



ORMISTON
SWB
ACADEMY

Knowledge Organisers Autumn Term – Year 10

Name: _____

Please remember:

- It is to be kept inside your knowledge organiser book
 - It is to be brought into school every day

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

1	2	3	4	5
Look	Cover	Write	Check	Repeat
Start with a small section of knowledge that you want to remember e.g <i>Henry VIII's wives in History</i> . 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?	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 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
Focus	Big ideas	Explain it	Link it	Record it
Make it manageable by selecting an area of your KO <u>where your learning is not secure</u> . Don't waste time going off something you can already do!	Pick out the main points or the big ideas in this section.	Explain what you know about the main points (this could be written or shared verbally – a friend, a family member.	Now, see how it links to other areas within the subject. E.g <i>Eating meat – causes global warming. Cows produce methane which is a greenhouse gas.</i>	Write down as many 'think it, link it' ideas as you can in your book. See if you can beat others in you class!

Strategy 2- Think it, link it – Great for connecting the big ideas in your subject. How does 'x' relate to 'y'. What are the key factors which make an equation/ experiment/ process work? Challenge yourself to see how many links you can make!

1	2	3	4	5
Select topic	Prepare quiz	Answer it	Self check	Repeat
Decide which area you want to be quizzed on (this might build up over time)	Get someone else to prepare 10 random questions on that topic to challenge 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.

Strategy 3- Knowledge quiz – You might try this after a few weeks of using your knowledge organiser. Get someone to set you 10 questions using your knowledge organiser. These could be spellings, key words, processes, equations etc to see how much you can remember! Record your score and see if you can beat your personal best each half term!

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Your Task:

Prepare a spoken presentation on a specific topic.
The duration of the whole assessment should be around **8 minutes**.



Top Tips

- ✓ Ensure you use **Standard English**(a),
- ✓ Look at your audience,
- ✓ Don't just read from your notes,
- ✓ Don't have too many words on your power point (if you are using one) and
- ✓ Present your ideas on something you are **passionate about**.



Practise until you believe that you can deliver your speech with confidence.



- ✓ Key Criteria
- ✓ • Presentations must be **formal (b)**.
- ✓ • Presentations must be **planned** and organised.
- ✓ • You must listen to and respond appropriately to **questions and feedback**.



Assessment Objectives:

- **AO7:** Demonstrate presentation skills in a formal setting
- **AO8:** Listen and respond appropriately to spoken language, including to questions and feedback on presentations
- **AO9:** Use spoken Standard English effectively in speeches and presentations.

	Key terms	Definition
A	Standard English	English that is clear and most easily understood by a wide audience. It is the 'correct' form of English.
B	Formal	Language that doesn't use any slang or abbreviations.
C	Sophisticated	Complicated or showing higher level knowledge.

STEP 1: Choosing your Topic



Your topic should be of interest to you. Think carefully about whether you will be able to speak in a sophisticated and formal way about it though! You must talk for 4 minutes so ensure that it's something you are knowledgeable about.

Topics that have been successful in previous years:

- Does rap music glorify gang culture?
- Gaming: is it good for young people?
- Technology and its impact on our generation.
- Social Media: Benefits and Flaws
- Should animals be used for testing/ human entertainment?

OR Choose a topic you're interested in.
Previous successful topics:

- Is basketball a fair sport given it picks based on height and speed?
- Do we still need to travel abroad when we can see it all on the internet?

Step 2: Getting Started

To get started, answer the following questions:

- **What** is important about this topic?
- **Who** are you presenting to?
- **Why** have you chosen this topic and **why** should your audience listen?



Step 4: Practise

Read through your presentation to parents, guardians and friends.



Step 3: Planning your Presentation

You must make sure you plan and practise your presentation. Your organisation and preparation will improve your confidence and this will result in a higher grade.

1. Break your topic down into smaller sections:

- Introduction,
- Statistics,
- Facts,
- Specific cases/ case studies/ anecdotes or
- Personal opinion.

2. Do your research:

- You could look online for appropriate articles, documentaries etc.
- You could read some books/ magazines/ newspapers/ blogs.
- You should discuss your topic with friends and family to gain their ideas and inspiration.

3. Engagement Strategies: methods you could use to enhance your presentation:

- True/False with the audience
- Audience interaction .
- Some students have even played instruments and worn costumes!
- Emotive language, rhetorical questions, shocking facts/ statistics.
- When presenting, adapt your tone of voice, use hand gestures and eye contact!

Plan the questions for the questions you may be asked and how you will respond to them.



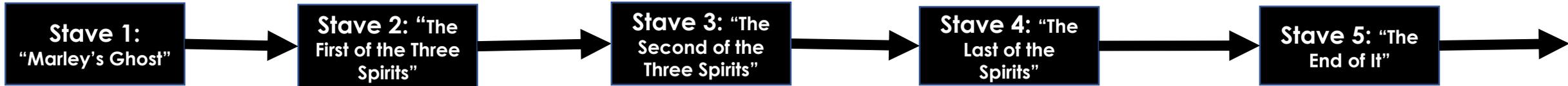
1. The **narrator** informs the reader that Jacob Marley (former business partner) died 7 years ago.
2. Scrooge described as mean and **miserly (d)**.
3. Harsh weather and harsh conditions towards Bob Cratchit.
4. Scrooge is mean towards Fred, his nephew.
5. He refuses to donate money to the Portly gentleman.
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.

1. **The Ghost of Christmas Past** visits Scrooge.
2. Scrooge is 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.

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.

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.

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 **joyful** 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.



'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**.'

'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.'

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

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

'As good as gold.'

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

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

'...legs trembled beneath him.'

'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.'

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 (r)

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

	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.

Characters

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

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

Fezziwig

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

Shows a vision of (S.2):

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 (f)** 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.

Employs (S.2)

Scrooge
A rich Victorian misanthrope (k).

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.

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

Martha Cratchit
The eldest Cratchit child.

Belinda Cratchit
The second eldest Cratchit child.

Peter Cratchit
The third eldest Cratchit child.

Emily Cratchit
Bob's wife who hates Scrooge.

Tiny Tim
Bob's disabled son.

The twins
The youngest Cratchit children.

KS4 – Macbeth – Plot and Key Quotations

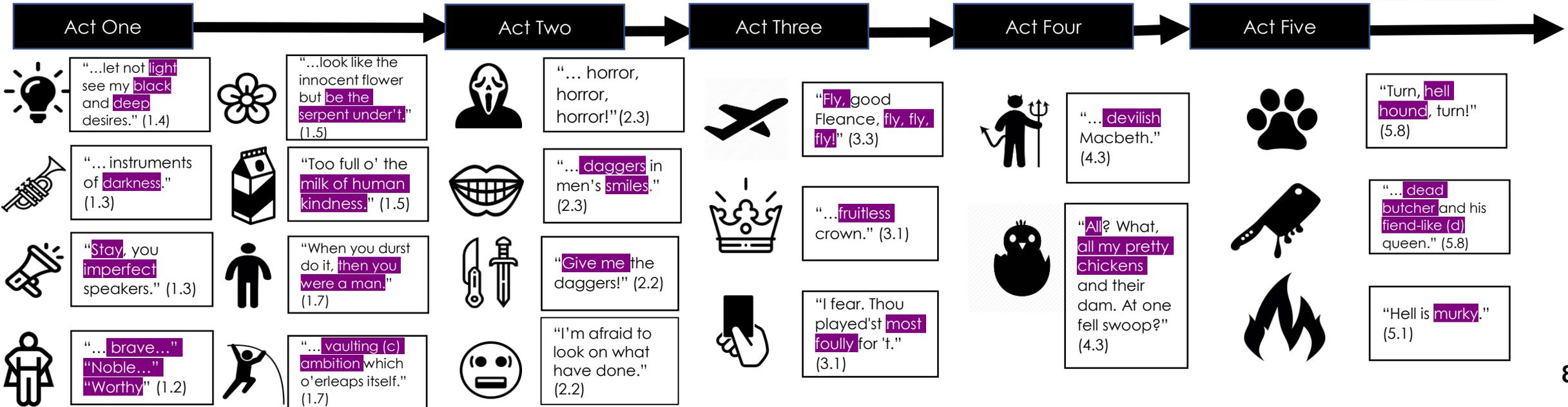
- The **witches** meet on the heath.
- Macbeth and Banquo** have fought and **won a battle**. They are praised for their bravery by the Captain.
- The witches meet Macbeth and Banquo and they make **three predictions**. They predict that Macbeth will become Thane of Cawdor and eventually king. Banquo is told that he will not become king but that his children will be. Shortly after, Macbeth is told he is the new Thane of Cawdor!
- Macbeth plans for **Duncan to stay at his castle**.
- Lady Macbeth convinces Macbeth to kill King Duncan**.
- Duncan arrives at Macbeth's castle.
- Macbeth tells Lady Macbeth he will not murder Duncan. However, **she convinces him to go ahead with the murder**.

