit GM3 – Area

Area of a Rectangle

The **area** of a **rectangle** is calculated by multiplying the **length** by the **width**.

Area of rectangle = length × width

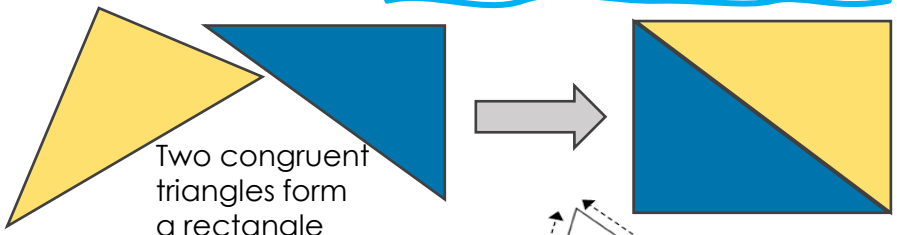
The length is 6cm, the height is 1.5cm.
6 × 1.5 = 9 so the area is 9 cm²



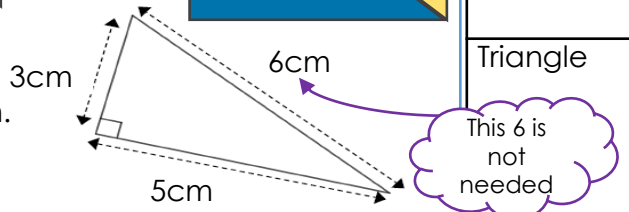
Area of a triangle

The **area** of a **triangle** is calculated by multiplying the **height** by the **base**, then **dividing by 2**.

Area of triangle = $\frac{\text{height} \times \text{base}}{2}$



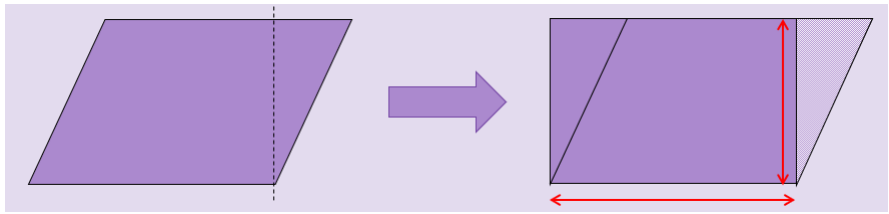
The height is 3cm, the base is 5cm.
$\frac{3 \times 5}{2}$ = 7.5 so the area is 7.5 cm²



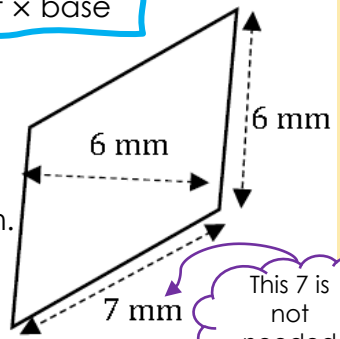
Area of a parallelogram

The **area** of a **parallelogram** is calculated by multiplying the **perpendicular height** by the **base**.

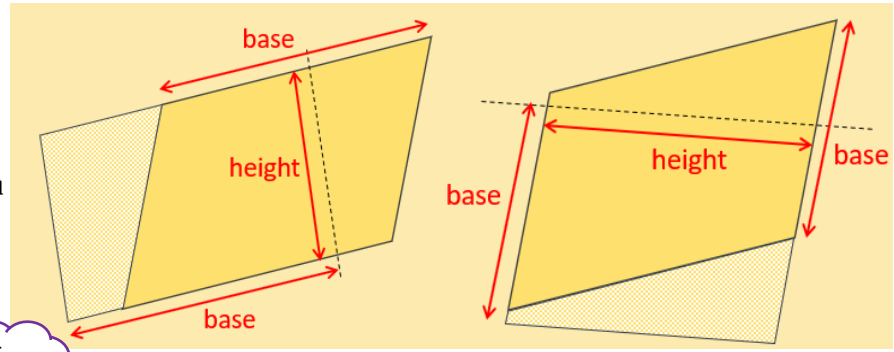
A parallelogram can be split and rearranged to form a rectangle



Area of parallelogram = height × base



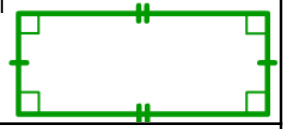
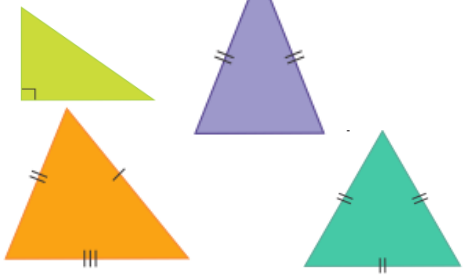
The height is 6cm, the base is 6cm.
6 × 6 = 36 so the area is 36 cm²



The height must be **perpendicular** to the base.

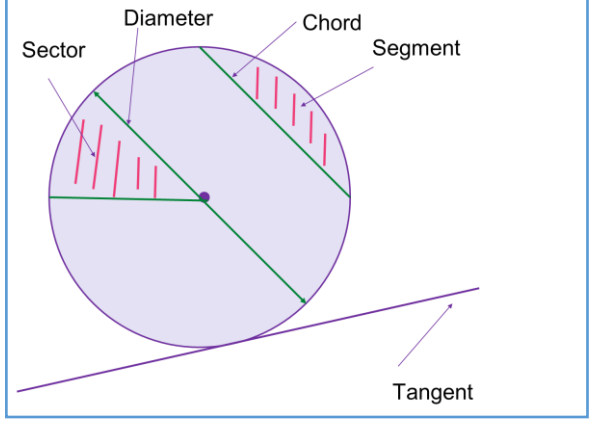
Other Topics/Units this could appear in:

- Perimeter and Area
- Plans and Elevations
- Surface Area and Volume

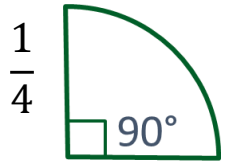
Keyword/Skill	**Definition/Tips**
Rectangle	4 right-angles 2 pairs of opposite equal parallel sides 
Triangle	3 sides and 3 angles. Scalene, isosceles, equilateral, right-angled. 
Parallelogram	2 pairs of equal parallel sides 2 pairs of opposite equal angles 
Perpendicular	Meeting at right angles (90°) 

Year 10 Maths – Unit GM3 – Area

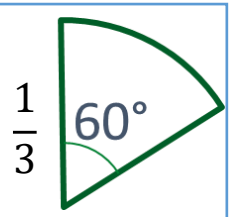
Labelling a Circle



Parts of a circle



Quarter of a circle



A third of a circle

A semi circle (half a circle)

Diameter and Radius of a Circle

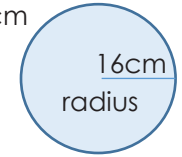
The diameter is double the size of the radius.

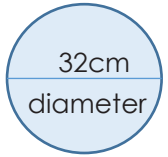
Example:

A circle has a radius of 16 cm. What is the diameter?

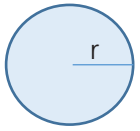
That means you need to double the radius: 16cm x 2 = 32cm

Diameter = 32cm





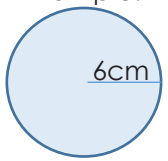
Area of a Circle



Here is the formula for area of a circle:

Area = $\pi r^2 = \pi \times radius^2$

Example: Find the area of the circle.



Radius = 6cm

Area = $\pi r^2 = \pi \times 6^2$

$= 36\pi cm^2 = 113.1cm^2$

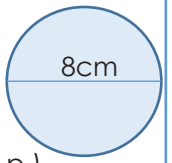
Circumference of a Circle

The circumference of a circle is the distance around the circle. It is another name for the perimeter of a circle.

Circumference = π x diameter

Example: Find the circumference of this circle

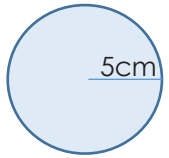
Diameter = 8cm



Circumference = 8 x π

= 25.13cm (2d.p.)

You may be given the radius instead of the diameter, so you need to know the relationship between them (this information is stated above).



Example:

Here the radius is 5cm.

Therefore the diameter = 5cm x 2 = 10cm

Circumference = 10cm x π

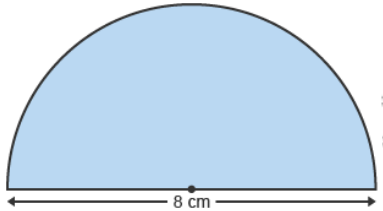
= 31.41cm (2d.p.)

Semicircles

The perimeter of a Semicircle:

Remember that the **perimeter** is the distance round the outside.

A semicircle has two edges. One is half of a circumference and the other is a diameter.



$C = \pi d$

$= 3.14 \times 8$

$= 25.12cm$

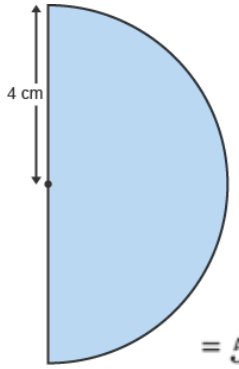
Remember this is the circumference of the whole circle, so now we need to half this answer.

$25.12 \div 2 = 12.56cm$

Total Perimeter $= 12.56 + 8 = 20.56cm$

The Area of a Semicircle:

A semicircle is just half of a circle. To find the **area** of a semicircle we calculate the area of the whole circle and then half the answer.



$A = \pi r^2$

$= 3.14 \times 4 \times 4$

$= 50.24cm^2$

$= 50.24 \div 2 = 25.12cm^2$

Keyword/Skill	Definition/Tips
Area	The size of a surface. The space inside a 2D surface.
Perimeter	The distance around a two-dimensional shape.
Formula	A rule or fact written with mathematic symbols.
Semi-Circle	It is half of a circle
Accuracy	How close a measured value is to the actual (true) value.
Surface Area	The total area of the surface of a three-dimensional object.
Segment	The smallest part of a circle made when it is cut by a line.
Arc	Part of the circumference of a circle or any curve.
Sector	A "pie-slice" part of a circle.
Circumference	The distance around the edge of a circle (or any curvy shape).It is a type of perimeter.
Radius	The distance from the centre to the circumference of a circle. It is half of the circle's diameter.
Diameter	The distance from one point on a circle through the centre to another point on the circle.
Pi	The ratio of a circle's circumference to its diameter. The symbol is π π = 3.14159265358979323846... (the digits go on forever without repeating)

Other Topics/Units this could appear in:

- Properties of shape and simple angle facts
- Perimeter and Area
- Mensuration
- Similarity in 2D & 3D
- Circle Geometry – Gradients & Tangents
- Circle Theorems
- Coordinate Geometry and Circles

Year 10 Maths – Unit GM7 – Advanced Drawing, Measuring & Constructing

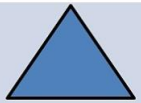
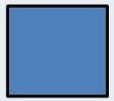
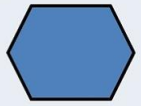
Interior Angles

For the **sum** of interior angles in a polygon we can use this formula:

$$sum\ of\ interior\ angles = 180(n-2)$$

Where n is the number of sides

Examples

	3	(3 – 2) × 180° = 180°
	4	(4 –2) × 180° = 2 × 180° = 360°
	5	(5 –2) × 180° = 3 × 180° = 540°
	6	(6 – 2) × 180° = 4 × 180° = 720°

For **one** interior angle in a **regular** polygon

$$\text{angle} = \frac{180(n-2)}{n}$$

Example

Calculate the size of an interior angle of a regular pentagon:

$$\text{Pentagon = 5 sides} = \frac{180(5-2)}{5} = 108°$$

Exterior Angles

To find an exterior angle = $\frac{360}{n}$ n= number of sides

Example

The exterior angle y would be $\frac{360}{6}$ = 60°

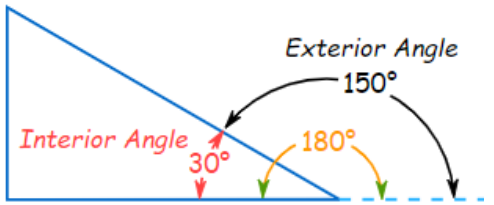
You may be asked to work out how many sides a shape has given the size of it's exterior angles.

Example

A regular polygon has exterior angles of 24°.
Work out how many sides the shape has.

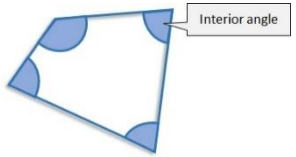
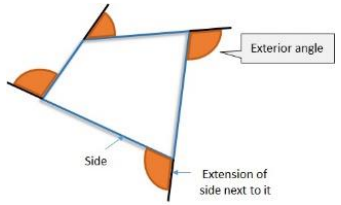
360 ÷ 24 = 15 sides

Remember
Interior angle + exterior angle in Regular polygons = 180°
(They sit on a straight line.)



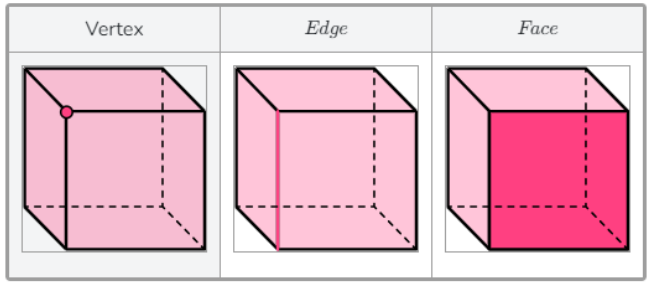
Exams!

- You will gain 2 marks for just having to work out an interior or exterior angle of a given polygon.
- A question that requires application of interior/exterior angles knowledge will be worth up to 4/5 marks.

Keyword/ Skill	Definition/tip
Angle	The amount of turning between two lines meeting at a point.
Polygon	A 2D shape with straight sides.
Interior angles	An angle inside a shape, between two joined sides. 
Exterior angles	The angle between any side of a shape and a line extended from the next side. 
Regular polygon	Has all equal length sides and all equal sized angles.
Irregular polygon	Has differing sized lengths and angles.

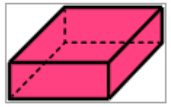
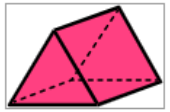
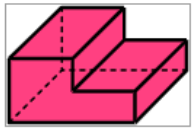
Other topics/Units this could appear in:
Circle theorem
Congruence and geometric proof

Year 10 Maths – Unit GM7 – Advanced Drawing, Measuring & Constructing

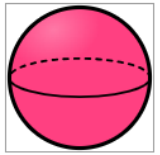
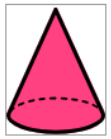
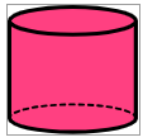
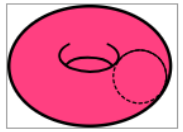


Some of the most famous polyhedra are called the **Platonic solids** named after the Greek philosopher and Mathematician, Plato. Each of the Platonic solids are considered to be regular 3D polyhedra.
The number of faces determines the name of the polyhedron:

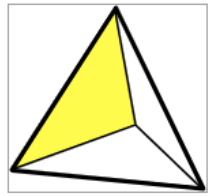
Polyhedra – flat faces, straight edges and sharp vertices

	Tetrahedron	*Cuboid*	*Triangular prism*	*L-shaped prism*	*Dodecahedron*
Image					
Vertices	4	8	6	12	20
Edges	6	12	9	18	30
Faces	4	6	5	8	12

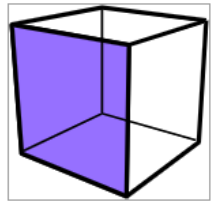
Non-polyhedra – **don't have** flat faces, straight edges and sharp vertices

	Sphere	*Cone*	*Cylinder*	*Frustum*	*Taurus*
Image					
Vertices	0	1	0	0	0
Edges	0	1	2	2	0
Faces	1	2	3	3	1

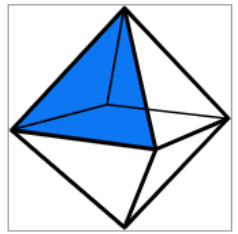
Tetrahedron
4 vertices
6 edges
4 faces
Each face is an equilateral triangle



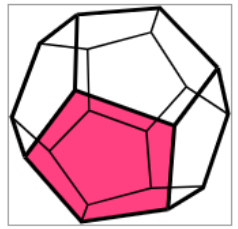
Cube
8 vertices
12 edges
6 faces
Each face is a square



Octahedron
6 vertices
12 edges
8 faces
Each face is an equilateral triangle



Dodecahedron
20 vertices
30 edges
12 faces
Each face is a regular pentagon



Icosahedron
12 vertices
30 edges
20 faces
Each face is an equilateral triangle

Keyword/Skill	Definition/Tips
Faces	Flat surface of a 3D shape
Edges	The outside lines of a 3D shape (the lines must be straight)
Vertices	Where two or more **edges** come together at a point (corner). Singular term is vertex
Polyhedron Plural - Polyhedra	3d shapes with flat faces, straight edges and sharp vertices.
Properties of Solids	You need to say how many **faces, edges and vertices** the 3D shape has.

Euler's Polyhedra Formula

$$V - E + F = 2$$

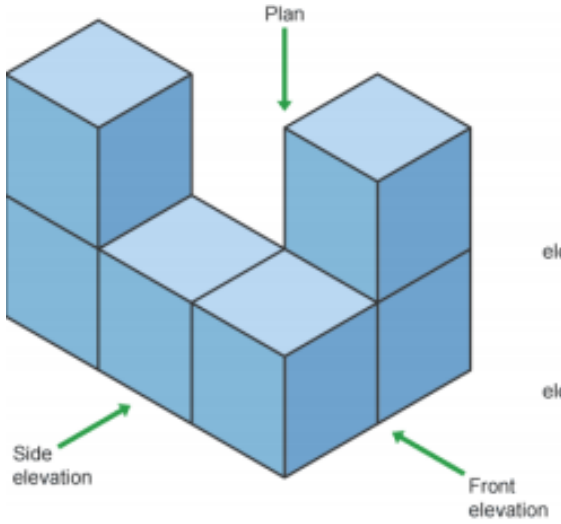
Where F is the number of faces
V is the number of vertices
E is the number of edges

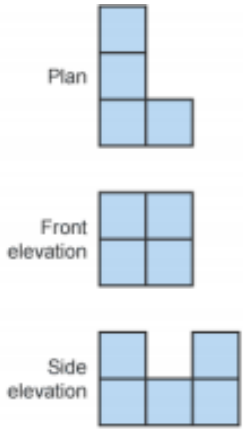
Other Topics/Units this could appear in:

- Surface Area & Volume
- Simplifying Expressions
- Similarity in 2D & 3D
- Plans & Elevations

Year 10 Maths – Unit GM7 – Advanced Drawing, Measuring & Constructing

Plans and Elevations





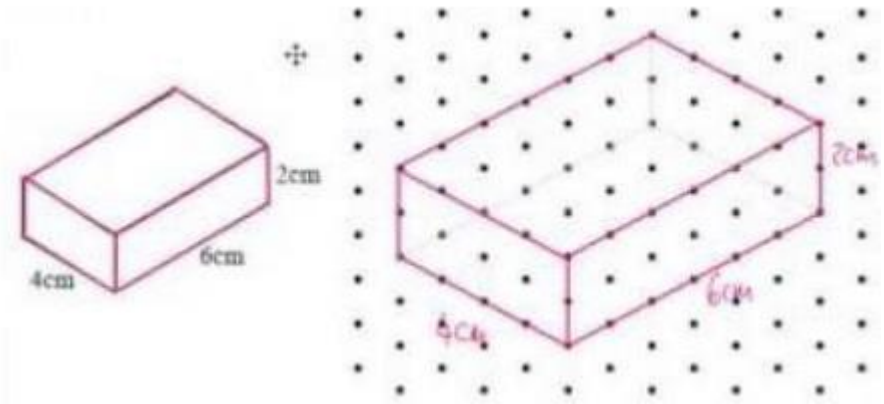
Plan
The view from above.

Front Elevation
The view from the front of the solid.

Side Elevation
The view from The side of the solid.

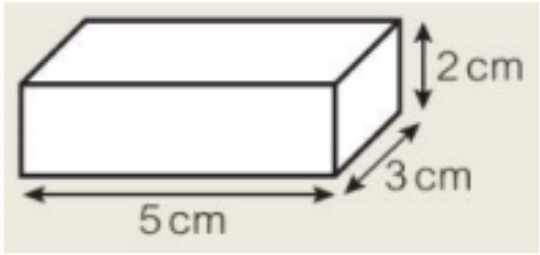
Isometric Drawing

A representation of a solid where all of the dimensions are drawn to scale.

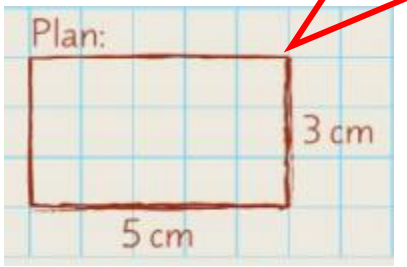


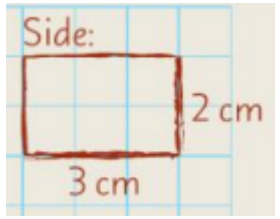
Worked Exam Question

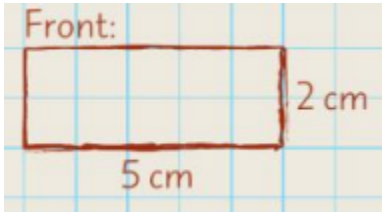
Draw the plan, the front elevation and the side elevation of this cuboid on the grid below.



Use a ruler.
Measure accurately.
Label Lengths.



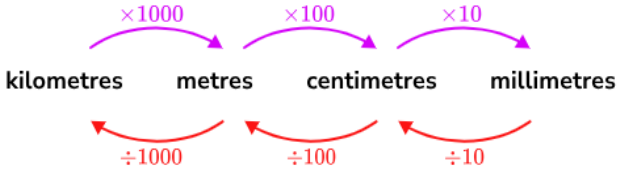




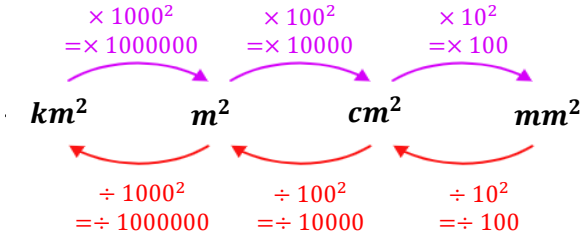
Keyword/Skill	Definition/Tips
Elevations	Different views of an object, e.g. Side elevation – view from the side. Or front elevation – view from the front.
Plan	A drawing of something as viewed from above.

Converting between 2D and 3D units of measurements

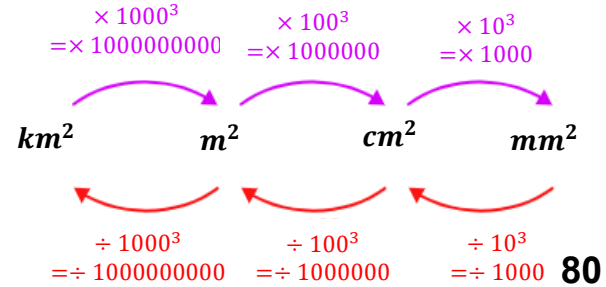
Metric units of LENGTH



Metric units of AREA



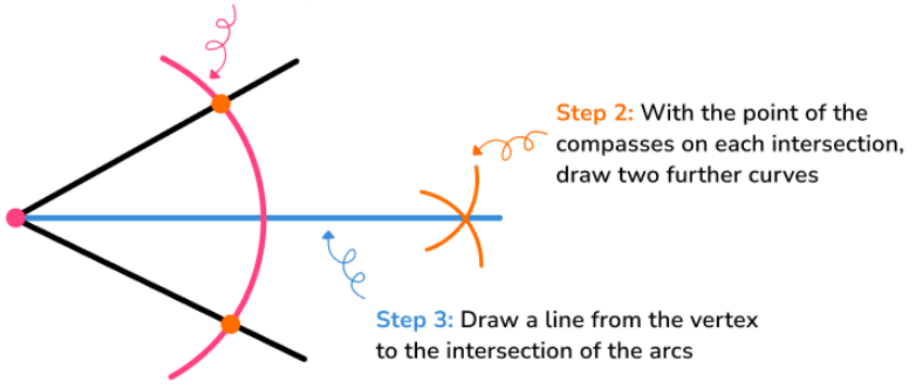
Metric units of VOLUME



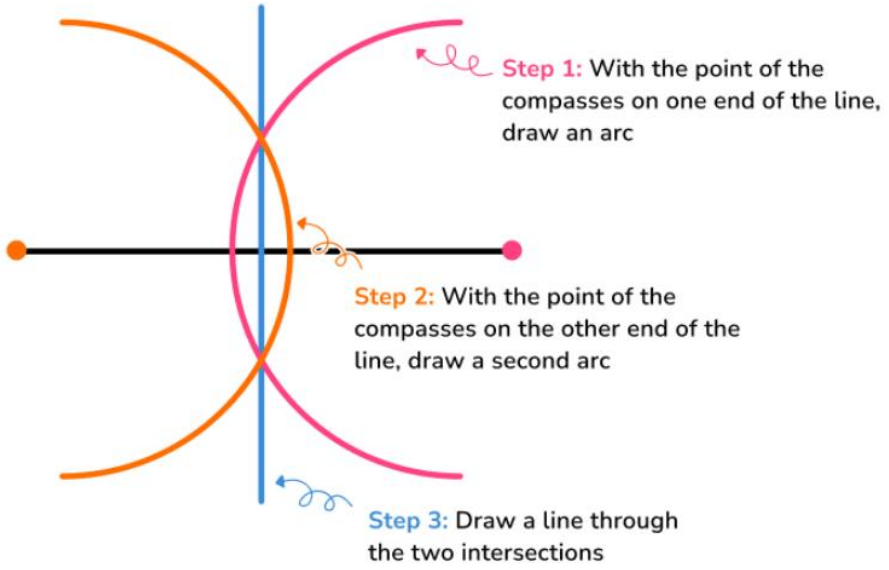
Year 10 Maths – Unit GM7 – Advanced Drawing, Measuring & Constructing

Constructions

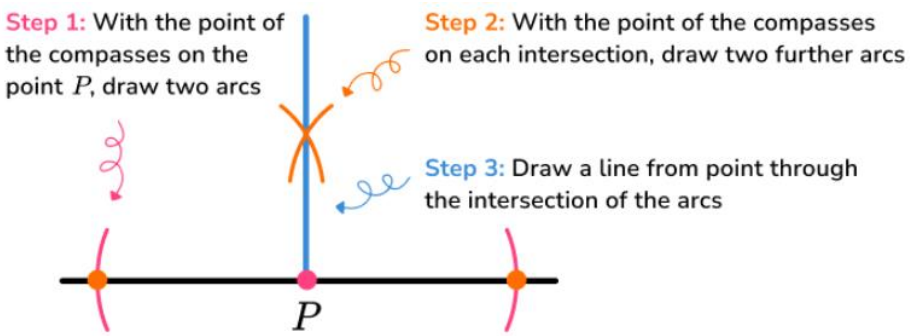
Angle bisector



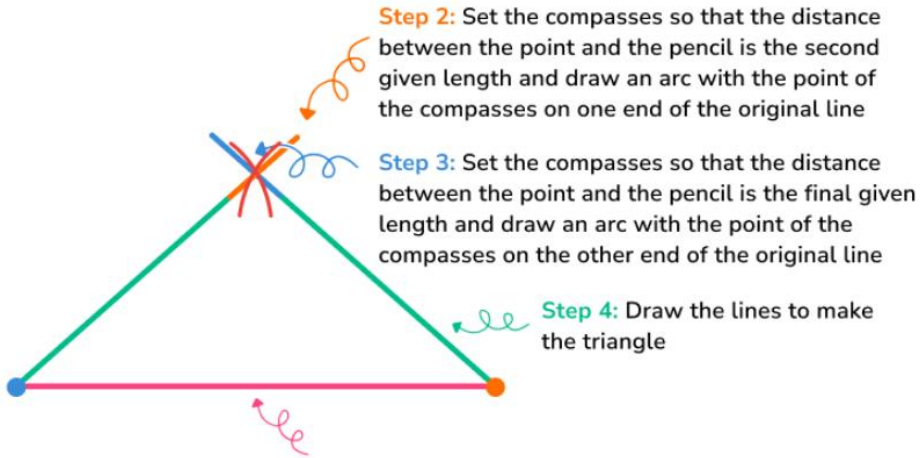
Perpendicular bisector



Perpendicular from a point on a line



Triangle given all three sides



Other Topics/Units this could appear in:

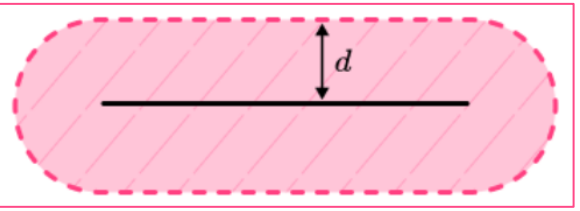
- Circles, Arcs and Sectors Bearings
- Plans and elevations
- Constructions
- Surface Area & Volume – cylinders, cones, spheres & frustums
- Similarity in 2D & 3D
- Circle Geometry
- Circle Theorems

Year 10 Maths – Unit GM7 – Advanced Drawing, Measuring & Constructing

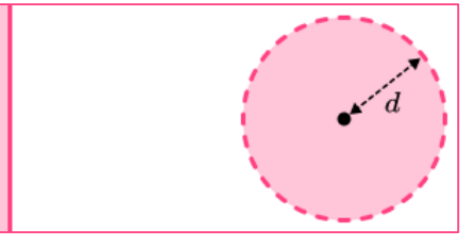
Loci

The **locus** of points (plural loci) is a set of points that follow a given rule.
When given that rule, or set of rules, we need to be able to draw the area that satisfies that rule.

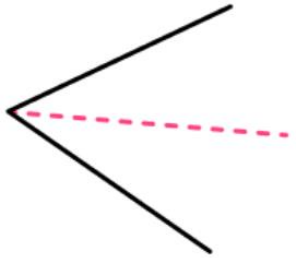
The locus of points within a given distance, d, of a line.



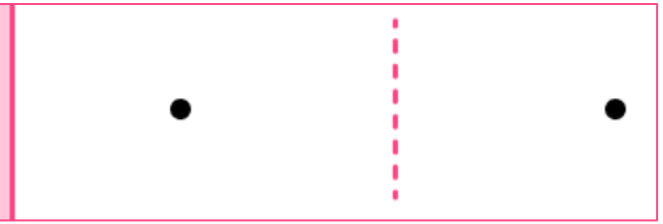
The locus of points that are a given distance, d, from a point.



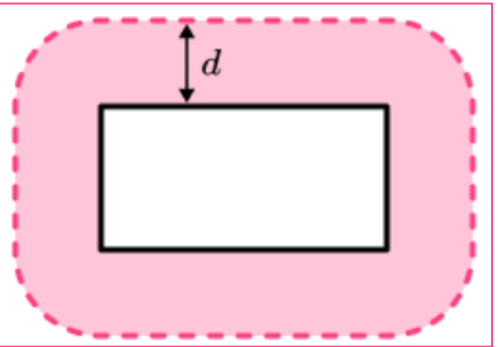
The locus of points equidistant between two lines (angle bisector).



The locus of points equidistant between two points (perpendicular bisector).



The locus of points a given distance, d, from a polygon.



Other Topics/Units this could appear in:

- Circles, Arcs and Sectors Bearings
- Plans and elevations
- Constructions
- Surface Area & Volume – cylinders, cones, spheres & frustums
- Similarity in 2D & 3D
- Circle Geometry
- Circle Theorems

Year 10 Maths – Unit SP4 – Continuous Data

Finding the class interval that contains the median

The following grouped frequency table shows the ages of a group of people.

Ages of people	Frequency
0 - 4	4
5 - 9	5
10 - 14	8
15 - 19	4
20 - 24	2
	Total = 23

To work out the median value, first work out the **cumulative frequency column**.

Ages of people	Frequency	Cumulative Frequency
0 - 4	4	4
5 - 9	5	4 + 5 = 9
10 - 14	8	9 + 8 = 17
15 - 19	4	17 + 4 = 21
20 - 24	2	21 + 2 = 23
	Total = 23	

There are 23 data items, so to find the position of the median

$$Median = \frac{n+1}{2} = \frac{23+1}{2} = 12$$

The median value would be the **12th value** in the table.
We can then use the **cumulative frequency column** to find where this piece of data would be.

The 12th value which is the **median** would be in this category.

So, the **median** is in the class interval 10-14

Estimated mean from a grouped frequency table

When we have grouped data, we cannot find the actual mean, because we have only got a range of possible values, not the exact data. So instead, we estimate by finding the midpoint from each group.

The tables below shows the test scores of 20 students.

Marks scored	Frequency	Mid-point	Frequency × Mid-point
0 - 9	3	$\frac{0+9}{2} = 4.5$	$3 \times 4.5 = 13.5$
10 - 19	5	$\frac{10+19}{2} = 14.5$	$5 \times 14.5 = 72.5$
20 - 29	8	$\frac{20+29}{2} = 24.5$	$8 \times 24.5 = 196$
30 - 39	4	$\frac{30+39}{2} = 34.5$	$4 \times 34.5 = 138$
	n = 20		Total = 420

We don't know the exact scores of these three students, so we estimate that they each scored 4.5

So the total for those three students is 13.5.
We repeat this for each row of the table and finally add up the total estimated scores for all 20 students.

Finally the mean is calculated by dividing the total scores by the number of students (total frequency)

$$\frac{420}{20} = 21$$

So the estimated mean score is 21.

Keyword/Skill	Definition/Tips
Continuous	Continuous data can have an infinite number of possible values within a selected range
Quantitative	Quantitative data that can be counted (discrete), quantitative date that can be measured (continuous)
Qualitative	Information that describes something
Average	A calculated 'central value' of a set of numbers
Mean	The mean amount is the total amount split evenly
Median	Place the numbers in value order and then find the middle number. When there are two numbers in the middle we average them.
Mode	The number which appears most often in a set of numbers
Range	The difference between the highest and lowest values
Frequency	How often something happens.
Data	A collection of facts, such as numbers, words, measurements, observations or even just descriptions of things.
Univariate Data	Univariate means "one variable" (one type of data).

Finding the modal class from a grouped frequency table

The following grouped frequency table shows the heights of some shrubs.

Height of shrub, h (cm	Frequency
$0 < x \leq 50$	9
$50 < x \leq 100$	13
$100 < x \leq 150$	12
$150 < x \leq 200$	7

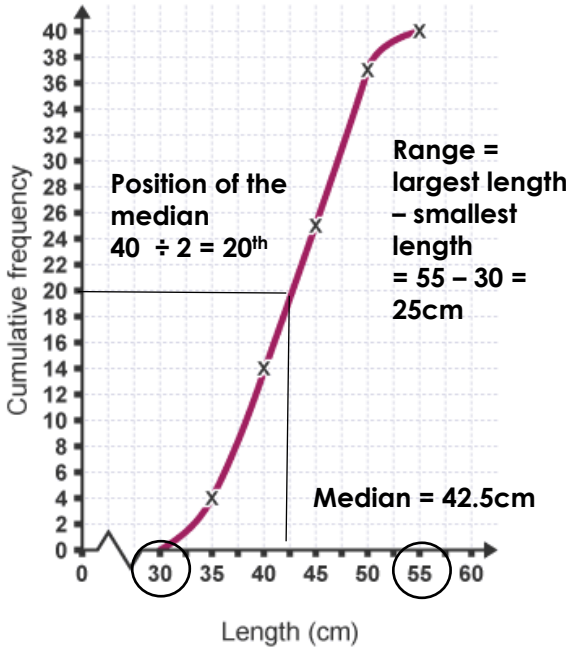
The **modal class** is the class that has the highest frequency. In this case the modal class is:
$50 < x \leq 100$

Year 10 Maths – Unit SP4 – Continuous Data

Cumulative Frequency Graphs

A **cumulative frequency diagram** creates a running total of the amounts within a table.

A cumulative frequency diagram is drawn by plotting the **upper class boundary** with the cumulative frequency.

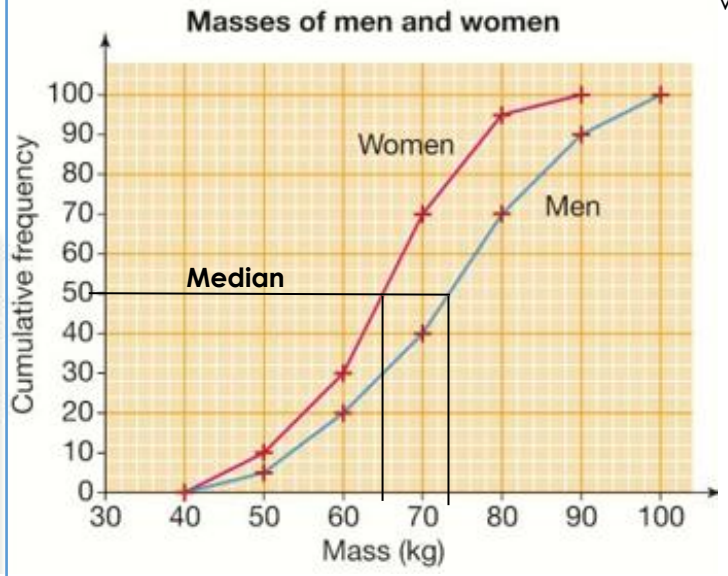


The upper class boundaries for this table are 35, 40, 45, 50 and 55.

Length (cm)	Frequency	Cumulative frequency
30 ≤ l < 35	4	4
35 ≤ l < 40	10	14 (4 + 10 = 14)
40 ≤ l < 45	11	25 (4 + 11 = 25)
45 ≤ l < 50	12	37 (25 + 12 = 37)
50 ≤ l < 55	3	40 (37 + 3 = 40)

Making Comparisons

*When making comparisons use an **average** or **spread** to back up your statement!*



2) Range of women's masses = 90 – 40 = 50kg
Range of men's masses = 100 – 40 = 60kg

*The men's masses **vary** more than the women's masses*

These cumulative frequency graphs summarise the masses of samples of 100 men and 100 women.

Finding the median mass for 100 women. Position of the median is 100 ÷ 2 = 50 so find the mass of the 50th person. Read from 50 on the cumulative frequency axis to the value on the mass axis.

1) Median mass of women = 65kg
Median mass of men = 73kg

*On **average**, the women are lighter than men*

Range of masses = largest mass (read from the final point) subtract the mass from where the line starts

Exam Tips!

- *Be sure to label the axis "cumulative frequency" not just "frequency"*
- *Note how the graphs don't have to start at origin*
- *Smooth curve going to through all the points – use a pencil!*
- *When making a comparison, write a statement and back it up with evidence from the graph (comparing the medians or IQR in context of the question!)*

Keyword/Skill	Definition/Tips
Sample	A group from the population that we are testing .
Population	The whole group from where the sample is taken, i.e. a whole year group.
Discrete	Discrete data can only have a finite or limited number of possible values. (Whole numbers)
Continuous	Continuous data can have an infinite number of possible values within a selected range. (Can include decimal numbers).
Quantitative	Quantitative data that can be counted (discrete), quantitative date that can be measured (continuous)
Mode	The number which appears most often in a set of numbers
Median	Place the numbers in value order and then find the middle number. When there are two numbers in the middle, we find the average them.
Range	The difference between the highest and lowest values.
Outlier	A point that "lies outside" (is much smaller or larger than) most of the other values in the dataset.
IQR (interquartile range)	The spread of the middle 50% of data. A smaller IQR shows that the data is **consistent**.

Other Topics/Units this could appear in:

- A Level Statistics- Data Collection

Year 10 Maths – Unit SP5 – Set Theory & Logic

Set Notation

A set is a collection of numbers (or objects). We call the numbers in the set, elements of that set. We have notation that is related to sets.
Example:

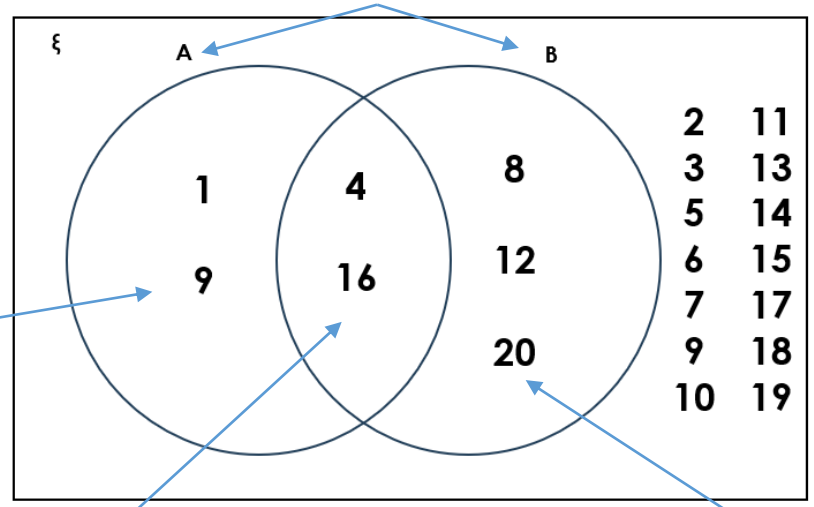
ξ = $\{Numbers\ 1\ to\ 20\ inclusive\}$ These would be all the integers from 1 up to and including 20. We call this the universal set; it is usually denoted with **ξ.**
A = $\{Square\ Numbers\}$ - $1, 4, 9, 16$ we do not need anymore, as the universal set only includes the numbers 1 – 20.
B = $\{Multiples\ of\ 4\}$ - $4, 8, 12, 16, 20$ again we do not need anymore because of the universal set.

A ∪ **B** - ∪ means union. This would be the combination of **A** and **B**. **A** ∪ **B =** $\{1, 4, 8, 9, 12, 16, 20\}$
A ∩ **B** - ∩ means intersection. This is the elements only in **A AND B** (the overlap). **A** ∩ **B =** $\{4, 16\}$ 4 and 16 appear in both **A** and **B.**
A' – means complement. This is everything not in A. We include the numbers that are also not in B but in the universal set.
A' = $\{2, 3, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20\}$

Venn Diagrams

A Venn diagram is a tool used to sort data into groups. If the data is in both groups, it is placed in the overlap of the circles (the intersection). Venn diagrams can be used to calculate probability. Let's use the same example as the one above.
Example:
ξ = $\{Numbers\ 1\ to\ 20\ inclusive\}$
A = $\{Square\ Numbers\}$
B = $\{Multiples\ of\ 4\}$

It is important to label each circle in your Venn diagram.



The numbers that are only in **A** go in this section

The numbers that are not in **A** or **B** but are still in the universal set **ξ** go outside the circles.

The numbers that are in both sets **A** and **B** go in this section

The numbers that are only in **B** go in this section

Keyword/Skill	Definition/Tips
Venn Diagram	The relationship between a group of different things.
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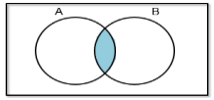
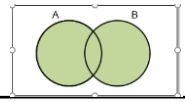
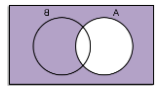
Intersection	This is where two sets overlap  $A \cap B$ This means **A and B.**
Union	This is two or more sets together.  $A \cup B$ This means **A or B.**
Compliment	This is the region that is not included.  A' This means **not A.**
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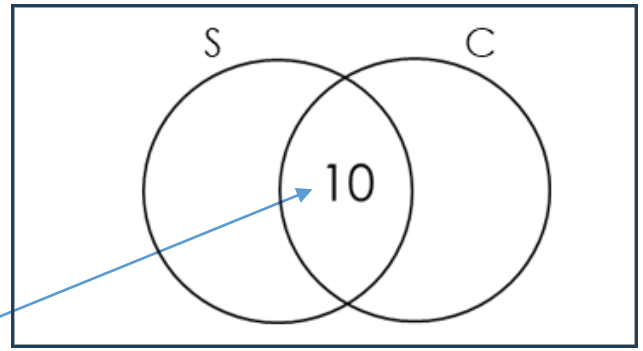
Conditional Probability	When one event has happened which has an affect on another. (If a blue bead has already been picked and not replaced, what would be the probability of picking a blue bead now?).
Percentage	Percentage questions must add up to 100. Use this to check your answer.

Year 10 Maths – Unit SP5 – Set Theory & Logic

You will need to be able to complete Venn diagrams based on information given.
Example:
A gym runs two fitness classes, spinning and circuits.
On Saturday 100 people visited the gym.
18 people attended the spinning class.
10 people attended both classes.
56 people did not attend either class.

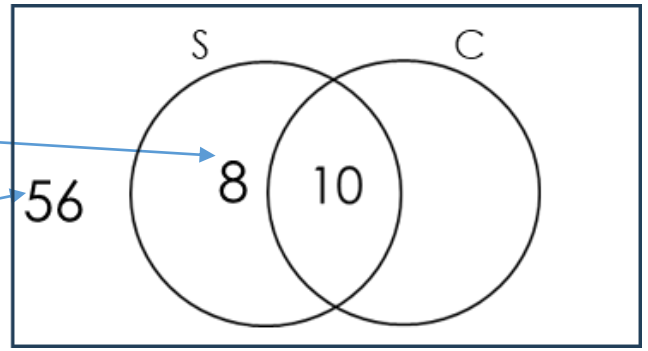
We will first represent this on a Venn diagram.

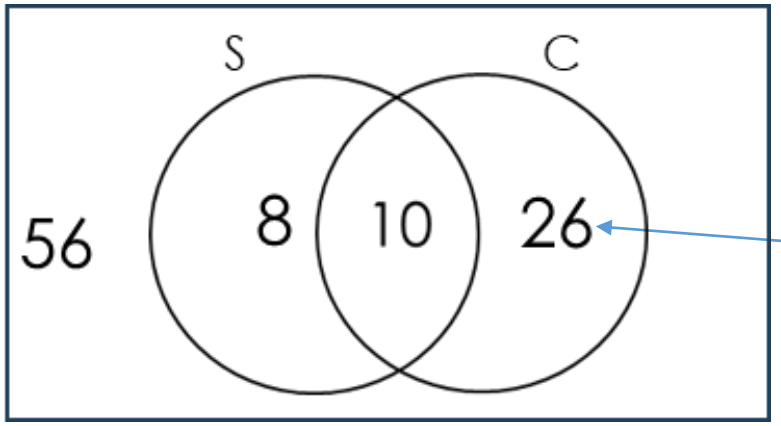


Try to start with the overlap first. 10 attended both so 10 goes in the middle.

18 people attended the spinning class.
There are already 10 people in the spinning circle (the overlap).
18 – 10 = 8

We can put 56 on the outside as none of those attended a class





We just need the last section. To calculate that, we know the whole Venn diagram should add up to 100.
We have 56 + 8 + 10 = 74
100 – 74 = 26
26 needs to go into the section just for C. The Venn diagram is now complete. To check, add the numbers and it should add together to make 100.

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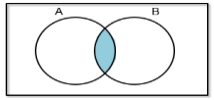
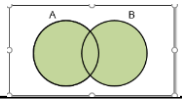
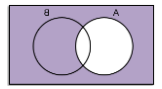
Intersection	This is where two sets overlap  $A \cap B$ This means **A and B**.
Union	This is two or more sets together.  $A \cup B$ This means **A or B**.
Compliment	This is the region that is not included.  A' This means **not A**.
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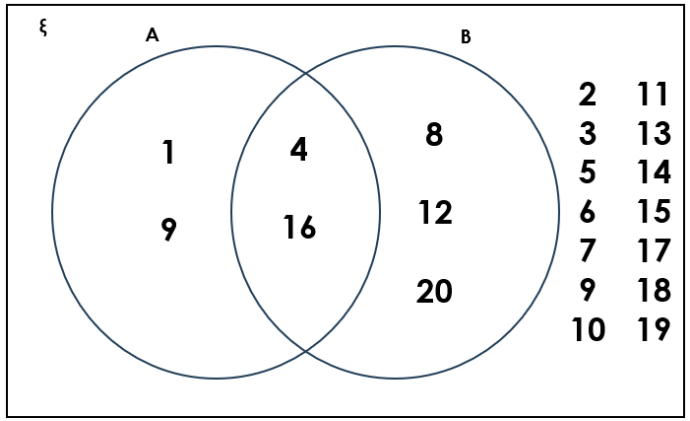
Year 10 Maths – Unit SP5 – Set Theory & Logic

Probability with Venn Diagrams

You need to be able to find probability from Venn diagrams. They can ask for a probability using words or by using set notation.



Example:

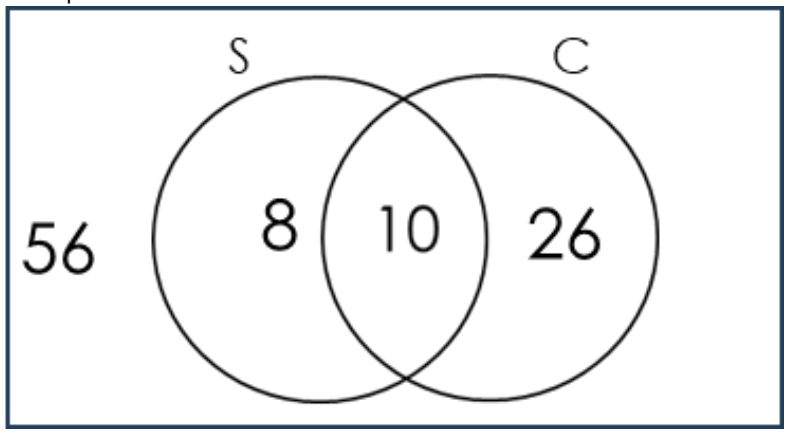
What is the probability of picking a number in **A** and **B**? (This would be the same as $P(A \cap B)$).
There are 2 numbers in **A** and **B**, out of 20 numbers in total.
Probability is usually written as a fraction (it can be a decimal or a percentage too).
Probability of **A** and **B** is $\frac{2}{20}$.

What is the probability of picking a number in **A** or **B**? (This is the same as $P(A \cup B)$).

There are 7 numbers in **A** or **B**, out of 20 numbers in total.
The probability is $\frac{7}{20}$.

Sometimes you will need to add together numbers for a probability.

Example:



Find $P(S \cup C)$
This is the probability of a person attending a 'spinning or circuit' class.
For this we need to add together 8, 10 and 26.

$$8 + 10 + 26 = 44$$

Out of the whole Venn diagram (100).

$$P(S \cup C) = \frac{44}{100}$$

Find C'
This is everything that is not C (all numbers not in the C circle).

$$\frac{8+56}{100} = \frac{64}{100}$$

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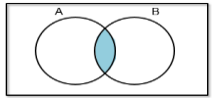
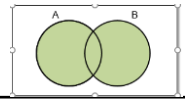
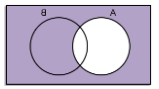
Intersection	This is where two sets overlap  $A \cap B$ This means **A and B**.
Union	This is two or more sets together.  $A \cup B$ This means **A or B**.
Compliment	This is the region that is not included.  A' This means **not A**.
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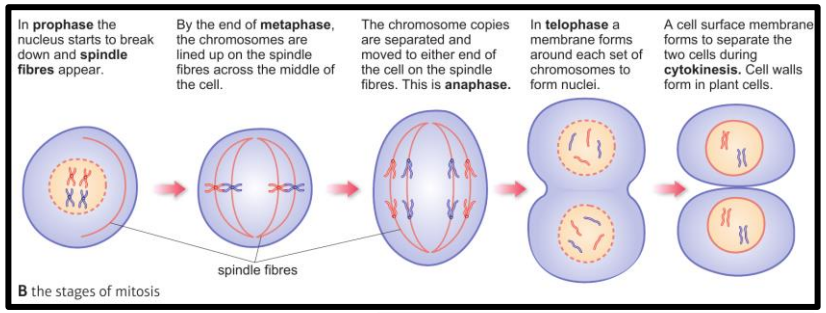
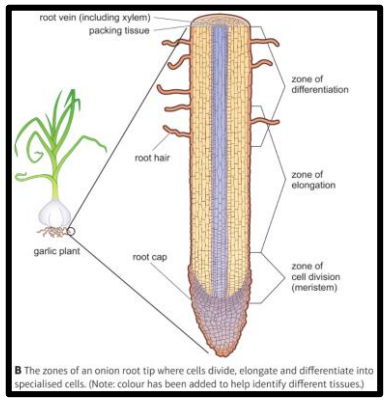
Year 10 Combined Science KO

Pages	Topic
89	Cells and Control
90	Genetics
91 – 92	Obtaining and Using Metals
93	Dynamic Equilibrium and Fertilisers
94	Groups in the Periodic Table
95	Rates of Reaction and Energy Changes in Reactions
96 – 98	Chemical Bonding
99 – 100	Acids and Alkalis
101	Calculations Involving Masses
102	Electrolytic Processes
103	Forces and Motion
104	Waves

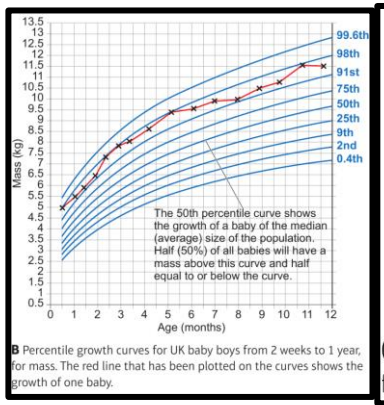
KS4 Biology – Cells and Control



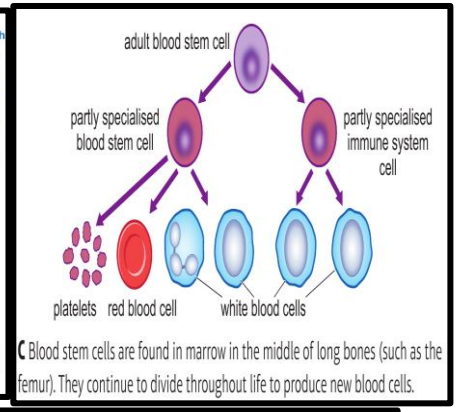
B the stages of mitosis



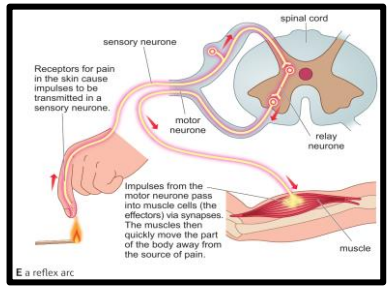
B The zones of an onion root tip where cells divide, elongate and differentiate into specialised cells. (Note: colour has been added to help identify different tissues.)



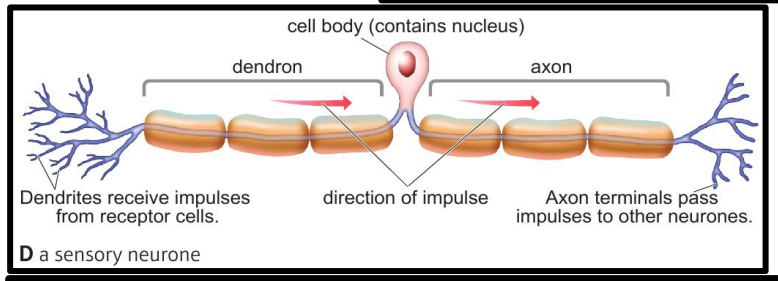
B Percentile growth curves for UK baby boys from 2 weeks to 1 year, for mass. The red line that has been plotted on the curves shows the growth of one baby.