- Macbeth sees a dagger** in front of him on his way to go and kill King Duncan.
- Macbeth murders King Duncan. Macbeth's guilt** is apparent as he appears covered in blood. Lady Macbeth feels no guilt and places the daggers on Duncan's guards.
- The dead body is discovered by Macduff. Duncan's sons, **Malcolm and Donalbain, run away**; one to England and one to Ireland.
- Macbeth and his wife **become king and queen of Scotland**.

- Macbeth questions Banquo. He is suspicious of Banquo. As a result, he plans his murder with the help of murderers.
- Banquo is murdered** by the hired murderers but his son, Fleance, manages to escape.
- At the coronation (a) banquet, **Macbeth sees the ghost of Banquo** at the table. Lady Macbeth persuades everyone that Macbeth is ill and they must leave and is furious at Macbeth.
- Hecate, the witches's leader, is angry that the witches meddled with Macbeth without her permission.
- Lennox shares his suspicions about Macbeth.

- The witches share **three more prophecies (b)**:
- Macbeth is told that: he must fear Macduff; that he will **not be harmed by anyone born of a woman** and that he will never be defeated until **Birnam Wood moves to 'High Dunsinane Hill'**. They also share a vision of Banquo.
- Macbeth has **Macduff's wife and children murdered**.
- In England, Malcolm tests Macduff's loyalty and checks they are on the same side, wanting the same things.

- Lady Macbeth sleepwalks**: she is overcome with guilt and loneliness.
- The rebels discuss the impending battle.
- Macbeth declares he has nothing to fear from the battle. He appears **confident**.
- The doctor reports on Lady Macbeth's condition. Macbeth orders him to cure her.
- Malcolm and Macduff's forces march to Dunsinane castle, disguising themselves with branches** from the trees of Birnam Wood.
- Lady Macbeth dies off stage**.
- Macbeth realises that he is not going to win but decides to at least die fighting.
- Malcolm prepares for battle.
- Macbeth kills young Siward.
- Both **Macduff and Macbeth fight and Macbeth is killed**. His head displayed on a spike, as he was a **traitor**. Macduff is able to kill him as he reveals he was born by **caesarean (k) section**.
- Malcolm is crowned the new king of Scotland**.



Kingship

The Great Chain of Being

People believed that God set out an order for everything in the universe. This was known as **the Great Chain of Being**. On Earth, God created a social order for everybody and chose where you belonged. In other words, the king or queen was in charge because God put them there and they were only answerable to God (the **Divine Right of Kings**). This meant that **disobeying (n) the King was a sin**.

The Divine Right of Kings

King James I

Supernatural

One of the most active centres of **witch hunting** was Scotland, where up to 4,000 people were burnt. This was due to royal witch-hunter King James I. **King James I wrote a book called 'Daemonologie'** in which he supported and encouraged the trials of witches. He believed the witches were controlled by the devil and he **described witchcraft as "high treason (e) against God"**.

Witchcraft

Gender

Men assumed a **dominant** position in the society; making it **patriarchal (f)**. The main responsibility of married women was to take care of the household matters and raise children. Before marriage, a girl was under the control of her father, after marriage her husband and after the death of her husband, her son. **Women** were made to depend on their male relatives throughout their lives and had **no power**.

Gender stereotypes

The Role of Women

King James I

Kingship

King James did not tolerate **Catholics** and this led a group of them to plot to kill him and everyone sitting in the Houses of Parliament on **November 5th, 1605**. This was **known as the Gunpowder Plot** which had failed. Shakespeare's Macbeth was likely written in 1606 in the aftermath of the Gunpowder **Treason**. Along with its responsive nature, it is known that Shakespeare wrote the play with the intent of honouring and displaying loyalty to King James I as a **cautionary (g) tale**.

Treachery and Regicide

Religion
Ambition

Appearance vs. Reality
Fate vs. Freewill

Masculinity
Ambition

Religion
Revenge

	Key terms	Definition
A	Coronation	Where the king or queen is officially crowned.
B	Prophecies	A prediction of what will happen.
C	Vaulting	High and leaping over something.
D	Fiend	An evil spirit or demon.
E	Treason	Betraying your country.
F	Patriarchy/al	Men being dominant in society.
G	Cautionary	Something to make you take notice and perhaps stop.
H	Tyrannical	Being cruel with power.
I	Regicide	The act of killing the king.
J	Righteous	Behaving in the 'right' way or being morally good.
K	Caesarean	Being cut from the womb rather than a natural birth.
L	Coven	A group of witches.
M	Succumbs	Being unable to stop something negative happening.
N	Disobey	To go against orders.

Characters

Hecate
The leader of the witches' coven (l).

Three Witches
They meet Macbeth on the heath after his first battle and give Macbeth and Banquo prophecies (b) about their lives.

Banquo
The loyal friend of Macbeth who witnesses the Witches' original prophecies (b) with him. His suspicions about Duncan's death lead Macbeth to act.

Fleance
Banquo's son or "seed".

Macbeth
Originally the Thane of Glamis...

Duncan
The original King of Scotland.

Malcolm
Duncan's first son who is eventually crowned King of Scotland. He flees to England when his father is murdered.

Donalbain
Donalbain is Duncan's second son who flees to Ireland once his father is murdered.

Lady Macbeth
The manipulative wife of Macbeth. We never know her name...
She eventually succumbs (m) to madness and kills herself.

Macduff
The Thane of Fife who did not attend Macbeth's coronation (a). He forms an alliance with Malcolm when the truth comes out and eventually kills Macbeth.

Lady Macduff
She is murdered along with her children when Macbeth cannot find Macduff.

Macduff's Children
Macbeth orders their murder when he cannot find Macduff.

Minor Characters

Lennox
A young Thane of the Scottish kingdom.

Ross
Macbeth's cousin who is initially loyal to the Thane of Glamis.

Influences A1.s3

Kills A3.s4

Kills A2.s2

Kills A5.s8

Join forces A4.s3

Act 1:

1. The Birling family are celebrating the engagement of Sheila Birling and Gerald Croft.
2. An Inspector arrives and tells them that a woman named Eva Smith has committed suicide.
3. After Inspector Goole questions Mr Birling, it becomes clear that **Mr Birling fired Eva** from his factory for asking for higher wages.
4. Inspector Goole then interrogates (I) **Sheila** and it is revealed that she used her position as a wealthy local person to get **Eva fired from her job at Milwards**.

Act 2:

1. The interrogation (I) moves to Gerald; it comes to light that **Gerald had an affair with Eva** after she was fired from Milwards – Eva had changed her name to Daisy Renton by now – and he had kept her in an apartment for six months before ending their relationship.
2. The Inspector then questions Mrs Birling about when Eva came to her charity for help whilst pregnant. **She refused to help** her as she believed Eva to be “impertinent” (H) for using the name ‘Mrs Birling’.