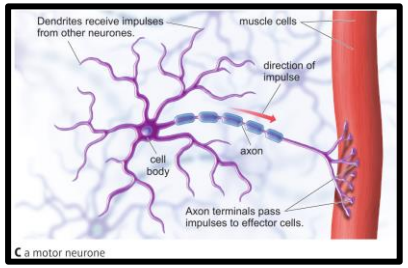
C Blood stem cells are found in marrow in the middle of long bones (such as the femur). They continue to divide throughout life to produce new blood cells.



E a reflex arc



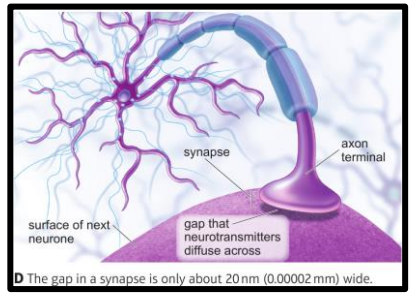
D a sensory neurone



C a motor neurone

Cell differentiation

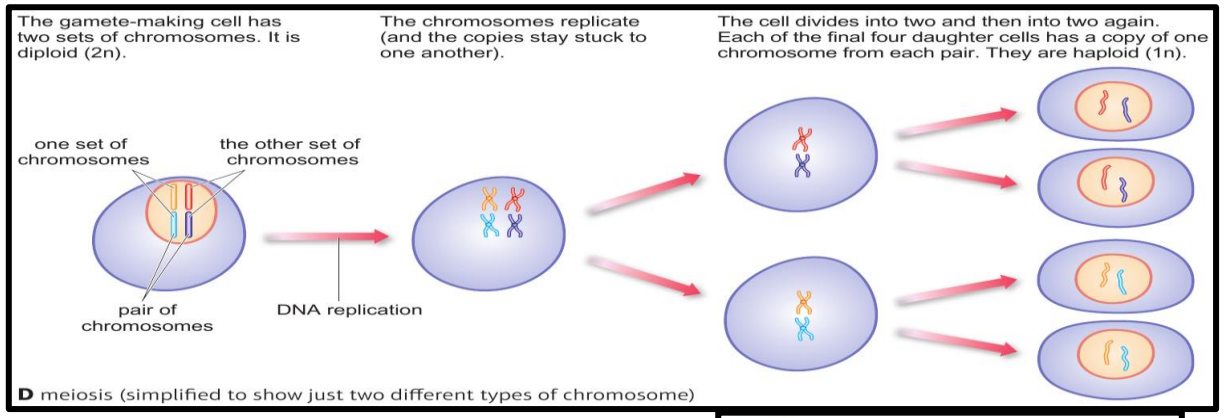
Although all animals develop from a single cell, not all the cells in their bodies are the same. Cells produced by mitosis are the same as the cell from which they were formed. However, the new cells may then change in different ways, so they become specialised for different functions. The process that changes less specialised cells into more specialised ones is called **differentiation**.



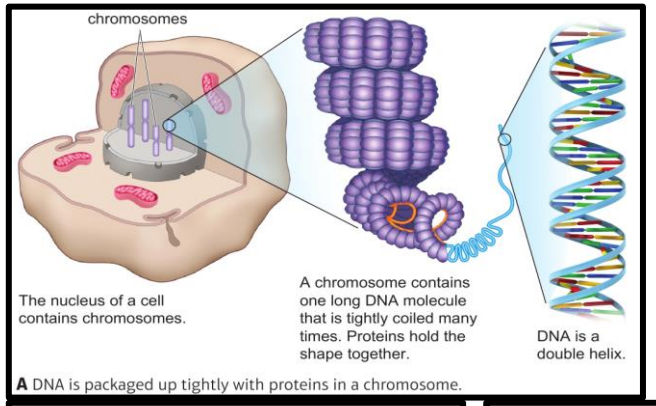
D The gap in a synapse is only about 20 nm (0.00002 mm) wide.

Keyword	Definition
anaphase	The stage of mitosis in which the separated chromosomes move away from each other.
cancer cell	Cell that divides uncontrollably.
cell cycle	A sequence of growth and division that happens in cells. It includes interphase and mitosis, and leads to the production of two daughter cells that are identical to the parent cell.
clone	Offspring from asexual reproduction. All the cells in a clone are genetically identical to each other and to the parent's cells.
cytokinesis	When the cytoplasm of the cell is separated as the cell membrane is pinched to divide the cell into two daughter cells.
daughter cell	New cell produced by cell division.
diploid	A cell with two sets of chromosomes.
DNA replication	The copying of the DNA within a cell.
haploid	A cell with one set of chromosomes.
interphase	The stage when the cell prepares itself for the process of cell division, and DNA replication takes place. The cell also makes more of its sub-cellular structures.
metaphase	The stage of mitosis when the chromosomes line up across the middle of the cell.
mitosis	The process of cells dividing to produce two daughter cells that are genetically identical to the parent.
prophase	The stage of mitosis in which the nucleus starts to break down and spindle fibres appear.
telophase	The stage of mitosis in which the chromosomes arrive at opposite ends of the cell and the nucleus membrane reforms.
differentiation	When a group of similar things, such as cells, become different in form from each other.
percentile	A $\frac{1}{100}$th division of a group. For example, 10 per cent of the data items are below the 10th percentile and 50 per cent are below the 50th percentile.
elongation	When something gets longer (such as a cell in a plant root or shoot before it differentiates into a specialised cell).
adult stem cell	Stem cell found in specialised tissue that can produce more of the specialised cells in that tissue for growth and repair.
cancer	Disease caused by the uncontrolled division of stem cells in a part of the body.
embryonic stem cell	Stem cell from an early embryo that can produce specialised cells of many different types.
rejection	When the immune system attacks and kills cells and tissue that come from another person, such as blood (after transfusion) or stem cells.
axon	The long extension of a neurone that carries an impulse away from the dendron or dendrites towards other neurones.

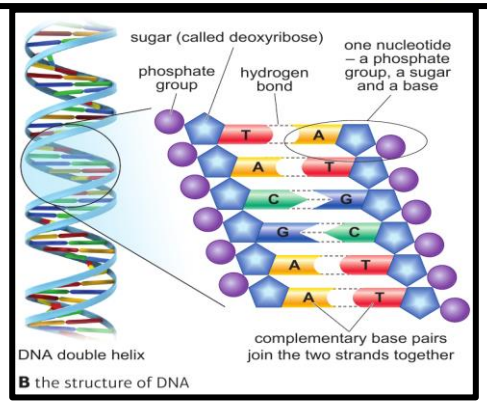
KS4 Biology – Genetics



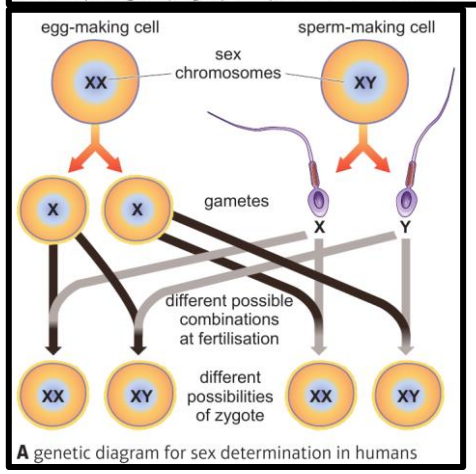
D meiosis (simplified to show just two different types of chromosome)



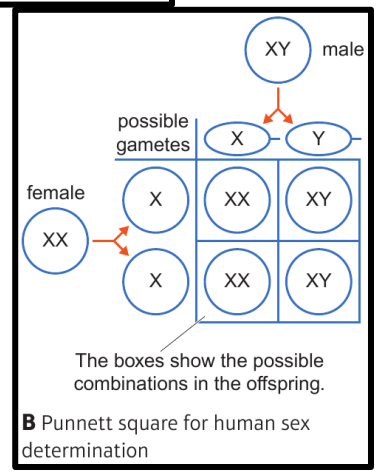
A DNA is packaged up tightly with proteins in a chromosome.



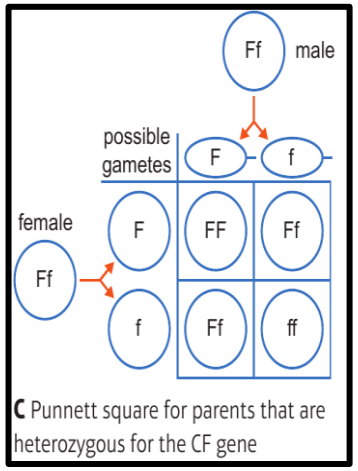
B the structure of DNA



A genetic diagram for sex determination in humans



B Punnett square for human sex determination



C Punnett square for parents that are heterozygous for the CF gene

Keyword	Definition
chromosome	A structure found in the nuclei of cells. Each chromosome contains one enormously long DNA molecule packed up with proteins.
daughter cell	A cell produced by another cell that has divided.
diploid	A cell or nucleus that has two sets of chromosomes. In humans, almost all cells except the sperm and egg cells are diploid.
DNA	Deoxyribonucleic acid. A polymer made of sugar and phosphate groups joined to bases. One molecule of DNA is found in each chromosome.
fertilisation	Fusing of a male gamete with a female gamete.
gamete	A haploid cell used for sexual reproduction.
gene	Section of the long strand of DNA found in a chromosome, which often contains instructions for a protein.
genome	All the DNA in an organism. Each body cell contains a copy of the genome.
haploid	A cell or nucleus that has one set of chromosomes. Gametes are haploid.
meiosis	A form of cell division in which one parent cell produces four haploid daughter cells.
replicate	When DNA replicates it makes a copy of itself.
zygote	Another term for 'fertilised egg cell'.
base (in DNA)	Four substances that help make up DNA, often shown by the letters A, C, G and T. Pairs of bases form 'links' between two 'spines' formed of phosphate groups and a type of sugar.
chromosome	A structure found in the nuclei of cells. Each chromosome contains one enormously long DNA molecule packed up with proteins.
complementary base pair	Two DNA bases that fit into each other and link by hydrogen bonds. There are two types of complementary base pair: A linking with T, and C linking with G.
double helix	Two helices joined together.
allele	Most genes come in different versions called alleles. So a gene for eye colour may have one version (allele) that can cause dark eyes, and another allele that can cause pale eyes.
phenotype	The characteristics that a certain set of alleles display.
genotype	The alleles for a certain characteristic that are found in an organism. Written in a shorthand using letters to represent the alleles (with the dominant allele having a capital and being written first).
dominant	Allele that will always affect the phenotype (as opposed to a recessive allele, whose effect will not be seen if a dominant allele is present).
recessive	Allele that will only affect the phenotype if the other allele is also recessive. It has no effect if the other allele is dominant.
heterozygous	When both the alleles for a gene are different in an organism.
homozygous	When both the alleles for a gene are the same in an organism.

Obtaining and Using Metals CC11 and SC11

Oxidation Is Loss (of electrons) Reduction Is Gain (of electrons)

HT ONLY: Reactions between metals and acids are redox reactions as the metal donates electrons to the hydrogen ions. This displaces hydrogen as a gas while the metal ions are left in the solution.

Reactions of acids and metals

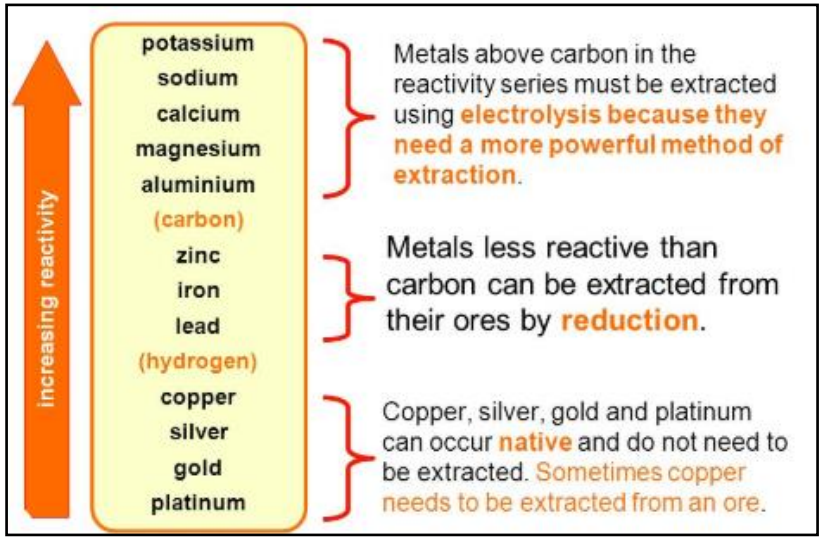
Reactions with acids	*metal + acid → metal salt + hydrogen*

magnesium + hydrochloric acid → magnesium chloride + hydrogen

zinc + sulfuric acid → zinc sulfate + hydrogen

Acids react with some metals to produce salts and hydrogen.

The reactivity series



Metal	Reaction with water	Reaction with dilute acids	Reactivity
Potassium	Violent with cold water	Violent	Most reactive
Sodium			
Calcium	Slow with cold water Rapid with steam	Rapid	
Magnesium			
Aluminium	Usually no reaction		
Zinc		Slow	
Iron	Rusts slowly		
(Hydrogen)			
Copper	No reaction	No reaction	
Silver			
Gold			Least reactive

Extraction of metals and reduction

Extraction using carbon	
Metals less reactive than carbon can be extracted from their oxides by reduction.	For example: **zinc oxide + carbon → zinc + carbon dioxide**

Unreactive metals, such as gold, are found in the Earth as the metal itself. They can be mined from the ground. More reactive metals are obtained by displacement or electrolysis.

	Reactions with water	Reactions with acid
Group 1 metals	*Reactions get more vigorous as you go down the group*	*Reactions get more vigorous as you go down the group*
Group 2 metals	*Do not react with water*	*Observable reactions include fizzing and temperature increases*
Zinc, iron and copper	*Do not react with water*	*Zinc and iron react slowly with acid. Copper does not react with acid.*

Metals form positive ions when they react	*The reactivity of a metal is related to its tendency to form positive ions*	The reactivity series arranges metals in order of their reactivity (their tendency to form positive ions).
Carbon and hydrogen	*Carbon and hydrogen are non-metals but are included in the reactivity series*	These two non-metals are included in the reactivity series as they can be used to extract some metals from their ores, depending on their reactivity.
Displacement	*A more reactive metal can displace a less reactive metal from a compound.*	Silver nitrate + Sodium chloride → Sodium nitrate + Silver chloride

Obtaining and Using Metals CC11 and SC11

Metals ores	***These resources are limited***	Copper ores especially are becoming sparse. New ways of extracting copper from low-grade ores are being developed.
Phytomining	***Plants absorb metal compounds***	These plants are then harvested and burned; their ash contains the metal compounds.
Bioleaching	***Bacteria is used to produce leachate solutions that contain metal compounds***	The metal compounds can be processed to obtain the metal from it e.g. copper can be obtained from its compounds by displacement or electrolysis.

Biological methods of metal extraction

Word	Definition
Reactivity series	List of metals in the order of reactivity
Cations	Positive ions
Displacement reactions	When a reactive metal replaces a less reactive metal
Extraction	Taking a metal out of a compound
Native state	Unreactive metals found naturally
Electrolysis	Passing electricity through molten ionic compound to decompose it into it's elements

Word	Definition
Oxidation	Gain of oxygen by a substance
Reduction	Loss of oxygen by a substance
Redox	Reactions in which oxidation and reduction occurs
Corrosion	When a metal reacts with oxygen and sometimes with water

Ionic half equations (HT only)

For displace - ment reactions	***Ionic half equations show what happens to each of the reactants during reactions***	For example: The ionic equation for the reaction between iron and copper (II) ions is: **$Fe + Cu^{2+} \rightarrow Fe^{2+} + Cu$** The half-equation for iron (II) is: **$Fe \rightarrow Fe^{2+} + 2e^-$** The half-equation for copper (II) ions is: **$Cu^{2+} + 2e^- \rightarrow Cu$**

Life cycle assessment and recycling

Life cycle assessment

LCAS	***Life cycle assessments are carried out to assess the environmental impact of products***	They are assessed at these stages: - Extraction and processing raw materials - Manufacturing and packaging - Use and operation during lifetime - Disposal
Values	***Allocating numerical values to pollutant effects is difficult***	Value judgments are allocated to the effects of pollutants so LCA is not a purely objective process.

Ways of reducing the use of resources

Reduce, reuse and recycle	***This strategy reduces the use of limited resources***	This, therefore, reduces energy sources being used, reduces waste (landfill) and reduces environmental impacts.
Limited raw materials	***Used for metals, glass, building materials, plastics and clay ceramics***	Most of the energy required for these processes comes from limited resources. Obtaining raw materials from the Earth by quarrying and mining causes environmental impacts.
Reusing and recycling	***Metals can be recycled by melting and recasting/reforming***	Glass bottles can be reused. They are crushed and melted to make different glass products. Products that cannot be reused are recycled.

Metal oxides

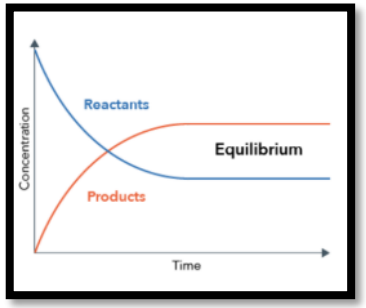
Oxidation and reduction in terms of electrons (HT ONLY)

Metals and oxygen	***Metals react with oxygen to form metal oxides***	**magnesium + oxygen → magnesium oxide** $2Mg + O_2 \rightarrow 2MgO$
Reduction	***This is when oxygen is removed from a compound during a reaction***	e.g. metal oxides reacting with hydrogen, extracting low reactivity metals
Oxidation	***This is when oxygen is gained by a compound during a reaction***	e.g. metals reacting with oxygen, rusting of iron

KS4 Chemistry – Dynamic Equilibrium and Fertilisers

Reversible Reactions and Equilibria

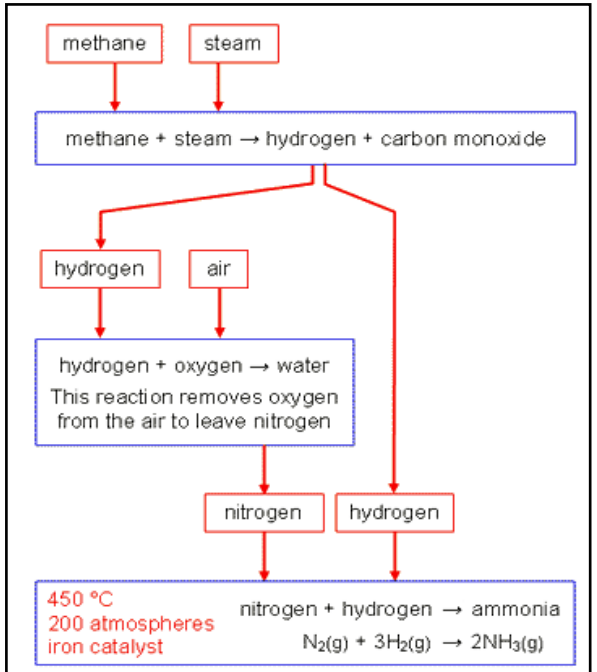
Reversible reactions	In some chemical reactions, the products can react again to re-form the reactants.
Representing reversible reactions	A + B ⇌ C + D
The direction	The direction of reversible reactions can be changed by changing conditions: A + B ⇌ (heat) C + D (cool)



Graph sketch shows in a reversible reaction, the backward reaction gets faster with time, and the forward reaction gets lower with time. When they are occurring at the same rate, dynamic equilibrium has been reached.

Changing concentration	If the concentration of a reactant is increased, more products will be formed . If the concentration of a product is decreased, more reactants will react.
Changing temperature	If the temperature of a system at equilibrium is increased: - Exothermic reaction = products decrease - Endothermic reaction = products increase
Changing pressure (gaseous reactions)	For a gaseous system at equilibrium: - Pressure increase = equilibrium position shifts to side of equation with smaller number of molecules. - Pressure decrease = equilibrium position shifts to side of equation with larger number of molecules.

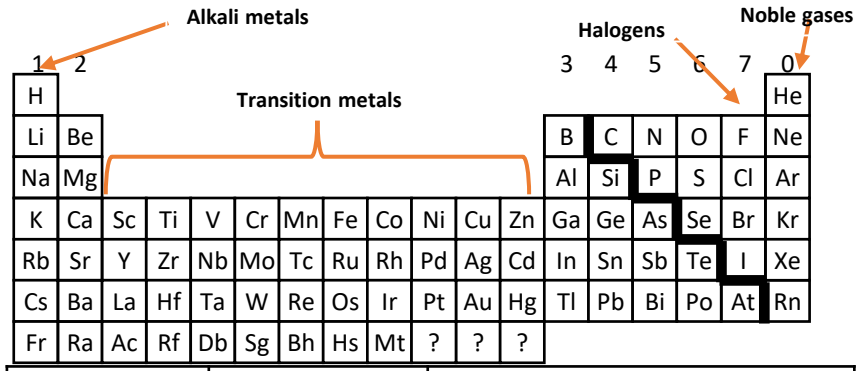
The Haber process	This process uses nitrogen from the air and hydrogen from natural gas to form ammonia. The reaction is reversible and uses optimum conditions and a catalyst in order to reach dynamic equilibrium.
Optimum temperature	The optimum temperature for the Haber process is 450ºC.
Optimum pressure	The optimum pressure for the Haber process is 200 atmospheres.
Optimum conditions	The optimum temperature for the Haber process is 450ºC and optimum pressure is 200 atmospheres. These are economically viable conditions as they produce the best yield to cost ratio.
The use of a catalyst	The Haber process uses an iron catalyst. This does not alter the position of the equilibrium but it does increase the rate of the reaction.



The Haber process for making ammonia

Keyword	Definition
Le Chatelier's Principles	States that when a system experiences a disturbance (change in condition), it will respond to restore a new equilibrium state.
Changing concentration	If the concentration of a reactant is increased, more products will be formed . If the concentration of a product is decreased, more reactants will react.
Changing temperature	If the temperature of a system at equilibrium is increased: - Exothermic reaction = products decrease - Endothermic reaction = products increase
Changing pressure (gaseous reactions)	For a gaseous system at equilibrium: - Pressure increase = equilibrium position shifts to side of equation with smaller number of molecules. - Pressure decrease = equilibrium position shifts to side of equation with larger number of molecules.
Equilibrium in reversible reactions	When a reversible reaction occurs in apparatus which prevents the escape of reactants and products, equilibrium is reached when the forward and reverse reactions occur exactly at the same rate.
Equilibrium in reversible reactions	When a reversible reaction occurs in apparatus which prevents the escape of reactants and products, equilibrium is reached when the forward and reverse reactions occur exactly at the same rate.
The Haber Process	This process uses nitrogen from the air and hydrogen from natural gas to form ammonia. The reaction is reversible and uses optimum conditions and a catalyst in order to reach dynamic equilibrium.
NPK fertilisers	Formulations of various salts containing appropriate percentages of the elements.

KS4 Chemistry – Groups in the Periodic Table



Elements arranged in order of atomic number	Elements with similar properties are in columns called groups	Elements in the same group have the same number of outer shell electrons and elements in the same period (row) have the same number of electron shells.

Group 0

Noble gases	Unreactive, do not form molecules	This is due to having full outer shells of electrons.
	Boiling points increase down the group	Increasing atomic number.

Helium	Used in balloons	Due to being less dense than air, which means balloons will float.
Neon	Used in signs	Glows when electricity flows through it.
Argon	Used in filament light bulbs	Stops the heated filament reacting with oxygen. Bulbs filled with unreactive argon instead.

Group 1

Metal	Reaction with water	Word equation
Lithium	Fizzing	Lithium + water → lithium hydroxide + hydrogen
Sodium	Fizzing more vigorously than lithium	Sodium + water → sodium hydroxide + hydrogen
Potassium	Fizzes and burns with a lilac flame	Potassium + water → potassium hydroxide + hydrogen

Alkali metals	Soft and easily cut	Low melting and boiling points.
	Very reactive with oxygen, water and chlorine	Only have one electron in their outer shell. Form +1 ions.
	Reactivity increases down the group	Negative outer electron is further away from the positive nucleus so is more easily lost.

Group 7

Halogens	Consist of molecules made of a pair of atoms	Have seven electrons in their outer shell. Form -1 ions.
	Melting and boiling points increase down the group (gas → liquid → solid)	Increasing atomic mass number.
	Reactivity decreases down the group	Increasing proton number means an electron is less easily gained as outer shell is further away from nucleus, therefore the attraction force is weaker.

With metals	Forms a metal halide	Metal + halogen → metal halide e.g. Sodium + chlorine → sodium chloride	e.g. NaCl metal atom loses outer shell electrons and halogen gains an outer shell electron
With hydrogen	Forms a hydrogen halide	Hydrogen + halogen → hydrogen halide e.g. Hydrogen + bromine → hydrogen bromide	Dissolve in water to form acidic solutions.
With aqueous solution of a halide salt	A more reactive halogen will displace the less reactive halogen from the salt	Chlorine + potassium bromide → potassium chloride + bromine	(HT) These are redox reactions. The halogen gains electrons and the halide ion from the compound loses electrons.

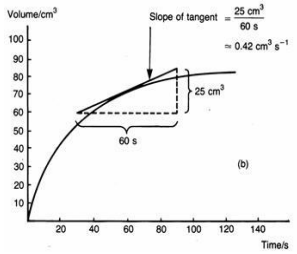
Keyword	Definition
Reactivity of group 1	The atoms get larger as you go down, so the single electron in the outermost shell (highest energy level) is attracted less strongly to the positive nucleus. The electrostatic attraction with the nucleus gets weaker because the distance between the outer electron and the nucleus increases. Also the outer electron experiences a shielding effect from the inner electrons, reducing the attraction between the oppositely charged outer electron and the nucleus.
Reactivity of group 7	When Group 7 elements react, the atoms gain an electron in their outermost shell. Going down the group, the outermost shell's electrons get further away from the attractive force of the nucleus, so it is harder to attract and gain an extra electron. The outer shell will also be shielded by more inner shells of electrons, again reducing the electrostatic attraction of the nucleus for an incoming electron.
Reactivity of group 0	Elements in Group 0 of the periodic table are called the noble gases. They are unreactive because their atoms have stable arrangements of electrons. The atoms have eight electrons in their outermost shell, apart from helium which has just two but still has a complete outer shell. The stable electronic structure explains why they exist as single atoms; they have no tendency to react to form molecules. The boiling points of the noble gases get higher going down the group. For example, helium boils at -269 °C and radon boils at -62°C.

KS4 Chemistry – Rates of Reaction and Energy Changes in Reactions

Rates of Reaction

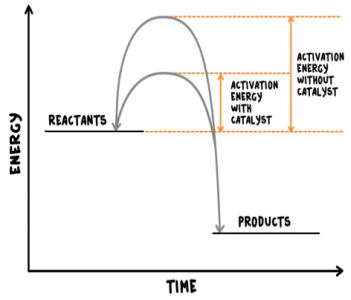
Rate of chemical reaction	This can be calculated by measuring the quantity of reactant used or product formed in a given time.	Rate = $\frac{\text{quantity of reactant used}}{\text{time taken}}$ Rate = $\frac{\text{quantity of product formed}}{\text{time taken}}$

Factors affecting the rate of reaction	
Temperature	The higher the temperature, the quicker the rate of reaction.
Concentration	The higher the concentration, the quicker the rate of reaction.
Surface area	The larger the surface area of a reactant solid, the quicker the rate of reaction.
Pressure (of gases)	When gases react, the higher the pressure upon them, the quicker the rate of reaction.

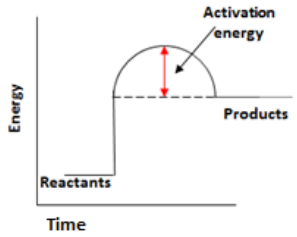
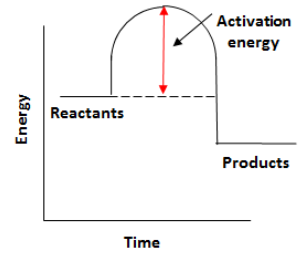


Quantity	Unit
Mass	Grams (g)
Volume	cm^3
Rate of reaction	Grams per cm^3 (g/cm^3) HT: moles per second (mol/s)

Catalyst	A catalyst changes the rate of a chemical reaction but is not used in the reaction.
Enzymes	These are biological catalysts.
How do they work?	Catalysts provide a different reaction pathway where reactants do not require as much energy to react when they collide.



Energy Changes

Endothermic		Products are at a higher energy level than the reactants. As the reactants form products, energy is transferred from the surroundings to the reaction mixture. The temperature of the surroundings decreases because energy is taken in during the reaction.
Exothermic		Products are at a lower energy level than the reactants. When the reactants form products, energy is transferred to the surroundings. The temperature of the surroundings increases because energy is released during the reaction.

Bond energy calculation	Calculate the overall energy change for the forward reaction $N_2 + 3H_2 \rightleftharpoons 2NH_3$ Bond energies (in kJ/mol): H-H 436, H-N 391, N≡N 945
	Bond breaking: 945 + (3 x 436) = 945 + 1308 = 2253 kJ/mol Bond making: 6 x 391 = 2346 kJ/mol Overall energy change = 2253 - 2346 = -93kJ/mol Therefore reaction is exothermic overall.

Keyword	Definition
Collision theory	Chemical reactions can only occur when reacting particles collide with each other with sufficient energy.
Activation energy	This is the minimum amount of energy colliding particles in a reaction need in order to react.
Heat energy changes	Occur in the following: - Salts dissolving in water - Neutralisation reactions - Displacement reactions - Precipitation reactions
Exothermic reactions	Heat energy is given out as bonds are being formed.
Endothermic reactions	Heat energy is taken in as bonds are being broken.

KS4 Chemistry – Chemical Bonding

Ionic	Particles are oppositely charged ions	Occurs in compounds formed from metals combined with non metals.
Covalent	Particles are atoms that share pairs of electrons	Occurs in most non metallic elements and in compounds of non metals.
Metallic	Particles are atoms which share delocalised electrons	Occurs in metallic elements and alloys.

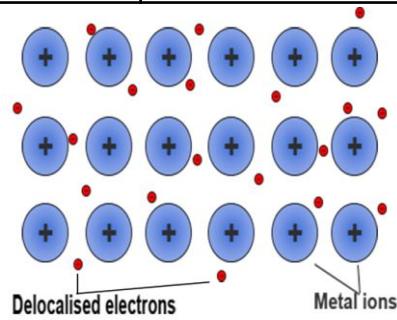
Keyword	Definition
Ionic bond	A strong electrostatic force of attraction between oppositely charged ions.
Covalent bond	The bond formed when a pair of electrons is shared between two atoms.
Metallic bond	The type of bonding found in metals. Positively charged ions in a 'sea' of negatively charged electrons.
Lattice Structure	An arrangement of many particles that are bonded together in a fixed, regular, grid-like pattern
Melting point	The temperature at which a substance changed fro the solid state to the liquid state when heated, or from the liquid state to solid state when cooled.
Boiling point	The temperature at which a substance changed from a liquid to a gas.
Charge	Also known as electric charge, is a characteristic of a unit of matter that expresses the extent to which it has more or fewer electrons than protons.
Electrical conductivity	Allowing electricity to pass through.
Aqueous solution	A mixture that is formed when a substance is dissolved in water.
Molten	A substance that has been liquefied by heat.
Electron pair	Two electrons occupying the same orbital in an atom or molecule, especially forming a nonpolar covalent bond between atoms.

Keyword	Definition
Ion	An atom with an electric charge, caused by the loss or gain of electrons.
Cation	A positively charged ion.
Anion	A negatively charged ion.
Electrostatic force	The attractive or repulsive force between two electrically charged objects.
Attraction	The electric force that acts between oppositely charged bodies, tending to draw them together.
Intermolecular force	Forces of attraction which act between molecules.
Atom	The smallest unit into which matter can be divided without the release of electrically charged particles.
Element	An element is a substance whose atoms all have the same number of protons.
Compound	A substance formed when two or more chemical elements are chemically bonded together.
Transfer	Movement of a particle from one place to another.
Share	Two bodies having equal portions distributed between the two.
Delocalised electron	An electron that is not associated with a particular atom within a shell, or held in a covalent bond.
Proton	A particle found in the nucleus of an atom, having a positive charge and the same mass as a neutron.
Neutron	A particle found in the nucleus of an atom having zero charge and a mass of 1.
Electron	A tiny particle with a negative charge and very little mass.
Shell	Area around a nucleus that can be occupied by electrons and usually drawn as circles.
Nucleus	The central part of an atom or ion.

KS4 Chemistry – Chemical Bonding

Metallic bonding

Giant structure of atoms arranged in a regular pattern	Electrons in the outer shell of metal atoms are delocalised and free to move through the whole structure. This sharing of electrons leads to strong metallic bonds.



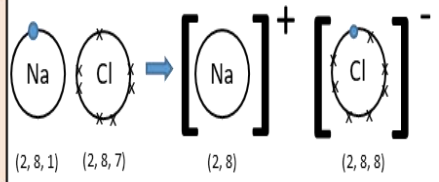
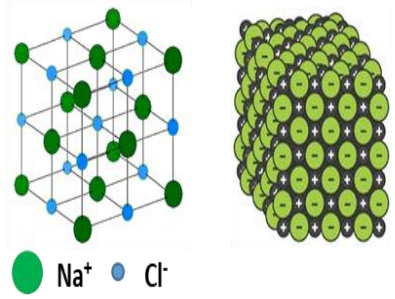
High melting and boiling points	This is due to the strong metallic bonds.
Pure metals can be bent and shaped	Atoms are arranged in layers that can slide over each other.
Good conductors of electricity and heat	Delocalised electrons transfer energy.

Ionic bonding

High melting and boiling points	Large amounts of energy needed to break the bonds.
Do not conduct electricity when solid	Ions are held in a fixed position in the lattice and cannot move.
Do conduct electricity when molten or dissolved	Lattice breaks apart and the ions are free to move.

Electrons are transferred so that all atoms have a noble gas configuration (full outer shells).	*Metal atoms lose electrons and become positively charged ions*	Group 1 metals form +1 ions Group 2 metals form +2 ions
	Non metals atoms gain electrons to become negatively charged ions	Group 6 non metals form -2 ions Group 7 non metals form -1 ions

Structure	• Lattices consist of a regular arrangement of atoms • Held together by strong electrostatic forces of attraction between oppositely charged ions • Forces act in all directions in the lattice

Dot and cross diagram	
Giant structure	

-ide	If a compound name ends in –ide, it usually contains only two elements.	For example: calcium + oxygen → calcium oxide
-ate	If a compound name ends in -ate, it usually contains three or more elements one of which is always oxygen.	For example: Calcium + carbon + oxygen → calcium carbonate

KS4 Chemistry – Chemical Bonding

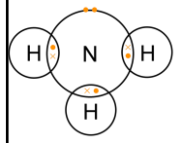
Covalent bonding

Simple molecular compounds

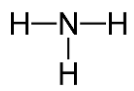
Low melting and boiling points	Small amounts of energy needed to overcome the intermolecular forces.
Poor conductors of electricity	No free electrons to transfer energy.
Size of atoms and molecules	Simple molecular structures consist of atoms joined by strong covalent bonds. This means that atoms are smaller than simple molecules.

Atoms share pairs of electrons

Can be small molecules e.g. ammonia



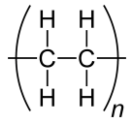
Dot and cross :
+ Show which atom the electrons in the bonds come from
- All electrons are identical



2D with bonds:
+ Show which atoms are bonded together
- It shows the H-C-H bond incorrectly at 90°

3D ball and stick model:
+ Attempts to show the H-C-H bond angle is 109.5°

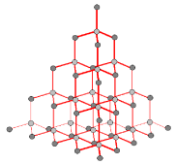
Can be giant covalent structures e.g. polymers



Simple polymers consist of large chains of hydrocarbons.

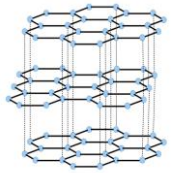
Giant covalent structures

Diamond

Each carbon atom is bonded to four others		Very hard.	Rigid structure.
		Very high melting point.	Strong covalent bonds.
		Does not conduct electricity.	No delocalised electrons.

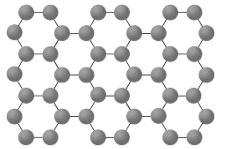
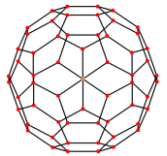
Used for cutting tools due to being very hard.

Graphite

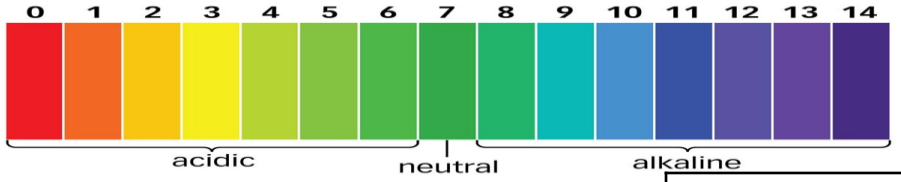
Each carbon atom is bonded to three others forming layers of hexagonal rings with no covalent bonds between the layers		Slippery.	Layers can slide over each other.
		Very high melting point.	Strong covalent bonds.
		Does conduct electricity.	Delocalised electrons between layers.

Used for electrodes as is inert.

Graphene and fullerenes

Graphene	 Single layer of graphite one atom thick	Excellent conductor.	Contains delocalised electrons.
		Very strong.	Contains strong covalent bonds.
Fullerenes		Buckminsterfullerene, C_{60} First fullerene to be discovered.	Hexagonal rings of carbon atoms with hollow shapes. Can also have rings of five (pentagonal) or seven (heptagonal) carbon atoms.
Diamond, graphite, silicon dioxide		Very high melting points	Lots of energy needed to break strong, covalent bonds.

KS4 Chemistry – Acids and Alkalis



The pH scale and indicators

Acids	Acids produce hydrogen ions (H^+) in aqueous solutions.
Alkalis	Aqueous solutions of alkalis contain hydroxide ions (OH^-).
Base	A base is any substance that reacts with an acid to form a salt and water only
Examples of soluble bases	Alkalis e.g. sodium hydroxide, potassium hydroxide

Universal indicator	*Red in acid, green in neutral and blue in alkali*
Litmus	*Red in acid, purple in neutral and blue in alkali*
Methyl orange	*Red in acid, yellow in neutral and yellow in alkali*
Phenolphthalein	*Colourless in acid and in neutral and pink in alkali*

A neutralisation reaction is between an acid and a base	In neutralisation reactions, hydrogen ions react with hydroxide ions to produce water: $H^+ + OH^- \rightarrow H_2O$

Reactions with acids

Metals	Metal + acid → metal salt + hydrogen	Magnesium + hydrochloric acid → magnesium chloride + hydrogen
Metal oxides	Metal oxide + acid → metal salt + water	Copper oxide + sulfuric acid → copper sulfate + water
Metal hydroxides	Metal hydroxide + acid → metal salt + water	Sodium hydroxide + nitric acid → sodium nitrate + water
Metal carbonates	Metal carbonates + acid → metal salt + carbon dioxide + water	Calcium carbonate + sulfuric acid → calcium sulfate + carbon dioxide + water

Gas	Test	Positive result
Hydrogen	Burning splint	'squeaky pop' sound.
Carbon dioxide	Limewater	Goes cloudy (as a solid calcium carbonate forms).

Keyword	Definition
H^+ ion	A positively charged hydrogen ion
OH^- ion	A negatively charged, diatomic hydroxide ion.
Aqueous solution	*A mixture that is formed when a substance is dissolved in water.*
Acid	*A solution that reacts with alkalis, turns litmus red and has a pH of less that 7.*
Alkali	*A solution which contains an excess of OH^- ions, turns litmus blue and has a pH greater than 7.*
Base	*A substance that will react with an acid to form only a salt and water.*
pH scale	*A scale going up to 14 showing acidity or alkalinity.*
Indicator	*A substance which can change colour depending on the pH of a solution.*
Concentration	*The amount of a solute dissolved in a certain volume of solvent.*
Concentrated	*Containing a large amount of solute dissolved in a small volume of solvent.*
Dilute	*A low concentration of solute in a solution.*
Strong acid	*An acidic solute that dissolves completely into ions when it dissolves.*
Weak acid	*An acidic solute that does not dissociate completely into ions when it dissolves.*
Salt	*A compound formed by neutralisation of an acid by a base.*
Filtration	*Using a filter to separate insoluble substances from a liquid.*
Crystallisation	*Separating the solute from a solution by evaporating the solvent.*
Soluble	*A substance that can be dissolved in a certain liquid.*
Insoluble	*A substance that cannot be dissolved in a certain liquid.*
Solute	*Describes a substance that dissolves in a liquid to make a solution.*
Solvent	*Describes the liquid in which a substance dissolves to make a solution.*
Solution	*Formed when a substance has dissolved in a liquid.*
Burette	*A piece of apparatus used to accurately measure the volume of solution that has been added during a titration.*
Pipette	*A piece of apparatus used in a titration to accurately measure a set volume of a solution.*
End-point	*When just enough solution has been added from the burette to react with all the solution in the flask in a titration experiment.*
Ionic equation	*A balanced equation that only shows the ions that react together. The spectator ions are not included.*
Half equation	*A chemical equation written to describe an oxidation or reduction half-reaction.*
Spectator ion	*These are ions that do not change within a reaction.*

KS4 Chemistry – Acids and Alkalis

Making pure, dry insoluble salts		
Step 1	Add insoluble reactant (e.g. metal oxide) to acid	Add until there is an excess of insoluble reactant.
Step 2	Filter the solution	Collect the filtrate in a conical flask and dispose of the residue.
Step 3	Crystallisation	Heat the filtrate using a Bunsen burner to evaporate the water from the solution.
Step 4	Evaporation	Leave the evaporating basin with the heated filtrate to evaporate any remaining water and make pure, dry insoluble salts.

Titrations are used to work out the precise volumes of acid and alkali solutions that react with each other to form salt and water.

Step 1	Use the pipette to add 25 cm^3 of alkali to a conical flask and add a few drops of indicator.
Step 2	Fill the burette with acid and note the starting volume. Slowly add the acid from the burette to the alkali in the conical flask, swirling to mix.
Step 3	Stop adding the acid when the end-point is reached (the appropriate colour change in the indicator happens). Note the final volume reading. Repeat steps 1 to 3 until you get consistent readings.

State Symbol	Meaning
s	Solid
l	Liquid
g	Gas
aq	Aqueous solution

Producing salts from soluble reactants	
Soluble salts	Soluble salts can be made from reacting acids with solid insoluble substances (e.g. metals, metal oxides, hydroxides and carbonates).
Production of soluble salts	Add the solid to the acid until no more dissolves. Filter off excess solid and then crystallise to produce solid salts.

Solubility	
Sodium, potassium and ammonium	All common sodium, potassium and ammonium salts are soluble e.g. sodium chloride and potassium fluoride.
Nitrates	All nitrates are soluble e.g. potassium nitrate.
Sulfates	Common chlorides (e.g. sodium chloride) are soluble, expect those of silver and lead.
Carbonates and hydroxides	Common carbonates and hydroxides are insoluble except those of sodium, potassium and ammonium.

Strong and weak acids (HT ONLY)	
Concentrated	High mass of substance in a given volume of solution
Dilute	Low mass of substance in a given volume of solution
Strong acids	Completely ionised in aqueous solutions e.g. hydrochloric, nitric and sulfuric acids.
Weak acids	Only partially ionised in aqueous solutions e.g. ethanoic acid, citric acid.
Hydrogen ion concentration	As the pH decreases by one unit (becoming a stronger acid), the hydrogen ion concentration increases by a factor of 10.

KS4 Chemistry – Calculations Involving Masses

1. How to find an empirical formula:

Example: 10.0g of calcium reacts with 17.8g of chlorine. Find the empirical formula of the product that is formed.

1. Symbol	Ca	Cl
2. Mass (g)	10.0	17.8
3. A_r	40.0	35.5
4. Divide mass by A_r	10.0 / 40 = 0.25	17.8 / 0.50 = 35.5
5. Divide answers by smallest number	0.25 / 0.25 = 1	0.50 / 0.25 = 2
6. Empirical formula	$CaCl_2$	

2. How to deduce the molecular formula from the empirical formula and relative formula mass:

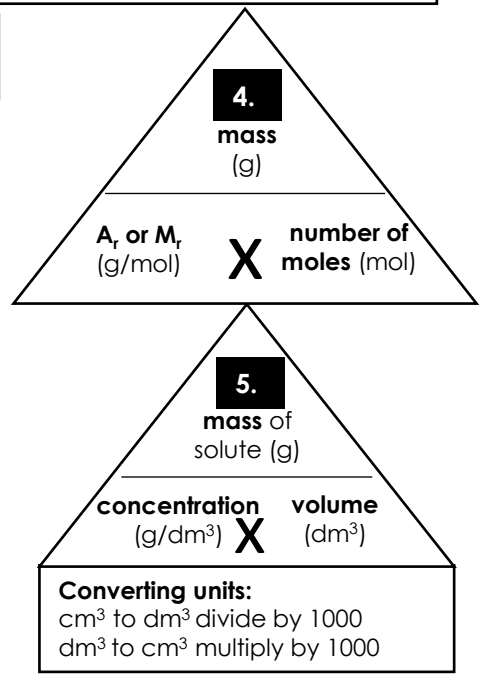
Example: The empirical formula for glucose is CH_2O and its relative formula mass is 180. Deduce the molecular formula for glucose.

1. Find the empirical formula mass by adding up the relative atomic masses of all of the atoms	C + H + H + O 12 + 1 + 1 + 16 = 30
2. Divide the relative formula mass by the empirical formula mass	180 / 30 = 6
3. Multiply the numbers in the empirical formula to get the molecular formula	• CH_2O x 6 • So $C_6H_{12}O_6$

3. How to calculate the masses of reactants or products:

*Example: Calculate the mass of chlorine needed to make **53.4g** of aluminium chloride.*

1. Write the balanced equation	$2Al + 3Cl_2 \rightarrow 2AlCl_3$
2. Calculate M_r of substances in the question	• $M_r Cl_2 = 2 \times 35.5 = 71$ • $M_r AlCl_3 = 27 + (3 \times 35.5) = 133.5$
3. Calculate the ratio of masses	• $3Cl_2$ makes $2AlCl_3$ • (3×71) Cl_2 makes $(2 \times 133.5)AlCl_3$ • 213g Cl_2 makes **267**g $AlCl_3$
4. Divide to work out the mass for 1g of product	• 213g Cl_2 / **267** makes 267g $AlCl_3$ / **267** • 0.798g Cl_2 makes 1g $AlCl_3$
5. Multiply to scale up	• (0.798g x **53.4**) Cl_2 makes (1g x **53.4**) $AlCl_3$ • 42.6g Cl_2 makes 53.4g $AlCl_3$



Converting units:
cm^3 to dm^3 divide by 1000
dm^3 to cm^3 multiply by 1000

6. Keyword	7. Definition
atom	The smallest neutral part of an element that can take place in chemical reactions.
Avogadro constant*	The number of particles in one mole of a substance (6.02×10^{23} atoms, molecules, formulae or ions).
closed system	Substances cannot enter or leave such as a precipitation reaction in a stoppered flask.
concentration	The amount of solute dissolved in a stated volume of a solution. Units include g/dm3.
conservation of mass	During a chemical reaction, the overall mass of substances does not change so the total mass of reactants is equal to the total mass of products.
empirical formula	The simplest whole number ratio of atoms or ions of each element in a substance.
excess reactant	There is more of this reactant present than is needed so it is not completely used up in a reaction.
limiting reactant	There is less of this reactant present than is needed so it is completely used up in a reaction. The mass of product formed is controlled by this reactant.
mole*	One mole of particles of a substance is defined as: a) the Avogadro constant number of particles (6.02×10^{23} atoms, molecules, formulae or ions) of that substance b) a mass of 'relative particle mass' g. The SI unit symbol is mol.
molecular formula	This represents the actual number of atoms of each element in one molecule.
molecule	A particle consisting of two or more atoms joined together by bonds.
open system	Substances can enter or leave such as a reaction in an open flask that takes in or gives out a gas.
precipitate	An insoluble substance that is formed when two soluble substances react together in solution.
precipitation	A reaction in which a precipitate is formed.
product	A substance formed in a reaction.
reactant	A substance used up in a reaction.
reaction	A process in which reactants are converted to different substances called products.
relative atomic mass	(A_r) The mean mass of an atom relative to the mass of an atom of C-12 which is assigned a mass of 12. Unit is g/mol.
relative formula mass	(M_r) The sum of the relative atomic masses of all the atoms or ions in its formula. Unit is g/mol.
stoichiometry*	The ratio of moles of each substance in a reaction.
volume	The amount of space hat a liquid takes up. Units include cm^3 and dm^3.

KS4 Chemistry – Electrolytic Processes

Oxidation Is Loss, Reduction Is Gain

Key Word	Definition
Electrolysis	Decomposition/break down of a compound using electrical energy.
Ions	Charged particle.
Cations	Positively charged ions, formed by losing electrons. Usually metal form cations.
Anions	Negatively charged ions, formed by gaining electrons. Usually non-metal form anions.
Electrodes	A rod made of metal or carbon which carries the current in the electrolyte.
Cathode	An electrode that is negatively charged.
Anode	An electrode that is positively charged.
Electrolyte	Ionic liquid where moving ions carry the current during electrolysis
Reduction	When a positive ion gains electrons.
Oxidation	When a negative ion loses electrons.
Discharged	When ions convert to elements due to transfer of electrons during electrolysis.
(H) Half equations	Ionic equation showing transfer of electrons in oxidation and reduction.

Electrolytic processes

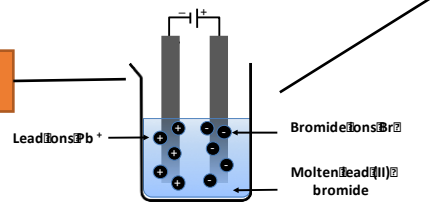
Process of electrolysis	*Splitting up using electricity*	When an ionic compound is melted or dissolved in water, the ions are free to move. These are then able to conduct electricity and are called electrolytes. Passing an electric current though electrolytes causes the ions to move to the electrodes.
Electrode	*Anode Cathode*	The positive electrode is called the anode. The negative electrode is called the cathode.
Where do the ions go?	*Cations Anions*	Cations are positive ions and they move to the negative cathode. Anions are negative ions and they move to the positive anode.

Extracting metals using electrolysis

- *Metals can be extracted from molten compounds using electrolysis.*
- *This process is used when the metal is too reactive to be extracted by reduction with carbon.*
- *The process is expensive due to large amounts of energy needed to produce the electrical current. Example: aluminium is extracted in this way.*

Higher tier: You can display what is happening at each electrode using half-equations:
At the cathode: $Pb^{2+} + 2e^- \rightarrow Pb$
At the anode: $2Br^- \rightarrow Br_2 + 2e^-$

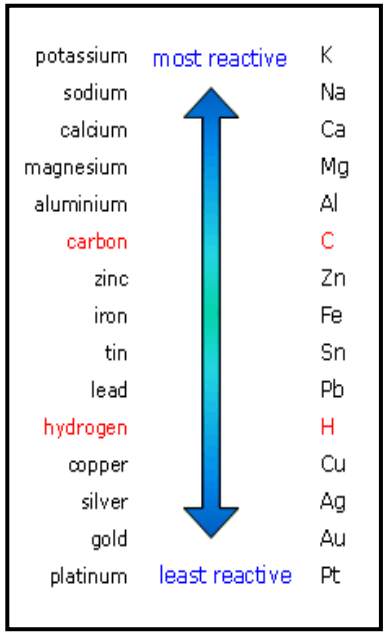
Electrolysis of aqueous solutions



At the negative electrode	Metal will be produced on the electrode if it is less reactive than hydrogen. Hydrogen will be produced if the metal is more reactive than hydrogen.
At the positive electrode	Oxygen is formed at positive electrode. If you have a halide ion (Cl^-, I^-, Br^-) then you will get chlorine, bromine or iodine formed at that electrode.

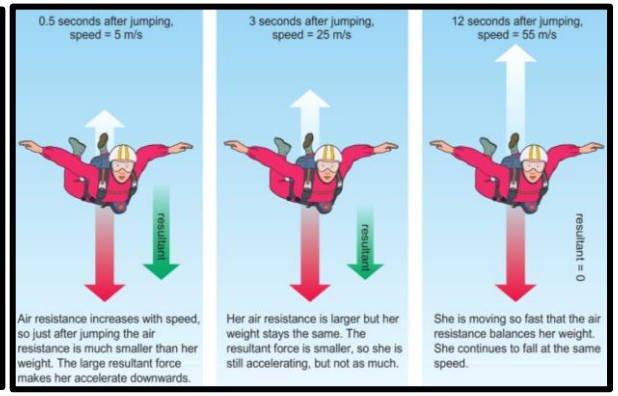
The ions discharged when an aqueous solution is electrolysed using inert electrodes depend on the relative reactivity of the elements involved.

Using copper	*Copper is a very good electrical conductor*	Much of the copper available isn't pure enough for this use so it is purified using electrolysis.
Copper sulfate solution	*The anode is made of impure copper and the cathode is made of pure copper*	Both electrodes are placed in copper sulfate solution. Copper ions (Cu^{2+}) leave the anode and are attracted to the cathode.
Electrodes	*The cathode of pure copper builds up*	The anode decreases in size. The impurities left behind form a sludge.



Negative ion	Element given off at anode
Cl^-	chlorine
Br^-	bromine
I^-	iodine
SO_4^{2-}	oxygen

KS4 Physics – Forces and Motion



Newton's First Law of motion can be written as:

- a moving object will continue to move at the same speed and direction unless an external force acts on it
- a stationary object will remain at rest unless an external force acts on it.

The acceleration of an object is a measure of how much its velocity changes in a certain time. Sir Isaac Newton's Second Law of Motion describes the factors that affect the acceleration of an object.

The acceleration in the direction of a resultant force depends on:

- the size of the force (for the same mass, the bigger the force the bigger the acceleration)
- the mass of the object (for the same force, the more massive the object the smaller the acceleration).

Newton's Third Law is about the forces on two different objects when they interact with each other. This interaction can happen:

- when objects touch, such as when you sit on a chair
- at a distance, such as the gravitational attraction between the Earth and the Moon.

On Earth the **gravitational field strength** has a value of about 10 newtons per kilogram (N/kg). This means that each kilogram is pulled down with a force of 10 N. The gravitational field strength is different on other planets and moons.

The weight of an object can be calculated using the following equation:

weight = mass × gravitational field strength
(N) (kg) (N/kg)

This is often written as: $W = m \times g$

Momentum is calculated using this equation:

momentum = mass × velocity
(kg m/s) (kg) (m/s)

This can also be written as $p = m \times v$, where p stands for momentum.

Momentum and acceleration

Table C shows two equations involving acceleration. These can be combined to give:

$$\text{force} = \frac{\text{mass} \times \text{change in velocity}}{\text{time}} \quad \text{or} \quad \frac{m(v-u)}{t}$$

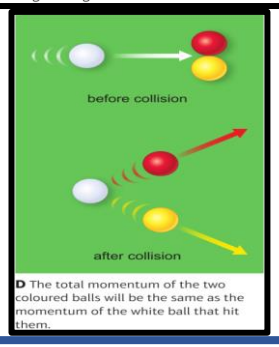
where v is the final velocity and u is the starting velocity.

As mass × velocity is the momentum of an object, this equation can also be written as:

$$\text{force} = \frac{\text{change in momentum}}{\text{time}} \quad \text{or} \quad \frac{mv - mu}{t}$$

H Momentum and collisions

When moving objects collide the total momentum of both objects is the same before the collision as it is after the collision, as long as there are no external forces acting. This is known as **conservation of momentum**. Remember, momentum is a vector so you need to consider direction when you add the quantities together. If two objects are moving in opposite directions, we give the momentum of one object a positive sign and the other a negative sign.