Act 3:

1. The Inspector then questions Eric as it has become clear that it was Eric who got Eva pregnant. **Eric reveals that he forced himself on Eva**. He says “I was in that state when a chap easily turns nasty.” Eric then confesses to stealing money from his father but Eva refused the money.
2. **Inspector Goole** leaves after delivering his final speech; he **warns that there is a lesson to be learnt in “fire and blood and anguish”** if we do not start taking responsibility for our actions and start treating everyone in society fairly.
3. Mr Birling calls up the police department who confirm there is no Inspector Goole so the family believe they’ve been tricked until they receive a phone call to let them know a girl has committed suicide and an Inspector is on his way to question them.



Act 1	Act 2	Act 3
<p>Narrator:</p> <p>"The dining room is of a fairly large suburban house, belonging to a prosperous manufacturer."</p>	<p>The Inspector:</p> <p>"A chain of events."</p>	<p>The Inspector:</p> <p>"A girl died tonight. A pretty, lively sort of girl, who never did anybody any harm. But she died in misery and agony – hating life –."</p>
<p>Mr Birling:</p> <p>"...unsinkable, absolutely unsinkable."</p>	<p>Mr Birling:</p> <p>"If you don't come down sharply on some of these people, they'd soon be asking for the earth."</p>	<p>Gerald:</p> <p>"...she told me she'd been happier than she'd ever been before."</p>
<p>Mr Birling:</p> <p>"...as if we were all mixed up together like bees in a hive – community and all that nonsense."</p>	<p>Mrs Birling:</p> <p>"Girls of that class."</p>	<p>Eric:</p> <p>"I was in that state when a chap easily turns nasty – and I threatened to make a row."</p>
<p>Sheila:</p> <p>"But these girls aren't cheap labour – they're people."</p>	<p>The Inspector:</p> <p>"Public men, Mr Birling, have responsibilities as well as privileges."</p>	<p>The Inspector:</p> <p>"We don't live alone. We are members of one body. We are responsible for each other."</p>
<p>Sheila:</p> <p>"No, he's giving us the rope so that we'll hang ourselves."</p>	<p>Mrs Birling:</p> <p>"As if a girl of that sort would ever refuse money!"</p>	<p>Sheila:</p> <p>"The point is, you don't seem to have learnt anything."</p>

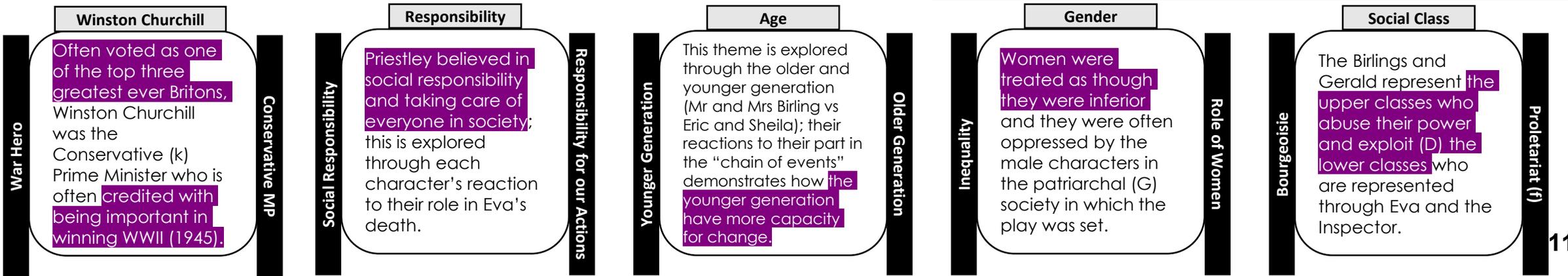
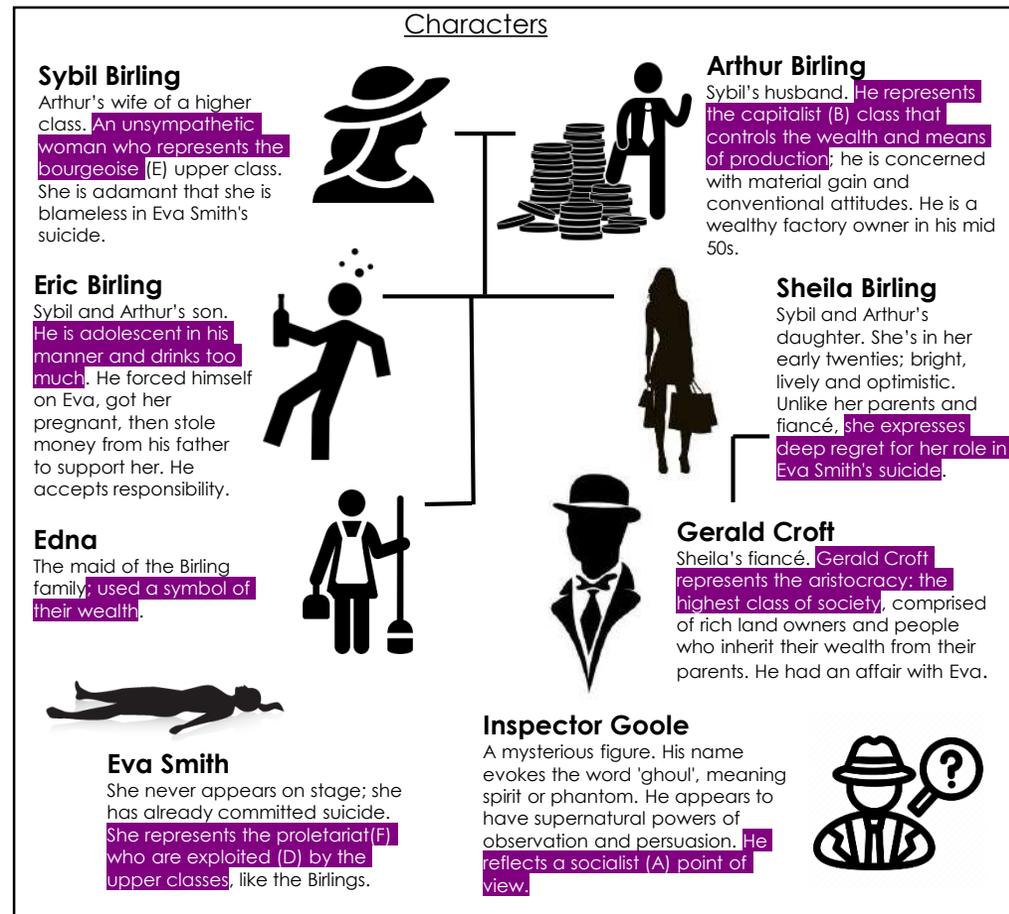
Key terms	Definition
A Socialism	A political system where people work together for society; where wealth is shared and everyone benefits equally.
B Capitalism	A system of private ownership that allows the rich to get richer; this system allows the lower classes to be exploited (D).
C Dramatic Irony	When the audience has more knowledge of what is happening than a character.
D Exploitation	The action or fact of treating someone unfairly in order to benefit from their work.
E Bourgeoisie	Middle Class
F Proletariat	Working Class
G Patriarchy	A society ruled by males in which women are valued less and often act in a obedient way.
H Impertinent	Rude
I Interrogates	Asks lots of questions
J Morality	Having morals/ good values
K Conservatives	A political party who values more capitalist attitudes.
L Mouthpiece	Someone placed there to speak your own views.
K Credited	Given the praise for.

Context

- The play was written in 1945 but set in 1912 – during this period, both world wars had happened
- Priestley fought in WWI and saw the horrors. At the end of the WWII he saw the class, age and gender divides all broken down and fought for the country to keep it like that, rather than go back to Edwardian attitudes of 1912 of patriarchy (g) and rich people ruling without considering the poor.
- After WWII, the Labour Party (a socialist (A) party) won the general election in a landslide victory against Churchill's Conservatives (k).
- Priestley held socialist (A) beliefs and wanted to encourage others to behave in a socialist (A) way
- In 1912 women did not have the right to vote and were seen as less than men; by 1945 they could vote and had more value in society after the war

Writer's Intentions

- Priestley wrote the morality (J) play, An Inspector Calls, as a warning for people to treat each other more equally otherwise horrible events could follow like World War One and Two.
- He highlighted the divisions that existed in pre-war Britain by setting the play in 1912 and through the characters.
- He wanted his 1945 audience to see how damaged society was and wanted to encourage them to work together and look after each other.
- He believed these socialist (A) values would help the country to avoid another war. He uses the character Inspector Goole as his mouthpiece for his socialist views and he shows his audience that the younger generation (through Eric and Sheila) have the ability to enforce these changes that society need.
- The arrogant and ignorant attitudes of Mr and Mrs Birling, the bourgeoisie (E), are what Priestley wanted society to shy away from and therefore characterises them as foolish and unlikeable.



Step-by-step approach for Q1

Step 1: Read the question: what is the **steer** (a)?



Step 2: Where can you find the steer (a) in the poem?

- Start with the **title**
- Beginning/middle/end
- **ONLY** things that **link to the steer** (a) or focus.



Step 3: Link your methods or ideas

- 1 overarching **thesis** (d) statement that **addresses the steer** (a).
- 3 supporting ideas or methods.
- language and structure



Step 4: **Explode the effects** of these three methods OR ideas in the poem.



Step 5: Structure this in three paragraphs.

- Idea, meaning, method (language and /or structure), connotations (words), effect (on a reader), **alternative** (b) **interpretations** (c) and secondary reference.



In 'Give', how does the poet present the speaker's attitude to **generosity**? (24 marks)

Thesis:
The speaker wants people to be kinder to those less fortunate; this kindness is not necessarily monetary.



Step 1:

Give

Of all the public places, dear to make a scene, I've chosen here.

Of all the doorways in the world to choose to sleep, I've chosen yours. I'm on the street, under the stars.

For coppers I can dance or sing. For silver-swallow swords, eat fire. For gold-escape from locks and chains.

It's not as if I'm holding out for frankincense or myrrh, just change.

You give me tea. That's big of you. I'm on my knees. I beg of you.

Simon Armitage

The direct address (f) used by the speaker makes the reader feel slightly uncomfortable at their own lack of action; the speaker is holding them accountable (g) and reminding them that they also have a social responsibility.

By listing these metals in order of their value and what they would do for each of them, the speaker conveys their desperation for kindness from people. We can conclude that the speaker feels dehumanised (l) from the unkindness they have faced as they are willing to act as a performer rather than a fellow human being.

The ambiguous (h) use of the word 'change' could be a literal (i) interpretation: the speaker seeks something as insignificant (j) as spare change. Or, this could be metaphorical (k): the speaker is hoping for a change in society's attitudes to those less fortunate.

Sentence Starters:

- The poet alludes to/implies/conveys/signifies/expresses/illustrates...
- The poet conjures up an image of...
- The reader can infer...
- At the start/end of the poem, the poet...
- The word '_____' accentuates/evokes...
- The poet's attitude becomes apparent...
- The theme of _____ is explored...
- The writer has employed the use of...

Key terms	Definition
A Steer	Direction/focus of the question.
B Alternative	Another option or possibility.
C Interpretations	Explaining the meaning of something.
D Thesis	Statement or theory as an argument to be proved.
E Speaker	The voice or narrator of the poem.
F Direct Address	The writer communicates a message directly to an individual or group of individuals.
G Accountable	Required to explain their actions; be responsible for something.
H Ambiguous	Not having a clear meaning.
I Literal	Something in its most basic sense; not metaphorical (k).
J Insignificant	Not important.
K Metaphorical	When something symbolizes something else (d).
L Dehumanised	Take away human qualities.
M Structure	The way something is put together. E.g. Stanzas, chapters, a novel, a play etc.

Step-by-step approach for Q2

Step 1: Read the question: what is the **steer** (a)?



Step 2: Where can you find the steer (a) in this poem and the other poem?

- Start with the **title**
- Beginning/middle/end
- **ONLY** things that **link to the steer** (a) or focus.



Step 3: **Compare the methods.**

- Find examples of how the poets have used language in each poem- are they the same or different?
- Find examples of how the poets have structured the poem – are they the same or different?



Step 4: **Explode the effects** of these methods in both poems.



Step 5: Structure this in one or two paragraphs.

- Poem A – method and effect
- Similar or different?
- Poem B – method and effect



In both 'Give' and 'People Need People' the speakers describe their attitudes **towards how people treat each other.**

What are the similarities/differences between the ways the poets present these attitudes? (8 marks)



Step 1:



This links to the 'steer' of the question because it's about how people treat each other.



Step 2:



The poet has repeated this phrase throughout the poem.



Step 4:



This has been done to emphasise how much and how often we need other people.



Step 3:



On the other hand, the speaker in 'Give' uses direct address: "I'm on my knees. I beg of you"



Step 4:



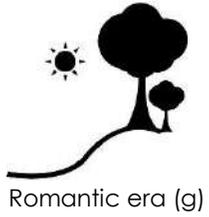
This also emphasises how much people need others as the speaker has to 'beg' for human affection

People need people,
To walk to
To talk to
To cry and rely on,
People will always need people.
To love and to miss
To hug and to kiss,
It's useful to have other people.
To whom to moan
If you're all alone,
It's so hard to share
When no one is there.
There's not much to do
When there's no one but you.
People will always need people.
To please
To tease
To put you at ease,
People will always need people.
To make life appealing
And give life some meaning,
It's useful to have other people.
If you need a change
To whom will you turn.
If you need a lesson
From whom will you learn.
If you need to play
You'll know why I say
People will always need people.

Comparison Connectives	
Similarly	Contrastingly
In the same way	On the other hand
Also	However
In addition	Whereas
Tentative Phrases	
Could	Maybe
Might	Possibly
May	Perhaps
Appears	Seems to

Things to consider when comparing:

- Ideas
- Themes
- Effect on reader
- Writer's intentions
- Tone
- Mood and atmosphere
- Imagery
- Narrative voice
- Language techniques
- Structural (m) techniques
- Shift of focus
- Beginning
- End



- 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) world.
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.

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.

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 state

1 1792

"I wander through **each chartered street.**"

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

13 2005

"**Dem tell me** what **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."

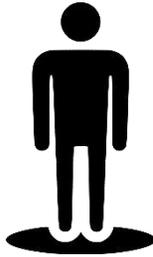
The war between tyrants (a) has forced the Émigré (a) to leave, making their country in the past tense.

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.



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

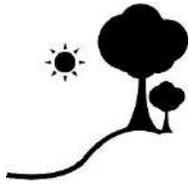
"I **traced the inscriptions** on the war memorial."

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.



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.	1 2 2000s
When written	"blood shadow stays on the street"
Quote	Analysis of quote The metaphor (j) 'king of kings' implies tyrant feels he is above all of rulers.

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

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...*

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

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.



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	'

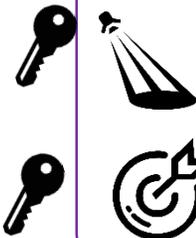
5: The 'Writing for a purpose' question.

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.



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

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

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 3 and 4, **zoom in** on words from text.
- ✓ Refer to the steer (f) of the question throughout.
- ✓ Use a range of **comparison connectives**.
- ✓ Keep quotes to 5-10 words long.



1: The 'True or False' Question

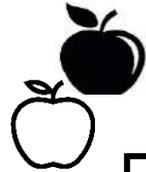


-Choose **four** statements which are true.

Draw a box around the lines to find the information.

Ensure to **shade** the boxes, not tick or cross.

4 marks



2: The 'Summary' Question

-Use details from both sources to write a summary of ...

Have 4 small quotes with **clear differences or similarities**.

Write 4 small paragraphs **inferring** (e) how they are different or similar.

Do not explain language devices, c).

8 marks



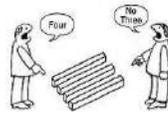
3 The 'Language' Question

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

Explain or analyse the **effect of language**.