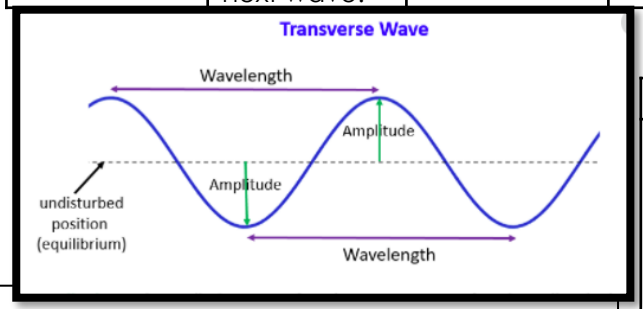
D The total momentum of the two coloured balls will be the same as the momentum of the white ball that hit them.

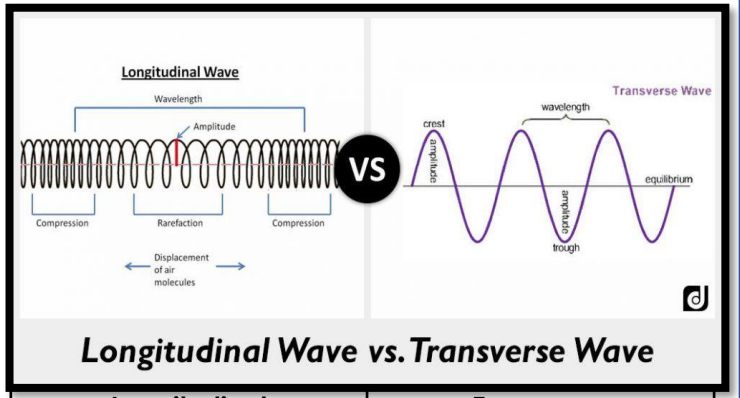
Keyword	Definition
acceleration	A measure of how quickly the velocity of something is changing. It can be positive if the object is speeding up or negative if it is slowing down.
balanced forces	When the forces in opposite directions on an object are the same size so that there is a zero resultant force.
resultant force	The total force that results from two or more forces acting upon a single object. It is found by adding together the forces, taking into account their directions.
scalar quantity	A quantity that has a magnitude (size) but not a direction. Examples include mass, distance, energy and speed.
speed	How fast something is moving. Often measured in metres per second (m/s), miles per hour (mph) or kilometres per hour (km/h).
unbalanced forces	When the forces in opposite directions on an object do not cancel out, to there is a non-zero resultant force.
vector quantity	A quantity that has both a size and a direction. Examples include force, velocity, displacement, momentum and acceleration.
velocity	The speed of an object in a particular direction. Usually measured in metres per second (m/s).
centripetal force	A force that causes objects to follow a circular path. The force acts towards the centre of the circle.
mass	A measure of the amount of material there is in an object. The units are kilograms (kg).
weight	The force pulling an object downwards. It depends upon the mass of the object and the gravitational field strength. The units are newtons (N).
gravitational field strength	A measure of how strong the force of gravity is somewhere. It is the force on a 1 kilogram mass, so the units are newtons per kilogram (N/kg).
inertial mass	The mass of an object found from the ratio of force divided by acceleration. The value is the same as the mass calculated from the weight of an object and gravitational field strength.
action–reaction forces	Pairs of forces on interacting objects. Action–reaction forces are always the same size, in opposite directions, and acting on different objects. They are not the same as balanced forces.
balanced forces	Forces acting on the same object. Balanced forces are always equal, in opposite directions, and always act on the same object. They do not have to be the same type of force An object acted on by balanced forces will not change the way it is moving..
equilibrium	When a situation is not changing because all the things affecting it balance out.
conservation of momentum	The total momentum of moving objects before a collision is the same as the total momentum afterwards, as long as no external forces are acting.
momentum	The mass of an object multiplied by its velocity. Momentum is a vector quantity, with units kilogram metres per second (kg m/s).
kinetic energy	A name used to describe energy when it is stored in moving things. The amount of energy stored depends on the mass of the object and on its speed (or velocity) squared.
work done	The energy transferred when a force acts through a distance to move an object or change its speed. It is calculated using the size of the force and the distance moved in the direction of the force. The unit for work done is the joule (J).

KS4 Physics – Waves

Wave	Vibrations that transfer energy from place to place.
Transverse	A wave where the vibrations are at right angles to the direction in which the wave is travelling.
Longitudinal	A wave where the vibrations are parallel to the direction in which the wave is travelling.
Frequency	The number of vibrations (or the number of waves) per second, measured in hertz.
Period	The time taken for one complete wave to pass a point. It is measured in seconds.
Wavelength	The distance between a point on one wave and the same point on the next wave.
Amplitude	The size of vibrations or the maximum distance a particle moves away from it resting position when a waves passes.
Refraction	The change in direction when a wave goes from one medium to another.
Normal	An imaginary line drawn at right angles to the surface of a mirror or lens where a ray of light hits it.

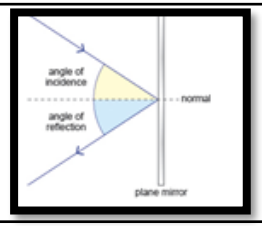
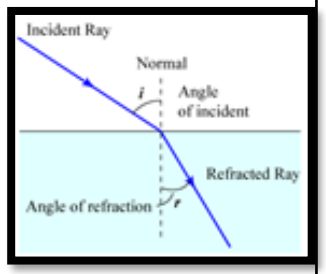
Frequency	The number of waves pass a point in a second.	Higher frequency = more energy transferred	Increasing frequency = higher pitch
Amplitude	Maximum disturbance from its undisturbed position.	Increasing amplitude increases energy transferred	Increasing amplitude = increase in volume
Wavelength	The distance between a point on one wave and the same point on the next wave.	Increasing wavelength = decrease energy transferred	





Longitudinal Wave vs. Transverse Wave

Longitudinal	Transverse
Particles oscillate (vibrate) in the direction of the wave's movement	Particles oscillate (vibrate) at right angles to the direction of the wave movement
Sound waves, ultrasound	Electromagnetic waves (light), water waves

	Description	Diagram
Reflection = light bouncing off a surface	Light waves reflect from surfaces. When waves reflect, they obey the law of reflection: the angle of incidence equals the angle of reflection.	
Refraction = light bends	Waves change speed when they pass across the boundary between two substances with different densities, such as air and glass. This causes them to change direction and this effect is called refraction.	

Wave Formula

Wave speed = wavelength x frequency

Wave speed is measured in meters per second (m/s)	Wavelength is measured in meters (m)	Frequency is measured in Hertz (Hz)

Example

Dylan is standing on the end of a pier. He measures the water waves going past him. The wavelength of each wave is 1.3m. He counts 2 waves every second. Find the wave speed

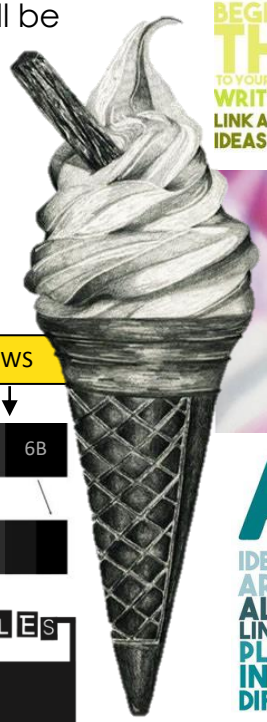
Wave speed = frequency x wavelength

Wave speed = 2 x 1.3

= 2.6 m/s

YEAR 10 ART WORKSHOP KNOWLEDGE ORGANISER

Throughout Autumn term you will be exploring a number of creative workshops to help build your technical skills in Art, Craft and design. All work will be completed within your booklet and will be assessed against the four AO's.



AO1 EXPLORE ANNOTATE IMAGES ARTISTS RESEARCH
BEGIN TO LINK A THEME
TO YOUR CHOSEN ARTISTS WORK
WRITTEN ANALYSIS
LINK ARTISTS WORK TO IDEAS AND ARTWORK

AO2 EXPERIMENT WITH A RANGE OF MEDIA WATERCOLOUR PEN AND INK
LINKING TECHNIQUES TO ARTISTS AND THEMES
DRAWING
TEXTILES
CLAY
MIXED MEDIA PHOTOGRAPHS OIL PASTEL

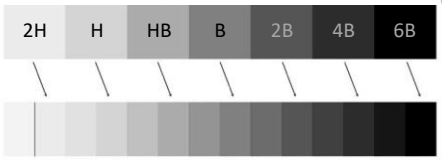
AO3 IDEAS OBSERVATIONAL DRAWINGS PLANS EXPLANATIONS ANNOTATION
IDEAS LINKING TO ARTISTS WORK
ALL ARTWORK LINKING TOGETHER
PLANS, DESIGNS IN A RANGE OF DIFFERENT MEDIA

AO4 FINAL PIECE OF WORK SHOW UNDERSTANDING LINKS TO ARTISTS WORK RELEVANT
MEANINGFUL INFORMED RESPONSE
LINK BETWEEN VISUALS AND ARTISTS PRESENTATION

GENERAL (LIGHT) SHADING

OUTLINES

SHADOWS



TONE PRINCIPLES

Mark-Making
- Circular motion
- Think about pencil direction

Tonal range
- Use 5+ tones
- Highlights and Shadows

Layering
- Build up tones
- Dont press down hard

Gradient
- Emphasis from dark to light
- Focus on transitions

When adding tone to your observational drawing follow the below steps…

1 Look at your model carefully and ask the following questions: **'Where are the dark areas?' 'Where are the light areas?'**
2 Think about your **stroke size, direction** and **hold** on the pencil.
3 Aim to add at least **10 levels** of tone
4 Blend your tones to create a **gradation** (do not smudge!)
5 Look every **3 seconds** at your model to pick up the right tones

Artist Spotlight: Sarah Graham
Sarah Graham is a well-known British painter who works in oil paint. She is a photorealism artist who concentrates on the bright colours and arrangements of her subjects, taking care with the composition and lighting. Sarah also focusses on depth of field and captures this elegantly using paint.

ARTIST RESEARCH

Research into the artist
- Artist bio (one sentence)
- Artist techniques, skills and processes (one sentence)
- What is the title of the work? (if applicable)

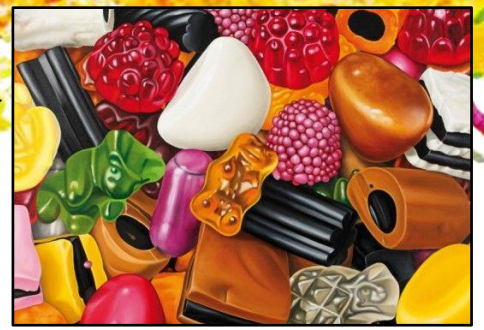
Describe the Art
- What do you see in the work? What is happening?
- What is the context? (portrait, landscape, abstract)
- What words describe the work? (contemporary, delicate, bold)
- Can you link the work to other art pieces/movements?

Analyse the Art
- What is the medium of work? (pencil, paint, sculpture, digital)
- What visual elements/principles have been used?
  - o Line - What mark–making techniques has the artist used?
  - o Shape/Pattern/Form – What kind of shapes, patterns or forms can you find?
  - o Tone /Colour - What colours or shading techniques does the artist use? How?
  - o Texture – What kind of textures can you see/feel?
- What message does the work communicate? What do you think the work is about?

Evaluate the Art
- What do you think is good about the work? Why is it not good?
- How does the work make you feel? Why?
- Will you use the techniques or processes in your own work?
- How will this piece influence your future artwork?

YEAR 10 PHOTOGRAPH WORKSHOP KNOWLEDGE ORGANISER

Throughout Autumn term you will be exploring a number of creative workshops to help build your technical skills in Photography. All work will be completed within your booklet and will be assessed against the four AO's.



Key Photographic Terms

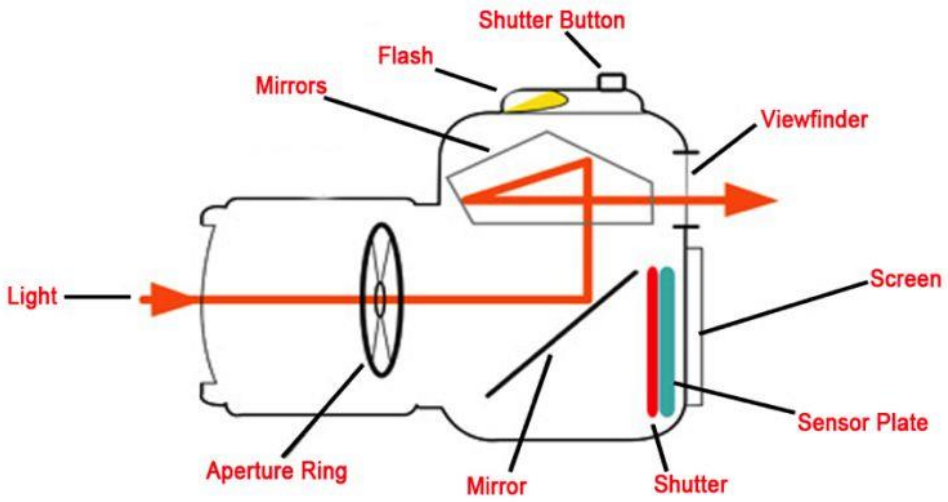
Focus, exposure, camera angle, viewpoint, close up, wide angle, overhead, low, high, small depth of field, large depth of field, shutter speed (slow/fast)

AO1: Develop ideas

AO2: Refine your work

AO3: Record your ideas

AO4: Present a response



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Definitions to learn!

Shutter speed	Shutter speed is the length of time the camera shutter is open, exposing light onto the camera sensor.
Aperture	You can shrink or enlarge the size of the aperture to allow more or less light to reach your camera sensor.
Depth of field	The distance between the closest and farthest objects in a photo that appears acceptably sharp.
ISO	ISO increases or decreases the brightness of a photograph.
Composition	Arranging elements within it in a way that suits the core idea or goal of your work best.
Viewpoints	The viewpoint refers to the position we take the photograph from.
High/Low key lighting	High-key lighting reduces the lighting ratio in the scene, meaning there's less contrast between the darker tones and the brighter areas. Alternatively, low-key lighting has greater contrast between the dark and light areas of the image with a majority of the scene in shadow.

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- How does the work make you feel? Why?
- Will you use the techniques or processes in your own work?
- How will this piece influence your future artwork?

Business Aims and Objectives

Aims and Objectives

Aims: Is the long term objective of the business. Its aim might be to become the biggest business in its sector.

Aims should be SMART:

Specific - Measurable - Attainable - Realistic - Time Manageable

Objectives: Is a short or medium term target of a business needed to reach its aim. An objective might be to increase sales by 20% in the next 5 years.

Aims of **For Profit** Organisations:

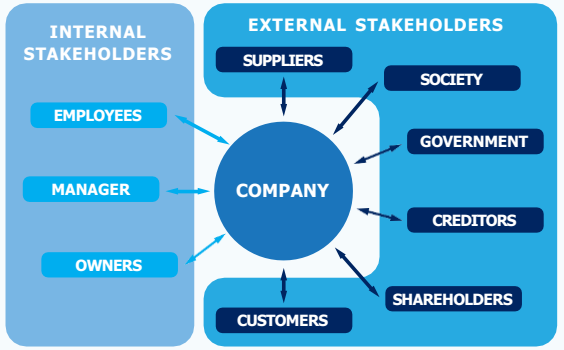
- Survival
- Profit maximisation
- Increase sales revenue / sales maximisation
- Increase market share / gain more customers / customer base
- Growth / expansion / diversification / multinational
- Improve reputation / increase brand awareness
- Improve quality / satisfy customers
- Environmental / ethical aims
- Provide jobs / community aims

Aims of **Not-For Profit** Organisations:

- To serve the community / ethical aims / environmental / social objectives / provide jobs
- To provide services
- To avoid wasteful duplication of resources where a natural monopoly exists, such as rubbish collection and beach cleaning
- To control strategic industries
- To prevent exploitation by monopoly suppliers
- To help people in need

Why do some businesses decide to remain small?

- **Some business owners do not want to grow / are content to operate as a small business ➔** without all the stresses and strains associated with a growing business ➔ examples such as; financial limitations, access to resources, management etc.
- **Small businesses can survive on a relatively low cost structure ➔** may operate from home ➔ have no stock holding costs etc.
- **Some serve niche markets and there is no scope for growth ➔** the market may not be possible to expand
- **Many services can be delivered more effectively on a small scale ➔** e.g. hairdressers, personal trainers, etc.
- **Some consumers like to purchase goods from specialist suppliers and outlets / small stores ➔** they may provide something unique / provide a personal service which some larger organisations struggle to achieve
- **Small businesses can adapt quicker than large businesses ➔** adapting to change quickly such as technology, fashion ➔ more able to satisfy customer needs effectively than a cumbersome plc



Stakeholders

Definition: Individuals and organisations who are affected by the decisions and actions of a particular business

- **Customers ➔** best quality / design / material from products bought ➔ may not buy the product
- **Workers ➔** fair treatment / pay / conditions ➔ may not be able to find employees ➔ hard working ➔ skilful
- **The government ➔** payment of taxes / keeping to various laws may add to costs
- **Pressure groups ➔** ethical source of materials / treatment of workers / the environment ➔ may effect way business is seen / costs / profits
- **Local community ➔** pollution / congestion ➔ effect on demand
- **Suppliers ➔** prompt payment / ethical treatment ➔ may not be willing to supply
- **Lenders / investors ➔** repayment of debts / interest ➔ may call in debts ➔ closure of business
- **Owners ➔** decision making effects on the business/examples
- **Competitors ➔** price wars

Business Enterprise

Business Enterprise

Definition: The formation of a new business or development of a new good or service to be introduced to the market.

Why do people want to set up their own business?

- **Personal ambition / satisfaction** ➔ always wanted to do it ➔ building your own business may help individuals reach higher goals in life ➔ challenge ➔ opportunity
- **Interest** ➔ may be passionate about the product or service they provide
- **To keep a family business running** ➔ taken over from family member
- **Reward for own efforts** ➔ to make profits ➔ earn income
- **Can exploit an opportunity**/identify a gap in the market to increase wealth
- **Provide a service to local community**/ social enterprise
- **Use skills** ➔ learnt in previous job / experience / interests / hobbies ➔ knows own strengths/weaknesses
- **Be own boss /** to be in control ➔ this will give greater flexibility than employment ➔ to be able to make own decisions
- **No work available** ➔ to get a job ➔ may be no similar business locally ➔ high unemployment in area
- **Use qualifications** ➔ gained in school / college or in previous job
- **Encouragement by external/government agencies** to set up own business ➔ support and advice offered by agencies ➔e.g. GO Wales, Careers Wales, Prince's Trust
- **To use redundancy pay to take advantage of the opportunity to set up a business**
- **Easy to set up** ➔ no qualifications needed ➔ no formal documentation ➔ may need limited finance ➔ site available

Entrepreneur

Definition: A person who sets up a business by taking on the financial risks in the hope of making a profit.

They are responsible for bringing together the other factors of production, land, labour and capital, to create a business.

This involves:

- Initiative ➔ Taking action
- Innovation ➔ Idea for a new good or service
- Identifying opportunities ➔ Spotting a gap in the market
- Organising resources ➔ Planning and using a range of resources e.g. raising finance, employing staff, buying materials

Functions of an Entrepreneur:

- They set up a business / they are the business owners / they run (manage) the business ➔ survival / success depends on their efforts
- They have the idea / show the initiative / innovation
- They take the risks / face the uncertainties / suffer the consequences of failure ➔ of e.g. not selling / low demand ➔ particularly with unlimited liability
- Qualities / characteristics of an entrepreneur ➔ determined / organised
- They invest / put money into the business
- They earn the profits / earn an income ➔ to fund their lifestyle ➔ to further invest

The Motives of Entrepreneurs

Financial
- Generate a profit
- Provide employment for self
- Financial security for self and family

Non-financial
- Self satisfaction/challenge
- Be own boss
- Fill a gap in the market
- Create employment for others

Social/community
- Social enterprises are those whose prime objective is to do good in society rather than to make a profit
- Surplus revenue is used to support a specific cause e.g. a children's charity or community group

REWARDS of being an Entrepreneur	RISKS of being an Entrepreneur
The potential personal and financial gains of being an entrepreneur	**The potential personal and financial losses facing an entrepreneur**
Be their own boss Flexible working hours Pursue an interest Good customer feedback Earn more money (profit) Dissatisfaction with current job Greater work life balance Self- esteem from building something new Self- satisfaction Provide employment for self and others	Financial loss of income and money invested Low sales Unexpected costs e.g. rise in rent Unexpected events e.g. new competitor Potentially long hours and stress Loss of security Pressure on friends and family Damage to reputation if fail May lose home

Business Ownership

Public Sector

Definition: Organisations owned and controlled by the government.

Examples: NHS, Police, Education, Armed Forces

Aims & Objectives:
1. Provide a service
2. Improve accessibility to others
3. Avoid wasteful duplication of resources

Public sector	Private sector
Provides Public goods	Profit incentive to be efficient
Not affected by recession	Entrepreneurs create jobs where needed
Gov't jobs to protect environment	Less bureaucracy and scope for corruption
Helps reduce inequality in society	Doesen't require taxes to fund

Private Sector

Definition: Businesses run by private individuals

Examples: sole traders, partnerships, Ltd.'s and Plc.'s

Advice available to Start Up businesses

There are many places that people can go to when thinking of starting up a business. Examples include:

- **Business Wales**
  https://businesswales.gov.wales/
  This is a government run website-based information resource, for those individuals who are thinking of starting a business or wanting to grow their business and are seeking information, advice and guidance.
- **Commercial Banks**
  Many of the high street banks offer a dedicated service to small businesses and offer advice on how to construct a business plan and gain financial approval.
- **The Prince's Trust**
  https://www.princes-trust.org.uk/
  They work with 18 to 30-year-olds to turn big ideas into a business reality through their Enterprise programme and offer training and mentoring support to funding and resources.
- **British Chambers of Commerce**
  http://www.britishchambers.org.uk/
  They provide continued advice and support for local businesses. The BCC is a strong campaigning voice for the interests of business, delivers services that help business grow and is the premier private sector source of advice and support for international trade.

Unlimited Liability

Definition: Means that the owners of a business are responsible for all of the debts of a business. Personal belongings may need to be given up to pay the debts of the business.

Sole Trader

Definition: Businesses owned by one person who has unlimited liability. Other people can be employed but there is only one owner.

Advantages:
- ☑ **Profit** → can keep all profit / no need to share
- ☑ **Making decisions** → without consulting others / will be speedy → e.g. of decision
- ☑ **Own boss** → free to choose / any example
- ☑ **Independence** → can work at own pace etc.
- ☑ **Easy to set up** → few formalities → therefore cheaper to set up
- ☑ **Have a job** → may not be able to find one elsewhere

Disadvantages:
- ☒ **Unlimited liability** → responsible for debts of the business
- ☒ **More responsibility** → relies heavily on their own ability to make decisions → may work long hours and have limited holidays, as there is no one to cover them
- ☒ **Limited sources of resources**

Partnerships

Features:

- A business that is owned by between 2 and 20 people
- A business that is owned/run by at least 2 people
- An unincorporated business
- A business with unlimited liability

Advantages:

☑ **Raise more capital than sole traders** ➔ individuals may not be able to raise sufficient capital alone

☑ **Extra skills / expertise in business** ➔ may be able to specialise in aspects of business to provide a better service

☑ **More people to make decisions** ➔ more considered approach to running the business ➔ more ideas which may lead to success

☑ **Shared responsibility and more flexibility** ➔ reduce pressure on individuals such as duties / working hours ➔ able to take time off ➔ debts / losses can be shared

☑ **Easy to set up** ➔ may involve no legal requirements ➔ Deed of Partnership possible

Disadvantages:

☒ **Partners may disagree** ➔ time used up in discussion ➔ decisions take longer

☒ **Profits will be shared** ➔ compared to a sole trade where the owner can keep all profits to themselves

☒ **Some partners may not work as hard as others** ➔ may demoralise/ lead to arguments

☒ **Continuity** ➔ also applies to sole trader ➔ but effect on surviving partners if one leaves

☒ **The owners will still have unlimited liability** ➔ the partners will be held responsible for the debts of the business

Deed of Partnership

Definition: A legal document which is an agreement between partners that sets out the rules of the partnership, such as how profits will be divided and how the partnership will be valued if someone wants to leave.

It contains:

- Names of partners
- How profits are to be shared
- Suggests how it can help overcome partnership problems
- Shows proportion of ownership to determine distribution of profits
- Shows duties/responsibilities of partners indicating who does what
- Conditions for end of partnership to show distribution of assets
- Liability of partners in case of business debts

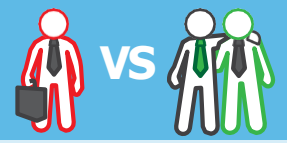
Suggest and explain two advantages to Sam and Mary of being in a business partnership

Suggestions comparing with sole trader might include:

- extra money to invest ➔ more people in business
- more skills/specialisation ➔ partners can do tasks for which best suited
- share workload ➔ share ideas ➔ two heads better than one
- can cover ➔ for holidays/illnesses etc.
- share risks/losses ➔ each can input own resources

Suggestions comparing with limited companies might include:

- business affairs kept private ➔ no need to publish accounts
- less chance of takeover ➔ no one can buy in without owner's permission



Why Move From A Sole Trader to a Partnership?

Arguments in favour of a partnership:

☑ **Potentially more capital** ➔ ideal for example if the business needs to find new premises as the current one is becoming too small

☑ **A new partner brings new skills**

☑ **Possibility of specialisation**

☑ **More ideas/problems can be shared**

☑ **Share workload** ➔ presents an opportunity to reduce working hours/take holidays.

☑ **Avoids need to employ somebody** ➔ a risk ➔ new staff need training ➔ not sure of their capabilities

Arguments against forming a partnership (staying as a sole trader):

☒ **Original sole trader will lose their independence**

☒ **Will need to share profits** ➔ though possible to generate more

☒ **Could result in disagreements/quarrels.** Though many family businesses are successful others end in acrimony

☒ **Decision making potentially slower** ➔ need to consult/less flexibility

☒ **By employing a new worker the original sole trader could retain their independence** and also reduce their own working hours

☒ **If after a short time the new partner finds they want to leave the partnership, then the original sole trader is back to square one**

Limited Liability

Definition: When the owners of a business are not responsible for the debts of a business. Personal belongings will not need to be given up to pay the debts of the business. The owners however will lose the money they invested in the business if it fails.

Public Limited Companies [Plc]

Definition: Businesses which are owned by shareholders who have limited liability. Their shares are available to others by selling to the general public often on the Stock Exchange. They are generally recognised with plc after the business name.

Advantages:

- ☑ **Limited liability** ➔ liable only for money invested ➔ if business fails ➔ the owner will not lose personal possessions
- ☑ **Continuity** ➔ business will not end if one of the shareholders / owners leave
- ☑ **More capital** ➔ by selling shares on the stock exchange ➔ may be easier to get bank loans
- ☑ **Specialised management** ➔ shareholder/owners /managers can do the work they are skilled at
- ☑ **Divorce of ownership and control possible** ➔ the owner may not spend all time managing
- ☑ **Invited shareholders** ➔ able to maintain control

Disadvantages:

- ☒ **Cost of setting up** ➔ with documents ➔ must have £50,000 share capital
- ☒ **Need to share profits** ➔ with shareholders
- ☒ **Affairs not kept private** ➔ need to publish accounts ➔ more expensive to produce
- ☒ **May lose control/may need to share decision making** ➔ if another shareholder gains majority control

Private Limited Companies (LTD)

Definition: Businesses which are owned by shareholders who have limited liability. Their shares are not available to others except with the agreement of other shareholders. They are generally recognised with Ltd after the business name.

Advantages:

- ☑ **Limited liability** ➔ liable only for money invested ➔ if business fails ➔ the owner will not lose personal possessions
- ☑ **Continuity** ➔ business will not end if one of the shareholders / owners leave
- ☑ **More capital** ➔ by selling shares ➔ may be easier to get bank loans
- ☑ **Specialised management** ➔ shareholder / owners / managers can do the work they are skilled at
- ☑ **Divorce of ownership and control possible** ➔ the owner may not spend all time managing
- ☑ **Invited shareholders** ➔ able to maintain control

Disadvantages:

- ☒ **Legal procedure in setting up takes time and costs money**
- ☒ **Having to disclose the accounts** ➔ financial information filed with the Registrar can be looked at by the public/competitors
- ☒ **Profits have to be shared with the other shareholders**
- ☒ **Slower decision-making** ➔ especially if all shareholders have to be consulted
- ☒ **Limited capital available** ➔ unable to use stock market/ reduced investors available
- ☒ **Restriction on share ownership** ➔ shareholders have to agree on sale of shares

Dividend

Definition: The term for the share of the profits of limited companies and Co-operatives.

Social Enterprises / Co-operatives

Social Enterprise: Businesses which operate for the benefit of the community, or its workers, or as a charity.

Co-operative: A business organisation that is owned by its customers / workers / producers / members ➔ they have a common purpose or aim ➔ they receive dividends ➔ they share /are consulted in decision-making

Examples: Big Issue, Eden Project, Co-operative, Devine Chocolate

Advantages:

- ☑ Community interested company
- ☑ Positive Public Relations
- ☑ Benefits society

Charities

Definition: Organisations set up to provide help and raise money for those disadvantaged in society.

They are not established to make profits but they can earn surpluses.

Charities can often have a narrow focus (single issue) in what they are trying to achieve.

Charities raise the majority of their finances through voluntary donations, but more and more charities now operate retail outlets as well.

Providing Goods and Services

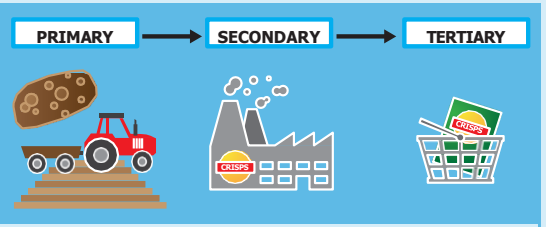
Sectors of Industry

Primary: Where the *raw materials* are produced, e.g. farming, mining, forestry.

Secondary: Where the raw materials are *manufactured* into goods, e.g. factory.

Tertiary: Businesses in this sector *provide a service*, e.g. retailer, hotel, school.

Chain of Production: This process links the primary, secondary and tertiary sectors together in the production process.



Factors of Production

Land: The natural resources that are needed to produce goods.

Labour: Physical and mental element that is needed to produce goods and services.

Capital: The money (working capital) and fixed capital that is needed to produce goods and services.

Enterprise: These people have the ideas to start a business and organise the other 3 factors of production.

Consumers

Definition: The final users of goods and services. They are at the end of the distribution channel.

Needs

Definition: Items that you have to have in order to survive.

Examples: Food, Water, Warmth, Clothing, Shelter

Wants

Definition: Items that you would like to have but are not necessary to your survival. They enhance your lifestyle.

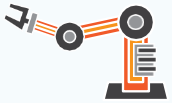
Examples: TV, mobile phone, holidays, cars

Goods

Definition: These are *tangible* items that you can physically touch.

Consumer Goods: Goods which are produced for the final consumer.
Examples: cars, food, clothes

Producer (Capital) Goods: Goods which are produced for other businesses to be able to produce other goods and services.
Examples: vehicles, computers, robots, furniture & fixtures



Durable Goods: Consumer goods which are not used at once and do not have to be bought frequently because they last for a long time.
Examples: TV, mobile phone, washing machine

Non-Durable (Single Use) Goods: Goods which are immediately consumed or which have a lifespan of less than three years.

Services

Definition: Things you cannot touch; they are non-physical intangible items.

Examples: hairdressing, taxi service, education

Personal Services: Services provided for individuals.They include services for personal grooming, house maintenance, car repair etc.

Commercial Services: Services that provide mainly to businesses such as transport and warehousing, but they may also be available to individuals such as insurance and banking.

Markets

Definition: Where buyers and sellers meet in order to exchange goods and services, often for money.

Retailers

Definition: Sells goods to consumers. Small retailers buy their stock from wholesalers but large-scale retailers buy directly from manufacturers.

Functions of a Retailer:
- Display goods
- Promote goods
- Sell to consumers / sell goods and services
- Give customers advice / provide customer service
- Deal with faulty goods / complaints
- Distribute goods / deliver goods
- Buy from wholesalers / manufacturers / suppliers
- Break bulk / buy in large quantities and sell in small quantities
- Closer to consumer / Local
- Can offer credit

Year 10 Child Development – Component 1 Learning Aim A: Understand the characteristics of children's – Development from birth to five years old

KEY WORDS for Growth and development	
Physical development	Growth and other physical changes that happen to our body throughout life
Intellectual development	The development of language, memory and thinking skills
Emotional development	The ability to cope with our feelings about ourselves and others
Social development	The ability to form friendships and relationships and to learn to be independent
Cognition/ Cognitive	Acquiring knowledge and understanding though thoughts, experiences and senses.
Communication	Exchanging information through speaking and writing.
Language	The method of human communication
Recognition	Identifying something and someone based on previous experience and knowledge
Independence	Not depending on another
Identification	Identifying something (spotting something)
Memory	The mind stores and remembers information
Fine motor skills	Smaller muscles which allow for coordination and control in the hands and fingers.
Gross motor skills	Large muscles in the body, allowing the child to run, crawl and walk.
Senses	The body perceives an external stimulus, such as sight, smell, taste, touch and hearing
Self-soothing	A young child learning to stop crying without the comfort and attention of parents
Confidence	The feeling of belief that someone can have faith or rely on someone or something
Self-esteem	Confidence in one's own worth and abilities
Bonding	Relationship or link with someone based on feelings, interests, experiences
Trust	Firm belief in the reliability, truth or ability of someone or something
Socialisation	The activity of mixing socially with others
Hand eye coordination	The ability to coordinate information you receive visually to guide and direct the hands to complete a task
Speech	Express thoughts and feelings by articulating sounds
Perseverance	Persistence in doing something despite difficulty or delay in achievement
Sensory development	Discovering or understanding through the senses, interpreting meaning through each of the senses
Prone position	A person lying flat with chest down and back up.

AREAS OF GROWTH

Areas of growth

Changes to…
- Physical size
- Height
- Weight
- Head circumference
- Skeleton
- Muscles
- Brain

Measurement of growth

A **centile chart** is used to **measure the growth** of a child's **height, weight** and head **circumference**. It shows comparison of growth to other individuals backed by research. This allows parents to track their child's growth. It is not used to show normality's or abnormalities.

Consistency of charts

Having a consistent chart, allows parents to track **consistent patterns**, so they can highlight potential issues at an early stage in a child's life. This can then be checked by a registered medical professional.

AREAS OF DEVELOPMENT

Skills

Children are developing in all of the PIES. The five main areas of development are…
- **Cognitive development- learning and solving problems**
- **Social and emotional development**
- **Speech and language development**
- **Gross and fine motor skills**

Knowledge

Children are learning to **identify objects**, **senses** and **attachments**. They are developing knowledge in r**eading, building, solving basic problems**, which will assist them in later life. They are learning about their own emotions and how to share and play with other children.

Different rates

Children can vary at their rates of development. Just because a child doesn't meet their expected milestone, doesn't mean their development has been negatively impacted, or is behind the expected rate.

Milestones

These are known as **developmental norms**, indicating stages of development that a child may meet at an expected.

Holistic development

Think of a whole circle, if there are missing pieces the circle isn't complete. **Holistic development** is when a child develops well rounded progress **physically, intellectually and cognitively, communication and language, socially, and emotionally.**

5 AREAS OF DEVELOPMENT

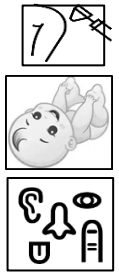
Physical development

Instant reflexes:
Rooting and sucking, startle reflex, grasping reflex, walking reflex.

Control over the body – motor sequence of development, including head and trunk control, rolling and turning, sitting upright, crawling, standing with help, walking with help, standing, without support, walking without support.

Development of the senses – sight, sound, touch, taste and smell **Gross motor skills** – large movement of limbs, developing locomotion, balance, hand-eye coordination.

Fine motor skills – movement of fingers, developing hand-eye coordination.



Cognitive and intellectual development

Development of information processing –
Attention span, responds to pitch and tone, recognises self, responding to own name, building up to vocabulary of approximately 2000 words, learning to read and write basic words.

Memory–
Recognition of familiar objects and people, songs and rhymes.

Problem-solving skills – exploring objects with hands and mouth, counting and sorting objects by colour and size.

0-18 months

3-5 years

Communication and language development

Development of speech sounds and language skills Listening and

attention skills, including responding to sounds,
responding to name, understanding instructions of varying steps

Social skills – smiling; babbling; interacting with others by combining words, gestures and sounds; speaking in turn

Formation of sentences – from single words to up to nine-word sentences

18 months- 3 years

Social development

Development of secure, positive relationships with others, including attachment to primary caregivers.

The importance of primary and secondary

socialisation. Building confidence and self-

esteem

Development of friendships.

Emotional development

Ways that children attract attention of caregivers – crying, turning their head, smiling, giggling

Development of bonds and trust – positive relationships; recognition of familiar caregivers; wariness of unfamiliar and unknown others Increase in independence – exploring the environment independently, development of self-soothing skills

Developing emotional resilience – learning how to cope with emotions, including testing boundaries, understanding cause and effect of feelings and behaviours, learning how to manage feelings and frustrations.

Year 10 Child Development – Component 1 Learning Aim B: Explore factors that affect growth and development

KEY WORDS for FACTORS	
Physical development	Growth and other physical changes that happen to our body throughout life
Intellectual development	The development of language, memory and thinking skills
Emotional development	The ability to cope with our feelings about ourselves and others
Social development	The ability to form friendships and relationships and to learn to be independent
Cognition/ Cognitive	Acquiring knowledge and understanding though thoughts, experiences and senses.
Communication	Exchanging information through speaking and writing.
Language	The method of human communication
Genes	Inherited characteristics transferred from parents to children
Abnormalities	An abnormal (something unusual or not normal) feature or characteristic
Chromosomes	A threadlike structure inside most living cells that carry genetic information
Foetus	An unborn human.
Spina bifida	A defect in the spine, which causes a gap in the backbone. This causes paralysis of lower limbs and sometimes learning difficulties.
Substances	An intoxicating and stimulating chemical or drug that causes harm.
Premature	A baby born before the full term of pregnancy.
Mental health	Psychological and emotional well being
Deprivation	A lack or denial of something that is necessary- e.g. food.
Housing need	Considers the households who do not have access to accommodation that meets the normal requirement.
Abuse	Treated cruelly or with violence regularly or repeatedly.
Neglect	Failure to care for someone.
Exploitation	Treating another unfairly to benefit yourself
Mutilation	Inflict serious damage on.
Prescription drugs	Medicine that is only given with a doctor's prescription (recommendation)
Illegal drugs	A drug that is forbidden by the law due to the harm it causes.
Socio economic	Social and economic factors.
Discrimination	Unjust or prejudice treatment of different groups of people based on their age, sex and race.
Social exclusion	Removal from the social system and its rights and privileges due to poverty or belonging to a social group.
Poverty	The state of being extremely poor.

FACTORS AFFECTING GROWTH AND DEVELOPMENT

PHYSICAL FACTORS

BEFORE BIRTH: An effect on the foetus.

Prenatal: based on genetics that are passed on through parents. Genetic abnormalities can be caused by:

- Maternal nutrition and exercise
- Paternal drug or substance abuse
- Premature/low birth weight
- Mothers mental health

AFTER BIRTH

Health status: chronic or life limiting illness
Diet and dietary deficiency- e.g. not enough calcium
Amount of exercise: not encouraged to eat healthy food, risk of diabetes.

ENVIRONMENTAL FACTORS

Housing:
Living in deprivation or housing needs.
Housing needs- When the local council look at the amount of homeless households, those living in temporary accommodation, and households not big enough for their family.

Home environment:
Living with parental conflict, experiences of abuse and neglect

Exposure to harmful substance:
Drugs, alcohol and smoking and the effects of this on a child.

SOCIOECONOMIC FACTORS

Discrimination against the child:
Based on their race, social or cultural grounds. For example what religion they follow, or the groups of individuals they associate with.

Income and poverty:
Unemployed or workless families
Whether they had access to early education services, preschool, nursery.

Poor relationships with significant adults:
Whether they receive warmth and affection from family. How they respond to significant adults offering support, attention.

Year 10 Child Development – Component 2 Learning Aim A: Understand how children play

KEY WORDS for Growth and development	
Unoccupied play	From birth to 3 months. The child will be making random movements with no clear purpose. The child may seem uninterested but they are trying to figure out their environment and new objects around them.
Solitary play	This type of independent play happens after three months up to 2 years. Children will play by themselves, giving them time to think, create and explore. They have not yet formed an understanding of relationships in play, which is why they will play alone.
Spectator/onlookers play	A child starts to notice others around them between 2-2 ½ years. In this stage, a child will be observing other children playing, to build an understanding of playing around others. The child may not join in the play, but may socially engage with other children while they are playing.
Parallel play	This stage happens between 2 ½ years and 3 years. This is where children will play on their own but with another playing next to them. It is important for children to learn how to play with each other, learning how to observe each other and cooperating with others, even if they are on their own task.
Associative play	This stage of play happens between 3-4 years. They may be playing separately but they are actively engaging with them whilst playing. This may be in a similar activity, they are interacting through talking and borrowing items of play from each other. They are not ready to participate in group play.
Collaborative/ Co-operative play	This is between the ages of 4-5 years. This is organised play, where children are involved in group play to achieve an aim or goal such as creating art. It is clear to see a leader and follower in this play.
Language	WAYS TO ORGANISE PLAY
Genes	In adult led play, the adult plans and leads the activity. This allows them to consider activities that are suitable and challenging for the child. They can focus the activity on promoting skills such as organisation, counting, and creativity.
Abnormalities	This is when adults will set up the environment with the tools to guide children to play. It may be they want them use hand eye coordination, so they set up paints in interesting areas of the room. This means they can guide the child in their decisions, but the child is making more decisions for themselves.
Chromosomes	A threadlike structure inside most living cells that carry genetic information making a decision of how to play with them. This promotes a range of social skills and will develop concentration levels are they are focused on their own activity.

STAGES OF PLAY + EXAMPLES

STAGE 1: Unoccupied play

+
Develops confidence Allows them to learn about their environment

Examples:
Looking at objects Trying to reach for objects

STAGE 2: Solitary play

+
Promotes freedom Learning to practice physical skills Embrace the flow of play

Types:
Solitary active play: creating an imaginary friend or make believe Solitary imaginative play: Using actions in an imaginative story.

STAGE 3: Spectators/onlooker play

+
Helps to build confidence by watching others play Gaining information that will help later in childhood

STAGE 4: Parallel play

+
Copy adults and children Learning through trial and error

STAGE 5: Associative play

+
Problem solving, reasoning, socialising, further development of language

STAGE 6: Collaborative play

+
Sharing ideas Taking turns Negotiating Following rules

3 WAYS OF ORGANISING PLAY

Adult led play:

Adult play is important is child development, as it allows children to take guidance and instruction from a lead person, and learn how to participate independently in the future. The adult will play and organise the play, depending of the aims and goals of the activity. For example, if they want the child to identify colours and shapes, they may plan a sensory activity helping them organise different shapes into certain pots.

The benefits:

- Allows for **higher risk activity** because of the adult supervising and monitoring the activity for safe development.
- Allows children to learn new **skills** such as sharing, organising, communicating, identification, kindness and creativity.
- Helps children **develop language**- as the adult models words and teaches through play, children will copy and pick up on the meaning of words.

Potential disadvantages:

Learning can become **limited** due to adults taking the lead.

- This may enable the child to relay on adult help. If the activity is limited and means the children are all completing the same task, they may not have the opportunity to develop their own creativity and imagination.
- Learning **may not be effective** if they are in large groups, they may not have enough time to complete the activity.

Adult initiated play:

This is where adults will place resources and toys in specific places in the room, for children to choose what they can play with and the activity they would like to complete. Adults are allowed to guide them in their activity, but it is about them making decisions for themselves. This happens, when children have developed an understanding of activities and skills from adult led play.

Child led play:

This is when children have **'free play'**. The activity and resources are chosen by them, and they can use the flow of play to assist in developing organisation, creativity, imagination and problem solving. Adults are able to join in with children, but have to follow children's activity and instructions.

Benefits:

- **Develops concentration**- this is because children have chosen the activity and have a clear understanding of why they are doing it **(purpose).** Usually because they have chosen to do this, they have more control of their decisions and can be more invested in the activity.
- Develops social skills- children are learning to **take it in turns and share**. They may have issues with this at first, but **learning through experience** will help them overcome adversity.

Year 10 Child Development – Component 2 Learning Aim B: Demonstrate how children's learning can be supported through play

Key Terminology	
Activities	A task or application of actions which allow completion.
Holistic needs	Meeting all areas of a child's needs to combine physical, intellectual, emotional, social and spiritual growth.
Promote learning	Activities to encourage development of a child.
Logical	Reasonable and realistic.
Spatial awareness	Understanding the appropriate distance between bodies of others.
Body co-ordination	Performance of body movements which are efficient movements to complete tasks
Imagination	Use of creativity and intelligence to form new ideas and thoughts,
Problem solving	Be able to use logical thinking to find solutions to issues.
Communication and language play	Learning through use of speech by developing vocabulary by books, technology and role play.
Intellectual/cognitive play	Learning through use of the brain to develop creativity, imagination, literacy and numeracy skills as well as problem solving and confidence development.
Physical play	Learning through physical activities to develop spatial awareness, coordination in order to stay fit and well. Physical play develops fine and gross motor skills.
Social play	Learning through developing friendships, relationships and understanding the importance of manners, values and trust.
Emotional play	Learning through understanding feelings, independence and self-confidence to build relationships.

5 WAYS OF PLANNING LEARNING THROUGH PLAY

PHYSICAL PLAY

Spatial awareness- eye, hand, feet and leg coordination
How to look after yourself
Activities to stay healthy
Gross motor skills- bodily coordination, strength
Fine motor control- manipulation

Role play
Food preparation games
Bat and ball games
Climbing frames
Playdough and sand activities
Construction toys

Cognitive and Intellectual play

Problem solving
Creativity
Use of imagination
Listening and attention skills
Numeracy skills
Exploring environments inside and outside

Counters
Play money
Trips and visits
Writing
Puzzles
Shape sorters

Computer games

Skills/learning

Recommended activities

Communication and language play

Listening skills- refined speech sounds
Vocabulary and literacy skills- speaking and questioning skills How to express and understand feelings Understanding of others
experiences- cultural experiences (religion)

Books- lift the flap, textured, talking books, stories, images Role play- dressing up games Nursery rhymes
Action games- follow the leader, hide and seek Cooking games- understanding instructions

Social play

Development of friendships and relationships- build bonds, trust, emotional support networks
Sharing, turn taking, compromise
Understanding culture and values

Team games
Group projects such as gardening or building
Board games

Emotional play

Expression of feelings, teaching children how to self-manage their feelings
Promote independence Improve confidence, self-esteem and self-concept
Building relationships

Puppets and dolls
Role play activities
Emotion faces- how do I feel today
Circle time, carpet time

Year 10 – Computer Science – 1.2 Memory

Possible Careers
- Computer Technicians
- Computer developer
- Computer hardware engineer

RAM – RANDOM ACCESS MEMORY : The PURPOSE of RAM is to process the instructions & programs that are CURRENTLY in use by the computer system

ROM – READ ONLY MEMORY – The PURPOSE of ROM is to store the BIOS, which contains the boot strap instructions used to boot up (start) the PC

Volatile Memory – this is a type of memory that is temporary – all data stored in here **is LOST** when the computer is turned off e.g. RAM, CACHE, Virtual memory.

Non Volatile Memory – is a permanent type of memory – data **still remains** here when the computer is turned off. E.g. ROM

Firmware – this is permanent software that cannot be changed. – e.g. the BIOS is firmware on the ROM as this contains the instructions to start up the PC

RAM Vs ROM

RAM is Volatile	ROM - Non Volatile
RAM Stores data & Programs currently in use	ROM – stores the BIOS used to start up the PC
RAM is larger than ROM	ROM is smaller than RAM
Data can be changed	data on here cannot be changed

Why do we need Virtual Memory?

VM is created when RAM has insufficient space. The hard Drive will create a temporary memory (virtual Memory) to store instructions waiting to be fetched by RAM.
Data will be sent back and forth between RAM and VM (known as Disk thrashing, paging or swapping) until RAM has enough space to be able to deal with the data.

Flash Memory

This is an electronic re-programmable form of memory. Data here can be erased and re-written. Flash memory is often used for long term storage devices. E.g. SD cards, USB sticks.

Year 10 – Computer Science – 1.2 Memory

Magnetic (eg Hard Drive) - Uses magnetic patterns to represent information. Has an electronic head that writes to a disk or tape

- Very Large capacity
- relatively cheap

Optical (eg DVD / CD Rom) - uses lasers and lights as its method of reading and writing data.

- Cheap to produce
- Portable
- Universally readable by a most computers

Solid State (eg Flash Drive) - Solid state – non volatile no moving parts when saving data to the device

- No Moving parts so not sensitive to being moved around while used
- Quick access (for instant on)

Secondary Storage: Normally non-volatile, data and programs that are not running on a CPU are stored in here. Examples are hard disks, DVD, magnetic tape etc

WHY:

Allows you to save and store things that you need/use on a regular basis or need to use at a later date.

Don't forget about Online storage! **term used to describe services provided over a network by a collection of remote servers.**

Flash

Magnetic

Optical

Online - Cloud

Possible Careers

- Computer Technicians
- Computer developer
- Computer hardware engineer
- Teaching

Year 10 – Computer Science – 1.2 Memory

When we talk about how suitable storage is we use these terms…….

Capacity
-how much data can it store?

Speed
-how fast can it access the data?

Portability
-how easy is it to move it from one place to another

Durability
-how well does it last e.g. if it is dropped

Reliability
-how consistently does it perform

Cost
-how much does it cost per KB, MB or GB?

You would be expected to suggest a suitable storage type and give the advantages and disadvantages using these characteristics

Capacity

Bit (1 or 0)
Nibble (4 bits e.g. 1101)
Byte (8 bits e.g. 10111001)
KB (1000 or 1024 bytes)
MB (1000 or 1024 KB)
GB (1000 or 1024 MB)
TB (1000 or 1024 GB)
Petabyte (PB) (1000 or 1024 TB)

PRIMARY

VOLATILE – areas of memory that CPU can access quickly
RAM
CACHE
VIRTUAL MEMORY
ANYTHING STORED HERE IS FORGOTTEN WHEN THERE IS NO LONGER POWER TO THE COMPUTER

SECONDARY

NON-VOLATILE – where the OS, applications, files and programs are stored
USED FOR LONG TERM STORAGE
USB
HARD DRIVE
CLOUD
TAPE
CD/DVD

TERTIARY

NON-VOLATILE – for storing more long term – for archives and back-ups
USED FOR LONG TERM STORAGE
USB
HARD DRIVE
CLOUD
TAPE
CD/DVD

Year 10 – Computer Science – 1.2 Memory

A SOUND file has 2 bytes per sample, it takes 10 samples per second, over 2 channels and is 30 seconds long.

The formula to work this out is:
bytesPerSample * samplesPerSecond * channels * duration

2 * 10 * 2 * 30 = 1200 bytes or...
..1200/1024 = 1.17 KB

An IMAGE is 1024 x 720 pixels in size, 1 byte per pixel. It has 256 different colours

The formula for working this out is……
(Number of pixels * number of bytes per pixel) * 10% for overheads
Divide answer by 1024 to get KB.
Divide further again by 1024 if you want answer in MB

SO……

Number of pixels = **1024 * 720 = 737280 pixels**
737280 * 1 * 1.1 = 811,008 bytes or ...
...811008/1024 = 792KB

A TEXT FILE that contains 1000 characters. Give your answer in KB

1 byte per character, + 10% for any overheads (e.g. file type) **See below to work this out

A text file with 1000 characters will have approximately?
1000 bytes * 1.1 = 1100bytes

How many KB?
1100/1024 = 1.07 KB

Overheads Files store more than the data in the file. This term refers to the **extra that the system** has to process to. E.g. allocating memory, bandwidth, file types etc. You should **allow for 10% extra** on top of normal storage capacity

To work out an overhead – Find 10% of the number of bytes per character: so 1 byte per character
How do we work out percentages – 10% of 1? (10% as a decimal is 0.10)

1 x 0.10 = 0.1

So we now know that 10% of 1 is 0.1
Lets add this to 1

1 + 0.1 = 1.1 overhead

A database has 6 fields and 200 records:

- **CDNumber**, a text field with 6 characters
- **Title**, a text field with max. 20 characters
- **Artist**, a text field with max. 15 characters
- **DatePublished**
- **NumberOfTracks**, an integer field
- **TotalLength**, a real field

Calculate the file size of this database…..
See right box for how to….

Text = 1 byte per character.
Integer = 4 bytes
Real = 4 bytes
Date = 8 bytes

Step 1: Work out how many bytes are in the record (you will need to know the datatype of each field)

CDNumber= **6** bytes, Title = **20** bytes, Artist = **15** bytes, DatePublished = **8 bytes**, NumberOfTracks = **4 bytes**, TotalLength = **4 Bytes**

Total = 57 bytes

Step 2: Multiply by the number of records

57 * 200 = 11,400 bytes

Step 3: Add 10% for overheads (1.1)

11,400 * 1.1 = 12,540 bytes

Step 4: work out how many KB by dividing by 1024

12,540 / 1024 = 12.24kb

In short:

(6+20+15+8+4+4) * 200 * 1.1 = 57 * 200 * 1.1 = 12540 bytes = 12.24 KB

Year 10 – Computer Science – 1.2 Memory

Careers

- Software development
- Programing
- Software Engineering

Constant

Value STORED IN A **MEMORY LOCATION** that **never changes WITHIN A PROGRAM**

Variable

Value STORED IN **MEMORY LOCATION** that **can change WITHIN IN A PROGRAM**

Sequence: Completing steps in the order which they must happen

Selection: Where a choice is made in a program depending on a condition or outcome

Iteration: Act of repeating or lopping specific sections of code

Count controlled Iteration:
Repeats a set number of times

Condition controlled:
Repeats until a condition is met or something in the program changes

Syntax Error
An error in the rules/grammar of the language Eg missing colon / spelling mistake

Logic Error
The program is written to do something other than what the programmer intended Eg Resetting only the first 9 elements in an array instead of all 10.

Run Time Error:
More difficult to spot as it can run a program without reporting an error. E.g. runs but Doesn't give an output. Or the program hangs or Becomes inactive

Data Types

Real /Float
Number with decimal Point

Integer
Number without a decimal Point

String
A series of characters/TEXT

Character
A single letter or symbol

Date/Time
Date and Time in any format

Boolean
Yes no, true false value

Other Info

Concatenate
To join different data types together

 # Comments
Use these to add comments in to your code to explain what you have done

Validation: An computer check to ensure that the data entered is sensible and reasonable. It does not check the accuracy of data.