12 marks



4: The 'Comparison' Question



16 marks



Find **4-5** differences for the **question focus**.



Find a **quote** from each source for each of the differences.



Find **language or structure devices** in those quotes. Use **connectives** to link paragraphs and connect ideas.



Write 4-5 paragraphs, using **methods** (d) and focusing on the question.

Active Verbs (similar to "shows")

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

The writer (active verb) the...



Question	marks	% of paper	% of GCSE
1	4	10	5
2	8	20	10
3	12	20	10
4	16	50	25

	Key terms	Definition
A	Specific	Clearly identified or marked out.
B	Appropriate	Suitable for the focus of the question.
C	Devices	A thing made for a specific purpose.
D	Methods	The ways a writer achieves their aim.
E	Infer	Work out from the information.
F	Steer	What the examiner has asked you to focus on when answering.



Start of the exam

- ✓ 5 minute plan with question in mind.
- ✓ Underline the **audience (a), purpose (b) and form (c)** the task/question
- ✓ 35 minute response
- ✓ 5 minute checking SPaG, including paragraphing.

Top Tips

- ✓ Consider the following first: what do you **already know** about the topic?
- ✓ What is your **opinion** on the topic?
- ✓ Do you have any **personal experiences** that could support your ideas?
- ✓ What would others' opinion be?
- ✓ What is the **effect on others or society**?

5: The 'Writing for a purpose' question.

Question 5: Writing to argue AO5/AO6
 You will produce a written text for a specified **audience (a), purpose (b) and form (c)**. You will give your own perspective on the theme introduced in Part A. **Example question:** "Cars are dangerous."
 Write a letter to the Minister for Transport arguing your point of view on this statement.



Key skills:
AO5: You should: Ensure the story or description is **clear**.
AO6: You should: Use **varied and accurate** sentence structures.

Letter

Dear Sir/Madam or name •
 Addresses • Date •
 Paragraphs • Yours sincerely/faithfully.

Speech

- Clear address to audience
- Use rhetorical devices throughout
- A clear sign off, e.g. 'Thank you for listening'.

Article

- Clear/apt/original title
- Introductory paragraph
- Use persuasive techniques to convince reader of your viewpoint.

Leaflet

- Clear/apt/original title
- Organisational devices such as inventive subheadings or boxes
- Bullet points.



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

Overview of each paragraph

P1: Outline your **main opinion** (big idea) and list your **three reasons** (supportive ideas). You could use a **circular structure (e) (hook)**: either open with a **descriptive hook (i)** 'Imagine a world where..' or a **questioning hook** 'Have you ever thought...' or an **anecdotal hook** 'Meet Dave...' – a made up character that is affected or not affected by the statement.

P2: **First reason** acknowledges **audience (a), purpose (b) and form (c)** and support main idea - back up with anecdotal evidence or a scenario(h).

P3: **Second reason** supports main idea - back up with anecdotal (f) evidence or a scenario.

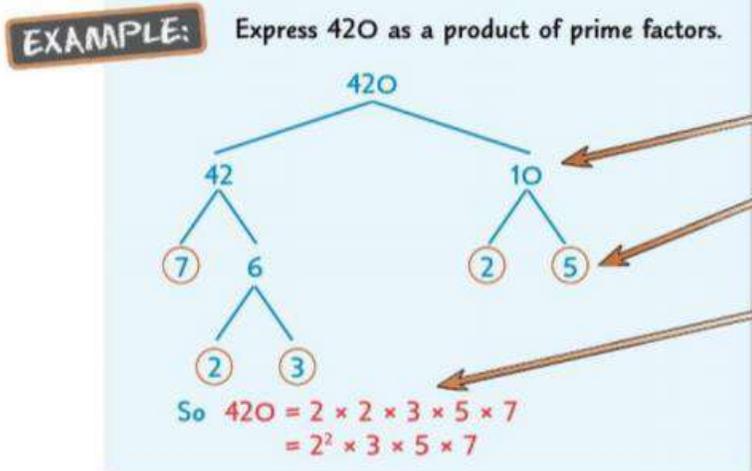
P4: Use a **counter argument with third reason or how** might this issue impact on society?

P5: **Conclusion** – refer back to the circular structure (e). Comment on how this problem or statement might impact on others or society. **Return to 'hook' (i) from the beginning**. Imagine a world now that.. Answer question from the beginning or return to 'Dave'.

	Key terms	Definition
A	Audience	This is who you are aiming your writing towards.
B	Purpose	This is why you are writing. Is it to inform, persuade, advise etc?
C	Form	This is what your writing will be in the form of i.e. a letter, speech, article, leaflet, blog etc.
D	Hook	A technique that 'hooks' the reader's attention so that he or she will keep on reading.
E	Circular structure	You start and end using the same idea or message.
F	Anecdote	A short personal story adding meaning or significance to your message.
G	Counter	The opposite point of view.
H	Scenario	An imaginary situation.
I	Hook	Something which catches the reader's attention.

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

We use a factor tree method to do this:



- 1) Start with the number at the top and split it into **factors** as shown.
- 2) Then do the same with factors you have written.
- 3) If the number is a **prime number** put a circle around it.
- 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**).

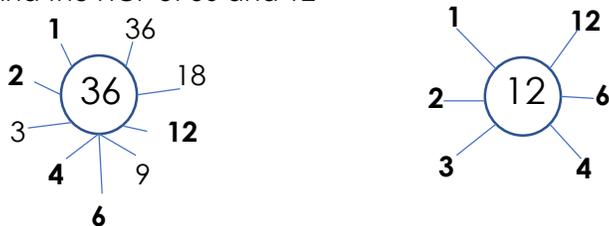
No matter what numbers you choose for each step, you'll find the product of primes is exactly the same!

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. $6 \times 6 \times 6 \times 6 = 6^4$ <- 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
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.

Highest Common Factor

To find the highest common factor of two numbers, you need the biggest number that is a factor of the two (or more) numbers stated.

Ex1: Find the HCF of 36 and 12



As you can see: 1, 2, 3, 4, 6 and 12 are all common factors.
 We want the **highest common factor** which in this case is 12
 Ans: HCF of 12 and 36 = 12

Lowest Common Multiple

To find the lowest common multiple you need to list the multiples of two (or more) numbers and see which number appears in both first.

Ex1: Find the LCM of 4 and 6
 First list the multiples of 4 and 6

Multiples of 4: 4, 8, **12**, 16, 20, **24**, 28, 32, ...
 Multiples of 6: 6, **12**, 18, **24**, 30, ...

As you can see: 12 and 24 are common multiples
 We want the **lowest common multiple** which in this case is 12
 Ans: LCM of 4 and 6 = 12

Other Topics/Units this could appear in:

- Factorising
- Use of Calculator
- Algebraic Proof

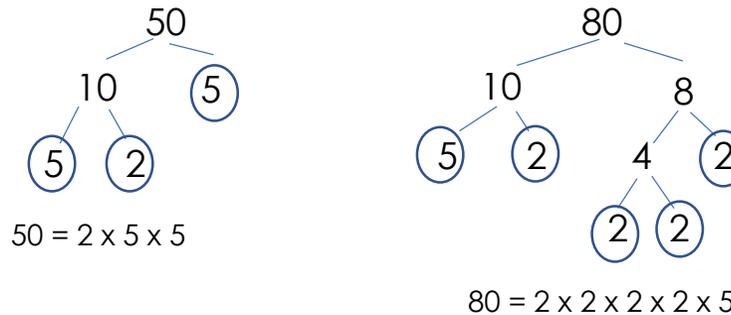
Exams!

- In an exam you will get the first mark for correctly listing 5 correct factors or multiples of one of the numbers, then a second mark for listing 5 correct factors or multiples for the second number. So try and do that if you are unsure how to go any further.

We can also use the product of primes to figure out the HCF & LCM of two numbers:

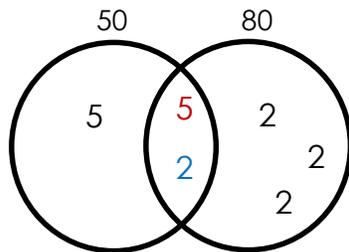
Example: What is the HCF and LCM of 50 and 80?

Step 1 - Find the product of prime factors for 50 and 80.



Step 2 - Put the prime factors of 50 and 80 into a Venn Diagram (you can use **Crossover Unit 3 – Venn Diagrams** knowledge organiser to help)

$50 = 2 \times 5 \times 5$ $80 = 2 \times 2 \times 2 \times 2 \times 5$



Numbers common to both 50 and 80 go in the middle...

Multiply the middle numbers to find the **HCF**

HCF $\rightarrow 2 \times 5 = 10$

Multiply **all** of the numbers in the Venn Diagram to find the **LCM**

$\rightarrow 5 \times 5 \times 2 \times 2 \times 2 \times 2 = 400$

Multiples in Context:

How to ...

Matt and Dan cycle around a cycle track.

Each lap Matt cycles takes him 50 seconds.

Each lap Dan cycles takes him 80 seconds.

Dan and Matt start cycling at the same time at the start line. Work out how many laps they will have each cycled when they are next at the start line together.

There are a couple of ways of solving this type of question - less mistakes are made by listing multiples

Matt - 50, 100, 150, 200, 250, 300, 350, 400
450, 500, 550...

Dan - 80, 160, 240, 320, 400
I can stop here as its in both lists

So Matt and Dan will be at the start when they have both been cycling for 400 s... *thats not what the question asked for...*

...count the 'multiples of 50' and 'multiples of 80'

Matt 8 laps
Dan 5 laps
(3)

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. $6 \times 6 \times 6 \times 6 = 6^4$ <- 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
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 listing 5 correct factors or multiples of one of the numbers, then a second mark for listing 5 correct factors or multiples for the second number. So try and do that if you are unsure how to go any further.

Exchange Rates: One currency can be exchanged for another currency by calculations using exchange rates.

Example 1

John went to Paris on holiday. He changed £1450 into Euros at Manchester Airport before his flight to Paris. The exchange rate at the airport was £1 = €1.14. On the holiday he spent €1355. On his return to England he changed his remaining euros back into pounds. Work out how much he returned to England with. Give your answer in pounds to the nearest penny.



$$£1 = €1.14$$

$$£1450 = 1450 \times 1.14 = €1653$$

$$€1653 - €1355 = €298$$

$$298 \div 1.14 = £261.4035.....$$

$$= £261.40 \text{ (nearest penny)}$$

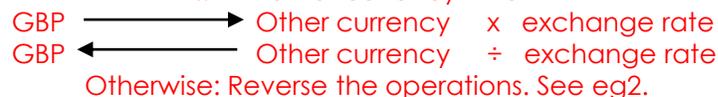
Step 1 - For EVERY pound John receives he gets €1.14. Therefore, for £2 he gets $2 \times €1.14$, for £3 he gets $3 \times €1.14$ etc so for £1450 he gets $1450 \times €1.14 = €1653$

Step 2 - On holiday in Benidorm he spends € 1355 so the next thing we do is subtract 1355 from 1653 which is €298

Step 3 - When we changed from pounds to euros we used multiplication, so to convert back from euros to pounds we do the inverse of multiplication ie. division.

Therefore the calculation is $298 \div 1.14 = £261.4035$ which is £261.40 to the nearest penny

Note: When the exchange rate is given as £1 = "other currency" then



Example 2

Elaine is going to New York. She wants to change £500 into US Dollars. The exchange rate in the UK is £1 = \$1.26 and the exchange rate in New York is \$1 = £0.81. In which country is she best changing her money? Explain your answer.



$$UK : 500 \times 1.26 = \$630$$

$$US \text{ (New York)} : 500 \div 0.81 = \$617.28$$

She should change her money in the UK because she will get more dollars.

Step 1 - If Elaine changes her money in the UK, for every
 £1 she gets \$1.26
 £2 she gets $2 \times \$1.26$
 £3 she gets $3 \times \$1.26$ etc

so for £500 she gets $500 \times \$1.26 = \630

Step 2 - If Elaine changes her money in New York, even though she is changing pounds to dollars the calculation is "divided by the exchange rate" because the exchange rate in New York is given as \$1 = £0.81

Exams!

- As you can see, these questions are all about money, so make sure in an exam you use the correct units, e.g £ or \$ etc.
- You also need to make sure all of your answers are rounded to 2.d.p, as money is always in this form.

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
Multiply	Repeated addition
Divide	To split into equal parts or groups
Changing Format	If the rate is given in the format (for instance) \$1 = £0.85 Divide both numbers by 0.85 to get the exchange rate in the format £1 = \$1.18

Other Topics/Units this could appear in:

- Drawing and Interpreting tables and graphs
- Expressions and substitution into simple formulae

Rounding – Decimal Places

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

3.248

3 is the units digit.

2 is worth 2 **tenths**, and is the **first** decimal place.

4 is worth 4 **hundredths**, and is the **second** decimal place.

8 is worth 8 **thousandths**, and is the **third** decimal place.

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

3.248 rounded to 1 d.p.

3.248 → 3.2

1st dp 3.2

Look at the next digit. 4 stays down - stay at 3.2.

3.248 rounded to 2 d.p.

3.248 → 3.25

2nd dp 3.24

Look at the next digit. 8 rounds up - go to 3.25

Error Intervals

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

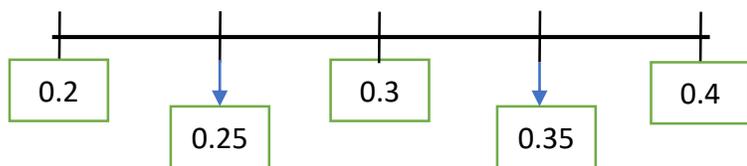
Example:

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**.

0.0004300

Zeros after the decimal NOT SIGNIFICANT before non zero numbers

All non zero numbers are significant

Zeros after non zero numbers in a decimal are significant

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

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.

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 \neq not equal to, \geq greater than or equal to, \leq less than or equal to, $>$ greater than, $<$ less than, $=$ equal to.
Error interval	A range of values that could be taken before rounding/truncating.

Other topics/Units this could appear in:

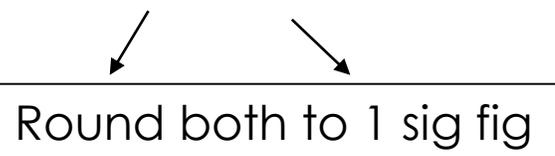
- Upper and lower bounds

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 2.9×403



2.9 rounds to 3
403 rounds to 400

$$3 \times 400 = \underline{1200}$$

Example 2

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

$$72 = 70$$

$$19 = 20p$$

$$70 \times 20 = 1400p = \underline{\pounds 14.00}$$

Round both to 1 sig fig

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

$$\pounds 19.95 = \pounds 20$$

$$395 = 400$$

$$20 \times 400 = \pounds 8000$$

$$\text{Take away costs} = 8000 - 6000 = 2000$$

$$= \underline{\pounds 2000}$$

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.

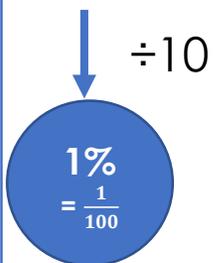
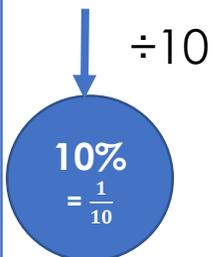
Other topics/Units this could appear in:

- Surface area and 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

1. Percentage of an Amount (without a calculator)



We can use combinations of these key percentages to find any percentage.
For example:
30% = 10% x 3
75% = 25% + 50%
16% = 10% + (10% ÷ 2) + 1%

Example 1:
Find 25% of £120
To find 25% you divide by 2 then divide by 2 again (or ÷ 4)
£120 ÷ 4 = £30
So, 25% of £120 is £30

Example 2:
Find 60% of 300kg
To get 60% we can use 50%+10%
To find 50% you divide by 2
So 50% = 150kg
To find 10% you divide by 10
So 10% = 30kg
Therefore 60% of 300kg = 180kg

2. Percentage increase/decrease (without a calculator)

Firstly, find the percentage of the given amount.
Then you add or subtract this amount depending on whether you are increasing or decreasing.