Year 10 – Computer Science – 1.2 Memory

Comparison Operators

==	Equal to
!=	Not equal to
<	Less than
<=	Less than or equal to
>	Greater than
>=	Greater than or equal to

Aritmetic Operators

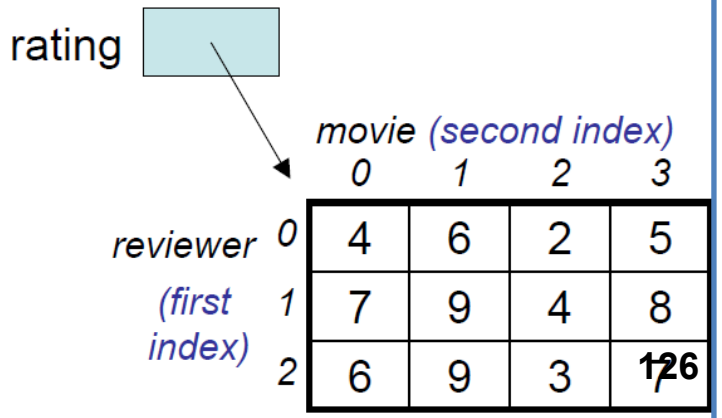
+	Addition eg x=6+5 gives 11
-	Subtraction eg x=6-5 gives 1
*	Multiplication eg x=12*2 gives 24
/	Division eg x=12/2 gives 6
MOD	Modulus eg 12MOD5 gives 2
DIV	Quotient eg 17DIV5 gives 3
^	Exponentiation eg 3^4 gives 81

Careers

- Software development
- Programing
- Software Engineering

TYPE	INFO	SYNTAX
LIST	MUTABLE DIFFERENT DATA TYPES	[ ] E.G. [1,"HELLO", 3.4]
TUPLE	IMMUTABLE DIFFERENT DATA TYPES	( ) E.G. (1,2, "Hello", 4.3)
ARRAY	IMMUTABLE SAME DATA TYPE	[ ] E.G [1,2,3,4]

- Two-dimensional (2D) arrays are indexed by two subscripts, one for the row and one for the column.
- Example:



Careers
- Software development
- Programing
- Software Engineering

Data Representation

Binary to denary

1 = On 0 = Off

128	64	32	16	8	4	2	1
0	0	1	1	0	1	0	0

32 + 16 + 4 = **52**

Binary 00110100 = 48 Denary

Denary to Binary

24 =

128	64	32	16	8	4	2	1
0	0	0	1	1	0	0	0

Year 10 – Computer Science – 1.2 Memory

Binary to Hex

00111010

8	4	2	1
0	0	1	1

8	4	2	1
1	0	1	0

3 A

Hex to Binary

4B

8	4	2	1
0	1	0	0

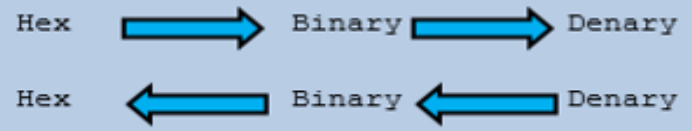
8	4	2	1
1	0	1	1

128	64	32	16	8	4	2	1
0	1	0	0	1	0	1	1

HEXDECIMAL
BASE 16. Uses 0-9 and then A-F
Notice that we use the values A-F to represent 10-15

0-9
A = 10
B = 11
C = 12
D = 13
E = 14
F = 15

Binary	Base 2	0, 1
Denary	Base 10	0, 1, 2, 3, 4, 5, 6, 7, 8, 9
Hex	Base 16	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F



Binary Addition

Binary addition rules:
0 + 0 = 0
0 + 1 = 1
1 + 0 = 1
1 + 1 = 0 carry 1
1 + 1 + 1 = 1 carry 1

```
  0 0 0 1
+ 0 0 1 0
---------
  0 0 1 1
```

```
  1 0 0 1
+ 1 0 1 0
---------
(1)0 0 1 1
```

```
    1
  1 0 0 0 1 0 0 1
+ 1 0 1 0 1 0 1 0
-----------------
(1)0 0 1 1 1 0 1 1
```

There is not enough bits available to store the answer, so an **overflow error** has occurred

Careers

- Software development
- Programing
- Software Engineering

Engineering Disciplines

You must know about different **Engineering disciplines** and the types of products produced by each of the disciplines.

Mechanical
Machinery, Hydraulics, gears and pulleys, mechanisms

Electrical and electronicpower station, household

appliances, integrated circuits **Aerospace**
aircraft, space vehicles, missiles

Communicationstelephone, radio and fibre optic

Chemical
pharmaceuticals, fossil fuels, food and drinks

Civilbridges, roads and railways

Automotive
cars, motorcycles and trains

Biomedicalprosthetics, medical devices and radiotherapy

Software
applications, systems and computer programming.

Year 10 DT KO

You must know how every product from each discipline on the list has solved problems and shaped the modern world.

Example: Bridges (Civil Engineering):

Problems solved: Bridges have allowed people and transport to cross over obstacles such as large bodies of water, roads and railways quickly and safely. Prior to a bridge being built people would either have to travel a long way around the obstacle,or make a potentially dangerous crossing. Both methods would be time consuming (slow) and possibly more hazardous or expensive.

They have shaped the modern world by making it easier and quicker to transport people and goods on foot, by road and by rail to places that might have been difficult to get to.

They have enabled people to work in places that they may not have been able to get to before. They have reduced the cost of goods by making them cheaper to transport. They have reduced journey times.lincluding queuing and crossing, taking a ferry over a river might add 30 minutes travel time to a journey. The same crossing over a bridge may take less than a minute.

Furthermore, they have improved safety as people no longer have to make dangerous crossings (e.g. by boat at night or in bad weather or by crossing busy roads or railway lines).
Finally, travelling long distances around obstacles will use more fuel and release more CO2, which is harmful to the environment, so bridges can have environmental benefits.

Likely to be an 8-10 mark question. Break it down into two sections:

Problems solved - Think about what the product actually does. Then explain what we can do now that we couldn't do easily before, because of the existence of the product in question.

How has it shaped the modern world? - List all of the possible benefits of the product. You must explain how or why each one is a benefit. Give examples where you can. For every point made, ask yourself 'so what?' then write your answer down after the point.

The Health and Safety Legislation Governing Engineering

Health and Safety in Engineering is important to ensure that every person is safe from harm or injury caused by accidents and hazards

Health and Safety at Work Act

- responsibilities of employers to their employees.
- responsibilities of employees at work.

Control of Substances Hazardous to Health (COSHH)

- chemicals
- fumes
- dust.

Manual Handling Operations Regulations

- Ensuring no-one lifts items that might injure them.
- Training and risk assessment of all manual handling tasks

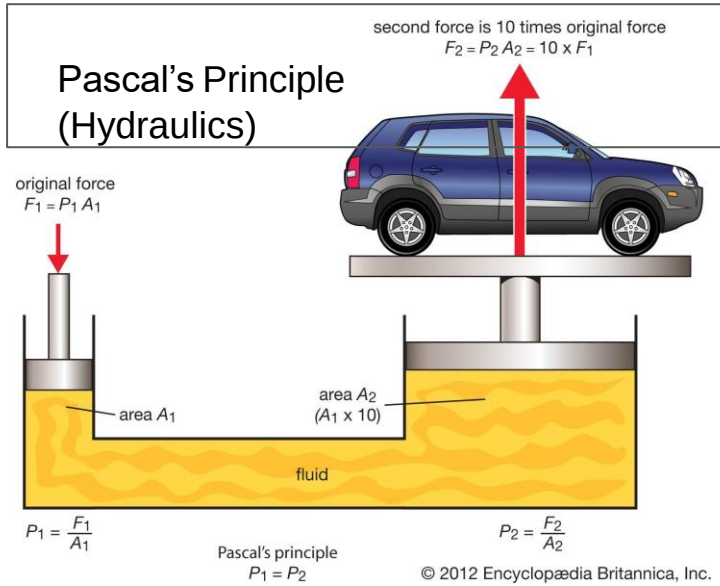
Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR)

- report forms (what information goes on them?)
- reportable incidents
- person responsible.

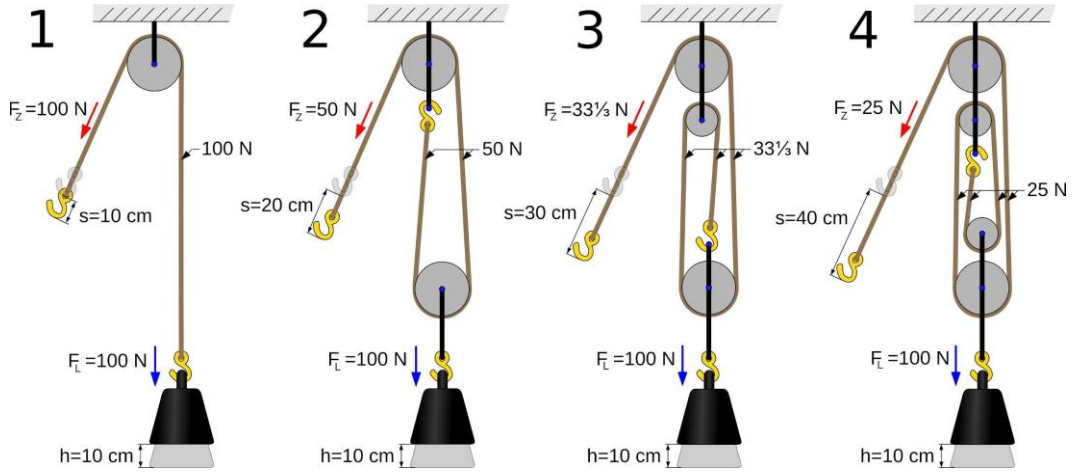
Personal Protective Equipment at Work Regulations

Eyes and ears - goggles, safety glasses, visors and ear protectors
Head and face – hard hats, helmets, bump caps
Respiratory – disposable filtering face-piece, full face respirators, breathing mask
Hand and arm – gloves, gauntlets, mitts, armlets
Clothing – disposable overalls, high visibility vest, aprons and boiler suits
Footwear – safety boots with protective toe caps, gaiters, spats.

Pascal's Principle (Hydraulics)

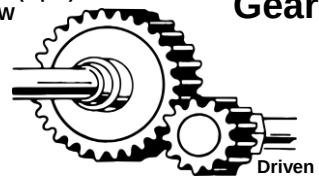


Pulley (block and tackle) Theory



Gears

Driver (input) SLOW



Driven (output) FAST

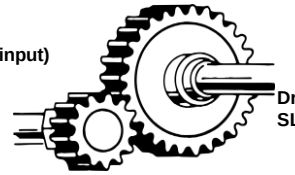
If the driver gear (input) is larger than the driven gear (output) then there will be an increase in speed.

The output gear will turn quicker than the input.
The trade off will be a reduction in turning force.

Useful in machines where high speed is needed but little resistance (food mixers).

In a car these gears are used for high speed driving where the car already has a lot of momentum as it is moving quickly.

Driver (input) Fast



Driven (output) SLOW

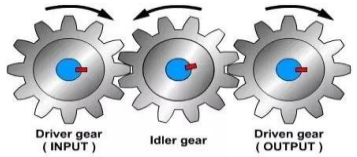
If the driver gear (input) is smaller than the driven gear (output) then there will be an reduction in speed.

The output gear will turn slower than the input.
The benefit will be an increase in turning force.

Useful in machines where heavy loads need moving using a low powered motor (automatic garage door)

In a car these gears are used pulling away from a stopped position or driving up a hill. This is because the force required is high.

Gears can be used to change direction

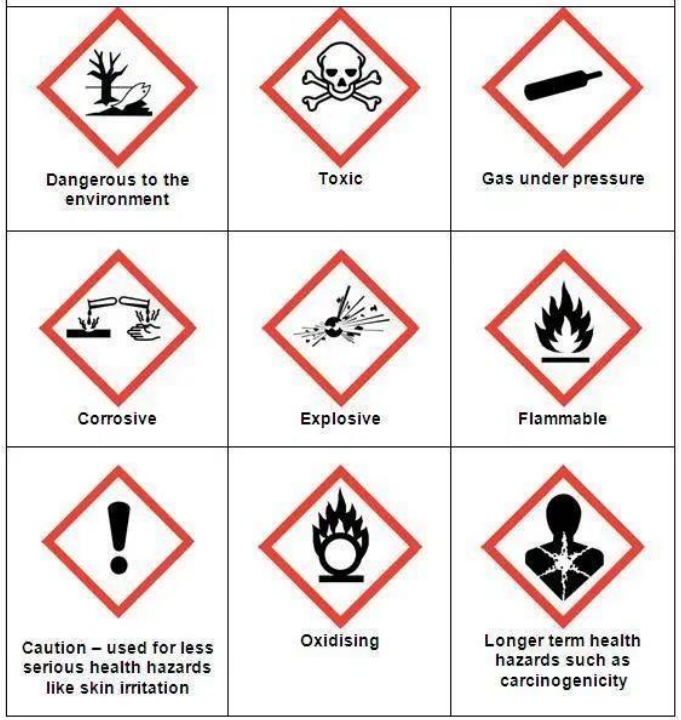


When gears are placed next to each other they will change direction from clockwise to anti clockwise direction. An idler gear placed in the gear train will keep the direction of travel the same.

Rack and pinions can be used to change from rotary to linear movement.

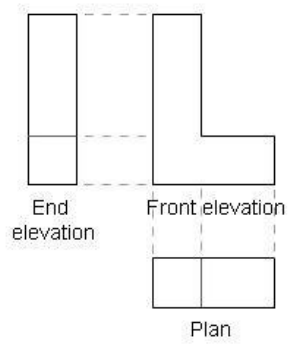
Bevel gears can change the direction of travel through 90 degrees.

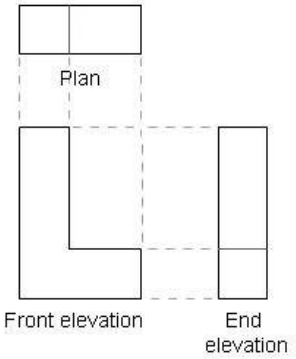
What do the COSHH symbols mean?



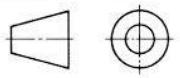
Engineering Drawing

2D drawings:

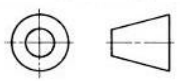




First Angle Projection

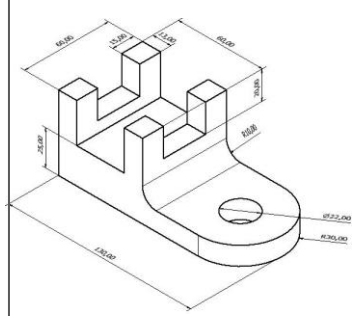
Projection	Symbol
First angle	

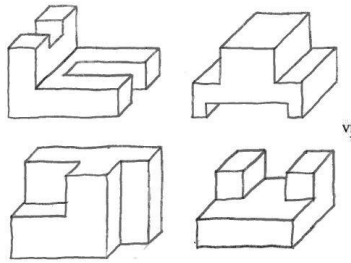
Third Angle Projection

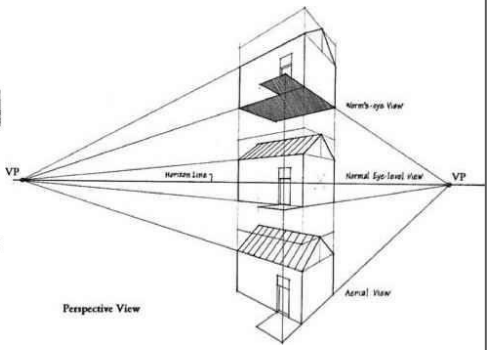
Projection	Symbol
Third angle	

When drawing at school you have always used 3rd Angle Projection

3D drawings:





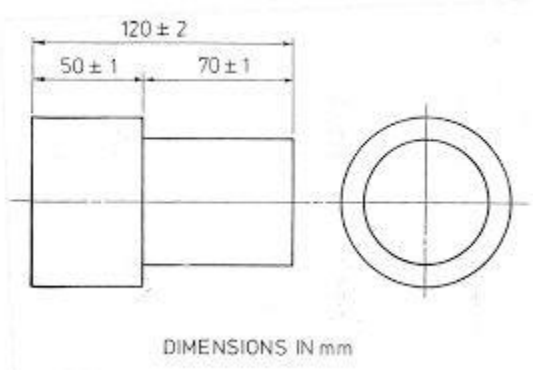


Isometric **Oblique** **Perspective**

Linetypes

- Visible - outlines and edges that exist
- Hidden - outlines and edges that exist but can't be seen (are hidden)
- Centre - line of symmetry
- Construction - used to help build a drawing and line up views
- Dimensions - used to show measurements between two points

Tolerances



For the dimensions shown on this drawing		
Dimension	Min	Max
120mm	118mm	122mm
50mm	49mm	51mm
70mm	69mm	71mm

Tolerances show the maximum and minimum permissible sizes of the finished part.

Title Blocks on Engineering Drawings - may contain the following information

Date of Production:	**Author:**	
System of Measurement:	**Title:**	
Scale:		
Projection:	**Drawing Number:**	**Sheet Number:**
	Material:	**Surface Finish:**

Engineering Drawing

Systems of measurement

Metric

Units include:
mm, cm, m, km
Grams (g), mg,
Litres (l), millilitres (ml)

Used in most of the world for measuring (except USA).

Used in the UK since around 1970

Sizes are all based on the decimal system - e.g. 3.25mm, 150.75 etc.
Easy to calculate as all in base 10

Thread forms are M3, M4, M5 etc.
M stands for metric, the number is the thread diameter.

Remember - Metric = mm

Imperial

Units include:
Miles, feet, inches.
Pounds and Ounces
Pints, fl oz

Only really used in the USA

System still used when dealing with 'legacy' (old) equipment.

Sizes are often given as fractions - e.g. 3¼, 6⅞ etc.

Lots of different thread forms e.g. UNF, Whitworth, UNC, BSF

Remember - Imperial = inches

Scale

An Engineering drawing is nearly always drawn to **scale.**

A drawing that shows a real object with accurate sizes reduced or enlarged by a certain amount is called a scale drawing.

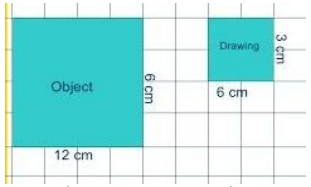
If a drawing is drawn **ACTUAL** size, the scale is 1:1. This means that one unit on the page represents one unit in 'real life'.

If a drawing is drawn **HALF** the actual size of the object, the scale is 1:2. This means that one unit on the page is equal to two units in real life.

If a drawing is drawn **DOUBLE** the actual size of the object, the scale is 2:1. This means that two units are used on the drawing to represent one unit in real life.

Scale is important because of the following reasons:

1. If an object is very small, the drawing may need to be enlarged (scaled up) so we can see all of the detail - E.g. electronics components
2. If an object is very big, it will need to be reduced (scaled down) so it fits on the drawing paper - E.g. Cars, buildings etc.
3. We can take measurements off drawings so it is important to know they are accurate and what scale they are drawn at.



Scale 1:1 Scale 1:2

British Standards and International Standards

British Standards are set by the BSI Group. They were the world's first national standards body, and still remain global leaders in this field.
A standard is an agreed way of doing something, in this case a technical drawing. They provide a framework for all businesses to follow, so there is a standard way of working recognised by all.
The current British Standard for technical drawings is BS8888.
This standard is related to the layout of technical drawings.

- the various ways to indicate dimension
- the way tolerance is identified
- the way surface finish is identified
- systems for adding
  - annotation
  - symbols
  - abbreviations.

The basic principles allow technical drawings to be easily interpreted by people with limited engineering knowledge.
Benefits include:

- Efficiency and Effectiveness
- Fewer Errors

Engineering Materials and their Characteristics p.1

Ferrous Metals - contain iron	
Metal type	**Metal uses**
Mild steel - A ductile and malleable metal. Mild steel will rust quickly it is in frequent contact with water. Properties – iron mixed with 0.15-0.29% carbon.	Used as Nuts and bolts, Building girders, car, bodies, gates, etc.
Cast iron - Is a very strong when it is in compression and is also very brittle. Properties – It is re-melted pig iron with small quantities of other metals. It consists of 93% iron and 4% carbon plus other elements.	Used as car Brake discs, car cylinders, metalwork vices, manhole covers, machinery bases eg: The pillar drill.
High carbon steel / Tool steel - Is a very strong and very hard, resistant to abrasion. It is also known as 'high carbon' steel or 'medium' steel. Properties – Up to 1.5% carbon content.	Used for hand tools such as screwdrivers, hammers, chisels, saws, spring and garden tools.
Stainless steel - is very resistant to ware and water corrosion and rust. Properties – It is an alloy of iron with a typical 18% chromium 8% nickel and 8% magnesium content.	Used for kitchen sinks, cutlery, teapots, cookware and surgical instruments.
High speed steel - is a metal containing a high content of tungsten, chromium and vanadium. However it is very brittle but is also very resistant to wear.	Used for drill bits, lathe tools, milling cutters on milling machines. It is used where high speeds and high temperatures are created.

Thermosetting plastics	Thermosetting plastic Properties
Epoxy resin (Epoxide, ER)	Good electrical insulator, hard, brittle unless reinforced, resists chemicals well.
Polyester resin (PR)	Stiff, hard, brittle unless laminated, good electrical insulator, resists chemicals well.

Non - Ferrous metals and alloys (don't contain iron)	
Metal type	**Metal uses**
Aluminium - tends to be light in colour although it can be polished to a mirror like appearance. It is very light in weight.	Used for saucepans. cooking foil, window frames, ladders, expensive bicycles.
Copper – is a ductile and malleable metal. It is often red / brown in colour. It is a very good conductor of heat and electricity.	Used for plumbing, electric components, cookware and roof coverings.
Tin – Is very ductile and very malleable. It is resistant to corrosion from moisture. It is bright silver in appearance. Tinplate is steel with a tin coating.	Used as a coating on food cans, beer cans. Used as whistles, tin foil and soldering.
Zinc – is very resistant to corrosion from moisture. However zinc is a very weak material.	Used as a coating on screws, steel buckets, American cents. It is also used to galvanise steel.
Brass – Is often cast and machined then plated. It is yellow in colour and is a mixture of 65% copper and 35% zinc.	It is used for decorative metal work such as door handles, candle sticks, musical instruments, ornaments.

Thermoplastics - softened and moulded with heat	
Common Name	**Properties**
Polystyrene (high impact polystyrene)	Not tough. Comes in a wide range of colours. Thermoplastic
Acrylic (Polymethyl methacrylate)	Stiff, hard glass clear. Very durable outdoors. Easily machined, cemented and polished. Good electrical insulator. Safe with food. Ten times more impact resistance than glass. Splinters easily. Scratches easily.
Polypropylene	Resistant to chemicals. Flexible and very tough. Difficult to break. Relatively high melting point

Engineering Materials and their Characteristics p.2

Composites = Materials that are combined with others to make new, often stronger, stiffer and lighter materials

Name	Appearance	Characteristics	Uses
Glass Reinforced Plastic (GRP)	Glass fibre matting covered in a smooth resin with a glossy finish. Can be coloured, complex shapes can be formed.	Lightweight, strong, resistant to heat, chemicals and corrosion. Waterproof. Labour intensive to produce.	Car body parts, pipes, helmets, boat hulls.
Carbon Fibre Reinforced Plastic (CRP)	Carbon in the form of graphite is soft. But very thin strands of carbon are very stiff. These carbon fibres are useful for reinforcing other materials to make them tougher. They are embedded in strong plastics to make composite materials.	Lightweight, strong, good tensile strength, rigid, very expensive resistant to heat, chemicals and corrosion. Waterproof. Labour intensive to produce.	Skateboards, boat hulls and high performance sports equipment.

Hardwoods	
Hardwood types	**Harwood uses**
Oak - A very strong wood which is light in colour. Open grain. Hard to work with. When treated it looks very classy and elegant. A hardwood.	Used for high class furniture, boats, beams used in buildings, veneers.
Balsa - is a pale white to gray. It has a distinct velvety feel. It has exceptional strength to weight properties. It is the lightest and softest wood on the market. A hardwood.	Used for light work such as model making and model airplane construction.

Manufactured Boards
MDF - Smooth, even surface. Easily machined and painted or stained. Also available in water and fire resistant forms. A manufactured board.
Plywood - A very strong board which is constructed of layers of veneer or piles which are glued at 90 degrees to each other. Interior and exterior grades are available. A manufactured board.
Chipboard - Made from chips of wood glued together. Usually veneered or covered in plastic laminate. A manufactured board.

Softwoods	
Softwood types	**Softwood uses**
Scots pine - A straight-grained softwood but knotty. Light in colour. Fairly strong but easy to work with. Cheap and readily available. A softwood.	Used for DIY and cheap quality furniture. Mainly used for constructional work and simple joinery.
Spruce - Creamy-white softwood with small hard knots. Not very durable. A softwood.	Used for general indoor work, whitewood furniture used in bedrooms and kitchens.
Cedar - A pale yellow-coloured softwood with a fine even texture. Light in weight but stiff and stable.	Used for furniture, boat building, veneers, and model making.

Properties of Engineering Materials

Chemical

- Heat of combustion - The amount of heat released when one mol of a material is burnt
- Toxicity - The degree to which a substance can harm humans or animals
- Oxidation state - The degree of electron loss (oxidation) of an atom in a chemical compound

Electrical and magnetic

- Conductivity - The ability of a material to allow electricity to flow through it
- Resistance - The ability of a material to prevent electricity from flowing through it.
- Magnetism - a force that can attract (pull closer) or repel (push away) objects that have a magnetic material like iron inside them

Mechanical

- Strength - The ability of a material to withstand a force without breaking (tensile or compressive)
- Hardness - The ability of a material to withstand scratching and indentation.
- Toughness - The ability of a material to withstand impacts without breaking
- Elasticity - The ability of a material to return to its original shape after an applied load has been removed
- Plasticity - The ability of a material to be easily shaped and moulded
- Ductility - The ability of a material to be stretched (drawn) out.
- Durability - The ability of a material to withstand wear, pressure or damage
- Malleability - The ability of a material to be hammered and pressed without breaking

Optical

- Reflectivity - The amount of light reflected by a material
- Photosensitivity - The amount to which a material reacts to receiving visible light

Thermal

- Flammability - The ability of a material to burn or ignite
- Thermal conductivity - The ability of a material to allow heat to flow through it
- Melting point - The temperature at which a solid material will change state to a liquid

Characteristics of Engineering Materials

Aesthetics

- Colour - the property possessed by an object of producing different sensations on the eye as a result of the way it reflects or emits light
- Surface texture - The roughness and variations of the surface of a material
- Finish effect - The effect on a material's surface created by adding a finish (e.g. paint, lacquer or plastic coating)

Environmental impact

- Extraction of raw material - How much energy used and environmental harm caused by extracting raw materials such as oil or metal ores.
- Fossil fuels - The use of fossil fuels as a form of energy releases CO_2 which contributes to global warming
- Sustainability - how much we can sustain (keep going) the earth's resources by carefully managing their use.

Tools and Equipment

Image	Name and description
	Scriber – used to mark out metals
	Steel Rule for measuring
	Engineers Square – used to measure right angles
	Marking gauge for marking straight lines in wood
	Dividers and Callipers – for measuring and marking out

Image	Name and description
	Hacksaw – For cutting metals
	Junior Hacksaw – Small / light metal cutting
	Tenon saw – cutting straight lines in wood
	Coping saw – Cutting curves and intricate shapes

	Tin snips – for cutting sheet metal
	Pliers – for gripping work
	Hammer – for striking objects e.g. a centre punch or nail.
	Files – for removing materials and making work smooth
	Jigsaw – for cutting shapes in sheet material

Angle Grinder – For grinding and cutting metal	Cordless drill – portable way of drilling holes	Pillar drill – bench or floor mounted method of drilling holes	Scroll Saw – For cutting curves and intricate shapes in thin materials
			

Router – For creating cuts, grooves and profiles in wood	Centre lathe – for making round and cylindrical items from metals	Milling Machine – for cutting steps, grooves and straight edges in metal	Laser cutter – for cutting and engraving materials
			

Image	Name and description
	Pop Rivet Gun – for securing pop rivets into holes in sheet metal
	Screwdrivers – Various heads – for tightening and loosening screws
	Spanners – Open, Ring and Adjustable – for tightening and loosening nuts and bolts

	Hot Glue Gun – for quickly gluing materials together
	Soldering iron – used to join electronic components to circuit boards
	Nail Gun – Used to rapidly insert nails into wood
	Machine Screws – for screwing into a tapped hole or securing items by screwing into a nut.

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Risk Assessment

A **risk assessment** is a careful examination of what, in your work, could cause harm to people, so that you can weigh up whether you have enough precautions or whether you should do more. ... It includes all the **risks** identified in the **risk assessment** and the measures needed to control those **risks**.

The aim of the **risk assessment** process is to evaluate hazards, then remove that **hazard** or minimize the level of its **risk** by adding control measures, as necessary. By doing so, you have created a **safer and healthier workplace.**

Machine Guards

The purpose of **machine guarding** is to protect the **machine** operator and other employees in the work area from hazards created during the **machine's** normal operation. This would include hazards of concern such as: ingoing nip points, rotating parts, reciprocating, transversing, and/or flying chips & sparks.
Machine guards help prevent injury.

SI units of measurement
(and other accepted units)

Current – ampere
microamp
milliamp
amp
Kiloamp.

Luminous intensity – candela
microcandela
millicandela

Temperature – kelvin
kelvin
degrees Celsius (accepted for use within the SI).

Mass – kilogram
milligram
gram

Length – metre
micrometre
millimetre
centimetre
Kilometre.

Amount of substance – mole
nanomole
micromole
millimole

Time – second
microsecond
millisecond
minute (accepted for use within the SI)
hour (accepted for use within the SI).

Energy			
Value required	Formula	Written	Units
Efficiency	efficiency (%) =	(useful energy out ÷ total energy in) x 100	No unit. % value
Power	P = E ÷ t	power = energy ÷ time	Watt (W)
Work done	W = F x d	work done = force x distance	Joule (J)

Forces and Motion			
Value required	Formula	Written	Units
Speed	s = d ÷ t	speed = distance ÷ time	m/s
Acceleration	a = (v-u) ÷ t	acceleration = change in velocity ÷ time	m/s^2 or ms^{-2}
Force	F = m x a	force = mass x acceleration	Newton (N)
Moment of force	m = F x d	moment = force x perpendicular distance from pivot	Newton metre (Nm)
Weight	w = m x g	weight = mass x gravity	Newton (N)
Momentum	p = m x v	momentum = mass x velocity	Kg x m/s
Density	d = m ÷ v	density = mass ÷ volume	kg/m^3 or g/cm^3
Pressure	p = F ÷A	pressure = force ÷ area	Pascal (Pa)

Geometric			
Value required	Formula	Written	Units
Area - square	L^2	length of side^2	m^2 or cm^2 or mm^2
Area - rectangle	l x h	length of side 1 x length of side 2	m^2 or cm^2 or mm^2
Area - triangle	½ bxh	(length of base x height of triangle) ÷ 2	m^2 or cm^2 or mm^2
Area - circle	π x r^2	π x radius^2	m^2 or cm^2 or mm^2
Volume – cube cuboid	l x b x h	Length x breadth x height	m^3 or cm^3 or mm^3
Volume - pyramid	1/3 x Abase x height	(1/3) x (Area of base) x height of pyramid	m^3 or cm^3 or mm^3
Volume - cylinder	πr^2xh	π x radius^2 x height of cylinder	m^3 or cm^3 or mm^3

Electricity			
Value required	Formula	Written	Units
Power	P = V x I	power = voltage x current	Watt (W)
Voltage	V = I x R	voltage = current x resistance	Volt (v)
Current	I = P ÷ V	current = power ÷ voltage	Amp (A)
Resistance	R = V ÷ I	resistance = voltage ÷ current	Ohm (Ω)

Year 10 GCSE French – Key phrases for your GCSE

Past

Perfect

Hier Yesterday
Hier soir Yesterday evening
La semaine dernière Last week
Le weekend dernier Last weekend
L'année dernière Last year
L'été dernier Last summer
L'hiver dernier Last winter

j'ai aimé I liked
j'ai détesté I hated
j'ai fait I did
j'ai fêté I celebrated
j'ai joué I played
j'ai mangé I ate
j'ai travaillé I worked
j'ai visité I visited
j'ai voyagé I travelled

je suis allé[e] I went
je suis sorti[e] I went out

Imperfect

Quand j'étais plus jeune
When I was younger
Dans le passé
In the past

j'aimais I used to like
j'allais I used to go
j'avais I used to have
j'étais I was/used to be
je faisais I used to do
je jouais I used to play
je voulais I wanted to

Opinions

j'adore I love
j'aime I like
je préfère I prefer
je n'aime pas I don't like
je déteste I hate

ce que j'aime, c'est what I like is
ce que je déteste, c'est what I hate is

à mon avis in my opinion
d'après moi according to me
pour moi for me
selon moi according to me
sans aucun doute without doubt

je considère que I consider that
je crois que I believe that
je dirais que I would say that
j'estime que I feel that
je pense que I think that

Future

Near future

Ce soir This evening
Demain Tomorrow
Ce weekend This weekend
Cet été This summer
Cette année This year
L'année prochaine Next year
À l'avenir In the future
Dans le futur In the future

je vais aller I am going to go
je vais faire I am going to do
je vais fêter I am going to celebrate
je vais jouer I am going to play
je vais manger I am going to eat
je vais travailler I am going to work
je vais visiter I am going to visit
je vais voyager I am going to travel

Conditional

Quand je serai plus vieux/vieille
When I'm older

Si j'étais riche If I were rich
Si je pouvais If I could

j'aimerais aller I would like to go
je voudrais faire I would like to do
j'aurais I would have
je serais I would be

Reasons

car, parce que because
puisque as, since
étant donné que given that
donc so, therefore

c'était it was
c'est it is
ce sera it will be
ce serait it would be

absolument absolutely
assez quite
complètement completely
extrêmement extremely
plutôt rather
tellement so
très very
trop too
un peu a bit
vraiment really

agréable pleasant
formidable terrific
génial great
inoubliable unforgettable
merveilleux marvellous
passionnant exciting

affreux awful
décevant disappointing
ennuyeux boring
insupportable unbearable

Adverbs

certainement certainly
entièrement entirely
exactement exactly
évidemment obviously
heureusement fortunately
malheureusement unfortunately
notamment notably
particulièrement particularly
probablement probably
régulièrement regularly
relativement relatively
simplement simply

de temps en temps from time to time
normalement normally
parfois, quelquefois sometimes
rarement rarely
souvent often
toujours always

Connectives

cependant, pourtant however
en revanche on the other hand
malgré ça despite that
même si even though/even if
par contre in contrast
peut-être perhaps

à vrai dire to be honest
bien sûr of course
il faut que je dise que I have to say that
autant que je sache as far as I know
je dois avouer que I must admit that
ça va sans dire que
it goes without saying that
en ce qui me concerne
as far as I'm concerned
il vaut mieux de it's better to

Star phrases

Year 10 GCSE French – Photo card phrases

Sentence starters

Sur la photo in the photo

Sur l'image in the image

Il y a there is/there are

Je vois I see

On peut voir you can see

Je pense que I think that

Je crois que I believe that

Je dirais que I would say that

People

x personnes x people

Une famille a family

Un homme a man
Une femme a woman

Un garçon a boy
Une fille a girl

Des amis friends
Des jeunes young people
Des vieux old people

Des élèves students

Action

Il/elle joue he/she is playing **ils jouent** they are playing

Il/elle mange he/she is eating **ils mangent** they are eating

Il/elle parle he/she is talking **ils parlent** they are talking

Il/elle regarde he/she is watching **ils regardent** they are watching

Il/elle sourit he/she is smiling **ils sourient** they are smiling

Il/elle travaille he/she is working **ils travaillent** they are working

Il/elle utilise he/she is using… **ils utilisent** they are using…

Location

Ils sont… they are …

à la maison at home
dans la cuisine in the kitchen
dans le salon in the living room

à l'école at school
au centre commercial at the shopping centre
dans un bureau in an office
dans un magasin in a shop
dans une salle de classe in a classroom

en ville in town
à la campagne in the countryside

Mood

Ils sont… they are…

amoureux in love
contents happy
emballés thrilled
étonnés surprised
relaxés relaxed

fâchés angry
fatigués tired
préoccupés worried

Weather

Il fait beau the weather is nice
Il fait mauvais the weather is bad
Il y a du soleil it is sunny
Il pleut it is raining

Year 10 GCSE French – Topic 1.1 – Identity and relationships with others

A Est-ce que tu t'entends bien avec ta famille et tes amis? Do you get on well with your family and friends?

elle/il m'aide avec mes problèmes s/he helps me with my problems
elle/il me comprend s/he understands me
elle/il m'écoute s/he listens to me
elle/il m'encourage s/he encourages me
elle/il est là pour moi s/he is there for me
elle/il me soutient s/he supports me
elle/il partage mes intérêts s/he shares my interests

Je m'entends bien avec I get on well with **Je respecte** I respect **Je dépends de** I depend on **Je m'entends mal avec** I get on badly with **Je me dispute avec** I argue with	**mon père** my dad **mon grand-père** my grandad **mon beau-père** my stepdad **mon frère** my brother **mon demi-frère** my stepbrother **mon oncle** my uncle **mon cousin** my cousin (m)	**car** because **parce qu'** because **puisqu'** as, since	**il est** he is **il n'est pas** he is not	**assez** quite **très** very **trop** too **un peu** a bit **vraiment** really	**bavard** chatty **drôle** funny **gentil** kind **fier** proud **fort** strong **sensible** sensitive **sympa** friendly **travailleur** hardworking **vif** lively	**égoïste** selfish **embêtant** irritating **ennuyeux** boring **fou** crazy **méchant** nasty **paresseux** lazy **sérieux** serious **timide** shy
	ma mère my mum **ma grand-mère** my grandma **ma belle-mère** my stepmum **ma sœur** my sister **ma demi-sœur** my stepsister **ma tante** my aunt **ma cousine** my cousin (f)		**elle est** she is **elle n'est pas** she is not		**bavarde** chatty **drôle** funny **gentille** kind **fière** proud **forte** strong **sensible** sensitive **sympa** friendly **travailleuse** hardworking **vive** lively	**égoïste** selfish **embêtante** irritating **ennuyeuse** boring **folle** crazy **méchante** nasty **paresseuse** lazy **sérieuse** serious **timide** shy
	mes amis my friends **mes copains** my friends **mes parents** my parents **mes grands-parents** my grandparents		**ils sont** they are **ils ne sont pas** they are not		**bavards** chatty **drôles** funny **gentils** kind **fiers** proud **forts** strong **sensibles** sensitive **sympas** friendly **travailleurs** hardworking **vifs** lively	**égoïstes** selfish **embêtants** irritating **ennuyeux** boring **fous** crazy **méchants** nasty **paresseux** lazy **sérieux** serious **timides** shy

Extra verbs

Je m'entendais bien avec
I used to get on well with

Je me disputais avec
I used to argue with

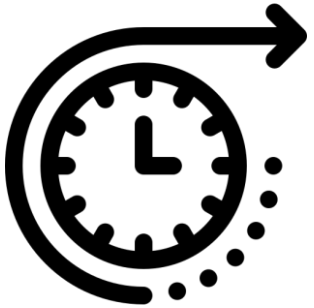
Elle/il était
S/he used to be

J'aimerais m'entendre mieux avec
I would like to get on better with

et and **ou** or **mais** but **par exemple** for example **car** because **alors** so
surtout especially **si** if **aussi** also **d'abord** firstly **puis** then **finalement** finally

Year 10 GCSE French – Topic 1.1 – Identity and relationships with others

B Qu'est-ce que tu voudrais faire dans le futur? What would you like to do in the future?



À l'avenir In the future **Dans le futur** In the future **Quand je serai plus vieux/vieille** When I am older **Après avoir terminé le collège** After having finished school	**j'aimerais** I would like to **je voudrais** I would like to **j'ai l'intention de/d'** I have the intention to **mon rêve serait de/d'** my dream would be to **mon but serait de/d'** my goal would be to **je ne voudrais pas** I would not like to **je n'aimerais jamais** I would never like to	**aller à l'université** go to university **avoir des enfants** have children **avoir ma propre entreprise** have my own business **avoir une carrière** have a career **entrer dans un PACS** enter a civil partnership **faire du bénévolat** do volunteering **gagner beaucoup de l'argent** earn lots of money **habiter à l'étranger** live abroad **prendre une année sabbatique** take a gap year **trouver un bon emploi** find a good job **voyager aux autres pays** travel to other countries	**car** because **puisque** as **étant donné que** given that	**ce serait** it would be	**extraordinaire** extraordinary **inoubliable** unforgettable **merveilleux** marvellous **spectaculaire** spectacular **affreux** awful **trop cher** too expensive **ennuyeux** boring **insupportable** unbearable

J'aimerais me marier I would like to get married	**car** because **puisque** as	**c'est une tradition importante** it's an important tradition **c'est important dans ma religion** it's important in my religion **on peut organiser une grande fête** you can organise a big party **c'est une journée très spéciale** it's a very special day
Je n'aimerais pas me marier I wouldn't like to get married		**c'est démodé** it's old-fashioned **c'est une perte d'argent** it's a waste of money **ça coute très cher** it's very expensive **les divorces sont stressants** divorces are stressful

Extra verbs

Avant je voulais
Before I wanted to

Je rêve de I dream of

J'espère I hope to

Je veux I want to

J'adorerais
I would love to

Je préférerais
I would prefer

et and **ou** or **mais** but **par exemple** for example **car** because **alors** so
surtout especially **si** if **aussi** also **d'abord** firstly **puis** then **finalement** finally

Year 10 GCSE French – Topic 1.2 – Healthy living and lifestyle

A Qu'est-ce qu'il faut faire pour être en bonne santé? What must you do to stay healthy?

Pour être en bonne santé to be in good health
Pour rester en forme to stay in shape

Il faut you must

On doit we must

On peut we can

Je dois I must

Je peux I can

Je vais I am going to

Je voudrais I would like to

(essayer de) (try to)

arrêter de stop
éviter de avoid

Il ne faut pas you must not
On ne doit jamais we must never

Je ne vais pas I am not going to

Je ne voudrais pas I would not like to

bien dormir sleep well
boire de l'eau drink water
bouger plus move more
être actif/active be active
être sportif/sportive be sporty
jouer au foot/au tennis play football/tennis
faire de l'exercice do exercise
faire du sport do sport
manger sainement eat healthily
se coucher tôt go to bed early
se reposer rest
se relaxer relax

boire trop d'alcool drink too much alcohol
fumer (des cigarettes) smoke (cigarettes)
passer beaucoup de temps sur les réseaux sociaux spend lots of time on social media
prendre des drogues take drugs
vapoter vape

sinon on peut devenir if not you can become

car c'est because it is

puisque c'est as it is

accro addicted
malade ill
obèse obese
stressé stressed

sain healthy
bon pour le corps good for the body
bon pour le cœur good for the heart
bon pour la santé mentale good for mental health
bon pour la santé physique good for physical health

dangereux dangerous
inquiétant worrying
malsain unhealthy
mauvais pour la santé bad for your health

une perte d'argent a waste of money
une perte du temps a waste of time

Extra verbs

J'allais I was going to

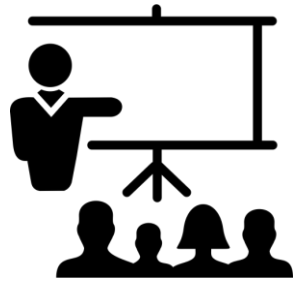
J'aimais I used to like to

Je voulais I wanted to

et and **ou** or **mais** but **par exemple** for example **car** because **alors** so
surtout especially **si** if **aussi** also **d'abord** firstly **puis** then **finalement** finally

Year 10 GCSE French – Topic 1.3 – Education and work

A Que penses-tu de tes matières et de tes professeurs? What do you think about your subjects and teachers?



J'adore I love **J'aime** I like **Je préfère** I prefer **Je n'aime pas** I don't like **Je déteste** I hate **Ma matière préférée, c'est** My favourite subject is	**le commerce** business **le dessin** art **le français** French **le théâtre** drama **la géographie** geography **la religion** PRE **la musique** music **la technologie** technology **l'anglais** English **l'EPS** PE **l'histoire** history **l'informatique** IT **l'instruction civique** CORE **les maths** maths **les sciences** science	**puisque** as, since **vu que** seeing as **même si** even if	**c'est** it is	**absolument** absolutely **extrêmement** extremely **tellement** so **plutôt** rather	**créatif** creative **facile** easy **fascinant** fascinating **pratique** practical **utile** useful **affreux** awful **difficile** difficult **dur** hard **ennuyeux** boring **inutile** useless
			j'y suis doué[e] I'm gifted at it **j'y suis fort[e]** I'm good at it **j'y suis faible** I'm weak at it **j'ai de bonnes notes** I have good marks **j'ai fait de bon progrès** I have made good progress		

Extra verbs

J'aimais I used to like to

Je détestais I used to hate

C'était it was

J'étais I was

Elle/il était s/he was

J'aime I like **Je m'entends bien avec** I get on well with **Je n'aime pas** I don't like **Je m'entends mal avec** I get on badly with	**mon prof** my teacher (male) **ma prof** my teacher (female)	**d'anglais** of English **d'EPS** of PE **de français** of French **de géographie** of geography **d'histoire** of history **de maths** of maths **de religion** of PRE **de sciences** of science	**car il est** because he is **car elle est** because she is	**assez** quite **très** very **trop** too **un peu** a bit **vraiment** really	**patient** patient **sympa** friendly **travailleur** hardworking **tolérant** tolerant **patiente** patient **sympa** friendly **travailleuse** hardworking **tolérante** tolerant	**impatient** impatient **paresseux** lazy **sérieux** serious **strict** strict **impatiente** impatient **paresseuse** lazy **sérieuse** serious **stricte** strict
			car il because he **car elle** because she	**a un bon sens de l'humour** has a good sense of humour **nous aide** helps us **donne de bons conseils** gives good advice **donne de bonnes explications** gives good explanations **donne trop de devoirs.** give us too much homework **me tape sur les nerfs** gets on my nerves		

et and **ou** or **mais** but **par exemple** for example **car** because **alors** so
surtout especially **si** if **aussi** also **d'abord** firstly **puis** then **finalement** finally

B Que penses-tu du règlement scolaire? What do you think about the school rules?

Dans mon collège In my school	**il faut** you must **on doit** we must	**être à l'heure** be on time **faire ses devoirs** do homework **porter l'uniforme scolaire** wear school uniform **respecter les autres** respect others **s'asseoir à sa place** sit in your place	**et** and
	il est interdit de/d' it is forbidden to **il ne faut pas** you must not **on ne doit jamais** we must never	**arriver en retard** arrive late **être impoli** be impolite **harceler d'autres élèves** bully others **manger en classe** eat in class **porter des bijoux** wear jewellery **porter du maquillage** wear make-up **utiliser son portable en classe** use your phone in class	

selon moi according to me **je considère que** I consider that **je pense que** I think that	**c'est** it's	**important** important **juste** fair **pratique** practical **raisonnable** reasonable **démodé** old-fashioned **injuste** unfair **nul** rubbish **strict** strict
		ça encourage la bonne discipline it encourages good discipline **ça nous prépare pour le futur** it prepares us for the future **ça réduit le harcèlement** it reduces bullying

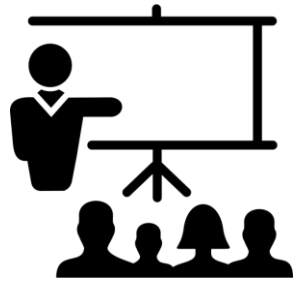
Extra verbs

Il est nécessaire de
It is necessary to

Il est important de
It is important to

et and **ou** or **mais** but **par exemple** for example **car** because **alors** so
surtout especially **si** if **aussi** also **d'abord** firstly **puis** then **finalement** finally

C Quel emploi aimerais-tu avoir dans le futur? What job would you like to have in the future?



À l'avenir In the future **Dans le futur** In the future **Quand je serai plus vieux/vieille** When I'm older	**j'ai l'intention de** I have the intention to **mon ambition est de** my ambition is to **mon rêve est de** my dream is to **je vais** I am going to **je voudrais** I would like to **je ne vais jamais** I am never going to **je ne voudrais pas** I would not want	**devenir** become **être** be **travailler comme** work as	acteur artiste auteur avocat bénévole chanteur chercheur coiffeur facteur influenceur infirmier journaliste médecin pilote policier professeur serveur soldat vétérinaire	actrice artiste auteur avocate bénévole chanteuse chercheuse coiffeuse factrice influenceuse infirmière journaliste médecin pilote policière professeure serveuse soldate vétérinaire	actor/actress artist author lawyer volunteer singer researcher hairdresser postman/woman influencer nurse journalist doctor pilot police officer teacher waiter/waitress soldier vet

Extra verbs

J'avais l'intention to
I had the intention to

Je rêvais de
I used to dream of

Je voulais
I wanted to

J'ai fait mon stage
I did my work experience

J'ai travaillé comme
I worked as

Ce sera it will be **Ce serait** it would be	**bien payé** well paid **divers** diverse **extraordinaire** extraordinary **gratifiant** rewarding **merveilleux** marvellous **spectaculaire** spectacular	**car** because **puisque** as, since	**j'aime** I like **je peux** I can **j'aimerais** I would like	**travailler** to work	**en équipe** in a team **avec la technologie** with technology **avec des adultes** with adults **avec des enfants** with children **dans un bureau** in an office **dans une grande entreprise** in a big business **chez moi** at home **à l'étranger** abroad

et and **ou** or **mais** but **par exemple** for example **car** because **alors** so
surtout especially **si** if **aussi** also **d'abord** firstly **puis** then **finalement** finally

Year 10 Geography – Changing Cities

Global Urbanisation

Urbanisation around the world is increasing.

Over the next 50 years, the continents that is expected to see the highest level of urbanisation are Africa and Asia.

Megacities are mostly found in Asia.

Urban areas around the world are densely populated whereas rural areas are sparsely populated.

Urbanisation in the UK

Urbanisation is unequal across the UK.

Flat land in the south-east of the UK is easy to build on therefore urbanisation has occurred quicker here. Mountainous land in the north of the UK is harder to build on therefore urbanisation had occurred significantly less here.

This has created what is known as a two-speed economy in the UK whereby economic growth in the south has been significantly quicker than that in the north.

Birmingham's Location

Site: A city with flat land in the West Midlands, UK.

Situation: Birmingham has many canals that were once used to transport coal and iron. The city is also close to other towns and cities such as Wolverhampton and Dudley.

Connectivity: Birmingham airport has over 12 million passengers per year. It is also connected to the rest of the UK with the M6 and train lines. HS2 will connected Birmingham to Manchester and London more efficiently.

Birmingham's Structure

The Burgess model is based on the idea that land values are highest in the centre of a town or city.

Due to expensive land buildings in the city centre are usually high rise.

The CBD is Birmingham is dominated by department stores, offices and hotels.

The inner-city areas of Birmingham such as Ladywood have many tower block flats that were developed in the 19th century.

Sutton Coldfield is a suburb area of Birmingham. Some of these areas were built in the 1930's, 1950's and 1960's.

The industrial zones of the city stand out clearly.

Birmingham's history and today

Over 1.1 million people live in Birmingham.

Birmingham is a youthful city, 45.7% of residents are estimated to be under 30.

Urbanisation happened in the 18th and 19th centuries.

Suburbanisation happened in the 1920's and 1930's. Counter urbanisation in the 1970's and then re-urbanisation after 1990.

Keyword	Definition
Bottom-up strategies	Community led strategies
Brownfield site	An area of land that has been built on before and can be regenerated
Carbon footprint	The carbon released by a company or individual
Central Business District (CBD)	The central area of a city where land-use is dominated by retail
Connectivity	A city's connectivity includes terminals such as ports, rail stations, airports and distribution centres
Counter urbanisation	The movement of people from urban to rural areas
Decentralisation	The movement of shops out of the city centre
Deindustrialisation	The decline of industrial activity in a region or in an economy
Densely populated	An area with a high number of people per square kilometre
Deprivation	Having a lack of material benefits
Developed country	Countries that are wealthy and generally have a high quality of life and an advanced economy
Developing country	Countries with a poor economy and generally a low quality of life
Emerging country	Countries with a growing economy but is not yet fully developed with a high quality of life
Emigration	People moving out of a country
Ethnicity	Belonging to a social group that has a common national or cultural tradition
Flag-ship store	The most important store in that chain
Globalisation	The world becoming increasingly connected
Green belt	A policy for controlling urban sprawl with a protected area of countryside
Greenfield site	An area of land that has not been built on before
Immigration	People moving into a country
Index of multiple deprivation	An index that measures the level of deprivation in an area (e.g., income/health)
Inequality	Not the same
Informal settlement	An illegal, overcrowded urban area inhabited by very poor people.
Land use	What the built environment is used for
Megacity	A city with over 10 million people
Migrate	The movement of people from one area to another
Migration	The process of people permanently changing their place of residence

Year 10 Geography – Changing Cities

Retail in Birmingham
The development of out of town shopping centres in the 1980's such as Merry Hill in Dudley impacted shopping in Birmingham.

Between 1990 and 1995 trade in the centre declined by 12%.

Birmingham needed to fight back resulting in them building several arenas, pedestrianising, encouraging late night opening and re-building the bullring in 2003.

Migration to Birmingham
People migrate to Birmingham for job opportunities, housing and a safe environment (no war or hazards).

The city has 5 universities so some also move there for education.

Due to migration Birmingham is now a diverse area.

Deindustrialisation
Unemployment increased in Birmingham in the 1980's due to factories closing down.

This was caused by globalisation as cheaper materials and labour are available abroad.

This caused inequality in Birmingham, Sutton Coldfield has relatively low crime rates and a good environmental quality and Sparkbrook has a low quality of life and concerns about air pollution.

Sustainability in Birmingham
Birmingham recycles 30.1% of their waste.

Birmingham introduced the clean air zone that will reduce emissions and requires people to pay a fee when driving through the city.

In 2012 a community centre opened in Sparkbrook.

Birmingham reduced its carbon emissions in 2009/10 by 12%.

HS2 plans to introduce a new train station in Curzon Street which will provide new jobs.

Mumbai location
Mumbai is located on the western coast of India and has flat land.

Mumbai is surrounded by mangrove swamps and has a naturally deep harbour. It is 29km away from Thana, another city.

Mumbai is well connected to the rest of India through extensive road and railway networks. Its harbour is also accessible for container ships, the docks here account for 25% of all India's international trade.

Mumbai structure
The inner suburbs was the first part of India to be developed for workers to live in. A large percentage of the population live in informal settlements such as Dharavi.

New industrial areas have developed along the railway line which does not fit with the Burgess model.

Challenges in Mumbai
Rapid urbanisation had led to inequality in Mumbai. It is one of the richest cities in Asia, but also home to some of the world's poorest people.

Due to a lack of housing informal settlements have been created in Mumbai. Only 60% of houses here are connected to Mumbai's sewerage system and school drop out rates are high.

Recycling is common in Dharavi, with over 80% of waste being recycled and the industry employing over 1,000 people. However, work is hazardous and children as young as five work alongside adults for £1 per day.

Improving Mumbai
Vision Mumbai is a top-down strategy that cost about $2 billion. It involves building high rise flats to replace informal settlements.

In 2007, 20,000 people moved into new flats. The problem is that the poorest of people cannot afford these.

Lok Seva Sangam is a bottom-up strategy that focuses on women's health.

In 30 years it treated 28,000 people and 75% of these were cured with leprosy.

A negative is they are a charity that rely on donations.