Example 1
Increase \$80 by 50%

50% of \$80 = \$40
Then **add** this onto the starting amount
\$80 + \$40 = \$120

Example 2
Decrease 500g by 3%

1% of 500g = 5g
3% of 500g = 5g x 3 = 15g
Then **subtract** this from the starting amount
500g – 15g = 485g

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

4. Percentage Increase/Decrease (with a calculator)

Here we can also use **percentage multipliers**.

Increasing Example
Increase 480 by 16%.
Every amount starts at 100%. If I want to **increase** by 16%, this would go up to 116%.
So I need my multiplier to be the decimal equivalent of 116%
116% = 1.16
So to increase 480 by 16%
480 x 1.16 = 556.8

Decreasing Example
Decrease 725 by 26%.
Every amount starts at 100%. If I want to **decrease** by 26% this would go down to 74%. (100 – 26 = 74)
So I need my multiplier to be the decimal equivalent of 74%.
74% = 0.74
So to **decrease** 725 by 26%
725 x 0.74 = 536.5

Keyword/Skill	Definition/Tips
Percentage	A number out of 100. Symbol %
Fraction	Any part of a group, number or whole. They are written as one number over another. fraction □ □
Decimal	A number with a decimal point in it. It can be positive or negative. 3746.374
Equivalent	Having the same value or amount.
Increase	To get larger in size or number.
Decrease	To get smaller in size or number.
Profit	This occurs when an item is sold for more than it cost to buy. It is the difference between the amount earned and the amount spent.
Loss	This occurs when an item is sold for less than it cost to buy.
Interest	Money paid regularly at a particular rate. Usually on bank accounts or loans.
Percentage multiplier	The number you multiply a quantity by to find a percentage or increase/decrease it by a percentage.
Simple Interest	Interest calculated as a percentage of the original amount.
Compound Interest	Interest paid on the original amount and the accumulated interest.
Decay/Depreciation	The decrease in the value or amount of something over time. (Car prices are a common example) 
Growth/Appreciation	The increase in the value or amount of something over time. (House prices are a common example) 

Recognising Fractions



3
|
8

Numerator

How many equal parts of a number are needed

Denominator

How many equal parts are there altogether

Simplifying Fractions

You will need to simplify your answers after you have added, subtracted, multiplied or divided your fraction. Here's a reminder how:

- To simplify a fraction you need to find a common factor of the **numerator** and the **denominator**.
- Ex: Simplify: $\frac{18}{30}$ A common factor of 18 and 30 would be 6. So I need to divide 18 and 30 by 6
- $18 \div 6 = 3$ and $30 \div 6 = 5$, therefore my simplified fraction is $\frac{3}{5}$

Keyword/Skill	Definition/Tips
Numerator	How many parts of a whole. The top number in a fraction.
Denominator	How many 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
Reciprocal	One of two numbers that multiply to make 1. e.g. the reciprocal of 2 is $\frac{1}{2}$ because $2 \times \frac{1}{2} = 1$
Multiplicative Inverse	Another way of describing reciprocal
Conversion	To change our fraction into something else (decimal or percentage)
Equivalent Fractions	Two or more fractions that are equal in value
Common Denominator	When two or more fractions have the same denominator

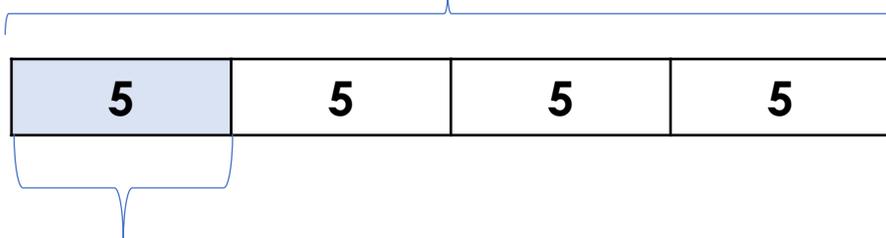
Fractions of Amounts

Zaki's mum buys 20 sweets and gives Zaki $\frac{1}{4}$ of them. How many sweets does Zaki get?

I am splitting 20 into four parts as it is $\frac{1}{4}$ of the sweets.

20

$20 \div 4 = 5$
That means each part is worth 5



As it is $\frac{1}{4}$ I only need one of these parts

So Zaki gets 5 sweets.

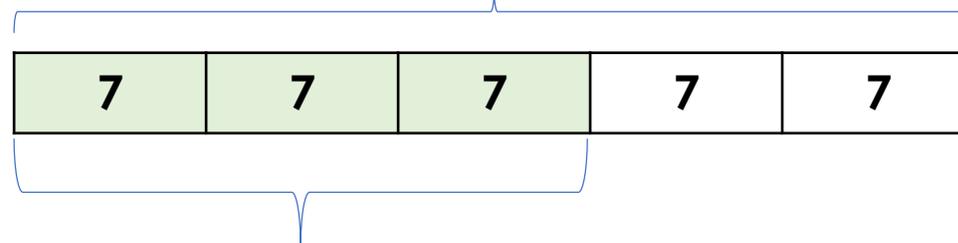
Gurpreet & Mitch share 35 sweets.

Gurpreet gets $\frac{3}{5}$ of them.

I am splitting 35 into five parts.

35

$35 \div 5 = 7$
That means each part is worth 7



As it is $\frac{3}{5}$ I need three parts so this is $7 \times 3 = 21$

So Gurpreet gets 21 sweets.

Multiplying Fractions

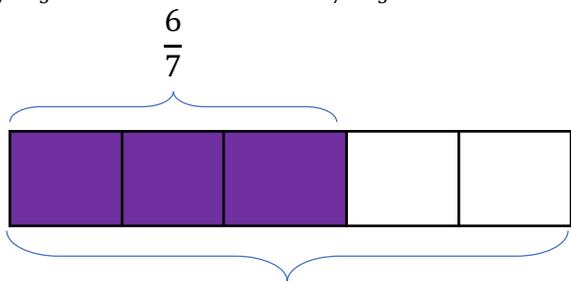
To multiply fractions together, we simply multiply the numerators and then multiply the denominators.

Don't forget to simplify your answer

$$\frac{2}{3} \times \frac{3}{4} = \frac{6}{12} = \frac{1}{2}$$

Dividing Fractions

$\frac{6}{7} \div \frac{3}{5}$ can be expressed as $\frac{6}{7}$ is $\frac{3}{5}$ of something?



We need to figure out what one part of the bar model is worth. We can do that by doing $\frac{6}{7} \div 3$ which equals $\frac{2}{7}$

This means one part of the bar model is worth $\frac{2}{7}$.

To find the answer to $\frac{6}{7} \div \frac{3}{5}$ we want to know what the whole bar is worth.



We have 5 lots of $\frac{2}{7}$ which equals $\frac{10}{7}$.