Keyword	Definition
National migration	People migrating within a country for permanent residency
Natural increase	The difference between the birth rate and death rate – people having babies
Pollution	Contaminating dangerous materials in air/soil/water
Population density	The number of people per square kilometre
Quality of life	The standard of health, comfort and happiness experienced by people
Rapid urbanisation	When the edges of the urban area grow faster than the urban centre
Re-urbanisation	The movement of people back towards the city centres away from rural areas
Retail	The sale of goods to the public
Rural-urban migration	The migration trend in developing countries where people move from poor rural areas to urban areas in search of a better quality of life
Site	The actual location of a settlement on the earth and the physical characteristics of the landscape specific to an area.
Situation	The location of the place relative to its surroundings and other places.
Sparsely populated	A low number of people per square kilometre
Suburban sprawl	The growth of the edges of an urban area, normally into greenfield sites
Suburbanisation	The outward spread of an urban area
Sustainable	Good for people, the economy and the environment now and in the future
Top-down	A government led strategy

Year 10 Geography – Changing Cities

Development
About improving people's quality of life and something getting better.

Levels of literacy improve because education improves.

Rural areas get electricity because there are more power lines.

Life expectancy increases and infant mortality rate decreases because healthcare is better.

As a country develops fertility rate decreases as women put their careers first and have less children. Families also know children have a higher survival rate so have less.

Measuring Development
Single measures:
Gross domestic product (GDP) is the total value of what is made in a country. This can also be divided by the population and measured per capita, The GDP per capita in India is $2,256 compared to $46,510 in the UK.

Life expectancy looks at the average number of years people are expected to live, this also indicates how good the healthcare is in a country. The life expectancy in India is 70 compared to 80 in the UK.

Literacy rate looks at the percentage of people that can read and write in a country. This indicates how good the education is. The literacy rate is 99% in the UK compared to 77% in India.

Political corruption indicates the quality of the government and how equal and peaceful a country may be.

Composite measures:
Composite measures look at multiple factors to give a better view of what a country mat be like.

Human development index (HDI) looks at mean years of schooling, life expectancy and gross national income.

HDI is a score between 0 and 1, 1 being a more developed country. The HDI in the UK is 0.929 compared to 0.633 in India.

Factors that affect development

Economic factors
Average income, trade, unemployment rates and the cost of living all influence the development of a country.

If there is less trade a country will have less access to resources and will be earning less money meaning they will develop slower.

India is currently developing due to a lot of trade.

Social factors
Health, education and housing all influence the development of a country.

If health is better people are more likely to have a better education and job, they are also able to work longer meaning they will pay more taxes.

Historical factors
Countries that were former colonies of empires were exploited. This may have meant they started to develop later.

Past wars may have an influence on development.

Demographic factors
The size and age of a population influence the development in a country.

India currently has a young population meaning many people can work.

Technological factors
Access to electricity and internet use both influence the development in a country.

India are currently rapidly developing and one of the contributing factors is the development in technology.

Cultural factors
The happiness of citizens can influence a country's development along with the balance between traditional and imported cultures.

Physical factors
Landlocked countries and countries that experience natural hazards can have their development hindered.

India is not landlocked and can therefore increase their development with trade.

India do experience natural hazards such as drought and flooding which can have a negative impact on their development.

Political factors
A good government and lack of corruption can have a huge influence on development.

Current conflict may prevent a country from developing further if they are investing too much in their military and not into enough into their education and healthcare.

Water Security
People don't have access to clean water because it is being wasted in the developed world and water sources are being polluted.

Food Security
800 million people live without enough food because it isn't available in the right places for when people need it, people don't have the money to buy it and people in developed countries are consuming too much.

Uneven Development
There is a development gap between the wealthiest and poorest countries.

Countries have variation in development. Urban areas are more developed than rural areas.

Gini coefficient: shows income inequality in countries.

The UK itself is uneven, it has what is known as a two-speed economy. This is also known as the north/south divide.

Deindustrialisation happened in the north meaning people lost their jobs and the economy declined.

The south of the UK also receives more investment.

Education and transport services are both better in the south of the UK and this has resulted in higher average incomes and life expectancy.

Mumbai is the core region in India, it has flat land and a port. 40% of the houses here are informal settlements, often due to the large number of people moving into the region.

Bihar is the periphery region in India. It is landlocked and mountainous. It also experiences brain drain as many skilled and educated people leave. 80% of people are rural farmers and fertility rate is high.

Keyword	Definition
Aid	Help/support.
Bottom-Up Strategies	Community led strategies.
Capita	Person person.
Colonialism	Taking control over another country , occupying it with settlers, and exploiting it economically .
Core region	A more developed region.
Debt relief	To reduce or remove a country's debt.
Demographic	Relating to the population.
Development	Process where people, a place or a country make economic or social progress.
Development gap	Difference in income and quality of life between the richest and poorest countries in the world.
Export	A country selling something.
Foreign Direct Investment	Overseas investment (monetary) by transnational corporations .
G-20	A group of 20 governments and/or banks from the 20 major worldwide economies.
Geopolitics	The politics influenced by geographical factors.
Gini coefficient	A statistical technique used to show the extent of income inequality within a country.
Gross Domestic Product (GDP)	The total value of goods and services produced by a country in a year.
Human Development Index (HDI)	A measure of development that looks at life expectancy, mean years of schooling and gross national income,
Import	A country buying something.
Life expectancy	The average number of years a person is expected to live.
Literacy rate	The percentage of people that can read and write.
Offshoring	When a company located some of their manufacturing abroad.
Outsourcing	When a company pays another company to complete part of its business/work.
Periphery regions	A less developed region.
Political corruption	Political corruption is the illegal use of powers by government officials or there contacts for personal benefit.
Primary sector	The economic sector that relates to extracting raw materials such as farming or mining,
Privatisation	The sale of state-owned assets to the private sector (businesses).
Quality of life	The standard of health, comfort and happiness experienced by people.
Quaternary sector	The economic sector that refers to research and development such as IT development.
Remittance	Money sent back by migrants to their family in their home community.
Secondary sector	The economic sector that relates to manufacturing such as factories.
Tertiary sector	The economic sector that relates to services such as education or retail.
Top-down strategies	Government led strategies.
Transnational corporations (TNC)	A company that owns or controls productive operations in more than one country through foreign direct investment

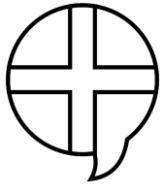
Year 10 Geography – Changing Cities

India – An Emerging Country
The largest population in the world.

Located in Asia, sharing. Border with both Pakistan and China and has a coastline.

Social context
Just over 35% of people in India live in urban areas, English is widely spoken in these urban areas.

Indian society is divided into social ranks known as 'castes'. A person's caste is determined at birth by their parent's status. This system is controversial.



India's economy
India's official currency is the Indian Rupee.

India has the 11th largest GDP in the world.

India is a member of the G20 countries.

India's major trade partners are China, USA, UAE, EU, Russia and Japan.

The Indian diaspora
An interesting aspect of globalisation is the spread of the Indian population abroad. The 20 million people who make up the Indian diaspora are scattered over more than 100 countries.

In 2015 they sent back $72 billion – a source of foreign exchange that exceeds revenues generated by India's software industry.

Colonialism and recent politics
The British empire rules India between 1858 and 1947. India had many resources that Britain wanted access to including tea.

The railway network in India was established under British rule.

The British portioned India into two separate states, India and Pakistan, with respective Hindu and Muslim majorities in each state.

These two countries now experience conflict due to the Kashmir region.

India's climate
India's geographical diversity and immensity creates great variety in climate conditions across the country. It varies from tropical in the south to temperate in the north.

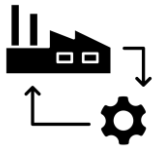
India experiences the most prominent monsoon systems in the world. The monsoon blows from the north-east during the cooler months and reverses during the warmer months. The monsoon rain is vital for water supply ands farming, but also results in flooding.

India's economic sectors
India saw a reduction in proportion of people working in agriculture (primary sector) 37% to just 14%.

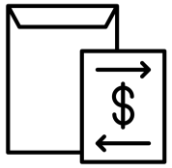
India saw a rapid increase in the contribution of service sector (mainly from call centres and ICT) from 45% to 67%.

India saw a small increase in the amount of manufacturing (secondary sector) industry from 16% to 18%.

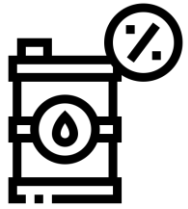
A rise in India's quaternary sector (from outsourcing, sale of services) from 0% to 6%.



Trade in India
Until the early 1990s India was a relatively closed economy. There were very high tariffs on imports along with other restrictions. Reducing the barriers to trade was an important part of the economic reforms India made at this time. As India has become more integrated into the global economy, the volumes of both its exports and its imports rose sharply.



In 2012 India exported $56 billion worth of oil.



In 2012 India exported a total of $142 billion worth of goods.

Trade allows India to access resources they otherwise wouldn't have,

Trade allows India's economy to develop by making money from exports and providing jobs to their population. A high employment rate also results in more taxes being made giving the government more money to invest in things like education and healthcare.

Trade does have negatives including creating hardships in times of war, for example Russia exported a lot of oil to India, this has not happened during current conflicts.

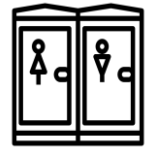
Trade creates economic dependence whereby a country struggles to continue to develop without the help of another.

Aid in India
Historically, India is the biggest recipient of foreign aid. However, such aid has declined rapidly in recent years as the country has developed. India itself now sends aid to other countries, such as Bhutan, Nepal, the Maldives, Sri Lanka and Afghanistan.

According to India's budget in 2021-22, its direct overseas aid stood at $2.3 billion.

The Assam floods in 2020 n India left 4.5 million people at risk of disease. India needed aid as a result of this.

UNICEF provided temporary toilets and water filtration systems to try and reduce the negative impacts of these floods.



Although India is beginning to develop the country still need aid. Each year in the country almost 2 million children do not get enough food or adequate healthcare.

Some argue that India do not need aid and that it could go to other countries.

When it comes to aid there is a risk that a country will become too dependent and not cope without it.

Investment
In 2014 to 2015, the two major sources of FDI into India were investors based in Mauritius and Singapore.

Every country's economy includes the public and private sectors. Public investment in education, health, transport and housing is essential to social and economic development.

India's well-educated workforce is vital to its ICT sector.

Nike are a TNC that invest in India. They have 18 factories in the country. This is a form of outsourcing.

Nike create a lot of employment and increase taxes in India.

However, the company was accused of not paying its workers during Covid-19 and workers have long working days in poor conditions for very low wages.

India's Geopolitics
India and Pakistan
India and Pakistan have experienced conflict over where the border should be. Particularly due to an area called Kashmir that both countries want control of.

This border is heavily militarised and conflict has caused deaths in the past.

Both countries have nuclear weapons.

India and China
Both countries have nuclear weapons.

Conflict over shortages of water from the Himalayan mountains.

India's technology sector
The development and spread of technology in India is unequal. Those who cannot access it become segregated (e.g. elderly people, those living in rural areas).

The rise of technology in education can put pressure on families who cannot afford it and create inequality.

The technology hotspot of India is Bangalore. Many start up businesses are based here.

Impacts of Rapid Development
Air is heavily polluted. The seven most polluted cities in the world are all in India.

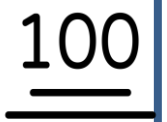
Deforestation for growing cities and space for industry. This is damaging habitats and reducing biodiversity.

A rise in consumerism creates a stronger economy.

Healthcare improves and mortality rate decreases.

There is huge pressure and cost to provide more services.

The Smart Cities Mission:
A plan to improve quality of life across 100 cities.



The mission aims to provide adequate water supply and electricity, improve sanitation, provide affordable housing, and improve healthcare, education and transportation.

This mission may leave rural areas even further behind.

The scheme cost approximately $24 billion.

Surat has benefitted from the scheme and now has better roads.

Year 10 – Geography – Ecosystems. Biodiversity & Management

Distribution of global biomes

Due to the spherical shape of Earth, solar radiation is more concentrated at the equator. This has a direct impact on the climate and biodiversity which affects the distribution of global biomes.

Factors that affect biomes include latitude, altitude, soil, and humans. The latitude and altitude will determine what climate is like. Humans can change ecosystems globally.

Tropical rainforests are located at the equator where it is hot and wet all year round. This results in high biodiversity.

Deserts are located along the tropics where it is hot and dry all year round. Biodiversity here is low due to a lack of water.

Tundra is located near the poles where it is cold and dry. Biodiversity here is low due to freeing temperatures

Temperate deciduous forests are located in the mid-latitude areas which means they are found between the polar regions and the tropics. The deciduous forest regions are exposed to warm and cold air masses, which cause this area to have four seasons.

Boreal forests are the world's largest ecosystem, characterised by its long cold winters and pine and spruce trees. They are found in Canada, Alaska and Russia and are an important carbon sink.

Tropical grasslands are found 5 to 15 degrees north and south of the equator and are characterized by grasses and shrubs. They have some dry and wet seasons but remain warm all year.

Temperate grasslands are found between high latitude forests and deserts. They have cold winters, warm summers and some rain.

The Biosphere

Humans use the biosphere for water, for fossil fuels and minerals like gold, silver and metal.

The nutrient cycle

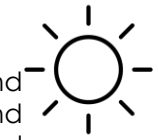
Nutrients move between soil, biomass and litter (these are the main 'stores' of nutrients.

As animals die the nutrients fall into the litter store. Decomposition moves nutrients into the soil. Plants take nutrients from the soil back into the biomass (it's a cycle). Nutrients can leave this cycle by leaching.

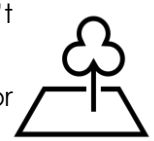
The climate affects how quickly this cycle happens. In a tropical rainforest it happens quickly as warm conditions result in fast decomposition and rain causes a lot of leaching.

UK ecosystems

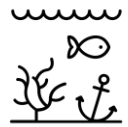
UK terrestrial ecosystems are: woodland (deciduous trees), moorland (upland areas), wetlands (areas around rivers and lakes), and heathland (sandy soil, can't be farmed).



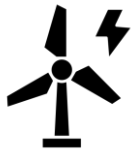
UK marine ecosystems are used for tourism and leisure activities.



The benefits of exploiting UK marine ecosystems include bringing in £3bn into the economy and provide 200,000 jobs. They also provide food from fishing and the opportunity for oil rigs.



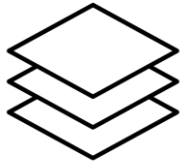
Overfishing is now causing damage to our UK marine ecosystems. In 2011 cod stocks were particularly low. Large wind farms and water ports are also disrupting marine wildlife.



Keyword	Definition
Abiotic	Non-living things
Adaptation	Changes to suit a particular environment
Afforestation	The planting of trees where there were none before
Agribusiness	Large-scale commercial farming and food supply
Altitude	The height of the land
Arable	The farming of crops like wheat and barley
Biodiversity	The variety of plants and animals
Biomass	The total mass of all living things in an area
Biome	A large-scale ecosystem (e.g.: deserts/tropical rainforest)
Biosphere	The places on earth that are occupied by living things
Biotic	The living aspects of an ecosystem
Carbon sink	An area that absorbs more carbon than it releases
Conservation	Protection and sustainable use of nature
Deforestation	Cutting down trees
Ecotourism	Tourism directed towards looking after natural environments
Fertiliser	Concentrated sources of plant nutrients
Function	An activity that is natural
Goods	Merchandise or possession
Governance	Laws
Habitat	The natural home of an animal or plant
Invasive species	An organism that is not native to a particular area
Leaching	Washed away by water
Litter	Dead things
Marine	Sea or ocean
Monoculture	When just one species of a crop or tree is grown
Nutrient cycle	Transfer of nutrients between the living and non-living parts of an ecosystem
Sustainable Management	Management that does not harm the environment and needs the needs of future generations
Recreation	Activity done for enjoyment
Services	A system supplying a public need
Structure	The arrangement and relationships between something
Terrestrial	On land
Timber	Wood
Topography	Shape of the land
Vegetation	Plants

Year 10 – Geography – Ecosystems. Biodiversity & Management

Tropical Rainforests
Tropical rainforest have four layers which are emergent, canopy, under canopy and shrub.



Adaptations
Drip tip leaves have pointed ends so that excess what drips off to prevent leaves from rotting. Leaves also have a waxy coating so water flows off them.

A poison dart frog is colourful to warn other animals and a toucan has a large beak to get food from between large leaves.

Goods	Services
Timber which is used for construction.	Produces oxygen. The Amazon produces 6% of the world's oxygen.
Medicine. More than 7000 drugs have their origins in the Amazon.	Stores carbon dioxide. The Amazon soaks up 2 billion tonnes of carbon dioxide a year.
Food for those who live in the forest.	Tourism which helps improve the economy.

Climate change
Climate change has an impact on both the structure and function of the tropical rainforest. Climate change can cause a dry season that is getting longer.

In 2005 the Amazon experienced a drought. As rivers dried up, remote communities were isolated while commerce slowed to a standstill. Thousands of square kilometers of land burned for months on end, releasing more than 100 million metric tons of carbon into the atmosphere.

Human threats
People are threatening the Amazon Rainforest due to deforestation for timber, land and to create palm oil plantations.

Managing the Amazon
Selective logging: only older trees are cut down to allow younger trees to grow taller.

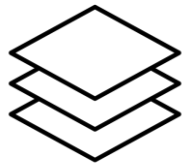
Governance is when the government put laws in place to ban deforestation. 150 million acres of the Amazon in Brazil are currently protected.

Yachana Lodge is an ecotourism project in Ecuador, in a remote area of the Amazon rainforest where local people rely on subsistence farming to provide a living. The project employs local people, giving them a more reliable income and a better quality of life. It also encourages the conservation of the rainforest so that visitors continue to want to visit.

Temperate deciduous woodlands
In the winter decomposition is slow due to cold temperatures o the slow lacks nutrients.

Deciduous woodlands have four layers which are the canopy, shrub, field and ground.

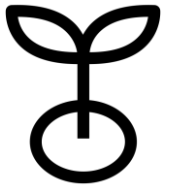
Adaptations
Trees drop leaves in the winter because of the lower temperature. Deep roots to find water and nutrients and stabilise during storms. Bluebells spring early to get light before the canopy grows.



Hedgehogs hibernate in winter to help them conserve energy during the colder months. Squirrels store their food for the winter. Birds migrate to warmer areas.

Goods	Services
Timber. The UK produced 13 million tonnes of timber in 2014.	Recreation activities. The New Forest has 15 million visitors a year,
Fuel. Some UK power stations now burn wood.	Stores carbon dioxide. Deciduous woodlands absorb 1 million tonnes of carbon each year.
Rearing birds.	Conservation.

Climate change
If winters become milder (slightly warmer) then diseases amongst trees can spread.



Seed germination is often triggered by cold temperatures, without these this will not happen.

The risk of drought and forest fires will increase.

The New Forest
Humans can damage the areas by walking, cycling or driving on vegetation.

92% of visitors drive to the New Forest which increases pollution.

Deforestation
Space is needed for people moving into cities (urbanisation).

The timber from trees is used for building houses etc.

Space is needed for land for farming.

Sustainable management
Conifer trees cut down are replaced by deciduous trees.

Chemicals are rarely used in The New Forest.

The New Forest became a national park in 2005 meaning it needs to be protected.

Sustainable use
Cycle paths and routes keep people away from damaged areas.

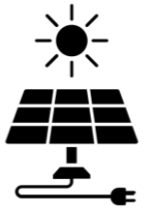
A visitor leaflet called '5 ways to love the Forest' explains how people can protect the forest.

Human Geography (Paper 2) Case Studies

Resource Management

Germany: A developed country in Europe

- Following Japan's Fukushima disaster in 2012, Germany closed eight of its nuclear plants and plans to close the rest by 2022.



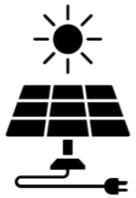
- By 2050, Germany will reduce greenhouse gas emissions by 60% compared to 1990 levels.
- Bavaria Solarpark is a solar farm in Germany set to reduce carbon dioxide emissions by more than 100,000 tonnes over the next 30 years.

- Germany's government plans to have wind energy production of around 6500 MW by 2020.
- The development of wind turbines has resulted in less opposition by people who recognise the advantage of wind power over dirty coal power.

China: An emerging country in China

- China has become the world's biggest producer of carbon dioxide.
- By 2020 China will have reduced its dependence on coal from it providing around 64% of China's energy to around 58%.

- China has a hydro-electric power (HEP) dam called the Three Gorges Dam. In 2014 it generated 98.8 billion kilowatt-hours of electricity.
- The dam meant 1.4 million people needed to be relayed and it damaged wildlife habitats.



- China has become one of the world leaders in generating solar energy. They have a solar farm in the Gobi Desert.

Changing Cities

Birmingham: A city in the UK, a developed country

- The site of Birmingham is important as it was built on flat land, the situation is important as it has many of canals to transport goods.

- There are many causes of migration into Birmingham including study as the city has five universities, job opportunities and people migrate internationally to flee war.
- There are many impacts of migration on Birmingham including impacting its population structure as there are now more people between 2o and 30 years, the city's population is now very diverse and specific areas such as Sparkbrook have been populated and adapted by migrants.

- Deindustrialisation led to inequality in many areas of Birmingham. Factories closed down and new jobs were only part time or low paid.
- The central business district in Birmingham needed to redevelop as it was impacted by out of town shopping centres. They pedestrianised the city centre and encouraged stores to stay open later.

- Birmingham has become a more sustainable city by introducing a clean air zone, encouraging use of buses and opening several community centres such as the one in Sparkbrook.

Mumbai: A city in India, an emerging country

- The site of Mumbai is important as it was built on flat land, the situation is important as it has a harbour that is used for transporting goods.
- The population of Mumbai is rapidly growing this has had both positive and negative impacts. There is now a higher percentage of working age people and it is a diverse city. Negative impacts include the development of informal settlements and pressure on healthcare and education.

- Dharavi is an informal settlement in Mumbai. There is a strong sense of community here and over 80% of waste is recycled. However, access to sanitation is poor, housing quality is poor, pollution is high and children often work in recycling for as little as £1 a day.

- A top-down strategy is when governments and large companies help local people. Vision Mumbai is an example of this and it is set to provide better housing for 20,000 people living in informal settlements across the city. A downside of this is that the rent for these flats is a lot highest so the poorest people cannot afford them.
- A bottom-up strategy is when local people help themselves. An example of this in Mumbai is Lok Seva Sangam, this is a health charity with the main focus of women and improving sanitation. In 30 years the charity cured 75% of people with leprosy.

Human Geography (Paper 2) Case Study

Global development: India

India – An Emerging Country
- 7th largest country in the world.
- Population: 1.2 billion

Uneven Development
- Western India is most developed. Industries: Finance, ICT.
- Eastern India is least developed because of physical geography (mountains, desert).

Mumbai: core region.
- Home to Bollywood, ICT and TNCs .
- 40% of houses are informal settlements.
- Work on an Industrial corridor is underway. $100bn project with Japan.

Bihar: periphery area.
- 100m population.
- High fertility rate.
- Many live in poverty.
- 80% of people are farmers in rural areas.
- Lacks investment.

India's Geopolitics
India Vs Pakistan
- Gained independence from Britain in 1947 and the land was split into India and Pakistan.
- India and Pakistan have argued over where the border should be. Particularly an area called Kashmir (northern India).
- Both countries have nuclear weapons.

India's Technology
- The development and spread of technology in India is unequal.
- Those who cannot access it become segregated (e.g. elderly people, those living in rural areas).

Impacts of Rapid Development
- Air is heavily polluted. Delhi is world's #1 polluted city.
- Deforestation for growing cities and space for industry.
- Coal is the main source of energy.

The Smart Cities Mission:
- A plan to improve quality of life across 100 cities.
- Aims to: improve water + electricity supply, build affordable housing for the poor and improve health and education.

Nike in India
- Nike has 18 factories in India, 13 of which are in the south.
- Outsourcing can create employment and a rise in people paying tax.
- Some companies take advantage of relaxed laws and are unethical for both people and the environment.

Human Geography (Paper 2) Located Examples

Resource Management
Nuclear power – Fukushima nuclear disaster
- Nuclear waste is radioactive, this can cause cancer
- Over 100,000 people needed to be evacuated

Oil in Canada
- Provides over 500,00 jobs

McDonald's – Managing their energy resources
- Use LED bulbs to reduce their energy use
- Use their leftover cooking oil as biodiesel

Volvic – Managing their energy resources
- Use recycled materials for their bottles – uses less energy
- Transport their bottles in Europe by train

Weather & Climate

Maldives

- Maldives is at risk from rising sea level, 3mm per year
- 89% of their GDP relies on biodiversity
- Airport is only 1.2m above sea level
- Running out of fresh water

Physical Geography (Paper 1)

Changing landscapes- using a figure as evidence

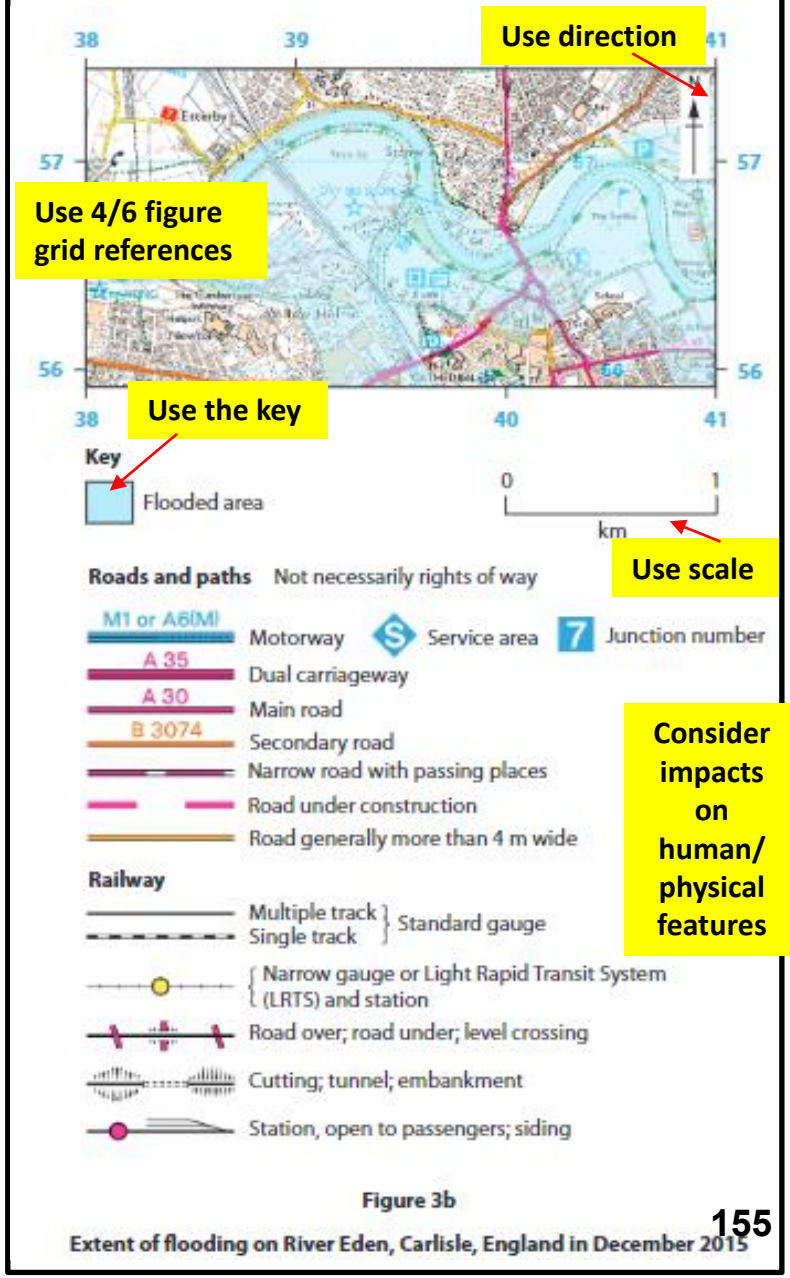


Figure 3b

Extent of flooding on River Eden, Carlisle, England in December 2015

Paper 1- Physical Geography Case Studies

Case study – Hurricane Sandy, USA 2012 (developed)

Impacts:

Social	Economic	Environmental
- 150 dead. - Millions left without electricity	- Estimated $65 billion. - New York Stock Exchange forced to close.	- Nature reserves damaged by storm surge. - Sewage leaks into water sources.

Response:

Short term	Long term
- Media raised funds. - Charities such as Red Cross provided relief.	- Rebuilding efforts set up by local government. - Money paid directly to homeowners to help with reconstruction.

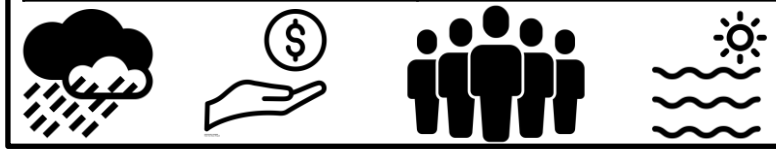
Case study – Typhoon Haiyan, Philippines 2013 (developing)

Impacts:

Social	Economic	Environmental
- 6000 dead. - Tens of thousands homeless.	- Estimated $2 billion. - Transport disrupted.	- Coastal mangroves damaged. - Chemical leaks from industry

Response:

Short term	Long term
- State of 'national calamity' - Aid slowed by	- Estimated $2 billion. - Transport disrupted.



Case study – Sustainable management - The New Forest National Park (South of England)

Problems

- Visitors trample on plants, erode pathways and grass verges through cycling and parking.
- Wildlife scared by dogs, litter, fires from barbeques.

Sustainable management

- Replacing conifers (cut down for timber) with native species.
- Pesticides used sparingly.
- Forestry work minimised during nesting season (to increase biodiversity)

Sustainable use

- Controlling visitors and where they go (pathways, cycle routes)
- Sustainable transport schemes. Building using local timber.
- Leaflet- 5 ways to protect the forest (educating visitors)
- Green Leaf businesses (10% of land used for conservation)

Case study – Sustainable management- The Amazon Rainforest (Brazil)

Importance

- TRF provides 6% of worlds oxygen. 40,000 species plants. Medicine.

Problem- deforestation

- Slash & burn for agricultural land
- Population pressure (settlements & roads)
- Resource extraction (mining)

Sustainable management

- Governance- laws to protect areas of rainforest (Brazil has reduced deforestation by 84%)
- Ecotourism- building using local products, money raised goes into conservation. Jobs are provided for local people.
- Selective logging (only taking trees needed)

Case study – California, USA drought 2012- present (developed)

Causes:

- Over abstraction from the Colorado River (shared with 5 states).
- Lower than average rainfall across western USA.

Key effects:

- Subsidence affected structure of buildings.
- Seawater intrusion in coastal areas (low ground water levels) contaminating ground water supplies.
- Wetlands and rivers receive less water (due to diversions for domestic use) which affects ecosystems.

Responses:

- Reducing water supplies down to minimum for health & safety.
- Running education to limit water wastage.
- Increased monitoring of rivers to check levels.

Case study – Ethiopia, Africa drought 1983- present (developing)

Causes:

- Short rainy season (since 1980s) becoming increasingly delayed.
- As Indian Ocean warms, drier air descends over East Africa.

Key effects:

- 85% of population live in rural (dependent on farming to survive)
- Unreliable rainy season makes arable and live stock difficult.
- 57% of Ethiopians have access to an improved water source.
- Hunger & malnutrition has led to famine in the past.

Responses:

- 'Live Aid' concert to raise awareness & funds.
- Developing drought resistant crops (to allow self sufficiency)
- NGOs (UNICEF and Oxfam)
- Government organises its own relief programmes.

Year 10 – Geography – Resource Management

The Location of Natural Resources Around the world

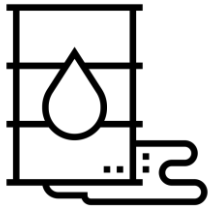
Fossil fuels are used a lot in many African and Asian countries.

African countries have many natural resources including gold in South Africa and Oil in Egypt.

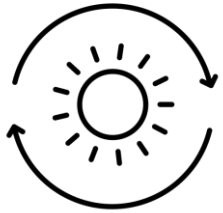
In the UK

Water is a valuable resource that the UK have a surplus of.

Due to variations in rainfall, the amount of water also varies across the country. The west receive much more rainfall than the east.



Renewable fuels make up less than 10% of the UK's energy mix. The government needs to increase the figure to 15% by 2020 to meet its target.



Exploiting natural resources

Rainforests around the world, including in Cameroon, are being cut down for palm oil plantations. This product is used in a lot of products from shampoo to chocolate.

This deforestation is damaging habitats and reducing biodiversity, around 5 Orangutans are killed a day because of this.

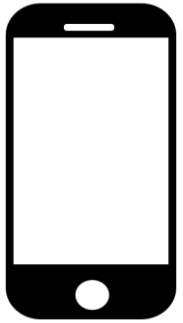
Oil and coal extraction in the Amazon has caused deforestation and biodiversity loss. It has also caused soil pollution as spills and toxic by-products are dumped. This can also cause indigenous conflict as the people that call the Amazon their home gain the least from natural resource extraction and are often given very little, if any compensation. Communities are also not always informed.

Consumption and demand of resources

People are using more resources everywhere in the world, but the biggest increase is in Asia.

The world population is now over 8 billion. The more people we have the more energy resources we will use.

Development also results in the increase of natural resources. People around the world will be using more energy for central heating, cooking and cars. China is an example of a country that are using significantly more energy due to development.



Technology such as iPhones being developed uses more energy as they are energy intensive to both manufacture and use.

The Energy Mix

Factors that affect a country's energy mix: size of population, wealth of the country, and availability.

India have 5.6 billion barrels of oil left so they use a lot of oil. Using their own resources is cheaper and it means they do not have to rely on another country.

Iceland have access to geothermal power due to volcanic activity. This means they use a lot of this, it also means their percentage of renewables is high.

Developed countries are more likely to use more renewable sources as they have the money to develop the technology, an example of this is the UK and Germany investing in wind power.

India and China have the world's largest populations so use a lot of fossil fuels.

Keyword	Definition
Abiotic resources	Resources obtained from lithosphere, atmosphere, hydrosphere (e.g., soil/sunlight/fresh water/minerals)
Biotic resources	Resources obtained from the biosphere which are capable of reproduction (e.g.: animals, plants, fungi, timber
Carbon footprint	Measurement of all greenhouse gases an individual produces (expressed in kg)
Consumption	The action of using up a resource; what we use
Distribution	How something is spread out
Energy mix	The proportion of different energy sources used in a country
Emissions	Gases released into the air
Exploit	Use for our own benefit
Fossil Fuels	Energy sources such as coal, oil and natural gas that were formed from the remnants of plants and animals that lived millions of years ago
Fracking	Drilling into the ground using high-pressured water mixture to release gas trapped within the rock
Hydro-electric power	The use of fast-flowing water to turn turbines and generate electricity
Non-renewable	Sources of energy that cannot be 'remade' because it would take millions years
Open-cast	A type of mining that extracts resources from open quarries
Renewable	Something that can be used again and will not run out
Sustainable	Good for people, the environment and the economy now and in the future
Soil erosion	The removal of the top layer of soil caused by erosion.

Year 10 – Geography – Resource Management

Oil

Advantages
- ✓ Cheaper than renewable sources of energy.
- ✓ Readily available.
- ✓ Easy to store.

Disadvantages
- ✗ Burning oil produces greenhouse gases.
- ✗ Transporting oil can cause spills.
- ✗ Oil will eventually run out.

Coal

Advantages
- ✓ Cheap and easy to mine.
- ✓ Creates large amounts of electricity.

Disadvantages
- ✗ Burning coal produces greenhouse gases.
- ✗ Open cast mining damages animal habitats.
- ✗ Coal will eventually run out.

Natural gas

Advantages
- ✓ Safer and easier to store than other fossil fuels.
- ✓ Available worldwide.

Disadvantages
- ✗ Releases greenhouse gases when burned.
- ✗ It is a highly flammable substance.
- ✗ The infrastructure is very expensive.

Nuclear power

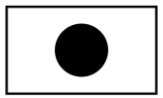
Advantages
- ✓ Produces electricity all year round.
- ✓ Produces less carbon dioxide than other fossil fuels.

Disadvantages
- ✗ Expensive to build.
- ✗ Leaks can occur, these are radioactive and can cause cancer. The Fukushima nuclear disaster in Japan in 2011 resulted in 100,000 people being evacuated.







Wind energy

Advantages
- ✓ Does not release greenhouse gases.
- ✓ A renewable source of energy.
- ✓ Can create cheaper electricity for customers.

Disadvantages
- ✗ Each turbine kills up to four birds per year.
- ✗ Can ruin the look of the landscape.
- ✗ Does not work when it is not windy.
- ✗ Turbines can break if it is too windy.
- ✗ Can be expensive to build and maintain.

Hydroelectric power

Advantages
- ✓ Does not release greenhouse gases.
- ✓ A renewable source of energy.

Disadvantages
- ✗ Expensive to build.
- ✗ Areas need to be flooded to build the dam.

Solar power

Advantages
- ✓ Does not release greenhouse gases.
- ✓ Surplus energy can be stored.
- ✓ A renewable source of energy

Disadvantages
- ✗ Expensive to set up.
- ✗ Uses a lot of land.
- ✗ Needs the right climate.

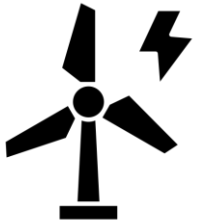
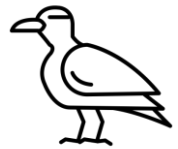
Fracking

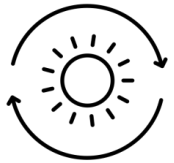
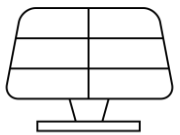
This involves drilling deep into the ground.

Water, sand and chemicals are used to release gas.

Advantages
- ✓ Would allow the UK to get their own natural gas.
- ✓ Will make natural gas cheaper.
- ✓ Produces less greenhouse gases than coal.

Disadvantages
- ✗ Can contaminate drinking water.
- ✗ Can cause earthquakes.
- ✗ Damages habitats.

Managing & Protecting Our Energy

Individuals

Measure their carbon footprint, use public transport like buses, not private transport like cars, and insulate homes and use solar panels.

Companies/organisations

McDonald's

Use cooking oil as biodiesel and use LED light bulbs.

Volvic

Transport all bottles in Europe via train and use recycled plastic for all bottles.

Governments

Build renewable energy sources, the UK for example want to become the world's leader in wind energy. Hornsea 2 is currently the world's largest offshore wind farm.

Case Study: China, an emerging country

70% of its energy comes from burning coal, 7 cities in China are classed as 'heavily polluted' and they are the world's largest polluter of carbon dioxide.

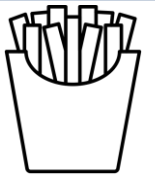
China built the 'Three Gorges Dam' to create hydro electric power. This dam produces 11% of China's electricity and cost $30 billion. To build the dam 1.4 million people were displaced.

A solar farm has been built in the Gobi Desert.

Case Study: Germany, a developed country

Germany wants to use less nuclear power and by the end of 2020 Germany plans to reduce greenhouse emissions by 40%, and by 80% in 2050.

Germany has built the Bavaria solar park with 60,000 panels. This will reduce carbon emissions by 100,000 tonnes. The country have also invested In wind power.






Year 10 – Geography – Changing Physical Landscapes - Rivers

Geology

- The study of rocks and different rock types
- Sedimentary = formed in layers (e.g. chalk)
- Igneous = formed from cooled lava (e.g. granite)
- Metamorphic = formed under intense heat and pressure (e.g. marble)

Erosion

There are four types of erosional processes that occur in both coastal and river landscapes.

- Abrasion (hitting)
- Attrition (rubbing)
- Hydraulic Action (water)
- Solution (dissolving)

Weathering

- There are three main types of weathering processes that can affect rocks.
- Biological Weathering (e.g. plant roots)
- Chemical Weathering (e.g. acid rain)
- Mechanical/Physical Weathering (e.g. freeze-thaw)

Transportation

- There are four main ways that sediment is transported in river and coastal environments.
  - Traction (rolling)
  - Saltation (bouncing)
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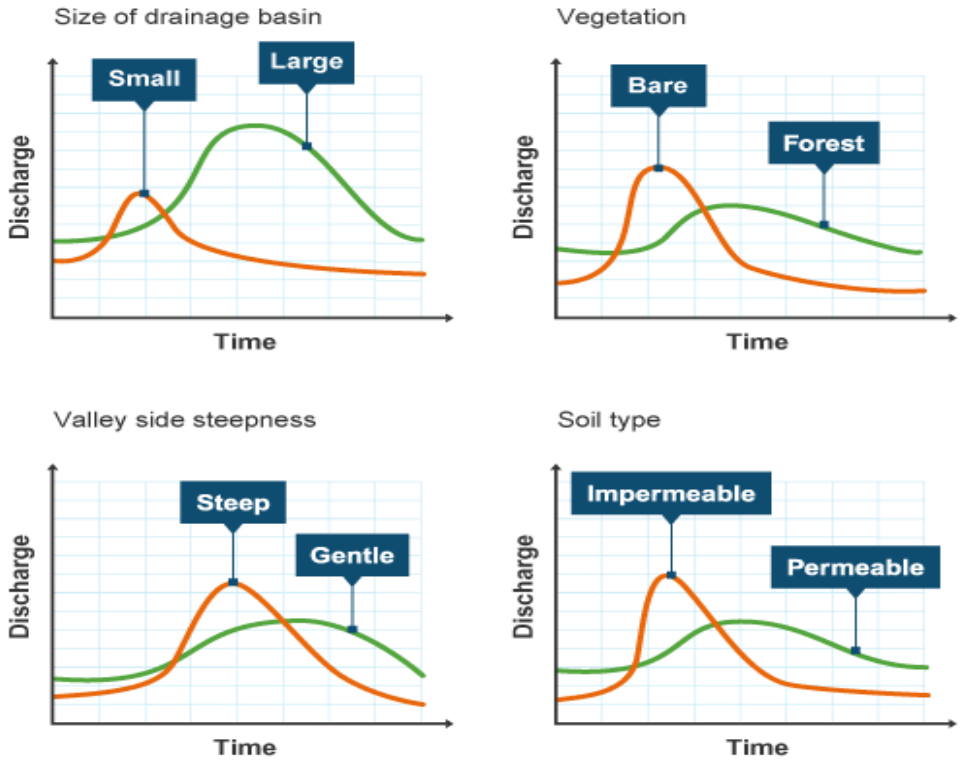
  - Solution (dissolved)



Storm hydrographs

- A storm hydrograph shows how a river responds to a rainfall event.
- Peak discharge = the highest amount of water in the river.
- Peak rainfall = the highest amount of rainfall.
- Lag time = the time between peak discharge and peak rainfall.

Impacts of river flooding

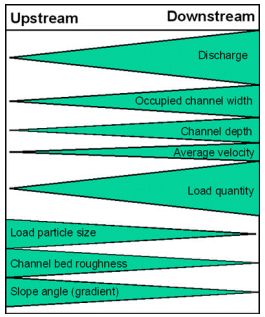
- Social: houses are damaged which causes people stress.
- Economic: damage is expensive, insurance costs increase, businesses close, people can't get to work, tourism is impacted.
- Environmental: habitats are damaged, trees are uprooted.
- On 16th August 2004 a month's rain fell on Boscastle in one day. This damaged 100 homes and businesses. It also resulted in 75 cars being washed into the sea. Habitats were damaged. The tourism industry was also significantly impacted.

Keyword	Definition
Discharge	A process where sediments are dropped by the river or waves that carried them.
Velocity	The speed of the water.
Vertical erosion	Erosion downwards into the land.
Source	Where the river starts, usually in the mountains
Mouth	Where the river ends, it flows into the sea.
Downstream	The river moving from the upper course to the lower course.
Tributary	A smaller river that flows into the larger river.
Gradient	The steepness of the land.
Contour lines	Orange lines on an OS map that shows the relief of the land.
Meander	A bend in a river.
River cliff	An area on the outside of a meander that has been eroded.
Point bar	An area of sediment that has built up on the inside of a meander due to deposition.
Levees	A natural embankment on the sides of a river.
Flood plain	An area of low lying land that is left to flood.

Year 10 – Geography – Changing Physical Landscapes - Rivers

How does a river channel change as it travels downstream?

- The Bradshaw Model is used by geographers to describe how the characteristics vary between the upper course and lower course of a river.
- Key characteristics are that width, depth, velocity and discharge all increase further downstream whereas particle size and gradient of the channel decrease further downstream.



Causes of River Flooding

- Intense rainfall (saturation of soil)
- Long duration of rainfall
- Impermeable surfaces
- Steeper relief of land
- Deforestation
- Urbanisation

Strategies to Reduce River Flooding

Strategy	Strategy	Evaluate
Hard Engineering	**Levees** – high banks on/near riverbanks	+ Stop water spreading into areas where it could be problematic - Can burst under pressure
Hard Engineering	**Channelisation** – deepening or straightening the river	+ Allows water to run through channel more quickly - Water taken downstream may put other places at risk
Soft Engineering	**Washlands** – areas on floodplain allowed to flood	+ Give a safe place for floodwater to go - May limit the use of the land (e.g. for recreation)
Soft Engineering	**Flood-plain Zoning** – allocate areas to different uses	+ Prevents using high risk zones for businesses and housing - May cause accessibility issues for the public

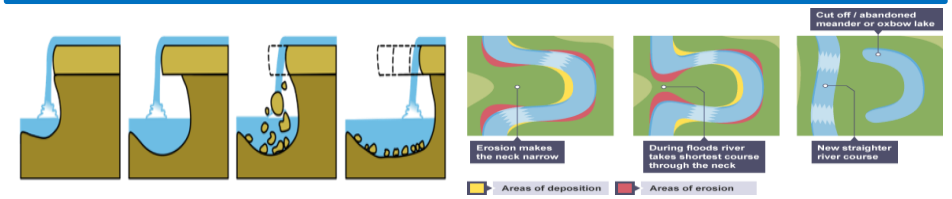
Formation of a Meander

As the river makes its way to the middle course, it gains more water and therefore more energy. Lateral erosion starts to widen the river. When the river flows over flatter land they develop large bends called meanders.

1. As a river goes around a bend, most of the water is pushed towards the outside. This causes increased speed and therefore increased erosion (through hydraulic action and abrasion).
2. The lateral erosion on the outside bend causes undercutting of the bank to form a river cliff.
3. Water on the inner bend is slower, causing the water to slow down and deposit the eroded material, creating a gentle slope.
4. The build-up of deposited sediment is known as a slip-off slope (or sometimes river beach).

Formation of an Oxbow Lake

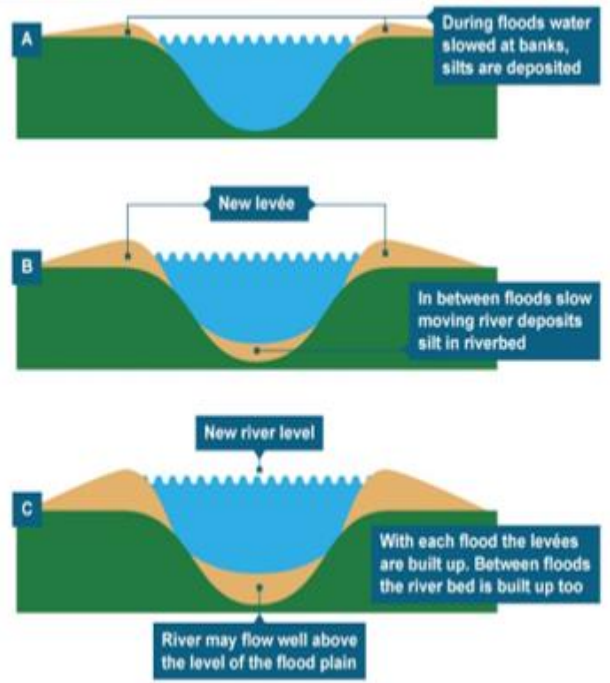
1. Due to erosion on the outside of a bend and deposition on the inside, the shape of a meander will change over a period of time.
2. Erosion narrows the neck of the land within the meander and as the process continues, the meanders move closer together.
3. When there is a very high discharge (usually during a flood), the river cuts across the neck, taking a new, straighter and shorter route.
4. Deposition will occur to cut off the original meander, leaving a horseshoe-shaped oxbow lake.



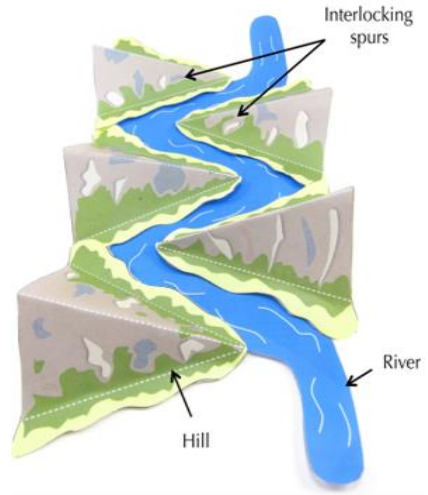
Formation of a waterfall

1. A band of hard rock sits over a band of soft rock.
2. Hydraulic action causes undercutting which creates an overhang.
3. Overtime, the overhang collapses due to a lack of support.
4. The eroded material falls into the plunge pool, creating further erosion through abrasion.
5. The waterfall retreats backwards leaving behind a steep sided valley known as a gorge.

Formation of a Levee



Interlocking spurs



Interlocking spurs form when the river travels around harder, more resistant rock creating a zip like shape.

Year 10 – Geography – Changing Physical Landscapes - Coasts

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There are four types of erosional processes that occur in both coastal and river landscapes.

- Abrasion (hitting)
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Weathering



- There are three main types of weathering processes that can affect rocks.
- Biological Weathering (e.g. plant roots)
- Chemical Weathering (e.g. acid rain)
- Mechanical/Physical Weathering (e.g. freeze-thaw)

Transportation

There are four main ways that sediment is transported in river and coastal environments.

- Traction (rolling)
- Saltation (bouncing)
- Suspension (floating)
- Solution (dissolved)

Longshore drift is also a method of transportation in coastal environments.

Mass movement

- The movement of sediment downhill due to gravity
- Rockfall, sliding (falling down a flat surface due to saturated soil), slumping (falling down a curved surface due to saturated soil).

Causes of coastal recession

- Storms and sea level rise both increase the rate of coastal erosion

Impacts of coastal recession

- Social: houses are damaged which causes people stress
- Economic: damage is expensive
- Environmental: habitats are damaged


Strategies to Reduce Coastal Erosion

Strategy Type	Strategy	Advantages and Disadvantages
Hard Engineering	**Sea Wall** – concrete walls built at the top of a beach	+ Effective at stopping the sea - Very expensive to build and maintain
Hard Engineering	**Rip Rap** – large boulders piled at top of a beach	+ Force waves to break, protecting cliffs + Relatively cheap and easy to maintain - Restrict access to beach - Do not fit in with local geology
Hard Engineering	**Groynes** – wooden or rock structures built along the beach at right angles	+ Quick to construct + Trap sediment and widens the beach reducing wave energy - Stopping movement of sediment can affect elsewhere on coast - Can be ugly
Soft Engineering	**Beach Nourishment** – adding sediment to a beach	+ Can absorb more wave energy + Easy and cheap to maintain - Needs constant maintenance
Soft Engineering	**Sand Dune Regeneration** – grasses and bushes are planted to stabilise dunes	+ Maintains a natural coastal environment - Areas of beach have to be fenced off

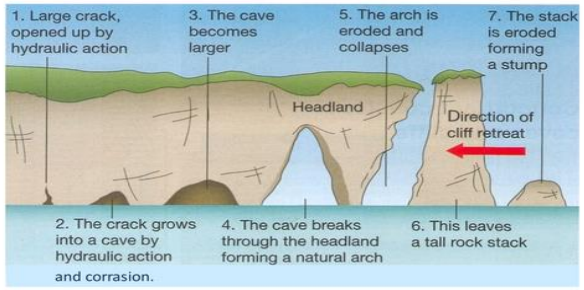
Keyword	Definition
Deposition	A process where sediments are dropped by the river or waves that carried them.
Engineering (hard)	Strategies using artificial structures (e.g. concrete) to prevent river or coastal flooding
Engineering (soft)	Flood defences that work with natural processes to reduce the risk of river or coastal flooding.
Erosion	The wearing away and removal of material by a moving force e.g. rivers or waves.
Fetch	The distance over which the wind blows over open water. Large fetch = stronger waves
Infiltration	The process of water entering soil or porous rocks
Longshore Drift	The movement of material along a beach transported by wave action.
Mass Movement	The movement of material down a slope due to gravity.
Permeable	Allowing liquids or gases to pass through it
Impermeable	Not allowing fluid to pass through.
Relief	Height/ shape of the land
Spit	A depositional landform created by longshore drift where the beach is extended into the sea by sediment transportation
Transportation	The movement of sediment by rivers or waves.
Upland/ lowland	Area of high/ low lying land
Weathering	The process of wearing or being worn by long exposure to the atmosphere.

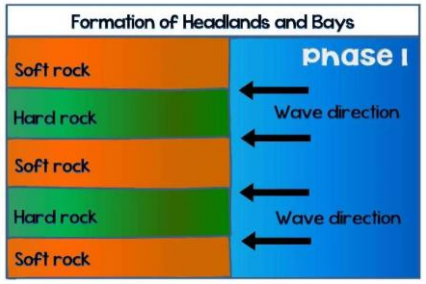
Year 10 – Geography – Changing Physical Landscapes - Coasts

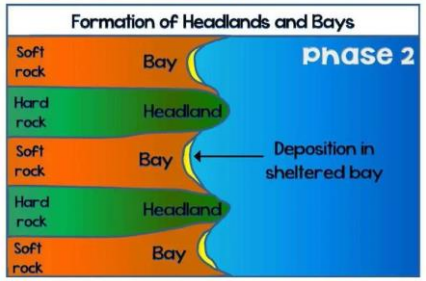
Erosional landforms

Formation of Caves, Arches, Stacks and Stumps

1. Caves occur when waves force their way into cracks in the cliff face. The water contains sand and other materials that grind away at the rock until the cracks become a cave. Hydraulic action is the predominant process.
2. If the cave is formed in a headland, it may eventually break through to the other side forming an arch.
3. The arch will gradually become bigger until it can no longer support the top of the arch. When the arch collapses, it leaves the headland on one side and a stack (a tall column of rock) on the other.
4. The stack will be attacked at the base in the same way that a wave-cut notch is formed. This weakens the structure and it will eventually collapse to form a stump.





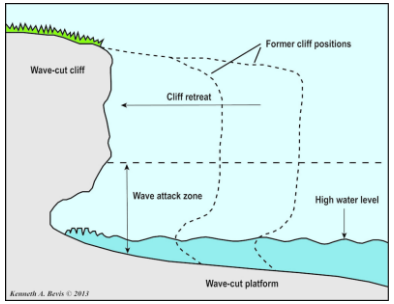


Formation of headlands and bays

1. Along a discordant coastline there are alternating bands of hard and soft rock.
2. Soft rock erodes faster causing a bay to form.
3. Harder rock erodes slower leaving behind headland.

Formation of a Wave-Cut Platform

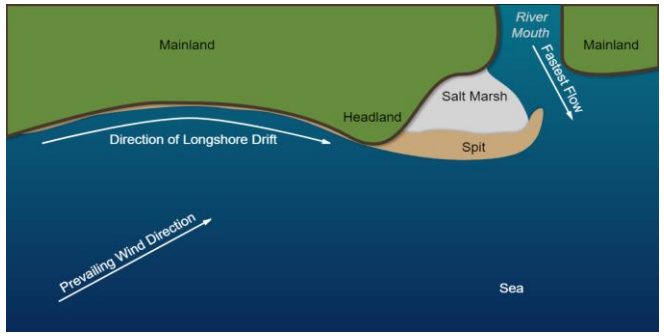
1.Weather weakens the top of the cliff.
2.The sea attacks the base of the cliff forming a wave-cut notch.
3.The notch increases in size causing the cliff to collapse.
4.The backwash carries the rubble towards the sea forming a wave-cut platform.
5.The process repeats and the cliff continues to retreat.



Depositional landforms

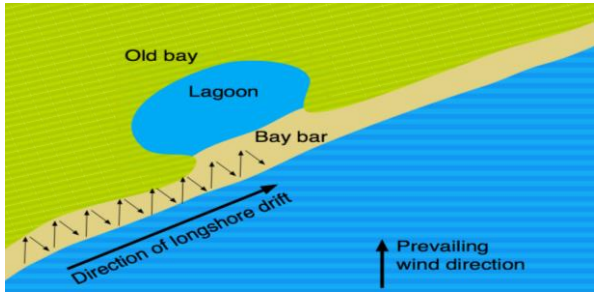
Formation of a spit

1. Prevailing wind comes in at an angle due to the prevailing wind.
2. This causes the swash to go up the beach at the same angle.
3. Backwash pulls sediment down at 90 degrees due to gravity.
4. This transports sediment in a zig-zag motion off the coastline.
5. Overtime this forms a spit.
6. A salt marsh usually forms behind a spit as it is protected from the waves.

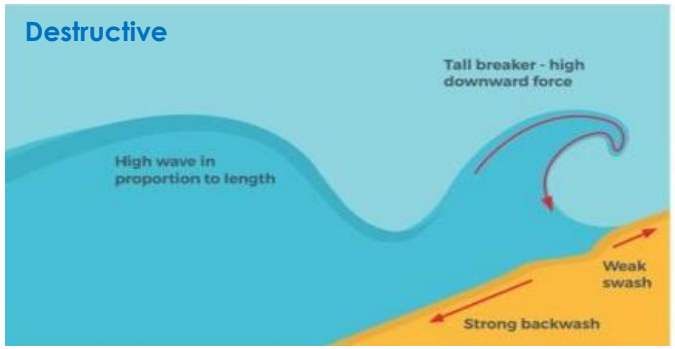


Formation of a bar

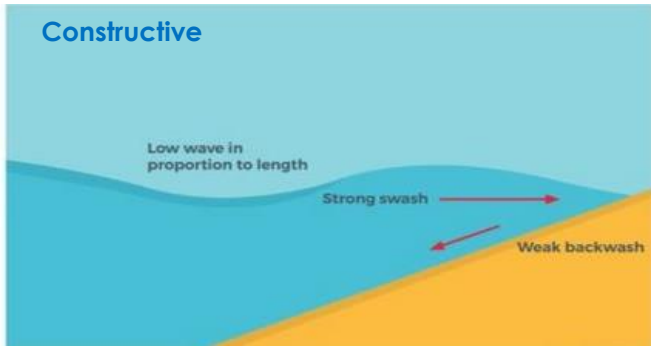
1. Prevailing wind comes in at an angle due to the prevailing wind.
2. This causes the swash to go up the beach at the same angle.
3. Backwash pulls sediment down at 90 degrees due to gravity.
4. This transports sediment in a zig-zag motion off the coastline.
5. When this occurs between two headlands, it forms a bar.
6. A lagoon will form behind the bar were the bay once was as it is protected from waves.



Waves



A strong backwash and powerful wave takes more sediment off the beach creating more erosion.



A less powerful wave deposits material. A strong swash drags material to the beach and builds them up.

Year 10 – Geography – UK Challenges

The UK's population

The UK population is currently over 67 million and through a combination of natural increase and migration, continues to rise.

If the population of the UK grows as projected, there will be an extra 8.4 million people in the UK by 2035, and a further 3.8 million by 2050.

Pressure on ecosystems

With an increase in population, an increase in food production will be needed. This expansion could reduce natural habitats.

The need for more housing will put pressure on local and national governments to release greenfield sites. The use of greenbelt land destroys open spaces and affects habitats.

New housing could be built on floodplains, increasing the likelihood of flooding.

Greenhouse gas emissions could increase through increased use of fossil fuels, leading to climate change unless alternative, sustainable energy sources are used.

Addressing the issues

Choosing alternative, sustainable energy sources to meet increased demand for energy in the UK.

Building at higher densities and using brownfield sites for new home building instead of greenfield sites.

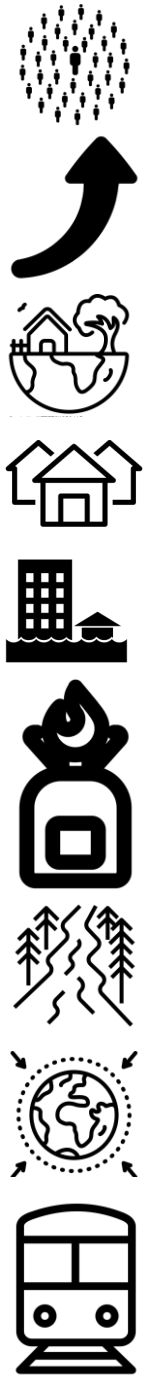
Managing river catchments to reduce the risk and impact of flooding.

Transport in the UK

Birmingham's transport is becoming more sustainable a they have a clean air zone and encourage the use of buses.

Birmingham has extended its tram-line, each tram also fits up to 200 people.

Curzon street train station has been built as part of the HS2 trainline development. This will provide jobs and connect Birmingham to both Manchester and London. This was also built on a brownfield site.



The UK's economy

The term two-speed economy refers to the idea that economic growth within the UK is not the same across the whole country.

London and the south of England have experienced faster economic growth than the north. This often results in those in the south having a better quality of life.

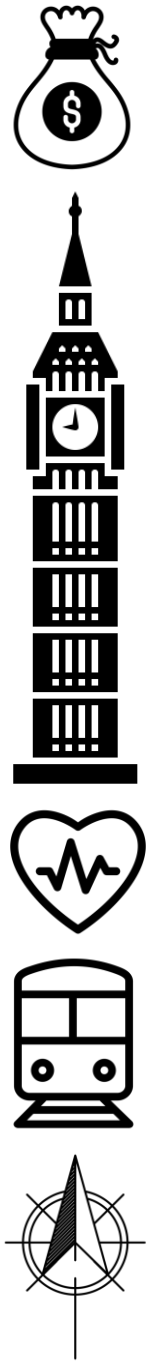
One of the reasons for this divide is that cities in the north of England experienced large-scale unemployment. This led to a loss of income and derelict land.

London also has more investment in education and transport.

The life expectancy of Liverpool is 75.7 years compared to Cambridge which has a life expectancy of 79.5 years.

Solutions to the north south divide include HS2 which will connect London to Birmingham and Manchester.

Locating businesses in the north will also create a multiplier effect and boost the economy.

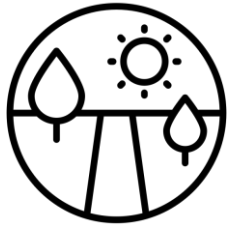


Keyword	Definition
Agribusiness	Economic activities that related to farming.
Birth rate	The number of births per 1,000 of the population.
Brownfield	Land that has been built on before.
Congestion	Heavy traffic.
Deindustrialisation	Factories closing down.
Economy	The jobs and money in an area.
Ecosystem	A community of living things and their environment.
Emigration	A person moving out of a country.
Environment	Land, air and sea.
Fertility rate	The number of babies per woman.
Fossil fuel	Resources made from the remains of living organisms.
Green belt	The area around a city to limit urban sprawl.
Greenfield	Land that has not been built on before.
Greenhouse gases	Gases that trap heat in the atmosphere.
Immigration	A person moving into a country.
Life expectancy	The average number of years a person is expected to live.
National Park	An area of protected by the state for the enjoyment of the general public or the preservation of wildlife.
Net migration	The difference between immigration and emigration.
Stakeholder	A person with interest or importance in something.
Sustainable	Good for people, the economy and the environment now and in the future.
Two-speed economy	A difference in economy, the north-south divide.
Unemployment	The number of people that do not have a job.
Urban	Cities and built up areas.

Year 10 – Geography – UK Challenges

Greenfield and brownfield sites

Greenfield sites are originally unoccupied therefore developers can build as they wish. However, it is more difficult to get planning permission as the government tends to be against it.



Brownfield sites sometimes have lower production costs and some infrastructure such as roads is already present, it is also easy to get planning permission for these sites as the government is encouraging the use of them. However, there is often the idea that the environment is contaminated which puts of buyers.

Making a sustainable choice when it comes to the use of greenfield and brownfield sites must consider people, the economy and the environment.

National parks

A national park is an area of countryside that is protected by the state for the enjoyment of the general public or preservation of wildlife.

The New Forest is a national park in the south of England. The national park is protected and advises people how to use the park sustainably by giving out a leaflet called '5 ways to use our park'.

However, 92% of visitors to the park travel there by car which pollutes the environment so more could be done to discourage this.

Houses in national parks are being built to meet the demands of a growing population, however they often don't match the look of the area and are more expensive than houses outside of the national park.

River flooding

About 330,000 properties are at risk of flooding today, increase to between 630,000 and 1.2 million by 2080.

More people living on floodplains has increased the risk of flooding.

Changes in land use such as urban development is creating more impermeable surfaces and increasing surface runoff.

Climate change is resulting in more extreme rainfall events.

In England, the Environment agency manages flood risk. It does this by making floods less likely with hard and soft engineering strategies and making the impacts less serious by helping people prepare and giving warnings.

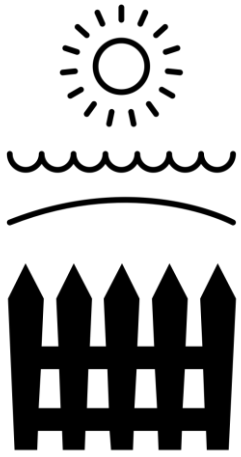
Very heavy rainfall throughout the winter of 2013 to 2014 led to the widespread flooding in Somerset. This damaged over 600 houses and local people complained the flood defences were not good enough.

Coastal flooding

Coastal flooding in the UK is also a major risk to homes, businesses and farmland. This type of flooding often results from storm surges when sea levels are higher than usual.

In December 2013, large areas of the East of England and Scotland were affected by a strong storm surge that caused widespread coastal flooding.

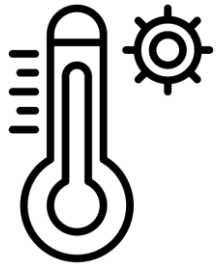
Hard and soft engineering can also be used to prevent coastal flooding, this includes sea walls, groynes, and beach nourishment.



Climate change

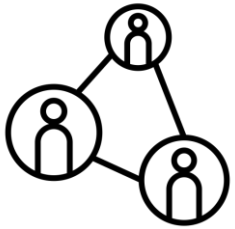
Human causes of climate change include burning fossil fuels, use of transport and cattle farming.

UK average temperatures have already increased by 1 degree Celsius in the last 100 years, by 2080 temperatures are likely to rise by 2 to 4 degrees Celsius.



Warmer and drier summers increase the risk of drought in the UK. This will bring negative impacts for people, the economy and the environment.

Climate change can be tackled by local people and communities, organisations and governments.



People can walk and cycle more. Using public transport is also better than a car.

Organisations can reduce their energy use by using LED bulbs. McDonald's do this as well as using biodiesel in their lorries.

Volvic transport their products by train in Europe which will decrease their carbon footprint.

The UK government wants to be the world leader in wind energy. Hornsea 2 is currently the world's biggest offshore wind farm.

The UK government is also signed up to international climate agreements to reduce their emissions and begin to tackle climate change.

Year 10 – Geography – Weather Hazards and Climate Change

Global Atmospheric Circulation

There are three atmospheric cells (Hadley, Ferrel, Polar) in which heat circulates (moves) globally.

Hadley cells: warm, moist air rises at equator creating rainforests.

Ferrel cells: air sinks over deserts creating dry conditions (warm deserts).

Polar cells: air sinks over deserts creating dry conditions (cold deserts).

Movements of air

Rising air = low pressure = moist conditions.

Sinking air = high pressure = dry conditions.

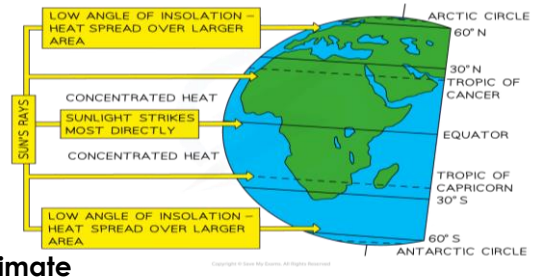
Ocean currents

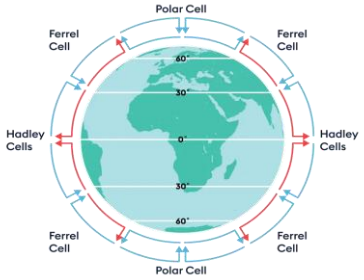
Ocean currents transfer heat energy across the globe.

The Gulf Stream of Mexico brings warm, moist air to the UK. Without this ocean current we would have a similar climate to Canada.

It is hotter near the equator because the sun hits earth at a 90 degree angle meaning it is more concentrated over a small surface area.

It is cooler near the poles because solar radiation is spread over a large surface area.





UK Climate

Climate is temperate (mild temperatures, steady rainfall). This is influenced by the sea (maritime influences)

Temperature is warmer in the south of England.

Precipitation is higher in the north and west of the UK. The is due to the altitude and relief rainfall.

The UK has gone through 2 major changes: medieval warm period (the year 1,000) and the little ice age (the year 1,700).

Evidence of climate change

Tree rings provides evidence for climate change. When they are close together during cold, dry periods and further apart during warm, wet periods.

Pollen can be used to predict what plant species lived during certain times and then be used to predict past climate.

Ice cores can be used to estimate the amount of carbon dioxide in the past which can be used to estimate past climate.

Impacts of climate change

Food production could be lower in some parts of the world and more places will experience extreme weather.

Not all impacts are negative. New shipping routes could be created due to melting ice.

Impacts in the Maldives

Maldives is at risk from rising sea level, 3mm per year. This is causing more erosion, flooding and contaminating drinking water.

89% of their GDP relies on biodiversity and the airport is only 1.2m above sea level. The economy relies on tourism and without these two things, people will not have an income.

Keyword	Definition
Agriculture	Farming
Anthropogenic climate change	Climate change caused by human activity
Atmospheric circulation	The global pattern of wind movements within the Earth's atmosphere
Carbon footprint	The total greenhouse gases produced by an individual or organisation
Climate	The average weather conditions of an area over a long period of time (usually 30 years)
Climate Change	The change in global climate
Coriolis effect	The deflection of air and ocean movement by the Earth's rotational spin
Drought	An extended period of lower than normal precipitation
Greenhouse effect	Trapping heat in earth's atmosphere
Glacial	A cold period where much of earth is covered in ice
Global warming	A rise in the global average temperatures
Jet stream	A fast moving current of air in the upper atmosphere
Interglacial	A warm period
Mitigate	To make the effects of something less serious
Monsoon	A seasonal wind that brings heavy rainfall
Solar radiation	The light and energy that comes from the sun
Storm surge	A change in sea level caused by a storm, this causes very high waves
Thermal expansion	When a liquid expands due to being heated
Weather	The day to day conditions of the atmosphere for example rain

Year 10 – Geography – Weather Hazards and Climate Change

Natural causes of climate change
The Milankovitch cycles
Eccentricity/orbit: Our orbit changes shape every 100,000 years. A circular orbit means we are closer to the sun and it is hotter, an oval orbit means we are further away from the sun and it is colder.

Precession: the earth wobbles on its axis creating warmer summers/colder winters as it wobbles towards/away from the sun.

Obliquity/tilt: the earth tilts on its axis, this is why we have seasons. When we are tilted towards the sun it will be summer and when we are titled away it will be winter.

Large volcanic eruptions can block out solar radiation and cause glacial periods.

Solar radiation can vary over time, this causes the climate to change.

Human causes of climate change
There are many human activities that result in greenhouse gases being released and trapping heat in our atmosphere.

Transport: cars become more affordable, people's disposable income increases. This involves burning fossil fuels release greenhouse gases.

Industry: more disposable income means more goods need to be made by factories. More fossil fuels are burnt.

Cattle farming: Cows release methane which is a powerful greenhouse gas.

Tropical Cyclones
Large rotating storms that start over oceans.

Features: extreme low pressure, eye (centre, calm). Eye wall (heavy clouds).

Formation:
High temperatures cause air to rise over oceans. This evaporation of the ocean creates heavy rain clouds. Cool air sinks towards the ocean surface which is then re – heated. The Coriolis effect causes the rapidly rising air to spin.

Storms need:
An ocean temperature of at least 27 degrees Celsius.

Winds at the surface of the ocean.

30 degrees north and south from the equator (enough Coriolis force). Tropical storms have a different name depending on what part of the earth they formed in.

Hurricane Sandy, USA, Developed

Social	Economic	Environmental
150 dead and millions left without electricity.	Estimated $65 billion and New York Stock Exchange forced to close.	Nature reserves damaged by storm surge and sewage leaks into water sources.

Short term	Long term
Media raised funds and charities such as Red Cross provided relief.	Rebuilding efforts set up by local government and money paid directly to homeowners to help with reconstruction.

Typhoon Haiyan, Philippines, Developing

Social	Economic	Environmental
6000 dead and thousands homeless.	Estimated $2 billion and transport disrupted.	Coastal mangroves damaged and chemical leaks from industry

Short term	Long term
State of 'national calamity' and aid slowed by damaged ports and roads.	Development in the country was paused so long term aid was needed.

Causes of Drought
Meteorological:
A lack of precipitation (rainfall).

Hydrological:
Water dries up so there is a lack of water stored in lakes, rivers and groundwater.

Human:
Dams: they stop water moving down the river. This can cause a lack of water in another area.

Agriculture: using too much water for farming.

California, USA, developed

Causes:

Over abstraction from the Colorado River (shared with 5 states) and lower than average rainfall across western USA.

Key effects:

Subsidence affected structure of buildings and wetlands and rivers receive less water (due to diversions for domestic use) which affects ecosystems.

Responses:

Reducing water supplies down to minimum for health & safety, running education to limit water wastage and increased monitoring of rivers to check levels.

Ethiopia, developing

Causes:

Short rainy season (since 1980s) becoming increasingly delayed.

Key effects:

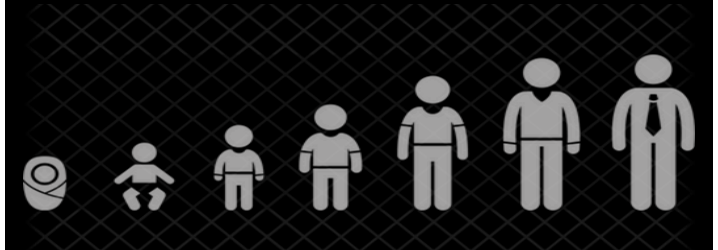
85% of population live in rural (dependent on farming to survive), 57% of Ethiopians have access to an improved water source and hunger & malnutrition has led to famine in the past.

Responses:

- 'Live Aid' concert to raise awareness & funds and developing drought resistant crops (to allow self sufficiency)

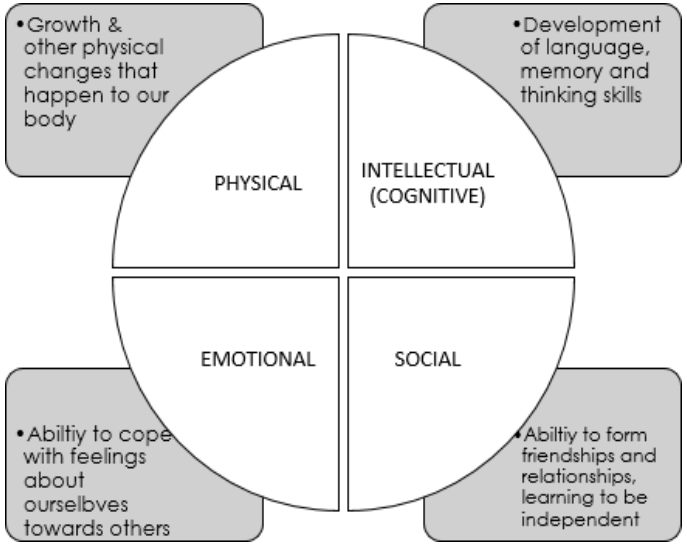
Year 10 Health and Social KO – Component 1 Learning Aim A – Human Growth and Development

Growth & Development are changes that individuals experiences through the life stages.



There are FOUR key aspect of growth and development.

1. **PHYSICAL**
2. **INTELLECTUAL**
3. **EMOTIONAL**
4. **SOCIAL**



		Key Words
Life Stage		A life stage is a distinct phase that an individual goes through during their lives
Growth		Is physical and results in a measurable increase in size including body weight and height
Development		Learning of intellectual, emotional and social skills. For example, reading, bonding, and making friends
Physical	Gross Motor Skills	Skills involving large muscle movements, such as independent sitting, crawling, walking, or running.
	Fine motor skills	The ability to control and coordinate the movements of the hands and fingers i.e. painting, writing, tying shoelaces.
	Primary sexual characteristics	These characteristics are present at birth and include ovaries, testes and penis, during puberty these organs mature.
	Secondary sexual characteristics	These characteristics appear during puberty and cause changes in shape and height of the body.
	Puberty	During adolescence, young people experience a period of change. This starts when the brain releases chemicals called hormones, which cause changes to their sexual, characterises.
	Menopause	The natural and permanent stopping of periods, occurring usually between the ages of 45 and 55.
	Mobility	The ability to move or be moved freely and easily.
	Skin elasticity	Skin's ability to stretch and snap back to its original shape, Happens in later adulthood
Intellectual	Language development	The process by which children go through as they learn to communicate with others using speech or words.
	Problem solving development	Needed to work things out and make predictions.
	Abstract and creative thinking,	The ability to think about something that might not even exist.
	Loss of memory and recall	Sometimes leads to dementia which is a illness affects the brain and memory and makes you gradually lose the ability to think and behave normally.
Emotional	Bonding and attachment	A form of attachment with a carer or parent.
	Independence	This involves doing things for yourself and making decisions without others.
	Self-esteem,	How people respect and value themselves.
	Contentment,	How happy someone is with his or her life.
Social	Formation of relationships	These involve developing the skills to interact with other people in formal and informal situations. Can turn intimate in adulthood.
	Socialisation	The activity of mixing socially with others.

Life Stage – PIES development		Physical Development	Intellectual Development	Emotional Development	Social Development
	Infancy 0-2	Growth and develop rapid **Gross Motor Skill Development:** *control their head, roll, crawl, stand alone, climb onto furniture, walk.* **Fine Motor Skill Development::** *grasp a rattle, palmer/pincer grasp, hold cutlery, draw lines and circles*	Rapid growth in language and intellectual skills. *Babbling, imitation of sounds, tow-word sentences.*	The quality of an infants attachment with a carer may affect emotional development for the rest of the child's life.	Infants interact with carers, they smile and form an emotional attachment.
	Early Childhood 3-8	Growth and develop rapid. *Children develop:* **Gross Motor Skill Development:** *run, balance, ride a bike, kick, throw, body coordination.* **Fine Motor Skill Development:** *write, draw, dress themselves, tie shoelaces, build a tower of cubes.*	Children begin to form simple sentences, knowledge of vocabulary grows rapidly and by the end of this life stage children can speak using full adult grammar.	Children use their imagination to understand social roles. They develop an idea of self-concept	. Children begin to learn social roles and behaviour within their family context. They will experience the stages of play
	Adolescence 9-18	The body continues to develop. **Growth Spurts** with the development of primary and secondary sexual characteristics: *Female:* Develop breasts, Grow pubic hair,hips widen,periods start *Male:* Penis & testes grow larger, grow pubic hair, muscles develop, can ejaculate sperm, Larynx (voice box) grows, voice breaks & becomes deeper	Adolescents think differently to young children. They start to apply the knowledge and skills they have gained from the first stages of their life. This helps them to think logically. an adolescent should be developing moral values- knowing right from wrong	The sense of self continues to develop. An understanding of their identity needs to develop to feel secure and make loving, sexual attachments.	Young people question their identity and who they are, they begin to see themselves as separate and independent from their family. They may question family values and become influenced by peer groups
	Early Adulthood 19-45	Your body has reach PHYSICAL MATURITY and there is little growth. Reach full height and strength. Pregnancy, lactation and perimenopause. Often adults put on weight, lose elasticity of the skin, muscle tone and strength, some people may show other signs of greying and thinning of hair. Most body systems continue to function fairly well, the heart become more susceptible to disease. Mobility and dexterity become more difficult and there are small changes in the brain,	Getting a job involves learning new skills. Many skills are also needed when a person leaves home and lives independently. These include cooking and managing a home and a budget. All these have to be learned. Raising children also involves learning new skills. Have learned from experience and are better at problem solving and making decisions	When we leave home we have to be independent & self reliant to cope. Living with a partner takes a high level of emotional maturity if the relationship is not to break down when there are problems. People have to understand their own emotions & those of their partner, & be able to control the way they respond to their emotions. Having children means accepting new responsibilities. Babies are very demanding & this can cause a lot of stress. Adults have to be emotionally mature to cope with this.	New types of relationships- may have a partner or get married -this means making decisions, accepting responsibility & sharing. Relationships with parents change. Young adults start to relate to their parents more as equals. Starting a job involves developing working relationships.
	Middle Adulthood 45-65	Aging process begins Muscle tone decreases Lower energy levels Hair greys Sight and hearing might start to decline Women - menopause	*Variety of jobs throughout* *Memory might not be as quick* *Life events develops stronger knowledge* *May have new knowledge*	Hormone changes – mood swings! Review life at this stage Recapture youth Try new things Mid- life crisis Empty nest feeling when children leave home	More time and money on their hands as the children have gone High unemployment and limited job opportunities Support adult children or care for grandchildren
	Late adulthood 65+	Skin wrinkles, hair thins & goes grey; Bones are more fragile Sight, hearing and body organs are less efficient, Mobility and balance becomes poor	Memory and reaction time becomes poor Sometimes confused Wider experience helping judgement	Time to spend more quality time with family and friends. Life partner and friends may pass away. This can be distressing and hard to cope with. The support of family, other friends and neighbours can be really important at this stage to make sure the person does not feel isolated and lonely.	Following retirement older adults have more free time to take up hobbies, pastimes and travel. Some older people miss regular contact with workmates, others enjoy having more time to spend on their hobbies & interests. • How people are affected may depend on their income.

Year 10 Health and Social KO – Component 1 Learning Aim B – Life events and types of support

KEY WORDS for LIFE EVENTS	
Life event	A change in an individual's life, which can cause disruption or positive change to their lifestyle and everyday activities
Expected	Something that is **likely** to happen 
Unexpected	Not thought it is likely to happen 
Physical events	Making changes to your physical health, body or mobility.
Relationship changes	A significant change in relationship status such as engagement, marriage, divorce, separation or death.  
Life circumstances	Impacts on day to day life and the choices you make.
Reasoning	The action of thinking about something in a logical and sensible way.
Adapt	To adjust to new conditions or circumstances
Professional	Describes a member of a profession who is trained and skilled in their area of work
Transition	The process of changing from one state or condition to another.
Disposition	An individual's **attitude** or **qualities**
Income	Money received on a regular basis from work.
Long term illness	An illness that cannot be cured by medicine or treatment.
Restriction	A limitation of someone or something.
Responsibility	Being accountable, having control over something or being to blame.
Chronic illness	**Another word for a long term illness.**
Lifestyle	The way in which a person lives
Grief	Intense sorrow, caused by someone's death
Mutual understanding	**A shared feeling or action, in which both people involved have sympathy for.**

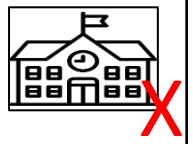
Physical life event	Relationship change	Life circumstance
Ill health	Bereavement	Moving house
Accident and Injury	New relationships	Starting or moving school
	Marriage	Exclusion from education
	Divorce	Redundancy
	Parenthood	Retirement

TYPES OF SUPPORT		
Informal support		Informal support is given by anyone who you know **outside of a professional capacity.** This could be **family** and **friends** or those you know well. This will involve the supporter offering security and **practical help,** through **emotional support** and **information and advice.**
Formal support		Formal support is offered by **statutory care services** provided by the government. It could also be from **private care services** and **charitable organizations.**
Emotional support		This involves showing **empathy**, **compassion** and **genuine care** for others. This can be via informal, formal or voluntary support.
Practical help		This involves helping an individual practically by helping them with finances, childcare or transport issues such as finding alternative transport services.
Information and advice		Involves providing the individual with information to improve their life event or circumstance. This will help them to understand where to go for help? What services are available? How that will benefit them?
Voluntary support		Working for free and offering support, working alongside those providing **informal** and **formal** support. This could involve organisations such as The Princes Trust and Relate.
Occupational therapist		Helping ill and disabled people to continue with daily activities and tasks at ease. This will include shopping, making meals and walking upstairs.
Counsellor		A person trained to give **guidance** on personal or **psychological** problems.
Accident and injury		Something that happens unexpectedly at an abrupt state. This means the individual will have to adjust quickly to their new life circumstance.
Social worker		Assists individuals handle everyday life problems who have experienced **neglect**, **abuse**, **mental health** and **domestic violence.**

New relationship:
New relationships develop qualities such as trust, patience and empathy. Having a new relationship will teach individuals about their own qualities, and how equal compromise is important. Having a relationship can take time to adjust to, especially if you have been used to independence. Mutual understanding is highly important when forming new relationships with others.

This can involve intimate relationships and friendships.

Exclusion from education:
Removing a child from education, could eliminate the issues that caused the exclusion, relieving stress and anxiety. However, moving to a new school or educational provision can cause apprehension about new routines and lack of interaction and socialisation. Missing out on valuable learning, can have a negative impact on intellectual development.



Engagement:
Engagement shows commitment to another individual. On acceptance, mutual understanding between both partners is important as they are planning to commit to each other for their remaining life. Engagement will be exciting for both, as planning for a wedding, house and family can be discussed.

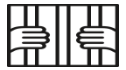
Marriage/Civil partnership:
Marriage/Civil partnership is a joining of two people together. This is a very happy time, as both individuals can forge a new life together, make plans and goals they want to achieve. This could involve starting a family.
Marriage/Civil partnership involves trust, honesty, mutual understanding, respect and empathy.
Couples will need to adapt to living together, changing their lifestyle to suit both partners equally, provides security and safety. It will also involve sexual intimacy.

Divorce/Separation
According to research, divorce is the second life event after death that has the highest emotional impact on an individual. By having strong family ties, support and stability can be offered during the uneasy time of divorce. However, a break down in relationship causes insecurity, which can lead to low self-esteem. With a loss of wider family networks and friendships, social development can be affected.
A positive outcome of divorce, if both people were unhappy, a fresh start could be needed for them to take a new direction in life.

Redundancy
Although this can be devastating, it can be an opportunity for a career change. Losing a job, can have an impact of lifestyle and diet, with a loss of earnings food options and socialising may be limited.

Moving house:
Moving house is an exciting time, it can involve a couple, friends or just the individual. There are opportunities to meet new people and join a new community. However, there can be apprehension moving away from family and friends and starting in a new community of unknown people. There are also pressures from up keeping mortgage fees and household bills.

Imprisonment:
Being imprisoned offers reflection, for the individual to solve issues to change their life. There are options for learning and developing new skills through voluntary roles within the prison. However, a loss of independence and socialisation, will have a negative impact on emotional and social development.



Parenthood:
Parenthood is an exciting time. You are bringing a new life into the world, which involves responsibility, and can cause anxiety especially if there is a single parent. There will be less time for themselves, and more time focused on looking after their child. A change of lifestyle and routine, can cause lack of sleep, adding pressure to the relationship. However, having a child brings positive emotions, excitement and content.

Bereavement:
With an expected death, this can be easier to come to terms with, as emotionally the people around have prepared themselves for death. This doesn't make it easier to get over, as death is a gradual process of coming to terms with. If it is unexpected, this will take longer to come to terms with. It is not about getting over the death, but finding a way to cope with the fact it has happened.

Year 10 Health and Social KO – Component 2 Learning Aim A – Health Services, Illnesses & Barriers to Access

SERVICES	
Primary care	**Healthcare provided in the community for all individuals. The individual makes the initial approach to a medical professional.**
General Practitioners (GP)	Treat all common medical conditions and refer patients to hospitals and other medical services for urgent and specialist treatment
Nurse	Practice nurses provide nursing and health care support, duties include vaccinations, new patient assessments and monitoring patients with long term conditions
Dentist	Dentists run daily clinics to diagnose and treat dental issues. Tasks include: advice, clean teeth, perform minor surgeries.
Optician	Examine eyes for vision problems, diagnose and treat eye disease, prescribing glass & lens if needed.
Pharmacist	Give advice on minor conditions, recommend medication and dispense prescriptions.
Walk in Centres	Provide routine and urgent treatment for minor injuries. No appointment needed.
Secondary care	**Primary care professional refers you to a specialist, you are then in secondary care.**
Cardiologist	Specialises in diagnosing and treating diseases of the heart. they may carry out tests, and they may some do procedures and surgeries.
Psychologist	Assess, diagnose and treat individuals suffering from mental distress and mental illness
Physiotherapist	Treats people who have mobility, breathing and neurological problems
Orthopaedics	Specialise in disorders of eye movements and diagnostic procedures related to disorders of the eye and visual system.
Tertiary Care	**Patient needs higher level of care within the hospital. Tertiary care requires highly specialised equipment and expertise.**
Dermatology	Dermatologist specialises in treating skin, nail and hair disorders.
Psychiatry,	They make a diagnosis and work with you to develop a management plan for your treatment and recovery for mental illnesses.
Allied Professionals	**Professionals who may not be medically trained but use their knowledge to support peoples health.**
Podiatrist	Provides essential foot care for individuals with diabetes, circulatory and nerve damage.
Art therapist,	Helps people who have behavioural and emotional problems by using drawing, painting and other art.
Dietician,	Uses their expert knowledge about the science of food to advise and support individuals in their dietary needs.
Social worker	Provide advice, support and resources to individuals and families to help them solve their problem
Youth Worker	Personal and social development.support for young people between 11-25.

ILLNESSES		
Asthma		Your **airways are sensitive** and become inflamed and tighten when they breathe if anything irritates them. This ca cause **tightness** and **wheezing** and make it hard to breathe
Diabetes Type 2		A condition that causes **high levels of glucose** in your blood because you have a problem with producing insulin. This means the glucose stays in the blood stream and can't be used to give you energy.
Dementia		**Memory loss** can be a problem. Risk increases with age
High Blood Pressure		When your **blood pressure**, the force of your **blood** pushing against the walls of your **blood** vessels, is consistently too **high**.
Autism		A disorder affecting brain development. It may affect the way a person relates to their environment. Some people find interacting more difficult than others.
Hearing Impairment		Is a **partial or total inability to hear**
Speech Impairment		A condition in which the ability to produce **speech** sounds that are necessary to communicate with others is **impaired**.
Mobility		**Mobility** refers to whether you can move an injured body part, like a joint or a limb.
Skin Conditions		**Acne**, **eczema**, seborrheic dermatitis, skin cancer and psoriasis are the five most common skin disorder
Gum Disease		**Swelling** of the soft tissue and abnormal loss of bone that surrounds the teeth and holds them in place.
Incontinent		Any **accidental or involuntary loss of urine** from the bladder or bowel motion, faeces or wind from the bowel.

Physical Barriers

Physical barriers are the structural difficulties that may limit service users' access. Includes- doors not being wide enough, uneven surfaces, lifts not working, no ramps etc.

Overcome - planning access before travel, amendments made to building to support equal access, consideration and careful planning of the services which need to be accessed.

Sensory Barriers

Sensory barriers are when an individual has an impairment which impacts their senses. Includes vision loss or hearing loss which may make process more difficult for them and cause them distress.

Overcome - by amending environments to support them or providing them with adaptive equipment to make their access easier.

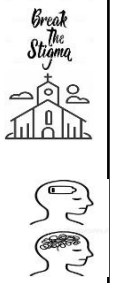
Social, cultural and psychological barriers

Social Barriers - linked to stigmas within the community; this could be stereotypes, addiction or opening hours of services.

Cultural barriers- may be limitations linked with their traditions, religion or beliefs. This may include; Gender of professionals or belief in treatments being offered.

Psychological barrier- may be fear, anxiety, mental illness, self-diagnosis or negative experiences that limit access.

Overcome - taking individual's preference's into consideration when offering services, making reasonable adjustments and, having a wider variety of professionals available to support.



Language barriers

Language barriers are when verbal communication struggles to be corresponded between two people or a group. This may be due to not speaking the native language, learning difficulty which impacts speech, use of improper English etc.

Overcome - by having translators in place to support the transition to a common language, use of alternative communication methods such as images and interpreters.

Geographical Barriers

Geographical barriers are when services cannot be effectively utilised due to their location. This may be due to fuel prices, public transport, and distance to the service.

Overcome - by voluntary services supporting with transport, having mobile units to provide treatment, or refunding fuel and car parking charges for long term health patients.

Intellectual Barriers

People with intellectual disabilities may be due to genetic conditions, childhood illnesses, or they may be uneducated and struggle to learn.

Overcome - breaking down information to the ability of the service user and reiterate key points, avoid noisy areas so information is clear, involve a family member or advocate as someone who can also be aware to repeat the information when required.

Resource Barriers

Resource barriers are when services struggle to provide adequate equipment, treatments and building to support the growing needs of service users. Also, having a lack of staff can affect how the services are provided and the quality of care people receive.

Overcome - government can redistribute funding to meet the needs of all, organising skills and equipment to make the most of what is available, reducing waste and amending ideas to stretch the availability of resources.

Financial Barriers

Financial barriers links to the use of money. This may be travel expenses, paying for services, or not having any disposable income to pay for preventative services.

Overcome - by the NHS having financial exemptions for vulnerable people, having services free at point of contact and also to refund expenses to ensure that services users are not missing out services due to their income.

Year 10 Health and Social KO – Component 2 Learning Aim B – Values in Health & Social Care

Empowerment & Prompting Independence

When you feel in control of your life.

Able to make decisions for yourself.

Positives

+ Higher self respect & confidence levels
+ Happier
+ Make safer hoices

Negatives

- Depression & Social Isolation
- Un safe choices
- Loss of self respect & confidence

Respect for the individual

Taking into account someone's feelings wishes and rights.

Being tolerant of others
Accepting views
Keeping people information private
Treating people as an individual

Positives

+ Promotes sense of belonging
+ Increase self-respect and confidence

Negatives

- Depression & Social Isolation
- Anger

Maintaining confidentiality

Keeping information that you have been told by the service user private.

Confidentiality can be broken only if the service user was in any form of danger
This includes storage of personal data and information in safe places.

Positives

+ Confidence in others

Negatives

- Distrust
- Anger

Preserving the dignity of individuals

Respecting a person's self-worth & treating them with care & respect, considering their feelings.

Need to consider how to protect their dignity.

Positives

+ Higher self-respect & confidence levels
+ Happier

Negative

- Depression & Social Isolation
- Loss of self-respect & confidence

Effective communication

Communication is messages we give through verbal and non-verbal means.

To be effective must show:
1. Empathy – understand feelings of others.
2. Warmth – demonstrate you care

Positives

+ Listen more carefully
+ Understand messages given
+ Happier

Negatives

- Confusion
- Unhappy and unrusting

Safeguarding & Duty of Care

Keeping people safe from harm. Health professionals have a legal duty to protect.

Health professionals user their understanding of the signs of danger and harm, they will be able to protect others.

Positives

+ People feel safe
+ Harm stops

Negatives

- Abuse
- Unhappy

Promoting anti-discriminatory practice

Discrimination = treating a person or groups unfairly or less well than others.
This happens due to disability, race, gender, religion, sexuality, age etc…

Anti- discriminatory practices don't treat people or groups unfairly.

Positives

+ Feeling of belonging community
+ Higher self respect & confidence levels
+ Happier

Negatives

- Feeling isolated
- Disempowerment
- Physical health problems
- Low self-esteem & mental anxiety

	Continuity	Change
Crime	Theft has always been a popular crime committed in Britain. It has existed through the early – modern period into the present. • Violent crimes have always existed in England. • Smuggling continues to exist in Britain – the items that are smuggled change a lot. • Drink driving continues – going from horse and carriage to cars.	Race crimes and drug crimes become much more serious in Modern Britain. The weapons used in volent crimes start to change – with wider access to firearms increasing gun crime. Smuggling cigarettes, alcohol and illegal drugs became much more common. Terrorism is not new. There is modern ways of communicating which means that ordinary people are at risk.
Law enforcement	Police continue to patrol neighbourhoods where there are crime issues. 'Bobbies on the beat' are police who patrol areas to keep crime low. - These are replaced with groups of Neighbourhood Watch – who are volunteers to protect their communities. The goal of catching criminals and preventing crime remains the same.	• Modern transport means that police can reach the crime scenes faster. • It also means there are less police on the street which people don't always like. Sometimes police are armed with guns – making them look like the military. Use of science and technology by police: Radios, DNA evidence, CCTV, Finger printing.
Punishment	Prisons are still used as a way to extend a prisoner's punishment. Prisons continue to teach important skills such as cooking, cleaning – but the public don't always support prisons that seem too 'nice. The death penalty continues up until 1998 when it is abolished (got rid of).	New types of punishments include – community sentences: working on projects to make an area nicer. Anti-social behaviour order (ASBO's) Electronic tagging to track individuals' movement. Abolition of the death penalty as a punishment for major crimes.

Year 10 – History – Crime, punishment and law enforcement 1900 – Present (Modern Britain)

Second order concepts:
Change and continuity. Similarity and difference. Significance. Chronology

Present (Modern Britain)

As Britain has developed and changed since 1900, criminals have found new and different ways of committing crimes involving people, property and the government.

Modern law enforcement is a mixture of community and police groups.
- The police continue to patrol the streets in Britain preventing crime.
- Community groups also try to help keep areas safer, especially in neighbourhoods.

Preventing crime becomes a main goal of the police in modern Britain – not just catching criminals.

Very quickly technology starts to improve – meaning criminals have much less freedom from being caught for their crimes.

Support officers such as PCSO's work with schools and communities to improve local policing.

Conscientious Objectors (CO's)

Conscription is a law that forces people to join the army to fight for their country – people cannot usually get out of this service as it is compulsory (forced).

Conscientious objectors are people who have religious, moral or political disagreements to war.

People treated Conscientious objectors quite poorly – they felt that they were not doing their part during the war, when everyone was getting involved in some way.

The Derek Bentley Case

In 1953 Derek Bentley was hanged for Murder. His execution was incredibly controversial and helped to abolish (get rid of) the death penalty in Britain.

- Derek Bentley had a learning disability and the mental age of 10 as an adult.
- After a failed robbery he was arrested and sentenced to death.
- He tried to appeal (fight) this punishment, but he was hanged on the 28th of January 1953.

Derek Bentley's death is also remembered as it increased the number of people who did not agree with the death penalty.

Year 10 – History – Crime, punishment and law enforcement 1900 – Present (Modern Britain)

Key Word	Definition
Hate crime	A crime, typically one involving violence, that is motivated by prejudice based on ethnicity, religion, sexual orientation, or similar grounds.
Extortion	The practice of obtaining something, especially money, through force or threats.
Neighbourhood watch	A scheme of systematic local vigilance by householders to discourage crime, especially burglary.
Borstals	A prison institution for young offenders.
Conscientious objectors	A person who for reasons of conscience objects to complying with a particular requirement, especially serving in the armed forces.
Bentley Case	Reasons Derek Bentley was a young man who was hanged for the murder of a policeman in 1953. His case was controversial and lead to people questioning the death penalty much more.
Cyber crime	Crimes usually with the involvement of technology in some way.
Abolish	**Putting an end to something (usually a system, law or tradition).**
Reform	Make changes in (something, especially an institution or practice) to improve it.
Tribunal	A body established to settle certain types of dispute.
Prevention	**The action of stopping something from happening or arising.**
Smuggling	**The illegal movement of goods into or out of a country.**
Terrorism	**Violence or aggression usually with the end goal of causing terror or fear on a group of people.**
Drug crimes	**Crimes that involve the use, transportation or selling of drugs.**
Rehabilitation	**The action of restoring someone to health or normal life through training and therapy after imprisonment, addiction, or illness.**
Death penalty	**Punishment by execution – usually for a serious crime.**
Conscription	**Compulsory enlistment for state service, typically into the armed forces.**
Authorities	**The power or right to give orders, make decisions, and enforce obedience.**

	Anglo-Saxon	Norman	Later Middle Ages
Crime	Crimes against **property**: Theft, Selling poor quality goods, Counterfeiting coins, Poaching, Stealing crops. Crime against **authority**: rebellion. Crime against **person**: Murder, Assault , Rape, Drunkenness.	The Norman invasion was not welcomed by the Anglo-Saxons and there was much resistance for the first few years, including large **rebellions.** **Forest laws**: only those people who paid for hunting rights were allowed to hunt in the Royal Forest. All crime was seen as disturbing the **king's peace**. As a result, more offences became capital crimes.	**Treason** is officially made a crime under King Edward III. **Heresy** officially became a crime in the 1400s.
Law enforcement	A **shire reeve** (later the sheriff) was a local man appointed by the community to take criminals to courts and make sure any punishment was carried out. **Hue and cry**: The victim or a witness to a crime raised a hue and cry shouting to alert others. **Tithings**: 10 households, all men over 12 responsible for each other **Trial by ordeal** such as cold/hot water, hot iron and blessed bread.	**Foresters** were used to enforce the forests laws. **Community policing** was still heavily used as the Anglo-Saxons were effic in it. The Normans **introduced trial by combat** (showing the more military nature of Norman society)	**Justices of the Peace** Act (1361), JPs had the power to hear minor crimes in small courts four times a year. The **watchman** tracked down criminals at night. 1250s, **parish constables** led the chase for the criminal after the hue and cry was given and tried to keep the peace. They arrested suspects. **Trial by ordeal** and by combat were abolished in 1215.
Punishment	**Wergild**: system of paying compensation to victims of crime. Corporal punishments such as maiming were fairly common but capital punishment was rarely used. Fines were most common. **Prisons** were only used for holding serious criminals before.	If an Anglo-Saxon murdered a Norman, and the culprit was not caught, a large sum of money had to be paid to the king, this was the **Murdrum fine.** Use of capital and corporal punishments rose dramatically.	Use of **capital punishment** gradually decreased, although crimes against authority were still harshly punished being hanged drawn and quartered and being burnt at the stake. Commoners were usually hanged for murder while nobles were usually beheaded. **Corporal punishments** were still widely used such as stocks and pillories or flogging. **Fines** became more common.

Year 10 – History – Crime and Punishment Medieval England 1000- 1500

Second order concepts:
Change and continuity. Similarity and difference. Significance. Chronology

Medieval Society

Social hierarchy

King: chosen by God, the most important person in the country. He controlled the land, protected the country from attack and protected citizens with laws.
Nobility: were the king's main supporters and advisers. In return for land, the nobles provided the king with knights and military service
Peasants: farmers who worked the land and lived in villages

Land division

Shires (a county) were split into **hundreds** (area of land) and each hundred was divided into ten **tithings** (an area controlled by a group of men). Most people lived in small hamlets or on farms, or in villages and a few small towns.

The Church

The Church was extremely **powerful** and so had a **large influence** over how crime and punishment worked. The Church courts provided alternative trials and punishments. Changes in Church law sometimes directly affected the countries laws.

Sanctuary, benefit of the clergy, church courts and the abolition of trial by ordeal demonstrate the power the church has on law and order.

The church was more lenient and focused on moral crimes.

Year 10 – History – Crime and Punishment Medieval England 1000- 1500

Key Word	Definition
Crime	An action that breaks the law.
Punishment	A consequence given out to a person who has committed a crime.
Law Enforcement	Methods of policing and upholding the law
Petty crime	A minor, less serious crime.
Serious crime	A crime with severe harm or threat.
Moral crime	A crime against the social norms.
Retribution	A punishment where someone takes revenge on the criminal
Deter	A punishment to stop other crimes being committed
Compensation	something, typically money, awarded to someone in recognition of loss or suffering
Capital Punishment	The death penalty.
Corporal Punishment	Physical harm caused to a criminal, e.g. cutting off a hand
Wergild	compensation paid to the victims of crime or to their families.
Tithings	group of ten men who were responsible for each others' behaviour
Trial by Ordeal	A trial to determine guilt, decided by God
Murdrum Fine	The whole community pays a heavy fine if a Norman was murdered there.
Forest Laws	Most of the land became under the Kings control and made hunting/gathering wood illegal
Benefit of the Clergy	Claim to be clergy to be tried in the Church Court
Sanctuary	Safe places/protection from the law

Year 10 – History – Crime and Punishment. Early Modern England 1500- 1700

Second order concepts:
Change and continuity. Similarity and difference. Significance. Chronology

	Continuity	Change
Crime	Crimes against **property**: Petty theft, Selling poor quality goods, Poaching, Stealing crops. Crime against **authority**: rebellion, treason, heresy Crime against **person**: Murder, Assault , Rape, Drunkenness.	**Vagabondage:** an unemployed, homeless person who wanders from town to town. New laws such as the 1601 Poor Law made separated the types of poor into deserving or undeserving. **Witchcraft:** those thought to be working for the devil. New laws were introduced to make this a serious crime.
Law enforcement	**Community policing** was still heavily used as there was no official police force. **Hue and cry**: The victim or a witness to a crime raised a hue and cry by shouting to alert others. **Justices of the Peace:** People of local importance who judged manor court cases. The often gave people fines or ordered them to be whipped.	A **Town Constable:** was a local man appointed by the local authority to arrest suspects and take criminals to courts and make sure any punishment was carried out. A **Watchman:** All male householders were expected to volunteer and it was unpaid. They patrolled the streets at night with a lamp and a bell to alert people
Punishment	**Fines**: system of paying compensation to victims of crime. **Corporal punishments** such as maiming and flogging became more common **Capital punishment** were still used and rose drastically, including hanging and burning. **Prisons** were only used for holding serious criminals before.	**Transportation:** sending criminals to colonies in North America or Australia to do manual labour as punishment. They were sentenced to 7 or 14 years. **The Bloody Code:** the number of crimes punishable by death increased. At the high of the Bloody Code over 200 crimes were punishable by death, including stealing a loaf of bread. **Houses of correction:** Inmates were whipped and made to do hard labour

Early Modern Society

There was an increase in population and a decrease in the feudal system. There was high unemployment and more people moved to towns in search of work.

There were changes to religion due to the **Tudors** who changed the religion **from Catholicism to Protestantism** causing an increase in crimes against authority.

England was becoming wealthier with trade opportunities and exploration, finding new goods. However, the majority remained poor.

Printing press enabled more education but also increased hysteria around new crimes, witchcraft and vagabonds.

Under the **Stuarts** society saw political changes as the people executed their own King Charles.

The Church

The Church became less powerful under the English reformation. People saw the Church as being greedy. Church courts still tried clergy but only moral crimes. The Benefit of the Clergy was changed to ensure serious crimes could not claim benefit and sanctuary was abolished was James I.

The Gunpowder Plotters 1605

When James I continued with anti-Catholic laws, a group of Catholic rebels, led by Robert Catesby, plotted to assassinate the king on 5 November 1605.
The plot was unsuccessful when Guy Fawkes was found under parliament with barrels of gunpowder. The plotters were punished harshly after they were found guilty of treason.

The witch-hunts of 1645-47

The witch-hunts were when people actively tried to discover witches. This period was during the civil war, a time of great upheaval for the people. Hundreds of women were investigated. Matthew Hopkins was a witch hunter who investigated around 300 people, 112 of those were hanged.

Year 10 – History – Crime and Punishment In Britain 1000-present – 1500-1700

Key Word	Definition
Reformation:	When England left the Catholic Church and the country became officially Protestant
Printing Press:	A machine used to transfer text and images to paper with ink.
Enclosure:	To take land that had formerly been owned by a village and change it to privately owned land with fences or hedges around it
Social Crime:	An act most people don't believe is criminal and which they are prepared to commit or ignore
Treason:	A crime against the country (monarch)
Heresy:	A crime against the country's religion
Vagabond:	A homeless, unemployed person
Witchcraft:	The crime of practising magic and worshipping the devil
Watchmen:	Watchmen: patrol the streets between 22:00 and dawn. Watchmen carried a lamp and rang a bell to warn people to go home or risk being identified as criminals.
Town Constable	: appointed and employed by the town authorities. The constable was expected to turn serious criminals over to the courts, break up fights, round up vagrants,
Capital Punishment:	The death penalty.
Corporal Punishment:	Physical harm caused to a criminal, e.g. cutting off a hand
Vagabond:	A homeless, unemployed person
Transportation:	Sending criminals to North America and, later, Australia
The Bloody Code:	The death penalty passed for minor crimes
Hung, drawn and quartered:	fastened to a hurdle, or wooden panel, and drawn by horse to the place of execution, where he was then hanged (almost to the point of death), emasculated, disembowelled, beheaded, and quartered.
Stocks and pillories	Stocks secured ankles while the pillory secured the arms and neck.
Civil War:	A fight between citizens in the same country

Year 10 – History – Crime and Punishment. Industrial England 1700- 1900

Second order concepts:
Change and continuity. Similarity and difference. Significance. Chronology

	Continuity	Change
Crime	Crimes against **property**: Petty theft, Selling poor quality goods. Crime against **authority**: treason, heresy Crime against **person**: Murder, Assault , Rape, Drunkenness, pickpocketing.	**Highway Robbery :** This crime increased because of the changes to transport and trade which made it a major disruption **Poaching:** This crime became punishable by death under the Black Act 1723 **Smuggling:** Smuggling increased due to the lack of law enforcement and public attitudes towards the crime
Law enforcement	**Community policing:** they still relied on witnesses to report crimes. **Courts:** People of local importance who judged court cases. They often sentenced people to transportation or a prison sentence.	**Metropolitan Police:** Metropolitan Police Act 1829 replaced watchmen and constables in favour of a governmen funded uniformed police force. In 1878 the **Criminal Investigations Department (CID)** was set up. **Bow Street Runners:** The Fielding brothers were the first to try and improve policing in the capital. They introduced a team of thief-takers who patrolled the streets of London on evening, some on horse patrol.
Punishment	**Fines**: system of paying compensation to victims of crime. **Corporal punishments** were still used but were on the decline. **Capital punishment** were still used but were on the decline.	**Transportation:** Transportation reached in peak in the 20s before declining in favour of prisons in 1840. **The Bloody Code:** The Bloody Code was abolished as ideas about punishment changed. **Prisons:** Prisons were reformed under people like Robert Peel. The use of prisons rapidly increased.

Industrial Society

There was an increase in population from 9.5 million to 41.5 million. There was high unemployment and more people moved to towns in search of work.

There was a shift in work from agriculture to industry, most people found jobs in workshops or factories.

England was becoming wealthier with trade opportunities and exploration, finding new goods. However, the majority remained poor as taxes increased.

Harvest became less important as food was imported cheaply and quickly from other countries.

Transport underwent huge changes in this century. Trains, trams and steamboats became more available and road quality improved.

People became more educated when school became compulsory for those under 13. This led to new ideas about evolution and the idea of a criminal under class.

People began to accept the government's growing interference in their lives. By 1885 nearly all men had the right to vote. The government made improvements to housing and health to gain votes.

Tolpuddle Martyrs

Wages were being cut due to the number of people desperate to find work. Six local labourers set up a union in response to this.

The government used a navy munity law to charge them.

They were sentenced to 7 years transportation in Australia. There was public outcry, and they were pardoned 3 years later.

Pentonville Prison

The government funded 90 new prisons, the first being Pentonville. The prison was built to house the increasing number of prisoners.

The aim of prison was not simply to deter but reform using the separate and silent system to allow inmates to reflect in isolation.

Robert Peel

Robert Peel became Home Secretary in 1822 and bought in many changes to law enforcement and encourage prison reform. In 1829 he introduced the Metropolitan police.

Year 10 – History – Crime, punishment and law enforcement in the 18th and 19th

Key Word	Definition
Industrial Revolution	The social change from agriculture to manufacturing
Transportation	Being sent to another country to serve a period of hard labour
Smuggling	Bring goods into the country illegally, not paying tax
Highway Robbery	Robbery committed on a public road
Stagecoach	A large horse-drawn vehicle used to carry passengers, goods or mail
Social Crime	An act most people don't believe is criminal and which they are prepared to commit or ignore
Tolpuddle Martyrs	Farm workers who demanded a wage rise after it was cut. Created a union but were accused of making secret oaths and sentenced to 7 years' transportation to Australia. Later pardoned.
Trade union	A system set up to protect workers rights
Bow Street Runners	Thief takers patrolling London
Separate System	Prisoners kept apart as much as possible (in separate cells for up to 23 hours)
Silent system	Prisoners were expected to be silent at all times and do pointless hard labour as a harsher punishment
Penal reforms	Improvements/changes to punishments
Pentonville Prison	The model prison. One of first modern prisons built in 1840
Gaol	A Prison
Reformer	Someone who wanted to change things for the better
Repeal	Undo/take back something – usually a law

Year 10 – Hospitality & Catering – LO1 – Understand the environment in which hospitality and catering providers operate

The structure of the H&C industry

Commercial	Non-Commercial	Residential
• Fast food • Pubs • Restaurant	• Prisons • Hospitals • Armed Services	• Hotels • B&B's • Holiday parks

Styles of Service

Counter Service	Table Service	Personal Service
• Cafeteria • Fast Food • Take away	• Family • Silver • Gueridon • Plate	• Travel • Tray • Vending

Contract Catering

Contract caterers provide food and drink at hired events such as weddings or birthday parties. The advantages of hiring contract caterers are:

✓ Organise the menu and the food
✓ Serve and feed guests
✓ Clear up everything

Standards and Ratings

Michelin Star	AA Rosettes
Good Food Guide	Online Review Sites

Supplier to the H&C industry

1. Specialist markets
2. Local suppliers
3. Independent suppliers
4. Large wholesalers
5. Equipment suppliers

Contracts of Employment

1. Full Time
2. Part Time
3. Temporary
4. Casual/Seasonal

Reasons for Unsuccessful Businesses

1. Poor location
2. Name is too long to remember
3. Lack of business knowledge
4. Lack of profit
5. Too many hours leading to poor quality of life
6. A saturated market – too many of the same
7. Lack of differentiation – the product is not different enough

Costing Recipes

Selling Price Per Portion = Cost of one portion X 100 /40

Staff Structure in a Hotel

Hotel Manager

Bar Staff
1. Head bar staff
2. Barmen/maids

Restaurant
1. Restaurant Manager
2. Head Waiter
3. Wait Staff
4. Wine staff

Housekeeping
1. Housekeep
2. Chambermaid

Kitchen Staff
1. Head Chef
2. Sous Chef
3. Chef de Partie
4. Commis Chef
5. Apprentice
6. Kitchen Porter

Front of House
1. Receptionist
2. Concierge
3. Porter

Reasons for Successful Businesses

1. Technology – using apps, EPOS systems and Wi-Fi available
2. Costs – making healthy profits
3. Environment – showing ways to reduce, reuse and recycle
4. Media – using celebrities, supporting charities, good community reputation
5. Competition – having a variety of offers to attract customers
6. Trends – ensuring the business is up to date with the latest options – such as new flavours
7. Customer service – demonstrating good customer satisfaction, encouraging customers to return.

Portion Control

Why?
✓ To offer consistent portions to customers to avoid complaints
✓ To reduce food waste
✓ To make a profit

How?
❖ Scoops for ice cream and mash
❖ Ladles for soups, gravies and sauces
❖ Fruit decoration for cakes

Keyword	Definition
Establishment	A place that serves food and drink
Commercial	To make a profit
Residential	Provides accommodation
EPOS	Electronic Point of Sale
Silver Service	Use a knife and fork to serve
Gueridon Service	Chef finishes the cooking or carving at the customer's table
Chef de Partie	Specialist chefs such as vegetable chef
Concierge	To assist customers with bookings

Year 10 – Hospitality & Catering – LO2 – Understand how hospitality and catering provisions operate

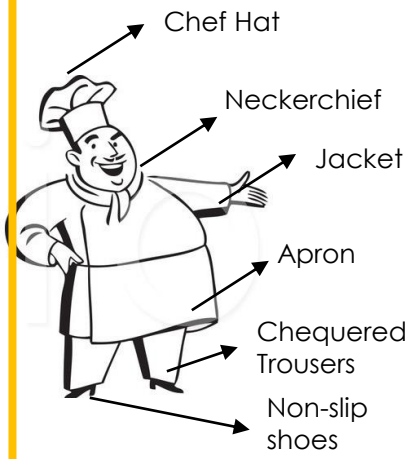
Kitchen Workflow

1. Delivery
2. Storage
3. Food preparation
4. Cooking
5. Holding
6. Food service
7. Wash up
8. Waste disposal

Types of Documentation

- ❑ Temperature charts (fridge, freezer)
- ❑ Time sheets (staff working hours)
- ❑ Accident report form (to log first aid/accidents)
- ❑ Equipment fault reports

Kitchen Dress Code (PPE)



Small Equipment

Large Equipment

All large scale equipment such as a floor standing mixer, walk in fridge/ freezer and a large oven must be:

- Turned off before cleaning
- Use correct cleaning materials
- Any attachments should be stored correctly
- If equipment is not working correctly it must be reported
- Ensure there is no food left on the equipment as it will contaminate future use

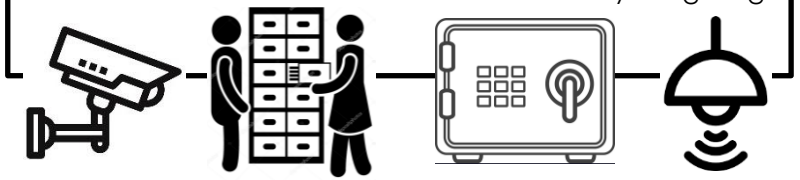
Types of Customer

Leisure	Local Residents	Business/ Corporate
Customers who visit the establishments in their leisure time e.g. a meal with friends, a family day out, tourists.	Customers who live in the local area who visit the establishment often e.g. regular Sunday lunch	E.g. business lunches. Use business facilities in establishment for meetings or presentations, courses and conferences

Safety and Security

All businesses should carry out a regular health and safety risk assessment. This involves looking at your business and identifying potential hazards that may affect staff or members of the public. Your risk assessment should tell you whether you are doing enough to mitigate these risks. Ways to achieve this is through:

CCTV | Staff Lockers | Safes for Money | Lighting



Customer Rights

- ❖ The right to be protected (against hazardous goods)
- ❖ The right to be informed (quality, quantity, allergies)
- ❖ The right to have their complaints be heard
- ❖ The right to seek compensation
- ❖ The right to receive satisfactory goods that match their product description

Good Customer Service

- ✓ Respectful and polite
- ✓ Helpful and attentive
- ✓ Smart and professional
- ✓ Friendly
- ✓ Patient
- ✓ Deals with customer problems effectively
- ✓ Knowledgeable
- ✓ Makes the customer feel welcome, to want to return.

Keyword	Definition
Perishable Foods	Foods with a short shelf life such as meat, fish and dairy
Staple Foods	Foods with a longer shelf life such as canned products
Stock Control	Using the First In First Out (FIFO) rule to rotate food stock
Consumer Rights Act 2015	A legal **right** to reject goods that are of unsatisfactory quality, unfit for purpose or not as described
Food Safety Act 1990	Businesses do not include, remove or treat **food** in any way that would be damaging to the health of people.
Equality Act 2010	All must be treated equally regard to age, gender, race...
Disability Discrimination Act 2010	Unlawful to discriminate against mental and physical disabilities

Year 10 – Hospitality & Catering – LO3 – Understand how hospitality and catering provision meets health and safety requirements

HASAWA

- ❑ All employers must take care of their own health and safety and not endanger others.
- ❑ The HSE exists to protect peoples health and safety by ensuring risks are properly controlled.
- ❑ HASWA also protects employees from risks to their health and safety arising out of the activities of people at work.
- ❑ The law applies to everyone at work and anyone can be prosecuted if they do not act safely.

RIDDOR

- ❑ The law requires employers and other people in control of work premises (known as the 'responsible person') to report to the Health and Safety Executive (HSE) and keep records of the following:
- ✓ Work related fatalities
- ✓ Work related accidents causing certain serious injuries
- ✓ Certain work related diagnosed occupational diseases such as severe cramp of the hand due to work related issues

COSHH

- ❑ These Regulations require employers to control exposure to hazardous substances to prevent ill health.
- ❑ Substances covered by COSHH:
- ✓ Chemicals including cleaning chemicals
- ✓ Micro-organisms
- ✓ Dusts
- ✓ Medicines, pesticides, gases
- ❑ COSHH Symbols:

Toxic

Oxidising

Gas under pressure

Reproductive Toxic

PPE

- ❑ The Food Safety (General Food Hygiene) Regulations 1995 require every person working in a food handling area to wear suitable, clean, and (where appropriate) protective clothing.

MHR

- ❑ Any transporting or supporting of a load by hand or bodily force
- ❑ Lifting, putting down, pushing, pulling, carrying or moving

Risk Assessment

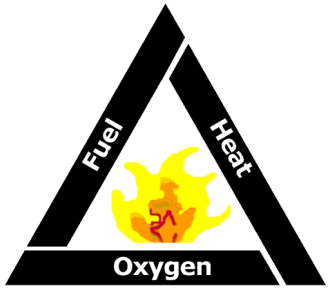
- ❑ Five steps to assessing risks:
1. Identify the hazard.
2. Decide who might be harmed and how.
3. Evaluate the risk.
4. Record the findings and implement them.
5. Review the assessment and update if necessary

Risk/Hazard	Location	Who is at risk? (Employer, Employee, Supplier, Customer).	Level of risk.
Incorrect storage of food.	Kitchen	Customer	High
Faulty Wiring	Bedroom	Employee, Customer.	High

Main Injury Types

Burns	Cuts
Strains	Slips, trips, falls

Fire Safety



Keyword	Definition
HASAWA	Health and Safety at Work Act
HSE	Health and Safety Executive
RIDDOR	Reporting of Injuries, Diseases and Dangerous Occurrences Regulations
COSHH	Control of Substances Hazardous to Health
PPE	Personal Protective Equipment
MHR	Manual Handling Regulations
Provision	An establishment that provides food and drink

Year 10 – Hospitality & Catering – LO4 – Know how food can cause ill health

What does bacteria need to multiply?

- Moisture
- Warmth
- Food
- Time

Sources of food poisoning bacteria

- People
- Raw food
- Rodents
- Packaging

Symptoms of food poisoning bacteria

- Nausea
- Stomach ache
- Diarrhoea
- Vomiting

Non food poisoning illness

- Chemicals

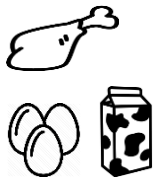
- Metals

- Poisonous plants

High Risk Foods

- Foods that are more likely to give food poisoning.
- Bacteria grow quickly in them because they are **mois**t and high in **protein**.
- Examples include:

i. Meat
ii. Fish
iii. Eggs
iv. Dairy products



Low Risk Foods

- Foods that are low in protein and unlikely to cause food poisoning.
- Examples include:

i. Dry foods (cereals, bread)
ii. Foods high in fat and sugar
iii. Acidic foods like fruit

Types of Food Poisoning

1. Salmonella – found in chicken and eggs.
2. E coli – found in raw meats and raw vegetables
3. Listeria – found in soft cheeses and meats
4. Staphylococcus aureus – found on the skin and in the nose and mouth of humans. It gets onto food when people touch it.
5. Bacillus cereus – found in cooked rice.

HACCP

- By law, catering establishments have to do a risk assessment for food hygiene.
- This is to stop food being contaminated before it reaches the customer.

Step	Hazard	Hazard Prevention
Buying and receiving food	High risk food could be contaminated with bacteria	Buy from suppliers with a good reputation.

EHO

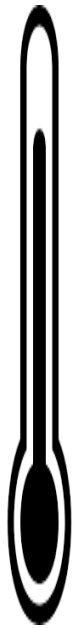
- EHOs check that catering establishments are obeying **laws** such as the **Food Safety Act**.
- They can inspect a catering establishment at **any time**.
- The EHOs check the hygiene of:

i. The **food premises** (the place where the food is)
ii. The **employees** (the people working with the food)
iii. The **working practices** (the ay that things are done around food)

- EHOs advise catering establishments to improve their hygiene.
- They have the power to close establishments, impose fines, or take legal action against catering establishments that break the law.
- They issue a food hygiene rating from 1 to 5

Key Temperatures

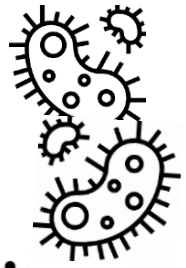
- Monitoring and controlling temperatures during cooking, serving and storage of food limits bacterial growth and helps prevent food poisoning.



100°C – Bacteria is dead

75°C – Food must be cooked to or higher in the middle. Most bacteria is killed.

63°C – Food must be hot held to or higher than.



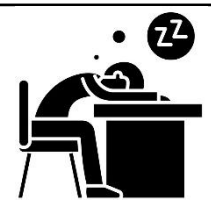
5°C to 63°C – Bacteria multiplies rapidly, this is the danger zone. Food should spend no more than 90 minutes in the danger zone.

0°C to 5°C – Food is stored in a fridge, bacteria has slow growth

-18°C – Food is stored in a freezer, bacteria is dormant(too cold to multiply).

Keyword	Definition
EHO	Environmental Health Officer
Due Diligence	Establishments have done everything in their power to safeguard consumer health
HACCP	Hazard Analysis Critical Control Point
Hot Held/holding	When food is kept hot until it is served

Year 10 – Hospitality & Catering – Unit 2 – Hospitality and Catering in Action

Functions of Nutrients	Nutritional Deficiencies (-)	Nutritional Excesses (+)
Carbohydrates provides the body with energy. There are two main types, complex and simple. Complex carbohydrates give long lasting energy. These are found in foods such as bread, pasta and cereals. Simple carbohydrates make blood sugar levels go up very quickly. This provides a short burst of energy. These are found in sugary; foods such as cakes, jams and sweets.	❖ Lack of energy/ tiredness ❖ Weight loss ❖ Severe weakness 	❖ Tooth decay (simple sugars) ❖ Raised blood sugar levels ❖ Weight gain 
Protein is needed for growth and to repair cells. Protein is made up of amino acids. Proteins that are high in essential amino acids are called high biological value (HBV) proteins. These are found in milk, cheese, fish, eggs, meat and soya beans. Proteins that are low in amino acids are called low biological value (LBV) proteins. These are found in nuts, cereals and pulses.	❖ Weak nails ❖ Hair loss ❖ Weakened immune system ❖ Poor growth (children) ❖ Food is nor digested properly 	❖ Weight gain ❖ Strain on kidneys and liver 
Fats are used by the body for energy. Fat also forms an insulating layer under your skin to keep us warm and protect our organs, such as our kidneys. There are two main types of fat, saturated and unsaturated. Foods such as meat, cheese and butter are high in saturated fats. Foods such as seeds, fish and vegetable oils are high in unsaturated fats. We should eat less saturated fats.	❖ Weight loss ❖ Bruising of the bones ❖ Lack of vitamin A, D, E and K 	❖ Weight gain ❖ Type 2 diabetes ❖ High blood pressure (adults) ❖ High cholesterol (adults) ❖ Heart disease (adults) ❖ Organ failure
Fibre helps food to move through our bowels and prevent constipation. Foods such as vegetables, wholemeal bread and beans are high in fibre.	❖ Constipation ❖ Bowel cancer 	❖ Children feel full and so miss out on other nutrients
Water is needed for lots of reasons, keeping our body at the right temperature, digesting food, lubricating our bones and keeping us hydrated. Water is found in drinks, fruits and vegetables.	❖ Dehydration ❖ Headaches ❖ Kidney stones 	❖ Water intoxication
Vitamin A good vision, especially when it is dark. **B group vitamins** releasing energy from carbohydrates. **Vitamin C** Fighting diseases and helping the body to absorb iron. **Vitamin D** along with calcium, it helps our body make strong bones and teeth.	**Vit A** infected mucus membranes. **Vit B1** beriberi. **Vit B2** sores. **Vit B3** pellagra, dementia, dermatitis. **Vit B9** megaloblastic anaemia. **Vit B12** pernicious anaemia. **Vit C** scurvy. **Vit D** rickets (children), osteomalacia (adults)	**Vit A** night blindness. **Vit D** kidney damage 
Iron to make red blood cells to carry oxygen around the body. **Calcium** Along with vitamin D, calcium helps make strong bones and teeth.	❖ **Iron** deficiency anaemia ❖ **Calcium** same as **Vit D**	**Iron** nausea, stomach pain.

Year 10 – Hospitality & Catering – Unit 2 – Hospitality and Catering in Action

Cooking Methods
Boiling – A liquid is heated to 100°C to cook foods like pasta, rice and potatoes. A quick and simple method of cooking that does not require any fat. Boiling makes the texture of food soft, over boiling really soft. If boiling vegetables, B vitamins and vitamin C is lost during boiling. .
Steaming – Food is cooked from the steam of boiling water. Steaming food such as vegetables, fish and rice helps to preserve colour, texture and water soluble vitamins.
Baking – Food is cooked using the dry hot air of the oven. Foods that are baked such as cakes, pastries and biscuits cause the outer layers to turn brown and crisp.
Grilling – Dry heat is used to cook food at a very high temperature, it is fairly healthy because no fat is added, and fat drips out of the food as it cooks. Because the heat is so high the food cooks quickly and browns the outside.
Stir-fry – Food is cooked in a wok with very little oil. This is a healthy method as food cooks quickly due to very small pieces of meat and vegetables, leading to crunchy and colourful vegetables that have limited vitamin loss.
Roasting – Food is also cooked using dry heat in a hot oven. Fat is added to the outside of roasted food, causing the outside to go brown and crisp, while the inside stays moist.
Poaching – Food is cooked very gently in liquid that is below boiling point. Delicate foods such as meat, fish and eggs.

- ✓ Use seasonal ingredients
- ✓ Use ingredients from local farmers and markets
- ✓ Use ingredients from rooftop garden
- ✓ Use less plastic

- ✓ Cover pans
- ✓ Use the correct size hob and pan
- ✓ Cook different foods together
- ✓ Don't boil more water than you need
- ✓ Use water carefully – bowls to wash

- ✓ Order in bulk to reduce packaging
- ✓ use FIFO to rotate stock
- ✓ Prepare the correct amount of ingredients
- ✓ Use accurate portion control

Environmental Policy

An establishment requires an environmental policy because :

1. It is the law
2. Saves the establishment money
3. Builds a good reputation
4. It saves energy, water and reduces waste
5. Reduced the harm to the environment

- ✓ Fully load dishwashers
- ✓ Fully load washing machines
- ✓ Carry out maintenance checks
- ✓ Turn equipment off
- ✓ Use energy efficient equipment

- ✓ Recycle materials using recycling bins
- ✓ Use biodegradable packaging for taking away food
- ✓ Give foods to charities
- ✓ Weigh ingredients accurately

- ✓ Recycle materials using recycling bins
- ✓ Use biodegradable packaging for taking away food
- ✓ Give foods to charities
- ✓ Weigh ingredients accurately

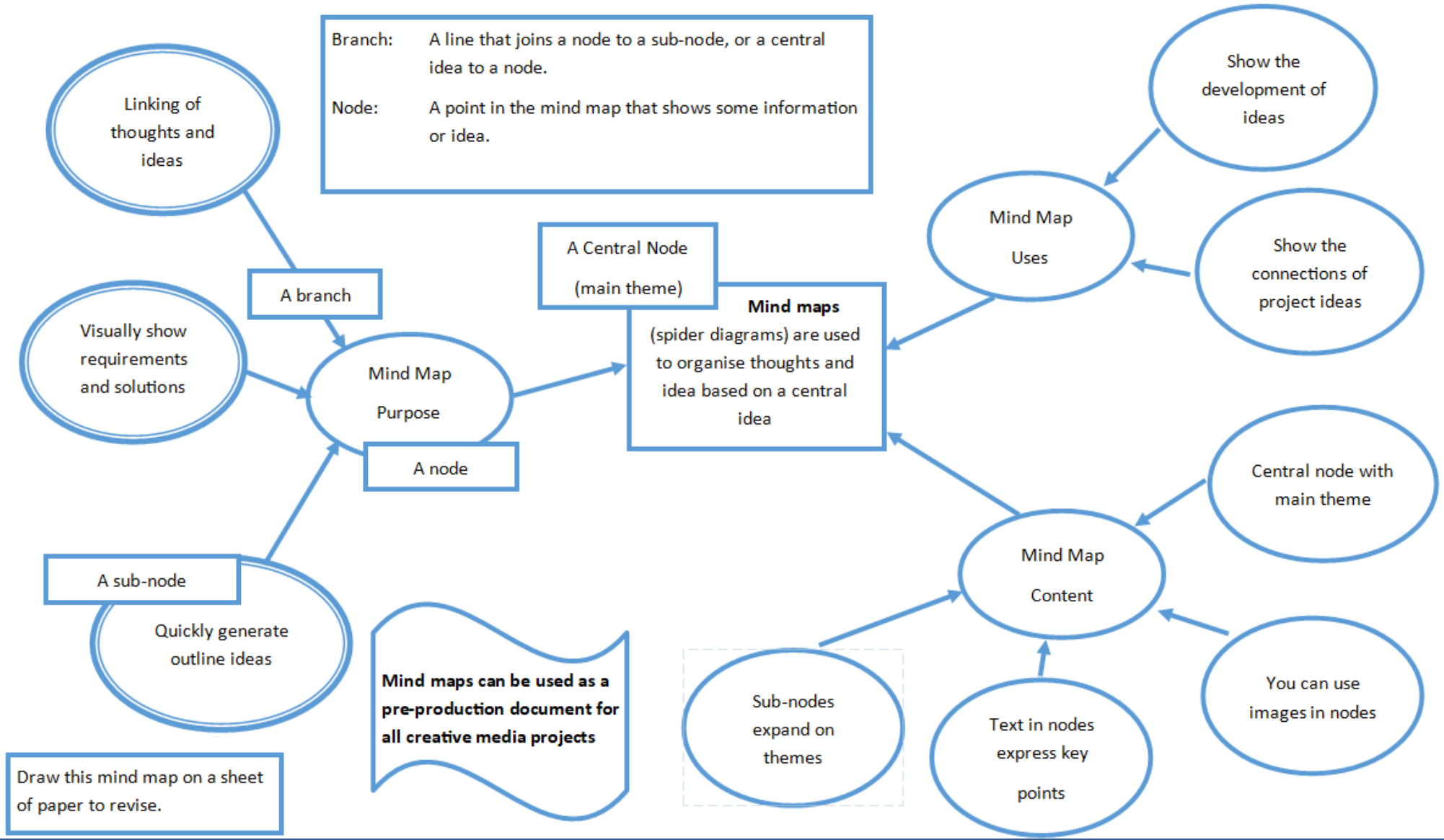
- ✓ Reuse glass bottles and plastic containers
- ✓ Reuse leftover food for stock, compost or animal feed
- ✓ Use cardboard for wet floors

Keyword	Definition
Biodegradable	Decomposes naturally in the ground
Food miles	The distance food has travelled from field to plate

Keyword	Definition
Recycle	Product is broken down and made into something new
FIFO	First In First Out

Year 10 – Cambridge National IT - Mindmap

You must be able to understand the purpose and use the content of different pre-production documents



Year 10 – Cambridge National IT - Mindmap

You must be able to understand the purpose and use the content of different pre-production documents

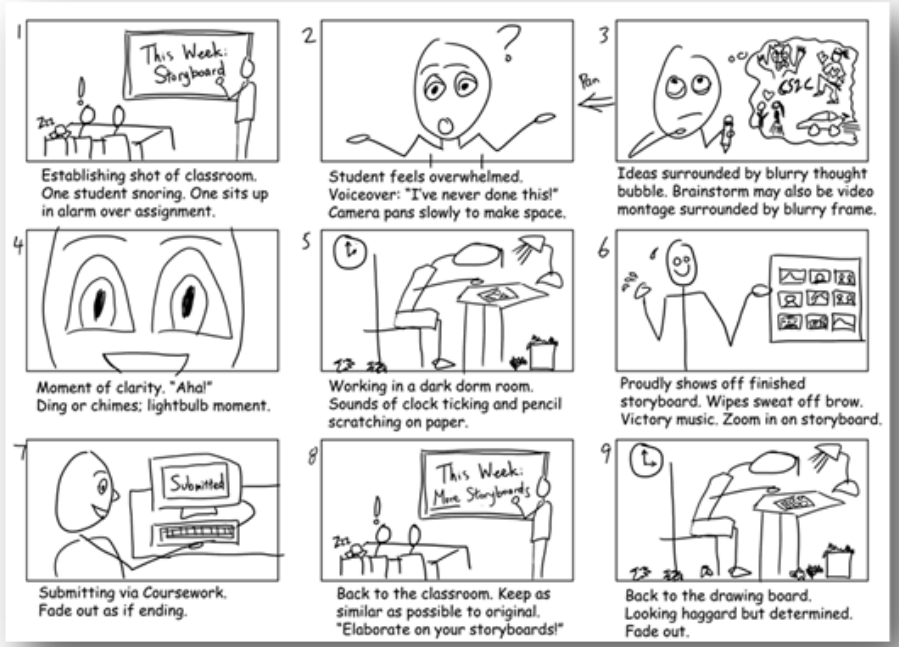
Storyboards

⇒ A storyboard is used by many people to illustrate a sequence of ***moving*** images.

⇒ A storyboard shows the flow of scenes that occur in a timeline, a succession of events.

⇒ This is different to a visualisation diagram which are used for a single of events.

⇒ Each scene of the story is placed in chronological order (in the order



Why use storyboards?

Best way to share your vision for the project

⇒ A visual aid makes it much easier for you to share and explain your vision for your video with others.

⇒ When you have a storyboard, you can show people exactly how your video is going to be mapped out and what it will look like. This makes it much easier for other people to understand your idea.

Makes production much easier

⇒ When you storyboard a video you're setting up a plan for production, including all the shots you'll need, the order that they'll be laid out, and how the visuals will interact with the script.

⇒ The storyboard is a starting point or suggested storyline around which you can plan your story (all the angles you will shoot of a scene). This really comes in handy when you're making your video, as it ensures you won't forget any scenes and helps you piece together the video according to your vision.

Saves you time

⇒ While it may take you a little while to put your storyboard together, in the long run it will save you time in revisions later.

⇒ Not only will it help you explain your vision to your team, it will also make the creation process go more smoothly.

Year 10 – Cambridge National IT - Mindmap

You must be able to understand the purpose and use the content of different pre-production documents

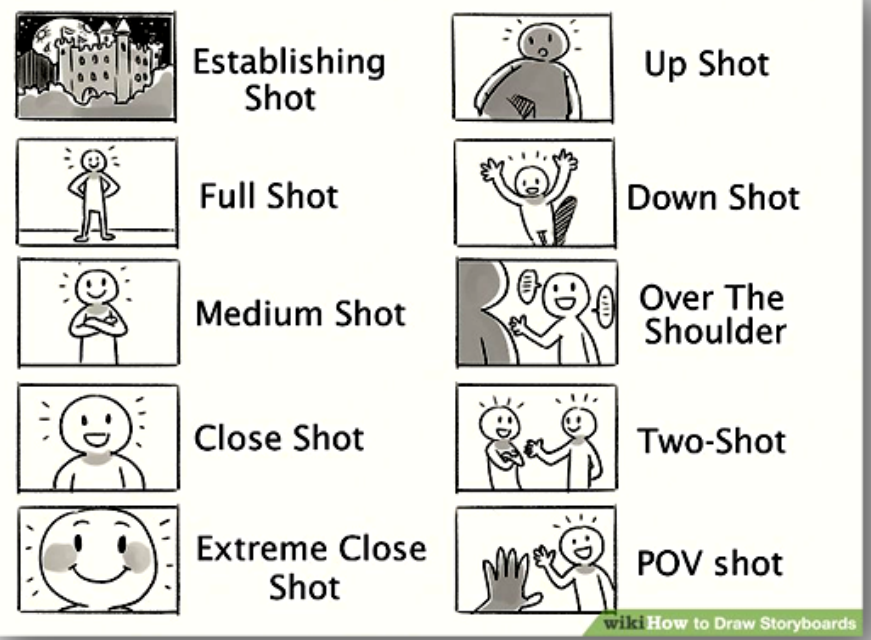
Storyboard and camera angles

⇒ The storyboard could be used by several people who could be involved in the production process.

⇒ Camera shots a angles are important aspects to a storyboard

⇒ The camera operator or animator will use the storyboard to decide how to create each scene.

⇒ Each scene is usually defined by changes to the camera use for each shot.



Purpose of a storyboard

⇒ To provide a visual representation of how a media project will look along a timeline

⇒ To provide a graphical representation of wat a sequence of movements will look like

⇒ To provide guidance on what scenes to film or create

⇒ To provide guidance on how to edit the scenes into a story

Uses of a storyboard

⇒ Any project where movement or a sequence is required, especially along a time-line, for example

- ◊ Video projects
- ◊ Digital animations
- ◊ Comic books to illustrate the story
- ◊ Computer games, to illustrate game flow, narrative or story
- ◊ Multimedia projects, to illustrate the sequence between scenes

Content of a storyboard

⇒ Images, for content of each scene

⇒ Locations

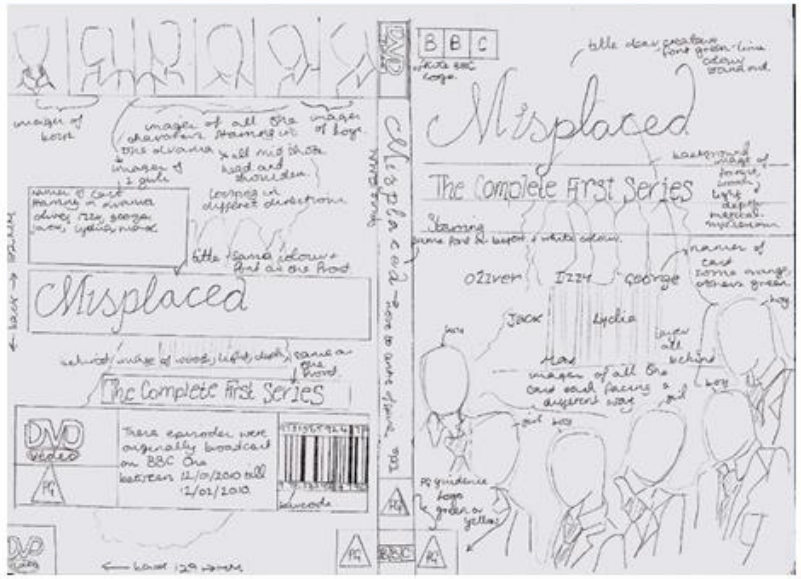
⇒ Camera shot type and angles

⇒ Cameral movement

⇒ Shot length and timings

Year 10 – Cambridge National IT - Mindmap

You must be able to understand the purpose and use the content of different pre-production documents



Visualisation Diagrams

Visualisation diagrams are a rough drawing or sketch of what the final static image product is intended to look like. They will have annotations to describe the design ideas. Typically, a visualisation diagram is hand drawn, but it does not need any artistic skills to communicate ideas.

It is intended to demonstrate the layout and content of the product that is being illustrated

You might produce several drafts to demonstrate ideas to your client. Your client might choose the draft they like the most. There must be sufficient information in the visualisation diagram for the client to make a decision about their preferred design.

Visualisation diagrams are valid for static designs, that is an image that does not move. It is, therefore, relevant for designs such as a magazine cover, a DVD cover, or an image for a website. It would not be suitable for a video or an animation.

Look closely at the detail in the example visualisation diagram. Compare the concepts in the visualisation diagram and compare them to the final product that was produced. Do you notice the similarities and the differences.

Notice how the visualisation diagram was not modified as ideas developed in the pro-

Purpose:

- ⇒ Plan the layout of a static or still image in a visual manner
- ⇒ To show how a finished item might look like

Uses :

- ⇒ CD/DVD cover design
- ⇒ Poster, such as for a film, event, leaflet or advertisement
- ⇒ A single game scene of display of a single scene
- ⇒ Comic book page layout
- ⇒ Web page layout
- ⇒ Magazine front cover

Content:

- ⇒ Multiple images, layout and positions of items.
- ⇒ Colours and colour schemes
- ⇒ Position and styles of text
- ⇒ Fonts, font colours and size
- ⇒ Notes as annotations which provide

Year 10 – Cambridge National IT – Flowcharts

Key Vocabulary	
Algorithms	A set of rules or instructions to be followed.
Flowcharts	A graphical way of showing an algorithm.
Selection	Deciding what code to run based on a decision or answer to a question. E.g an IF statement.
Sequence	A set of instructions that are completed in the exact order that they are written.
Iteration	Where a set of instructions is repeated. E.g a while loop, for loop and repeat until loop.
Input	Data that is given to the computer or program to then use.
Output	Information that is provided by the computer or program.
Procedure	A group of instructions grouped together that can be used by the main program.
Variable	A name given to a value in a program that can change when the program is running.

Careers

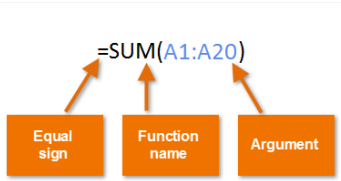
- Software development
- Programing
- Software Engineering

Flowchart Symbols	
	Used at the start and end of a flowchart.
	Controls all the inputs and outputs.
	General instructions and calculations carried out by the computer.
	Where a question/decision is asked. Must have a 'Yes' and 'No' output.
	Used to connect flowchart symbols to show the direction of flow in the program.

Year 10 – Cambridge National IT – Excel

Type of Functions

There are many types of Functions that can be used in spreadsheets helping to make calculations a lot easier. Some common uses are **MIN** of Minimum, **MAX** for Maximum, **AVG** for Average and **SUM** for Sum total



This is the correct way to structure a function – Remember always start with a =

Absolute Cell Referencing

Absolute Reference in Excel

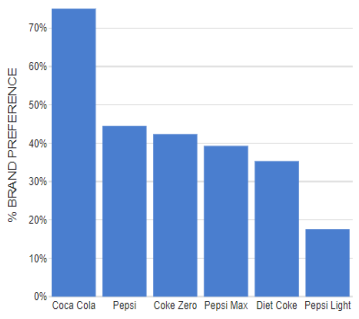
=E35*E33

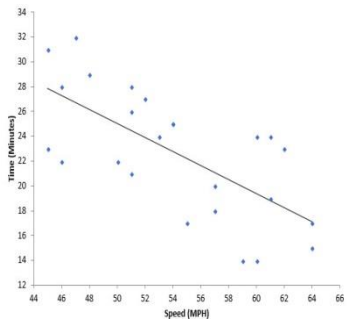
	B	C	D	E	F
			GST	10%	
	Item	Quantity	Price (Rs.)	Total Price	Total Price with GST
	Marie Gold Biscuits	5	40	200	=E35*E33

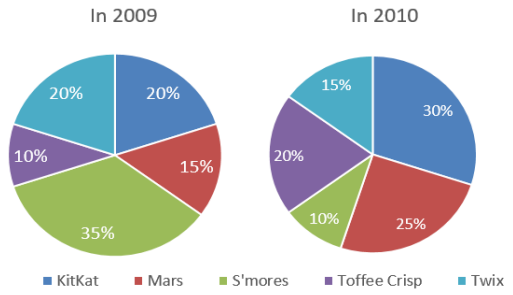
Select a cell which you need to permanently look at and press **F4** on you keyboard to make the absolute cell referencing $ to appear around the selected cells.

Type of Graphs

Bar chart	Visual tool, uses bars easy to see difference, long bar means greater value
Pie chart	size of portion represents the quantity, visually simple to flow, good for summaries
Scatter graph	show relationship between 2 variables, maximum and minimum values are easy to work out

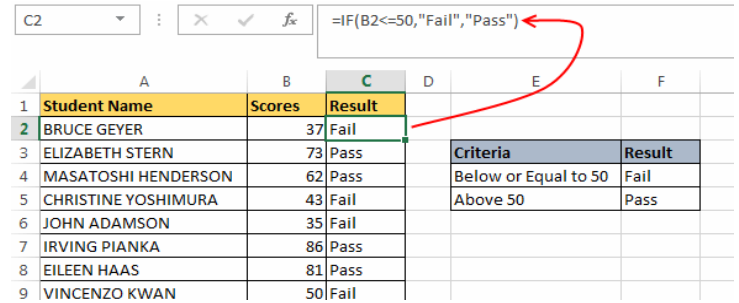






Keywords	Definition
Absolute Cell Referencing	When you want a formula to consistently refer to a particular cell.
Function	is a predefined **formula** that performs calculations in a particular order
Formula	is an expression which calculates the value of a **cell**
Conditional formatting	is a feature which allows you to apply a format to a cell or a range of cells based on certain criteria

IF Statement…



	A	B	C	D	E	F
1	Student Name	Scores	Result			
2	BRUCE GEYER	37	Fail			
3	ELIZABETH STERN	73	Pass		Criteria	Result
4	MASATOSHI HENDERSON	62	Pass		Below or Equal to 50	Fail
5	CHRISTINE YOSHIMURA	43	Fail		Above 50	Pass
6	JOHN ADAMSON	35	Fail			
7	IRVING PIANKA	86	Pass			
8	EILEEN HAAS	81	Pass			
9	VINCENZO KWAN	50	Fail			

The **IF function** can perform a logical test and return one value for a TRUE result, and another for a FALSE result.

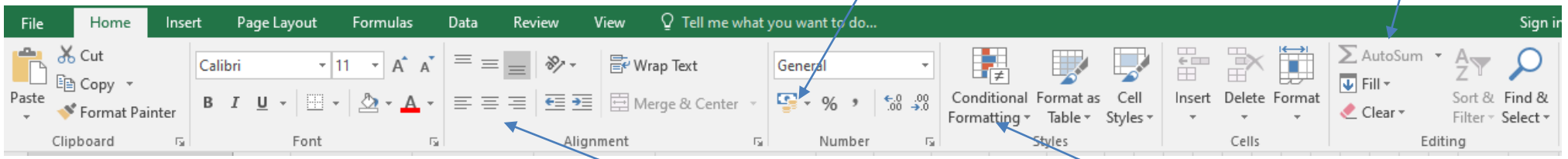
For example, a "Fail" is scores below 50:
=IF(B2<=50,"Fail","Pass")

Year 10 – Cambridge National IT – Excel

Excel Spreadsheet toolbar

AutoSum
Automatically add totals of selected cells

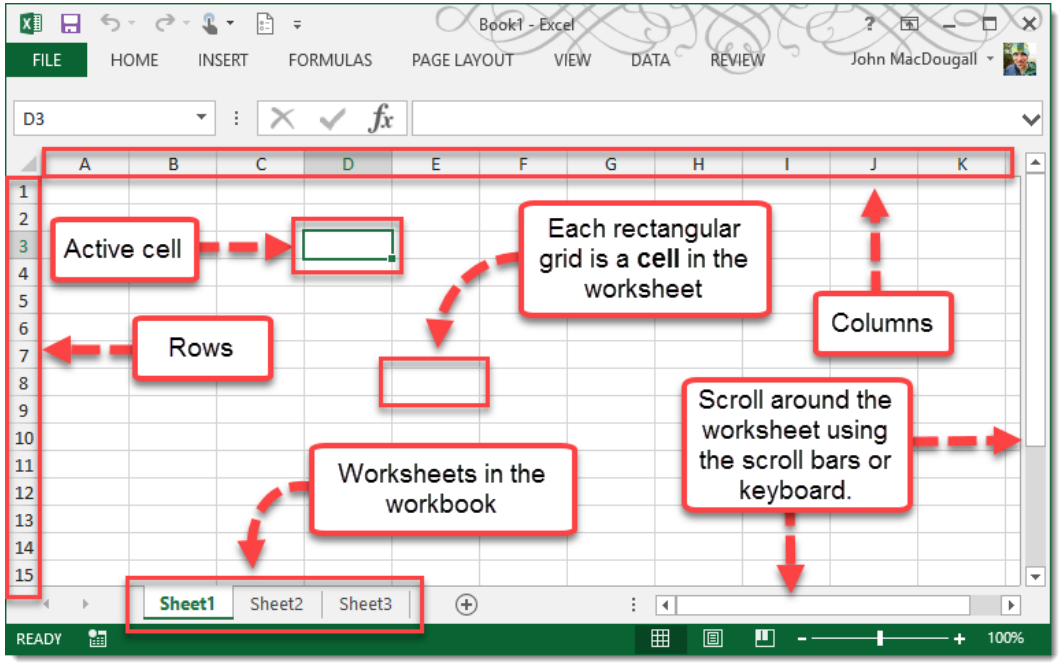
Currency / Accounting format
Used to add currency to the numbers in the cell



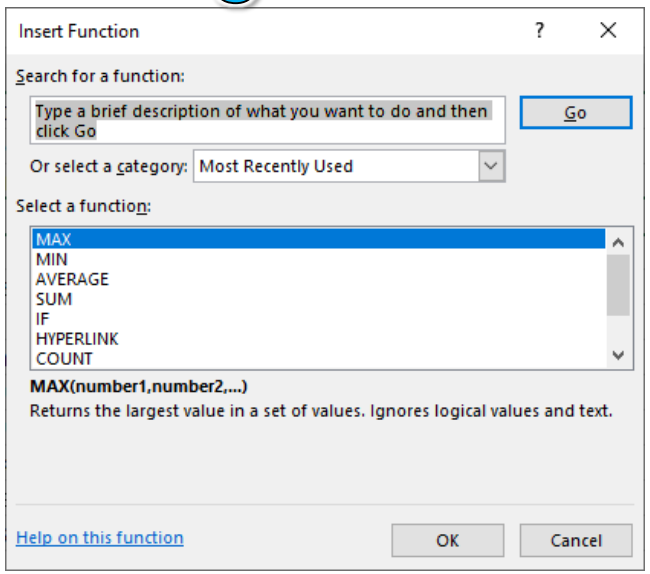
Conditional Formatting
Used to spot trends and patterns in your data

Text Alignment
Helps user align the text within the selected cell/s

Layout of a spreadsheet



Finding a function



is a predefined **formula** that performs calculations using specific values in a particular order

Year 10 – Cambridge National IT – Excel

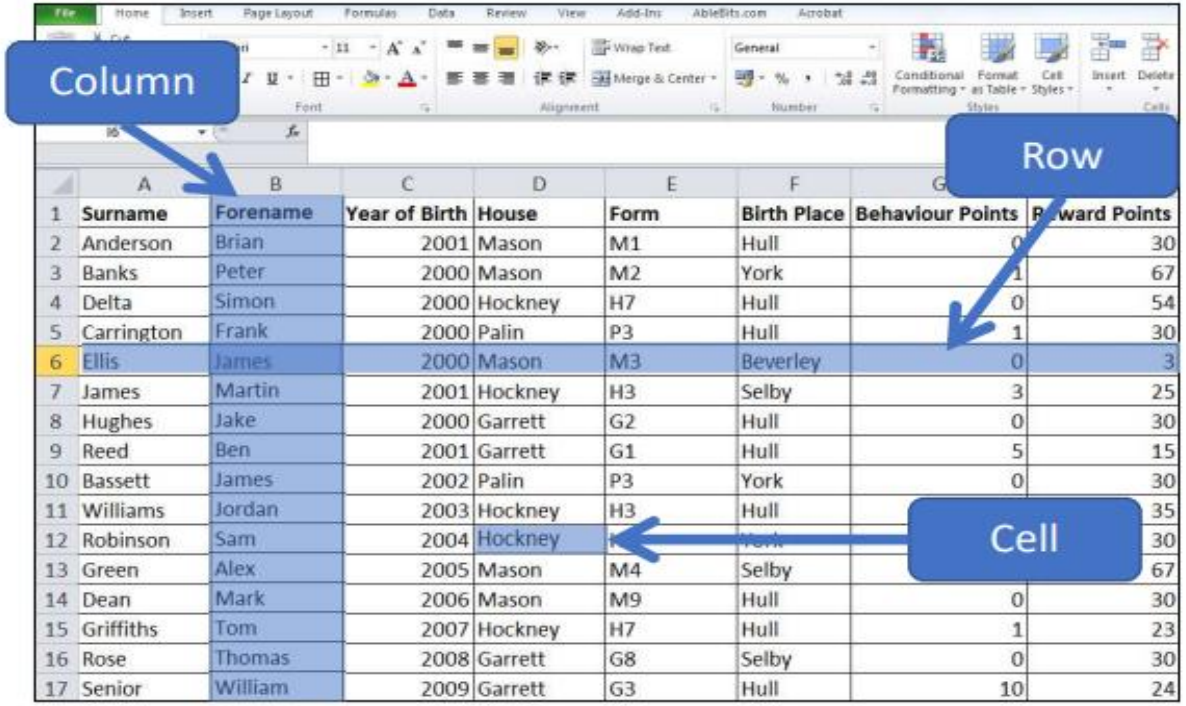
Key Words	
Absolute referencing	A cell reference within a spreadsheet which remains the same when copied (replicated) to another cell.
Alignment.	The way that text is set out. For example. right. left. centred or justified.
AutoSum	This feature will add up the numbers you have entered in your sheet and displays the total in a cell of your choosing.
Cell	A box on a spreadsheet that can contain text numbers or a formulae.
Cell attributes	The way the spreadsheet cell displays data such as numbers or dates.
Cell format	The way the spreadsheet cell looks. For example changing the column width or alignment.
Cell protection	Locking the contents of the cell to prevent them from being changed.
Charting	Drawing a graph from a set of numerical data. usually from a spreadsheet program.
Columns	Vertical parts of a spreadsheet.
Complex formulae	Complicated formulae's used in a spreadsheet.
COUNTA	Count the number of non-blank cells
COUNTBLANK	Count cells that are blank
Data	A general term used for numbers. characters. symbols. graphics and sound which are accepted and processed by a computer system.
Delete	To remove data
File	Information held on backing storage or in memory.
Formulae	A calculation involving one or more cell references in a spreadsheet.
Hard Copy	A printed copy of your work. usually on paper.
Insert	To put Information.
Insert column	To add a column .
Insert row	To add a row.
Integer	A whole number. with no fractional part or decimal point.
Merged Cell	When two or more cells are combined. it's become what is known as a merged cell.

Key Words	
Print file	To obtain hard copy.
Relative Referencing	When a formulae in a spreadsheet is changed relative to its position. during copying or replication.
Replicate	To duplicate
Rows	Horizontal parts of a spreadsheet.
Ribbon	Above the workbook is a section of command tabs called the Ribbon.
Spreadsheet	A program used mainly for dealing with number data. It divides the screen into rows and columns. The cells can contain text. numbers and formulae.
Table	A table is made up of data arranged in rows and columns like a spreadsheet and data is placed in the cells.
Workbook	The workbook refers to an Excel spreadsheet file.
Worksheet	Within the workbook is where you will find documents called worksheets.

Functions	
SUM	adds values in selected cells
MINIMUM(..) or MIN(..)	A function used to find a minimum value in a range.
MAXIMUM(..) or MAX(..)	A function used to find a maximum value in a range.
AVERAGE(..)	A function used to find the average value in a range.
COUNT	counts how many of the selected cells have numbers in them
IF	change the value of a cell if something is true. eg if a customer's total bill is over £100. deduct 10% from their bill.
COUNTIF	adds up cells that meet a certain rule. eg count the number of students that achieved level 6.
VLOOKUP	is an Excel function to lookup and retrieve data from a specific column in table.

Symbols used in formulas			
+	add	*	multiply
-	subtract	/	divide

Year 10 – Cambridge National IT – Excel

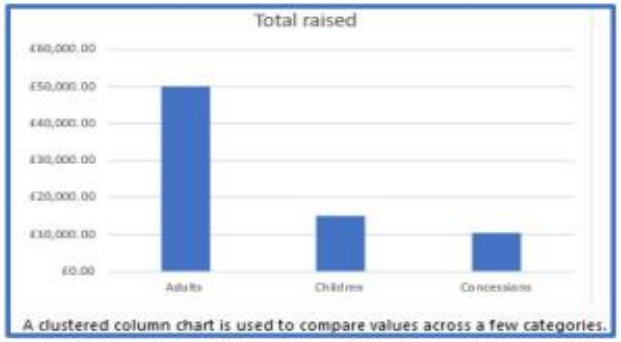


	A	B	C	D	E	F	G	H
1	Surname	Forename	Year of Birth	House	Form	Birth Place	Behaviour Points	Reward Points
2	Anderson	Brian	2001	Mason	M1	Hull	0	30
3	Banks	Peter	2000	Mason	M2	York	1	67
4	Delta	Simon	2000	Hockney	H7	Hull	0	54
5	Carrington	Frank	2000	Palin	P3	Hull	1	30
6	Ellis	James	2000	Mason	M3	Beverley	0	3
7	James	Martin	2001	Hockney	H3	Selby	3	25
8	Hughes	Jake	2000	Garrett	G2	Hull	0	30
9	Reed	Ben	2001	Garrett	G1	Hull	5	15
10	Bassett	James	2002	Palin	P3	York	0	30
11	Williams	Jordan	2003	Hockney	H3	Hull		35
12	Robinson	Sam	2004	Hockney				30
13	Green	Alex	2005	Mason	M4	Selby		67
14	Dean	Mark	2006	Mason	M9	Hull	0	30
15	Griffiths	Tom	2007	Hockney	H7	Hull	1	23
16	Rose	Thomas	2008	Garrett	G8	Selby	0	30
17	Senior	William	2009	Garrett	G3	Hull	10	24

Every cell has a unique name called a Cell Reference.
The cell reference for this cell is D12

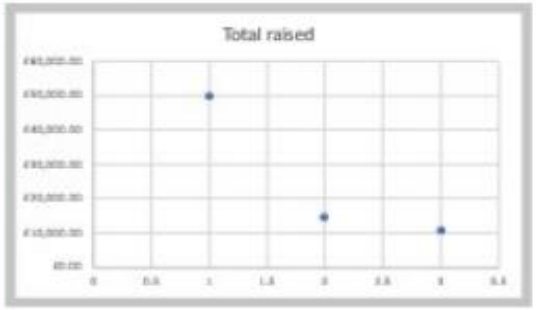
	A	B	C	D	
1	Surname	Forename	Year of Birth	House	Form
2	Anderson	Brian	2001	Mason	M1
3	Banks	Peter	2000	Mason	M2
4	Delta	Simon	2000	Hockney	H7
5	Carrington	Frank	2000	Palin	P3
6	Ellis	James	2000	Mason	M3
7	James	Martin	2001	Hockney	H3
8	Hughes	Jake	2000	Garrett	G2
9	Reed	Ben	2001	Garrett	G1
10	Bassett	James	2002	Palin	P3
11	Williams	Jordan	2003	Hockney	H3
12				Hockney	H9
13	Green	Alex	2005	Mason	M4

Charts and graphs	
line graph	to show a change over time
pie chart	show the individual parts that make up a whole
bar chart	compare things that aren't directly related
scatter graph	look for a pattern or link between two sets of data

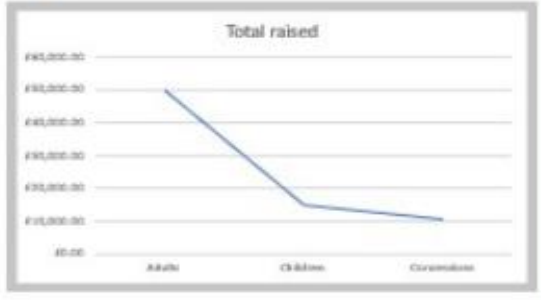


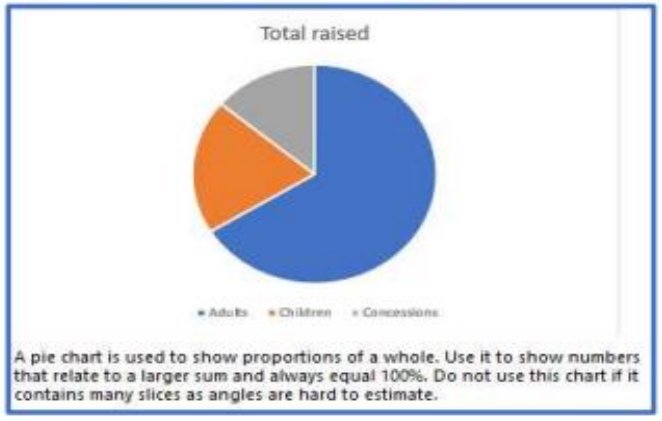
A clustered column chart is used to compare values across a few categories.

Scatter



Line





A pie chart is used to show proportions of a whole. Use it to show numbers that relate to a larger sum and always equal 100%. Do not use this chart if it contains many slices as angles are hard to estimate.

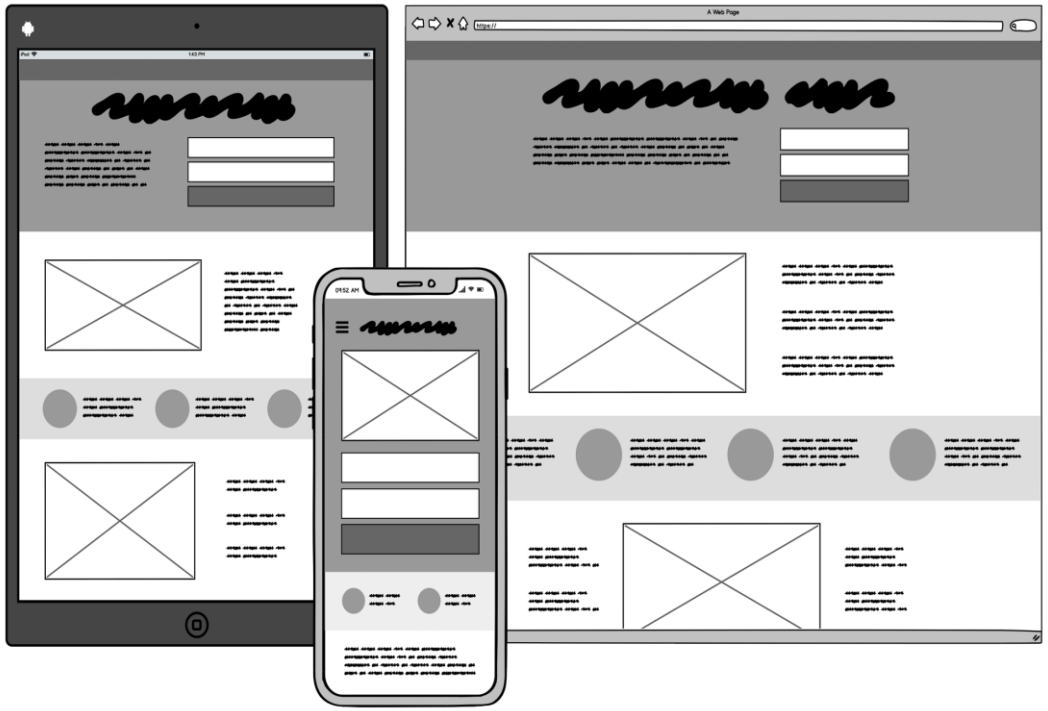
Year 10 – Cambridge National IT – Wireframe

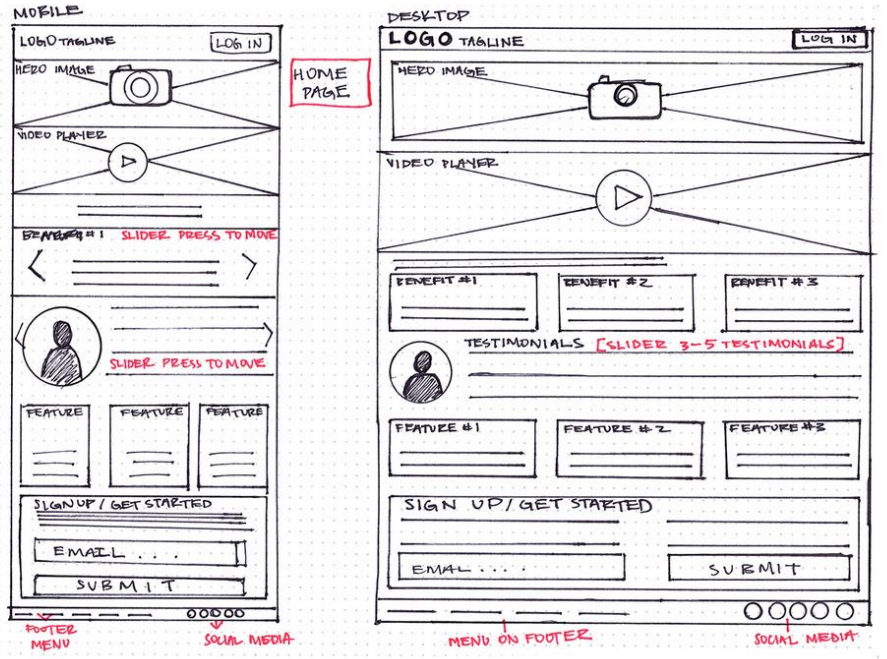
What is a wireframe?

A sketch or a guide before you build an actual form/document

A ‘skeleton graph’ that shows how the contents will be laid out.

Frames with no colours, images or any graphics.





What is HCI?

HCI (human-computer interaction) is the study of how people interact with computers and to what extent computers are or are not developed for successful interaction with human beings.
As its name implies, HCI consists of three parts: the user, the computer itself, and the ways they work together.

The Goals of HCI

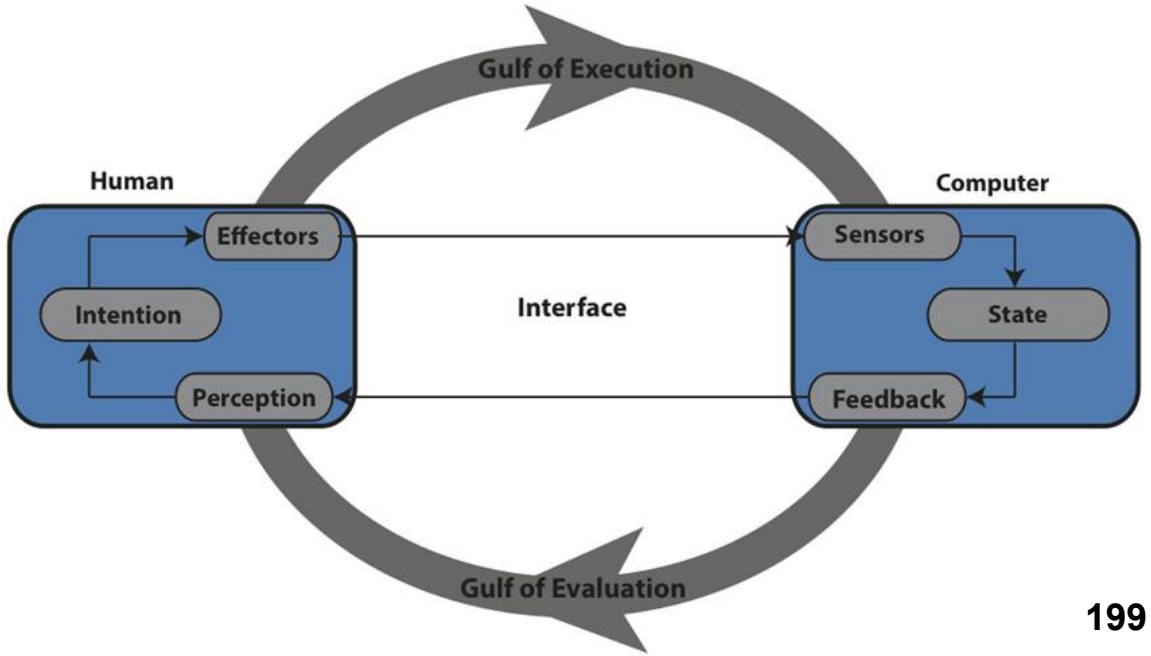
The goals of HCI are to produce usable and safe systems, as well as functional systems. In order o produce computer systems with good usability, developers must attempt to:

- understand the factors that determine how people use technology
- develop tools and techniques to enable building suitable systems
- achieve efficient, effective, and safe interaction
- put people first

Usability of HCI

Usability is one of the key concepts in HCI. It is concerned with making systems easy to learn and use. A usable system is:

- easy to learn
- easy to remember how to use
- effective to use
- efficient to use
- safe to use
- enjoyable to use



Y10/11 –IMEDIA IN THE MEDIA INDUSTRY (R093)

TOPIC 1: MEDIA INDUSTRY

MEDIA SECTORS

TRADITIONAL	NEW MEDIA
Film/ TV	Computer games
Radio	Interactive media
Print publishing	Internet
Radio	

JOB ROLES

CREATIVE	Animator, content creator, copy writer, graphic designer, illustrator, photographer, script writer, web designer…
TECHNICAL	Camera operator, games programmer, sound editor, audio technician, video editor, web developer…
SENIOR	Creative director, director, editor, production manager…

TOPIC 2: FACTORS INFLUENCING DESIGN

PURPOSE OF MEDIA PRODUCTS

advertise, promote, educate
entertain, inform, influence

Style, content and layout are linked to **purpose**

CLIENT REQUIREMENTS	CLIENT BRIEFS
1. Type of product 2. Purpose 3. Audience 4. Ethos 5. Genre/ style 6. Theme 7. Time scale	1. Formal 2. Informal 3. Negotiated 4. Commission 5. Meeting/ chat 6. written

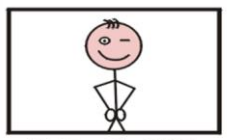
Audiences can be segmented by:

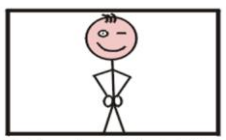
AGE
GENDER
OCCUPATION
INCOME/ EDUCATION
LOCATION
INTERESTS
LIFESTYLES

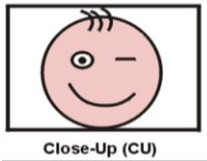
PRIMARY RESEARCH	SECONDARY RESEARCH
Research conducted your self • Interviews • Focus group • Questionnaires • Online survey	Making use of others peoples research • Books / Journals • Internet • Magazines/ newspapers • TV

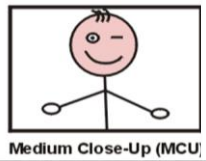
Y10/11 – IMEDIA IN THE MEDIA INDUSTRY (R093)

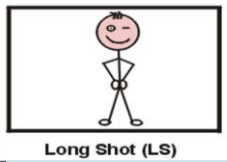
HOW MEANING IS CREATED:

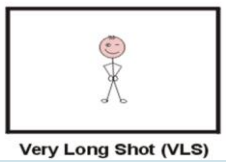


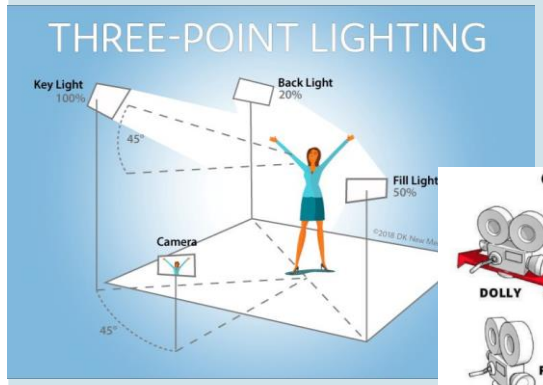


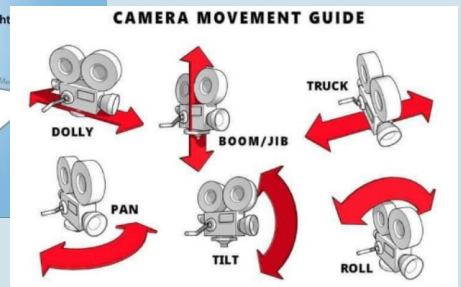












TOPIC 3: PRE-PRODUCTION PLANNING

PRODUCTION PROCESS

PRE-PRODUCTION: Planning and research

PRODUCTION: Creation of content such as article/ images/ graphics

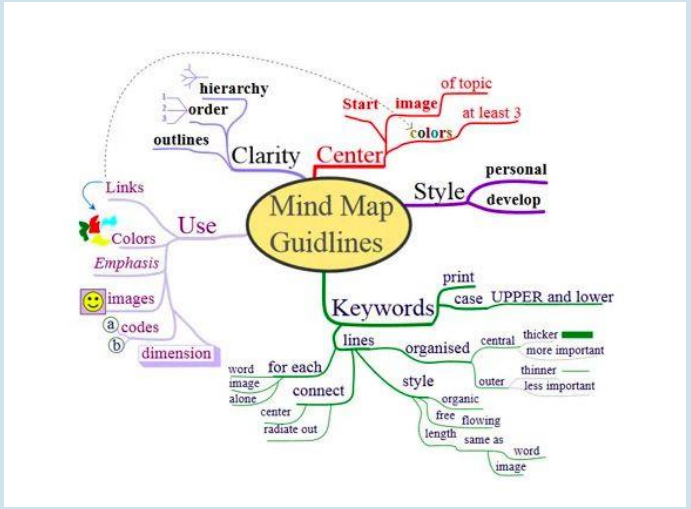
POST PRODUCTION: Editing and putting together considering space and layout choices

WORK PLANNING

MILES STONES	A smaller, signification stage in the process
CONTINGENCY	Having a back up plan
RESOURCES	Hardware, equipment, software, people

DOCUMENTS TO SUPPORT IDEA GENERATION:

MIND MAP (hand drawn/ digital)



MOOD BOARD (physical/ digital)

Year 10 PRE KO – Christian Beliefs: Part 1 – The Nature of God

Key Words

Monotheistic: A religion which believes in one God
Holy: Separate and set apart for a special purpose by God
Omnipotent: All powerful, Almighty
Omnibenevolent: all-loving
Just: Fair
Trinity: One God has 3 parts**;** God the Father, Son and Holy Spirit
Holy Spirit: God's presence in the world
God the Son: Jesus – enables humans to have a special relationship with God
Creation: God bringing the universe into being
The Word: Jesus – as described in the book of John
Genesis: The first book in the Bible which has the creation story in it
Incarnation: God in human form – Jesus.
Resurrection: coming back from the dead
Blasphemy: saying or doing something which goes against God
Crucifixion: Roman method of execution where a person is nailed to a cross
Ascension: 40 days after the resurrection when Jesus returned to God in heaven
Afterlife: What happens when you die
Day of Judgement: God will judge all souls at the end of time
Heaven: Eternal happiness, being in the presence of God
Hell: Eternal suffering, absence of God
Purgatory: Catholic belief in which souls are cleansed in order to enter heaven
Sin: Any action against God
Original Sin: First sin in the world committed by Adam and Eve which means all humans are born with this in them
Salvation: saving the soul from sin and going to heaven thanks to Jesus' sacrifice
Grace: A quality of God which shows to humans that God loves them, which they don't need to earn
Forgiveness: pardoning someone for their wrong doing
Atonement: restoring the relationship between people and God through the life, death and resurrection of Jesus

God as omnipotent, loving and just

- Christians believe **God is omnipotent: all-powerful**. ***'Nothing is impossible with God'***
- **God is omnibenevolent: all-loving.** Guidelines are given for us to live the best lives we can. Christians should love each other treating everyone with care and respect. ***'God so loved the world he gave his one and only Son…'***
- God has unlimited power and authority, together with complete love, and therefore gives **justice** in a fair way. Christians should try and bring about fairness in the world.

The Problem of Evil and Suffering: The Inconsistent Triad

- Christians believe God is omnipotent (all-powerful) and omnibenevolent (all-loving).
- However, why is there evil and suffering?
- If God was all powerful, he would be able to stop evil and suffering.
- If he was all loving, he would care enough to stop it. So he would stop it.
- But he doesn't! So God cannot exist, or is at least not omnipotent or omnibenevolent.
- A Christian defence: God is transcendent (beyond our understanding) and therefore we can trust God to know best – there is a reason for this inconsistency, even if we can't understand it.

Different Christian Beliefs about Creation

Genesis 1 v 1-3	- God created the world in 6 days and rested on day 7. ***'In the beginning God created the heavens and the earth'.*** God created the perfect world in the beginning: ***'It was good'*** - Not all Christians believe this story is literally true, but rather believe it is a story which represents the idea that God created life. - A further quote from Genesis: ***'The Spirit of God hovered over the waters'*** indicates that the Holy Spirit was present at creation.	Combined, these ideas suggest that all 3 parts of the Trinity were present at creation.
John 1 v 1-3	- ***'In the beginning was the Word, and the Word was with God, and the Word was God….through him all things were made…'.*** - 'The Word' refers to Jesus and therefore he was present at the beginning of the world and involved in the creation of the world	

The Oneness of God and the Trinity

- The Holy Trinity: God the Father, the Son and the Holy Spirit.
- God is three in one. There are not three Gods, but different forms of the same thing. Each part is fully God, but also these parts of the Trinity are not the same.

God the Father	God the Son	God the Holy Spirit
- First person of the Trinity. - Creator - Omnipotent, omnibenevolent, omniscient (all-knowing) and omnipresent (everywhere).	- Second person of the Trinity. - Jesus, who became God in human flesh (known as the Incarnation). - Performed miracles, healed the sick and showed kindness to outcasts.	- Third person of the Trinity. - God sent the Holy Spirit to influence, guide and sustain all life on earth after Jesus ascended. - The unseen power of God.

Different Christian Beliefs about the Afterlife

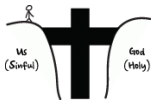
- Based on God's judgement Christians believe that people will go to heaven or hell.
- Judgement will happen at death or at the day of judgement (Christians vary on their understanding of this)
- ***The Parable of the Sheep and the Goats*** shows how people will be judged by God. The sheep represent those who did good actions (therefore going to heaven) and the goats represent those who did bad actions (therefore going to hell)
- Jesus also said, ***"I am the way the truth and the life, no-one comes to the Father except through me."***
- *So,* treating others well *and* believing in God is important to guarantee a good afterlife.
- Heaven is seen as being with God and eternal happiness where there is no suffering. Hell is seen as eternal torment or suffering and being absent from God, and where the Devil is.
- Some Christians believe that Heaven is a literal, real place you will go. Other Christians believe it is just being with God, in the same way hell may not be actually real but an absence of God.
- The Bible teaches that there will be a resurrection of the body for all people who go to heaven, though the details of this are debated.
- In the book of Revelation it mentions that people who go to hell will burn in a lake of fire.
- Roman Catholics believe in a place called purgatory in which your soul goes to be cleansed as not everyone is ready yet to go to heaven.

Year 10 PRE KO – Christian Beliefs: Part 2 – Jesus Christ and Salvation

Jesus' Life: Key Events

Event	Key Details	Importance/ Influence on Christians
Incarnation: Jesus is God in human form 	- 'Incarnate' mean 'In the flesh' – Jesus was God in the flesh. - Jesus' birth is explained in the Christmas story: the Nativity. - Humble birth (in a manger) shows Jesus was fully human, but he was born through the immaculate conception (Mary was a virgin), so he was fully God - This means Jesus does not have Original Sin because he was not conceived through sexual relations. - ***'Before they came together, she was found to be pregnant through the Holy Spirit'.*** - ***'The Word became flesh and made his dwelling among us'.*** '	- Encourages them to celebrate Christmas for its true meaning - Helps them in difficult times as they know their role model was human too - Allows them to have a personal relationship with God through Jesus
Crucifixion: Jesus' death on the cross 	- Crucifixion is remembered on Good Friday. - Jesus was arrested (having been betrayed by Judas) and put to death by Pontius Pilate. He was crucified alongside two criminals. - As Jesus was fully human he suffered pain as an ordinary human did. ***'Father, into your hands I command my spirit'*** - On the cross Jesus said ***'Father forgive them, for they know not what they do'.***	- By accepting Jesus' sacrifice they can be forgiven for sin and go to heaven. - Encourages them to follow Jesus' example and forgive others - Reminds them to be thankful and remember Jesus (especially on Good Friday) - Reminds them that suffering is a part of life and God can understand what it I like for someone to suffer.
Resurrection: Jesus rose from the dead 	- Jesus was buried in a tomb and left there until Sunday. Due to it being the Sabbath (on the Saturday), no-one could touch the body until after this. - Mary Magdalene returned to the tomb - it was open and empty. - An angel appeared and said Jesus had risen from the dead. - Evidence of resurrection: he appeared to people including disciples, they saw him eat, Thomas was encouraged to tough Jesus' palms to prove he was not a ghost.	- Shows Jesus was divine and not just a human so it may strengthen faith - Shows the power of good over evil - Encourages them to not fear death
Ascension: Jesus went back up to heaven to be with God 	- Happened 40 days after the resurrection - Jesus ascended to heaven. - He gave the disciples the Great Commission: ***'Go and make disciples of all nations, baptizing them in the name of the Father, the Son and the Holy Spirit'.*** - The Holy Spirit was left to guide and comfort people.	- Will encourage them to call on the Holy Spirit for guidance and comfort - Will encourage them to spread the message of Christianity (evangelise)

Sin and Salvation



- Sin: anything that goes against God's laws. Separates humans from God.
- Salvation means to be saved from sin (therefore being able to go to heaven)
- Humans are not perfect – impossible not to sin
- All humans are born with Original Sin – passed down from Adam and Eve.
- This action separated humans from God and brought about death into the world. They were tempted by the serpent (devil) and Christians believe that Christians are tempted in life to do bad things.
- **Salvation through Law**: humans have free will but should use this to make the right choices using God and Jesus' teachings to guide them, e.g. 10 Commandments.
- **Salvation through Grace**: being saved by accepting the sacrifice Jesus made on the cross – this showed God's grace: ***'For by grace you have been saved through faith'***
- **Salvation through Spirit**: having the Holy Spirit as a guide to accept God's Grace and follow his Law.

The Role of Christ in Salvation: Atonement

- Salvation is offered through Jesus, ***"For the wages of sin is death, but the gift of God is eternal life in Christ Jesus".***
- Jesus' death makes up for Original Sin. Humans can receive forgiveness for their sins because of Jesus' death and then receive eternal life.
- His sacrifice provides atonement, which means our relationship with God is restored. This removes the effects of sin and allows humans to get back to God. ***"He is the atoning sacrifice for our sins and for the sins of the whole world".***
- Jesus paid the price for the sin of all mankind through his death and Christians believe if you put your trust in him you can receive eternal life with God.
- Links with Salvation through Grace: salvation is a gift people must choose through belief in Jesus atoning for their sins

Exam Terminology

Influence: The capacity to have an effect on people's character, behaviour or actions
Contrasting: To show a difference
Contemporary: Occurring in the present time
Sacred Writings: Writing that is believed to contain words of God e.g. The Bible
Evaluate: Consideration of different viewpoints before arriving at a final judgement
Justified Conclusion: A final decision which is based upon a range of evidence.

Year 10 PRE KO – Christian Practices: Part 1 – Worship and Festivals

Worship and Festivals

Practice and Key Words	Details/ Contrasting Views		Importance and Quotations
Worship: Act of religious honour or devotion 	**Liturgical** - Takes place in a church and is led by a priest - **Formal**, **set prayers** are read out, and the worship follows a **set pattern and structure** - A more **traditional**, and formal form of worship - E.g. Eucharist in the Catholic Church	**Non-Liturgical** - Also takes place in a church but **less formal** - No set prayers, instead people take turns to preach and read from the **Bible** - Can be modern and appealing to young people - Service is usually focused around a Bible reading - E.g. Methodist or Baptist services	- Shows gratitude, love and respect to God - Could be a way of asking for forgiveness or asking for help - Brings comfort and strength - Gives time for reflection - ***'Sing to the Lord, for he has done glorious things; let this be known to all the world'.***
	Informal - Spontaneous prayers or sharing of thoughts - Community or house churches might meet to eat together and share their faith - Pentecostal Church – 'charismatic' worship. Led by the Holy Spirit and may involve dancing, clapping, calling out, speaking in tongues.	**Private** - Spending time with God alone or with close friends/ family - May involve prayer, meditation, studying the Bible.	
Prayer: Communicating with God 	**Informal** - Prayers that are made up by the individual using **his or her own words**.	**Set Prayers** - Prayers which have been written down and said many times by many people - E.g**. The Lord's Prayer**: The prayer that Jesus taught the disciples to pray, which includes thanks, asking for forgiveness and asking for guidance. ***"Our father who art in heaven…."***.	- Set prayers can bring a sense of unity - Prayer brings comfort and builds relationship with God - ***'Call on me and come and pray to me, and I will listen to you'.***
Sacraments: An outward sign of inward grace. **Eucharist/ Holy Communion** 	**Roman Catholic Church (Mass)** - Readings from the Bible - Offering of bread and wine **brought to the alter** - Priest says the words of Jesus at the Last Supper, says the Lord's Prayer and **gives a sign of peace** - **Congregation come to the alter** to receive the communion	**Orthodox Church (Divine Liturgy)** - Hymns, prayers, readings from Bible. - Priest comes through **Royal Doors** to chant the gospel. - Lord's Prayer said, behind Royal Doors words of Jesus said. - **Bread divided into four** – three consecrated as body and blood and fourth broken into small pieces. **Priest gives bread and wine together on a spoon**.	- Jesus started the tradition at The Last Supper (which took place the day before he died) - Christians now remember Jesus' death – reminds them of Jesus' sacrifice, and reminds them to forgive others. - ***"This is my body which is for you, do this in remembrance of me"***
Sacraments: An outward sign of inward grace **Baptism** 	**Infant Baptism** - Everyone is a descendent of Adam and Eve and therefore carries **Original Sin**. Baptism washes this away. - It also **welcomes them to the church community**. - Infant wears white, Godparents are chosen, font holds the water - E.g. Catholic, Orthodox	**Believer's Baptism (Adult Baptism)** - Some Christians think children are too young to understand the meaning and therefore don't baptise infants. - The person is old enough to understand the meaning behind what they are doing. - This includes a **full immersion** in a pool to wash away sin and start a new life in Jesus. - This is known as being **'born again'** - E.g. Baptist and Pentecostal churches	- Brings a person into the Christian family/ community - Water symbolises the washing away of sins - Jesus was baptised, setting an example for others to follow - Jesus also encouraged baptism in the Great Commission: . ***"Therefore go and make disciples of many nations, baptising them in the name of the father, son and Holy Spirit".***
Pilgrimage: religious jou holy site. 	**Lourdes (France)** - Dedicated to Mary as Bernadette believed to have seen visions of Mary in the 19th Century. - A spring of water was discovered which had **healing powers**. Now millions of people have been to drink from the spring of water in the hope of being healed.	**Iona (Island off west coast of Scotland)** - Small community set up by St. Columba, an Irish missionary in the 6th Century - Pilgrimages happen there in dedication to the virgin Mary. - The community in Iona hold **daily services in the Church leading a seven mile hike** to holy spots – it is a physical and spiritual challenge	- Pilgrimage shows commitment to God and strengthens faith - People may go on pilgrimage for healing - It brings a sense of community
Festivals: Celebrations for religious reasons 	**Christmas** - Remembers the birth of Jesus – **his incarnation**. - It is celebrated on the 25th December. - Trees and homes are decorated **with nativity scenes**. Lights remember Jesus is the light of the world. **Carol services** happen in Churches with readings from the Bible. Children act out nativity plays and **midnight mass** takes place on Christmas Eve.	**Easter** - Most important festival which celebrates Jesus' resurrection from the dead leading up from holy week. - Jesus was crucified on **Good Friday and rose on Easter Sunday**. - Special services take place and processions led by someone carrying a cross. - On Easter Sunday**, sunrise services** take place with hymns which celebrate the resurrection. **Easter Eggs** are used as a reminder of new life. **Paschal candle** is lit.	- Festivals celebrate the most important events of Jesus' life – his birth, death and resurrection. - They are a time for believers to come together and celebrate their faith. - ***"I bring you glad tidings that today a king is born"*** - ***'Christ is risen from the dead'.***

Year 10 PRE KO – Christian Practices: Part 2 – The Role of the Church in the Local and Worldwide Community

Key Words

Church: The holy people of God, the body of Christ or a building where Christians worship
Agape: compassionate love
Mission: A calling where an individual or group go out and spread the word of God.
The Great Commission: Jesus instruction to his followers to go and spread his message *"Go and make disciples of many nations"*
Missionary: A person sent on a religious mission to promote Christianity in a different country through preaching or charity work
Evangelism: Spreading the Christian message through preaching the Christian gospels
Alpha course: An example of evangelism –trying to tell others about Christianity
Convert: Someone who has decided to become committed to a religion and change his or her religious belief.
Reconciliation: A sacrament in the Catholic faith, also making up after an argument or disagreement
Persecution: hostility or ill-treatment, because of race or religious or political beliefs.
Poverty: When people live without having basic human rights such as having enough food, water or shelter

The Role of the Church in the Local Community

Food Banks 	- Provide **free food** (usually non-perishable items) to those in need, usually through donations - Some food banks also offer support in seeking employment - Example: The Trussell Trust	The work of food banks and street pastors supports the key Christian message to show love to all. Key words and quotes to support: ***Agape – compassionate love*** ***'Love your neighbour as you love yourself'*** ***'Faith, if not accompanied by action, is dead'*** ***'For I was hungry and you gave me something to eat' (Parable of the Sheep and the Goats)***
Street Pastors 	- Volunteers who patrol streets in urban areas - Do not actively preach but **show their faith through their actions** - Give out flip flops, lollipops and water on nights out, help people to get home safely, offer reassurance and support	

The Role of the Worldwide Church: Reconciliation and Persecution

Working for Reconciliation 	- Jesus came to earth to restore the relationship between humans and God, so Christians believe they have a responsibility **to restore the relationship between themselves and others.** - Lots of examples of arguing between faiths, even within Christianity e.g. **Catholics and Protestants**. Irish Churches Peace Project set up to reconcile these denominations - **Coventry Cathedral** – bombed during WW2. Cathedral has now become a centre for reconciliation as Christians wanted to respond with forgiveness, not revenge.	***'Therefore, if you are offering your gift at the altar and there remember that your brother or sister has something against you, leave your gift there in front of the altar. First go and be reconciled to them; then come and offer your gift'.*** ***'Blessed are the persecuted because of righteousness, for theirs is the Kingdom of Heaven'.*** ***'If one part suffers, every part suffers with it' (St Paul, likening members of the Church to different parts of the body)*** ***'Love your neighbour as you love yourself'*** ***Agape: Compassionate Love***
Responding to Persecution 	- Persecution (ill-treatment) happens all over the world – Christians are tortured or even killed for their faith - Christians have a **responsibility to help those who are persecuted** - They might pray for them, donate to charity or get involved with charities who work abroad. - **The Barnabus Fund**: send financial support, raise awareness for those persecuted, send spiritual and material support.	

Church Growth

Church Growth 	- Estimated to be 2.5 billion Christians in the world - Christians are taught **to help to grow the church** by sharing testimonies (how God has changed their lives), inviting people to meetings, prayer, social events etc.	- ***The Great Commission 'Go and make disciples of all nations, baptising them in the name of the Father, the Son and the Holy Spirit' (Jesus' words before he ascended to heaven).*** - *Example: The Alpha Course. Anyone is welcome to join in with a meal and conversation about the 'Big Questions' of Christianity.*
Mission and Evangelism 	- Evangelism means to **spread the message of Christianity** through preaching the Gospel (which means 'Good News') - Some do this through Mission work, which means evangelism overseas - The aim is to tell people that Jesus is the saviour of the world, in the hope of **converting them** to Christianity.	

The Role of the Worldwide Church: World Poverty

Responding to World Poverty 	- Jesus emphasised helping the poor so Christians follow his example - **Jesus told a rich man to sell everything he had** and give it to the poor. - **Christian Aid**: They aim to stop poverty, encourage sustainable development and provide emergency relief in areas such as Africa and the Middle East. - Their slogan is 'We believe in life before death' - They provide emergency food, shelter, water, sanitation and run a **Christian Aid Week** to fundraise every year.	- ***'If anyone has material possessions and see a brother or sister in need but has no pity on them, how can the love of God be in that person?'*** - ***Parable of the Sheep and the Goats*** - **'Go, sell everything you have and give to the poor, and you will have treasure in heaven. Then come, follow me.'**

Exam Terminology

Influence: The capacity to have an effect on people's character, behaviour or actions
Contrasting: To show a difference
Contemporary: Occurring in the present time
Sacred Writings: Writing that is believed to contain words of God e.g. The Bible
Evaluate: Consideration of different viewpoints before arriving at a final judgement
Justified Conclusion: A final decision which is based upon a range of evidence.

Year 10 PRE KO – Sikh Beliefs: Part 1 – Key Beliefs

The Nature of God: The Mool Mantra

- Opening words of the Guru Granth Sahib (GGS 1a)
- 'Mool Mantra' means 'Main Chant'.
- Sikhs believe the words were the first teachings of Guru Nanak after he became enlightened
- Most important part of the Guru Granth Sahib (GGS) and most important statement for Sikhs
- Said daily in Sikh prayers and recited in worship.

One Universal Creator God (Ik Onkar)
The Name is Truth
Creative Being Personified
No Fear, No Hatred
Image of the Undying
Beyond Birth
Self Existent
By Guru's Grace

God as Creator

- God (Waheguru) created everything.
- There are no creation stories in Sikhism, and Sikhs accept scientific views about how the universe came to be here, but nothing would have happened without it being God's will (hukam).
- Sikhs believe God is both separate from and part of His creation: ***'He possesses all qualities; He transcends all qualities'***

God as separate from the Universe

- God is transcendent – beyond human understanding
- He does not have a physical form, is timeless and spaceless, and has no limits
- God is without gender (Sikhs use 'He' to have a simple way to talk about God) and has no beginning or end.
- 'Nirgun' – without qualities or form.
- ***'He is the Perfect Transcendent Lord, from the very beginning and through the ages'***

God shown in and through the Universe

- God is present within creation and within human beings, as a soul or Divine Spirit
- There are ways that God can be understood by humans, e.g. through the Mool Mantra, the teachings of the Gurus, other parts of the GGS or through his creation.
- 'Sargun' – with qualities or form
- ***The Lord is seen to be manifest and present'***
- ***He Himself is the water… He Himself abides in each and every heart'***

The Virtues

- God has given people an opportunity to reunite with Him (Mukti)
- To achieve this, Sikhs must build good karma in the hope of being released from the cycle of birth, death and rebirth
- One way to build good karma is to live a good life, developing certain positive characteristics known as **virtues**.

Truth and Truthful Living	Telling the truth, living an honest life. Includes promoting justice and not discriminating. ***'Truth is higher than everything; but higher still is truthful living'***
Compassion and Patience	Being kind and aware of the needs of others. Being able to accept/put up with delays/problems with a calm mind and attitude. ***'Show kindness and mercy to all life'.***
Contentment	Not being greedy, being satisfied with what you have, maintaining detachment from material things.
Humility	To be humble, not proud. Not full of your own importance.
Love	To show a loving attitude to everyone, to show kindness, respect and forgiveness (just as God would do for them)
Wisdom	Having experience, knowledge and good judgement – understanding all of the virtues and being able to put them into practice.
Courage	Being brave. Many Sikhs throughout history have shown bravery in remaining true to their faith, even if they have suffered for it.
Temperance/ Self-Control	Showing self-control and moderation, can include not partaking of alcohol or drugs. Being able to control one's temper and behaviour.
Justice	Working to make all things fair, or to bring equality.

Gurmukh and Manmukh

- **Gurmukh**: **God centered**. Someone who prays, worships, follows the virtues etc and keeps God in mind at all times. ***'The Gurmukh acts in harmony with God's will; the Gurmukh finds perfection'***
- **Manmukh**: **Man centered**. Someone who is selfish, thinks they are above God and others, succumbs to the evils. ***'The foolish, self-willed manmukh is blind in the world'.***

Beliefs about Life After Death

Rebirth	- **Reincarnation**: when a human dies, their soul is reborn into another body - This rebirth is part of a cycle of being born, dying and reborn, known as **samsara**. - The cycle will repeat until the soul is freed/ liberated and becomes united with God - All animals, including humans, have souls, so a human may be reborn as an animal. - ***'They die and die, over and over again, only to be reborn, over and over again'***
Karma	- Sum total of a person's actions and words which determines their afterlife - Reincarnation is based on the good or bad karma they built in a previous life. - A human is the best being you can be reborn into as it gives you the best chance to build good karma and be liberated from samsara. - Good actions = good karma = a good reincarnation/ liberation from samsara - Bad action = bad karma = a lower reincarnation e.g. animal. - ***'The body is the field of karma in this age; whatever you plant, you shall harvest'***
Mukti	- Liberation, freedom and release from the cycle of samsara - The final goal for Sikhs - individual soul reunites with God - Negative aspects: To achieve mukti, a person must rid themselves of all that stands in the way of getting close to God. This can be challenging. - Positive aspects: the soul is free to unite with God. This is indescribable and can only be experienced. - ***'Through selfless service, eternal peace is obtained'***

Exam Terminology

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Year 10 PRE KO – Sikh Beliefs: Part 2 – Key Beliefs/ Beliefs about the Nature of Life

Key Beliefs Continued

The Stages of Liberation: The 5 Khands

- Stages a human being must pass thorough on the way to mukti.
- Usually will not all happen in one lifetime

1) Piety	- The opportunity for devotion to God, awareness of God.
2) Knowledge	- Knowing about God; learning about and experiencing God
3) Effort	- Devoting oneself to tuning in with God e.g. through prayer, worship, meditation
4) Grace	- Spiritual blessing given by God (as we can only go so far in developing ourselves)
5) Truth	- Finding God, the realisation of God. Can only be experienced, not described.

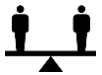
The Barriers to Mukit

- - Sikhs must avoid those things which will stop them from achieving mukti. There are 5 evils (below) bt Sikhs should also guard against:
- **Haumai** (pride and ego)
- Illusion (inability to see the truth; focus on material things)
- Self-centredness (ego, selfishness)

Anger 	- An emotion causing someone to act without balance
Lust 	- Sexual desire – sex outside of marriage leads people away from God: ***'Sexual desire and anger are broken, like a jar of poison'***
Greed 	- A desire to possess more than you need
Worldly Attachment 	- Placing too much emphasis on material possessions and worldly relationships
Pride 	- False pride – being proud of things that were given rather than achieved: ***'Why do you take pride in trivial matters?'***

The Oneness of Humanity

- Guru Nanak, the founder of Sikhism, had an experience where he disappeared into a river for 3 days. During that time, he said he met with God.
- Following this experience, he taught that there was not only one way to God; there is no need to convert others to Sikhism because we can all follow our own path to God.
- Everyone has a divine spark within them which unites us all, and this is known as the **oneness of humanity**.
- ***God is neither Hindu nor Muslim and the path I follow is God's'***
- ***'We are all sons of the one God; there is no Hindu and no Muslim'***
- ***'The Divine Light is within all'***
- This also means that everyone is equal – this was one of Guru Nanak's most important teachings.



The Equality of All
Equality is shown in Sikhism in the following ways:

<u>The life of Guru Nanak</u>

- Had both Hindu and Muslim friends. His best friend was a Muslim man called Mardana
- Emphasised equality between men and women: ***'From her, kings are born… without woman, there would be no one at all'***
- Taught: ***'There is no Hindu and no Muslim'***
- Introduced the practice of the langar: ***'No discrimination… must be made while making people sit in rows for eating'***

<u>The life of Guru Gobind Singh</u>

- Started the Khalsa – both men and women can join.
- When the first 5 members joined, they wore identical coloured robes to show equality.
- One key role of the Khalsa is to stand up against inequality
- Introduced surnames Singh (Lion) and Kaur (princess) to remove inequality shown by the caste system

<u>The Guru Granth Sahib</u>

- The GGS is a collection of hymns and writings from many teachers and saints e.g. the Gurus.
- Writers also included Hindus and Muslims, showing the inclusivity of Sikhism.
- Guru Gobind Singh declared the GGS 'The Living Guru' and is the 11th and final teacher for Sikhs. It contains many teachings about equality: ***'All beings and creatures are His; He belongs to all'. 'All are made of the same clay'.***

<u>Sikhism Today</u>

- The Langer: free kitchen where everyone is welcome. All sit on the floor together to show all are equal. Food is vegetarian so everyone can eat it.
- Both men and women take part in worship, reading GGS in the Gurdwara, cooking or serving food etc.

Sewa: Selfless Service

- Sewa is a duty Sikhs have to help others without expecting anything in return
- It will build good karma and help a Sikh on the path to achieving mukti
- ***'Through selfless service, eternal peace is obtained'***
- It helps Sikhs to show many of the virtues whilst avoiding the 5 evils.

<u>Tan (Physical Sewa)</u>
Using the body to help others e.g. serving in the langar, cleaning shoes or floors

<u>Man (Mental Sewa)</u>
Using the mind and mental skills e.g. reading the GGS, teaching others, inspiring others

<u>Dhan (Material Sewa)</u>
Using material wealth to help others e.g. giving a tenth of their income to the sangat or to charities. This 10% is known as Dasvandh

The Sangat: Sikh Religious Community

- The company of Sikhs meeting in the presence of the Guru Granth Sahib
- 'Sat Sangat' means 'True Congregation'
- ***'Join the Sat Sangat, the True Congregation, and find the Lord'***
- Sikhs may gather together to learn, pray, hold a ceremony, read the GGS etc
- Importance: provides opportunities for sewa, gives the chance to learn from other Sikhs, builds a supportive community to strengthen faith, helps to develop religious understanding.

Amritdhari and Sahajdhari Sikhs

- Amritdhari Sikhs are those who have been initiated into the Khalsa.
- They are expected to offer daily prayers, wear the 5Ks, take the name Singh and Kaur, practise the virtues, be vegetarian and obey the code of conduct (which includes rules such as no smoking, drinking or adultery)
- 5 Ks: **Kara** (steel bracelet), **Kirpan** (ceremonial sword), **Kachera** (cotton underwear), **Kanga** (wooden comb), **Kesh** (uncut hair). Amritdhari Sikhs must wear all of the 5 Ks. Sahajdhari Sikhs may choose to wear some.
- Sahajdhari Sikhs have not been initiated into the Khalsa so, whilst they believe in Waheguru and the Gurus, they do not have to follow the strict rules.

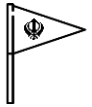
Year 10 PRE KO – Sikh Practices: Part 1 – Worship and Service

The Gurdwara: Religious Features

- The gurdwara is the Sikh place of worship. Translates to 'Door of the Guru'
- Technically a gurdwara is any place in which the Guru Granth Sahib is installed and treated with proper respect
- The gurdwara is open to all, no matter their age, race, religion etc.

Outside the Gurdwara:

- Many have a dome and decorations on the outside
- All will have a flag outside – the Nishan Sahib. This is usually yellow with the Khanda symbol in blue.



Prayer Hall: Darbar Sahib	Large space with a throne at one end Men and women sit separately so they are not distracted by one another, and all sit on the floor so they are lower than the GGS
Takht 	Throne: represents the GGS being treated like royalty/ a human guru. Seat covered in fine cloth, often surrounded by flowers, space for money and food offerings, and a bowl containing karah parshad (a sweet food which is seen as a blessing)
Palki	Domed structure used to cover the raised area where the GGS is placed. Canopy at the top may be engraved with the word 'Waheguru' or with scripture.
Manji	A small bed on which the GGS is placed during the day.
Chanani	Large canopy made of decorated cloth which is placed over the palki.
Langar Hall	The area of the gurdwara where free food is served. All are welcome, everyone sits together on the floor to represent equality.

Worship in the Gurdwara

- Worship can include meditating, listening, singing, reciting, working and serving people – is it true worship as long as God is kept in mind.
- ***'Worship and adore Him, and you shall be at peace forever'.***
- Worship in the gurdwara may last up to 5 hours but people may come and go.
- Shoes are removed, heads are covered, hands/ feet washed, before bowing and touching the floor in front of the GGS.
- Worship services start and end with the Ardas Prayer
- Kirtan – singing of hymns which nourishes the soul
- Ragis – musicians who sing or play accomoniment for kirtan
- Karah Parshad – given out at the beginning and end of the service, from the same bowl to show equality. Sweet like God's blessings.

The Role of Prayer in the Home

- Sikhs are expected to remember God at all times which includes reciting daily prayers at home.
- Some Sikhs have a copy of the GGS at home but many have a gutka instead, a prayer book, which is treated with as much respect as the GGS (ideally has its own room, or section of a room, and is kept in a clean cloth).
- GGS 305, written by Guru Ram Das, outline how Sikhs should pray:
- ***'One who calls himself a Sikh of the Guru, the True Guru, shall rise in the early morning and meditate on the Lord's Name'.***
- Prayer routine includes waking early, bathing, repeating the japji (a prayer given by Guru Nanak), and repeating other prayers at different points of the day.

Nam Japna: Meditating on the Name of God

- One key responsibility of Sikhs is to meditate on the name of God, known as Nam Japna.
- This keeps God in mind at all times and helps them to act well in their life.
- It may involve quietly reciting God's name to oneself, or by saying it out loud in a community recitation.
- It is the community recitation that is usually known as Nam Japna.
- ***'Those who have the treasure of the Lord's Name deep within their hearts – the Lord resolves their affairs'***

The Role of the Gurdwara in the Sikh Community

Management and Role

- There are very few paid roles as most Sikhs volunteer as part of sewa.
- A granthi (or management team) manage and maintain the gurdwara.
- Many gurdwaras are open 24/7 and all are welcome
- Besides prayer and worship, other roles for the gurdwara include langar, meeting/ education rooms to teach Punjabi and Gurmukhi, committee meetings, youth clubs etc.

Granthi:

- A male or female Sikh, who has been initiated into the Khalsa, who reads the Guru Granth Sahib.
- They are expected to be of good character and live life according to the Sikh code of conduct
- They do not have a higher status than other Sikhs but they are highly respected.
- Granthis arrange and conduct religious services, maintain the gurdwara, leads kirtan (singing hymns), lead an akhand path etc.
- Most importantly, granthis take care of the Guru Granth Sahib, organizing the ceremony to bring it to and from the rest room each day.

The Role and Importance of the Akhand Path

What 	- A continuous reading of the Guru Granth Sahib from start to finish – all 1430 pages. - Takes approx. 48 hours – male and female Sikhs take shifts to complete it. - Karah Parshad is given out at the beginning and the end as a blessing
When/ why 	- Usually takes place at the start of a festival - Times of joy and sorrow e.g. wedding, funeral, birth of a baby, death of a family member - GGS may be taken to a new home or new business as a blessing
Importance 	- Seen as a great blessing to have the Living Guru recited at an important event – it should not be taken lightly. - If it is to bless a new home or business, the family are expected to listen and take part at some point during the 48 hours to show respect

Showing Respect to the Guru Granth Sahib

- GGS is known as the Living Guru (as declared by the 10th and final human guru, Guru Gobind Singh) and is treated with as much respect as a human guru would be.
- Sikhs show respect to the GGS in a number of ways, e.g.:
- All printed copies have 1430 pages to show they are identical and the words do not change
- Sikhs sit on the floor to worship so they are lower than the GGS
- They do not point their feet towards it
- They bow before it
- They cover it with a rumalla, a decorated cloth (often made of silk)
- They wave a chauri over it – a fan made from yak's hair whch would have been waved over honoured teachers to keep them cool and keep flies away
- At the end of each day it is wrapped in clean cloth and carried in a procession to its rest room, where it is effectively put to bed overnight. The room is called Sach Chand.

Langar as an expression of Sewa

- Started by Guru Nanak to promote equality in a time of the Caste System
- Shows equality: all are welcome, all sit on the floor so they are on the same level, food is vegetarian so everyone can eat it.
- Excellent way for Sikhs to carry out Tan – physical sewa – by cooking, serving, cleaning. Can also show Dhan – material sewa – by donating produce.
- Both men and women take equal roles in helping in the langar.
- Many langars run in times of crisis, and to help those in poverty.
- ***Guru Gobind Singh: 'Keep the langar ever open'.***

Year 10 PRE KO – Sikh Practices: Part 2 – Festivals and Lifestyle

Festivals: Vaisakhi

- Originally a harvest festival where farmers would show thanks to God for a good harvest
- Usually celebrated on 13th or 14th April

Vaisakhi in 1699

- Guru Gobind Singh started the Khalsa – he asked who would be willing to die for their faith and 5 men stepped forward. They became the Panj Piare, the first 5 members of the Khalsa. The practice of the surnames Singh and Kaur began here.

Vaisakhi in 1919

- During celebrations at Jallianwala Bagh, Amritsar, many Sikhs were shot and killed by a British general who was acting on the orders of the Lieutenant Governor of the Punjab. Sikhs remember sad occasions such as this at Vaisakhi and it's a reminder to stand up for people's human rights to practise religion freely.

Celebrations at Vaisakhi

- Akhand Path
- Act of worship including Ardas Prayer and kirtan
- Community meals – langar
- Many Sikhs choose to join the Khalsa at Vaisakhi
- New clothes, especially for children
- Sending Vaisakhi cards
- Processions through the streets – floats, singing, dancing etc
- Nishan Sahib – a new flag replaces the old flag. Flagpole washed in yogurt and milk then rinsed with water as a symbol of purity.

Festivals: Divali

- Name means 'a row of lights' so Divali is often known as the festival of lights.
- Held in October/ early November
- Celebration of freedom, and the victory of good over evil.
- It's a time for Sikhs to remember those who have stood strong in their faith and who have been brave in times of persecution.
- Sikhs are encouraged to follow the example of Sikhs who have promoted and protected people's freedom

Guru Hargobind and the 52 princes

- Guru Hargobind (6th Guru) and 52 princes were arrested and imprisoned for political reasons.
- The emperor believed the charges were false and demanded Guru Hagobind be released, but he refused to leave unless the princes were released as well.
- The emperor said as many princes as could hold on to the Guru's clothes as he walked out of the gate could be released.
- The Guru's cloak had 52 long tassels – all could hold on and all were freed.
- Became known as 'prisoner release day' and is celebrated at Divali.

Celebrations at Divali

- Akhand Path
- Street Processions, firework displays and langars
- Homes are spring-cleaned and decorated with oil lamps and lights
- New clothes and presents given to children
- Huge celebrations at the Golden Temple – pool and buildings decorated with thousands of lights.

Festivals: The Gurpurbs

- Take place at anniversaries – usually the birth or death of a guru.
- 4 most widely celebrated gurpurbs: Guru Nanak's birthday, Guru Gobind Singh's birthday, martyrdom of Guru Arjan and Guru Tegh Bahadur.
- **Importance**: remind Sikhs of their religion's history, strengthen their faith as they join together to celebrate, enable Sikh children to learn about the gurus, gives Sikhs chance to share their faith and perform acts of sewa.

General Celebrations

- Akhand Path
- Guru Granth Sahib carried in processions
- Kirtan
- Langars

Guru Nanak's Birthday

- October/ November
- Most important gurpurb
- Processions, candles lit, firework displays, new clothes for children, holiday from school (in India)

Different Celebrations in Great Britain and India

Great Britain

Celebrated on nearest Sunday
Takes place at weekend so no schools closed
Quieter and more local celebrations, focused around gurdwara.

India

Celebrated on actual day
School often closed
Much bigger celebrations – colourful processions, firework displays, fairs.

Pilgrimage: Visiting the Golden Temple

Pilgrimage: a religious journey

- Many Sikhs travel to the Golden Temple (Harimandir Sahib) in Amritsar in the Punjab.

Features:

- Surrounded by a pool of fresh, clear water
- 4 entrances to represent that everyone around the world is welcome
- The upper storey is covered with gold leaf
- The original Adi Granth, the first version of the holy book, is installed on a takht inside the temple

Akal Takht

- Political building
- Houses the rest room for the GGS – it is carried in procession every morning and evening.

Visiting/ Importance

- Pilgrims may bathe in the sacred water, thought to have heling properties
- They visit the gurdwara, listen to kirtan, hear readings from GGS, meditate etc
- Langar feeds thousands of pilgrims
- Pilgrimage is not compulsory but Sikhs may choose to as it can strengthen and deepen their faith
- It teaches pilgrims more about the history of their faith and is a time for Sikhs, and non-Sikhs, to gather together
- Rituals such as pilgrimage, or bathing in the sacred pools, are less important than a person's inner faith – bathing would do nothing if they are not clean inside.

Naming Ceremony

What happens? 	- Takes place around 2 weeks after a baby is born - Baby is given a spoonful of amrit (sugar and water) and the amrit is stirred with a khanda by the granthi. - Granthi dips the sword into amrit and lightly touches the baby's head and tongue with the tip of the sword. - Mother drinks the rest of the amrit - Karah Parshad is given out.
Naming the baby 	- First name: Granthi opens the GGS at a random page. First letter of the first word of the first hymn on left hand page decides the first letter of baby's name. - Surname: Many Sikhs use Guru Gobind Singh's tradition of Singh (lion) or Kaur (princess)
Importance 	- A human is the greatest thing to be reincarnated into as it offers the best chance of achieving mukti, so the birth of a baby is a time to celebrate and give thanks to God.

Amrit Sanskar: Initiation Ceremony

What is it?	A ceremony where those who are prepared to be a fully committed Sikh are initiated into the Khalsa
What happens? 	Person being initiated must wash their hair, cover their head and wear clean clothes and the 5Ks. 6 other amritdhari Sikhs present – 5 to represent the Panj Piare, plus the granthi. They drink amrit from the bowl 5 times. Amrit is sprinkled on their eyes and hair 5 times. The remaining amrit is then shared between those being initiated, drinking from the same bowl. Karah Parshad is shared out.
What changes? 	Initiated Sikhs are known as amritdhari Sikhs. They will follow the Sikh code of conduct (Rehat Maryada) and keep rules such as: no smoking, alcohol or drugs, no eating meat, wearing the 5Ks, no stealing or gambling. They will also take the surname Singh or Kaur, if they didn't have this already.

Exam Terminology

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Justified Conclusion: A final decision which is based upon a range of evidence.

Self-Quizzing

Instructions: For this revision practice we would like you to create 9 questions from 1 subject using the knowledge organisers.

Tips:
- Write out the question first. Try questions that begin with: what, how, why.
- Answer the question without looking at your knowledge organiser. This will strengthen your memory and recall.
- Check your answer in green pen. Correct it if you didn't get it 100% right.

See link and QR Code below for a detailed video of this task:
https://www.youtube.com/watch?v=Y22g99Xj23A

Subject:_____

Question Number	Question	Answer	Self checking (green pen). Check your answer and give yourself a tick or a cross. If you got it wrong, correct your answer.
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9			

Subject:

Question Number	Question	Answer	Self checking (green pen). Check your answer and give yourself a tick or a cross. If you got it wrong, correct your answer.
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Subject:_____

Question Number	Question	Answer	Self checking (green pen). Check your answer and give yourself a tick or a cross. If you got it wrong, correct your answer.
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Subject:

Question Number	Question	Answer	Self checking (green pen). Check your answer and give yourself a tick or a cross. If you got it wrong, correct your answer.
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Subject:

Question Number	Question	Answer	Self checking (green pen). Check your answer and give yourself a tick or a cross. If you got it wrong, correct your answer.
1.			
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Look, Cover, Write, Check

Instructions:

- Pick out key words and key facts from a subject and copy out the definition or the fact. For this activity use your knowledge organiser, exercise book or revision tools to **look** at the correct definition of a keyword or fact.
- Next **cover** the definition or fact over with your hand so that you have to memorise the definition.
- Next **Write** out the definition or fact in the definition box below.
- Finally **check** if you have written your definition or fact out correctly from memory.

Tips:

- Look at the keyword or fact and read it aloud or inside your head.
- Read over it twice more and cover it up with your hand.
- Whilst it is covered up, write out the definition or fact in the space below.
- Check what you have written against what you read. Make any corrections in green pen.

See link and QR Code below for a detailed video of this task

https://www.youtube.com/watch?v=ItEzF0DoaE4

Subject:

Look - look at the sentence or word on your knowledge organiser. Read over it twice.	Cover (cover up the sentence or word by putting your hand over it or turning the page)	Write – write the sentence or word here. Spelling and word order both matter!	Self checking (green pen). Check your answer and give yourself a tick or a cross. If you got it wrong, correct your answer.

Subject:

Look - look at the sentence or word on your knowledge organiser. Read over it twice.	Cover (cover up the sentence or word by putting your hand over it or turning the page)	Write – write the sentence or word here. Spelling and word order both matter!	Self checking (green pen). Check your answer and give yourself a tick or a cross. If you got it wrong, correct your answer.

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			220

Subject:

Look - look at the sentence or word on your knowledge organiser. Read over it twice.	Cover (cover up the sentence or word by putting your hand over it or turning the page)	Write – write the sentence or word here. Spelling and word order both matter!	Self checking (green pen). Check your answer and give yourself a tick or a cross. If you got it wrong, correct your answer.

Mind Maps

Subject: _____

Instructions: Create a mind map for all the key topics associated within a specific part of a subject.

Tips:

- Read over the knowledge organiser and look for 3 – 5 main areas. Use these to start your mind map.
- Look for 3 – 5 main points in each part of your mind map. Add these to your mind map in a way that is concise and to the point (don't waste words).

See link and QR Code below for an explained video of this task in history:

https://www.youtube.com/watch?v=oh9BpSNvbME&t=37s

Mind Maps

Subject:

Topic: _____

Topic: _____

Mind Maps

Subject:

Topic: _____

Topic: _____

Mind Maps

Subject:

Topic: _____

Topic: _____

Mind Maps

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Topic: _____

Topic: _____

Mind Maps

Subject:

Topic: _____

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Mind Maps

Subject:

Topic: _____

Topic: _____

Flash Cards

Subject: _____

Instructions: Create a flashcard for all the key topics associated within a specific part of a subject.

Tips:

- Choose a topic to revise and identify the essential knowledge you need to remember
- On one side of your flash card add the key concept
- On the other side of your flashcard add the information which is essential for you to know for that concept
- If you remember all of the information on the flash card, well done! Review it in 3 – 4 days.
- If you can't remember all of the information the flash card, read the flash card 2 – 3 times and try again. Keep doing this until you can remember it.

Flash Cards

Subject:

Topic: _____

Topic: _____

Flash Cards

Subject:

Topic: _____

Topic: _____

Flash Cards

Subject:

Topic: _____

Topic: _____

Flash Cards

Subject:

Topic: _____

Topic: _____

Flash Cards

Subject:

Topic: _____

Topic: _____

Flash Cards

Subject:

Topic: _____

Topic: _____

Student Revision/Home Learning Timetable

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
3.00pm							Check next weeks HW & plan what days you will complete each set of HW.
4.00pm							
5.00pm							
6.00pm							
7.00pm							