Therefore the answer to $\frac{6}{7} \div \frac{3}{5} = \frac{10}{7}$

Adding and Subtracting Fractions

To add or subtract fractions we must first make the denominators the same. We do this by using equivalent fractions and common denominators. Once the denominators are equal we simply add or subtract the numerators (keeping the denominators the same)

$\frac{1}{6} + \frac{4}{9}$ The common denominator will be 18

$$\frac{1}{6} \xrightarrow{\times 3} \frac{3}{18}$$

$$\frac{4}{9} \xrightarrow{\times 2} \frac{8}{18}$$

$$\frac{1}{6} + \frac{4}{9} = \frac{3}{18} + \frac{8}{18} = \frac{11}{18}$$

$\frac{5}{7} - \frac{1}{3}$ The common denominator will be 21

$$\frac{5}{7} \xrightarrow{\times 3} \frac{15}{21}$$

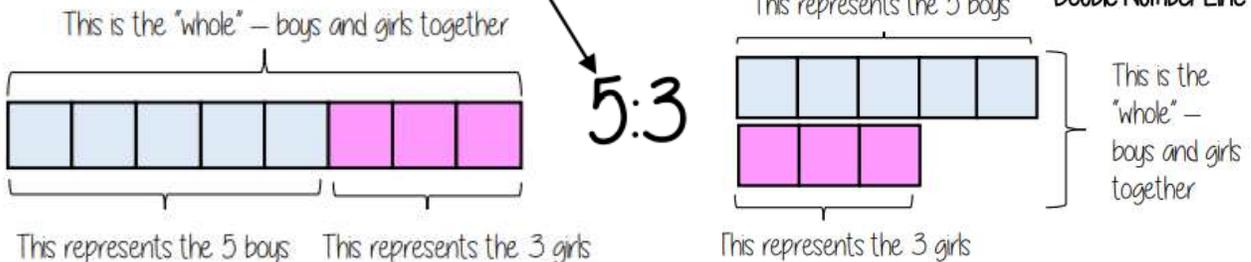
$$\frac{1}{3} \xrightarrow{\times 7} \frac{7}{21}$$

$$\frac{5}{7} - \frac{1}{3} = \frac{15}{21} - \frac{7}{21} = \frac{8}{21}$$

Keyword/Skill	Definition/Tips
Numerator	How many parts of a whole. The top number in a fraction.
Denominator	How many 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
Reciprocal	One of two numbers that multiply to make 1. e.g. the reciprocal of 2 is $\frac{1}{2}$ because $2 \times \frac{1}{2} = 1$
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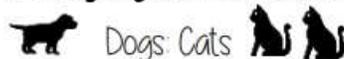
- Other Topics/Units this could come up in:
- Fraction Calculations
 - Recurring Fractions
 - Surds including Rationalising

Representing a ratio "For every 5 boys there are 3 girls"



Order is Important

"For every dog there are 2 cats"



1:2

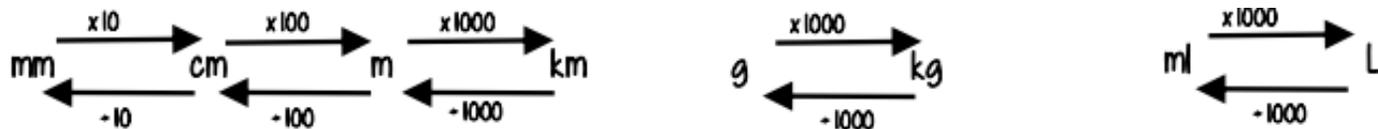
The ratio has to be written in the same order as the information is given.
eg 2:1 would represent 2 dogs for every 1 cat ✗

Keyword/Skill	Definition/Tips
Ratio	Ratio compares the size of one part to another part . Written using the ':' symbol. 3:1
Proportion	Proportion compares the size of one part to the size of the whole . In a class with 13 boys and 9 girls, the proportion of boys is $\frac{13}{22}$ and the proportion of girls is $\frac{9}{22}$
Share	Split or divide.
Parts	One cube in the bar model represents one part
direct proportion	As one amount increases, another amount increases at the same rate
inverse proportion	when one value decreases at the same rate that the other increases.
Best Buys	The product which is the best value for money/cheapest

Units are important:

When using a ratio – all parts should be in the same units

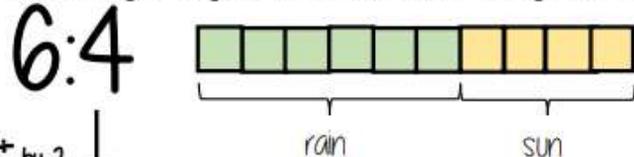
Useful Conversions



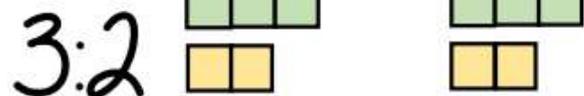
Simplifying a ratio

Cancel down the ratio to its lowest form

"For every 6 days of rain there are 4 days of sun"



+ by 2 ↓



Find the biggest common factor that goes into all parts of the ratio

For 6 and 4 the biggest factor (number that multiplies into them is 2)

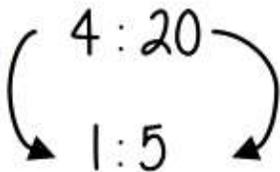
"For every 3 days of rain there are 2 days of sun" – when this happens twice the ratio becomes 6:4

Ratio 1:n (or n:1)

This is asking you to cancel down until the part indicated represents 1

Show the ratio 4:20 in the ratio of 1:n

The question states that **this part** has to be 1 unit. Therefore **Divide by 4**



This side has to be divided by 4 too – to keep in **proportion**

H the n part does not have to be an integer for this type of question

Other Topics/Units this could appear in:

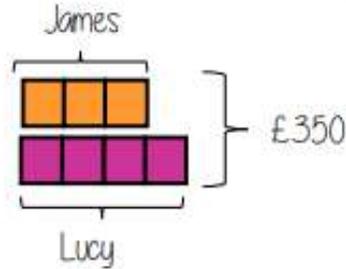
- Direct and inverse proportion

Sharing a whole into a given ratio

James and Lucy share £350 in the ratio 3:4
Work out how much each person earns

Model the Question

James: Lucy
3 : 4

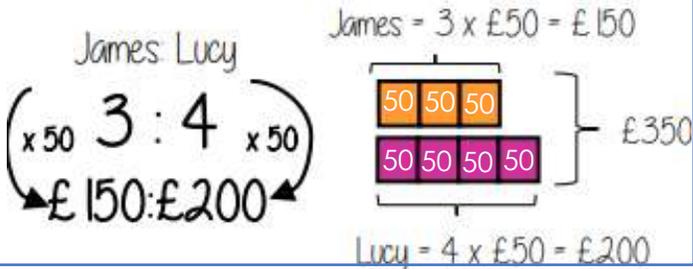


Find the value of one part

Whole: £350
7 parts to share between
(3 James, 4 Lucy)

$£350 \div 7 = £50$
□ - one part
= £50

Put back into the question



Other Topics/Units this could appear in:

- Direct and inverse proportion

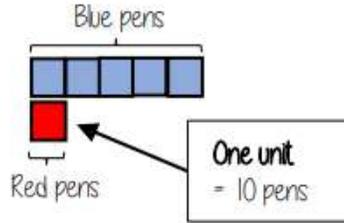
Finding a value given 1:n (or n:1)

Inside a box are blue and red pens in the ratio 5:1
If there are 10 red pens how many blue pens are there?

Model the Question

Blue : Red
5 : 1

□ - one part
= 10 pens



Put back into the question

Blue: Red
 $(\times 10) \quad 5 : 1 \quad (\times 10)$
 $\swarrow \quad \quad \quad \searrow$
 $50 : 10$

Blue pens = $5 \times 10 = 50$ pens
Red pens = $1 \times 10 = 10$ pens

There are 50 Blue Pens

Proportion – Using Recipes

This is very applicable to real life! It's all about adjusting ingredients in a recipe!

Here are the ingredients needed to make 16 gingerbread men.

Ingredients to make 16 gingerbread men

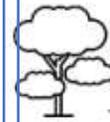
160 g flour	80g
40 g ginger	20g
110 g butter	55g
30 g sugar	15g

Find how much of each ingredient he needs for 8 gingerbread men (divide everything by 2!) and add that to your original recipe

$80 \div 2 = 40$	240	g flour
$20 \div 2 = 10$	60	g ginger
$110 \div 2 = 55$	165	g butter
$15 \div 2 = 7.5$	45	g sugar

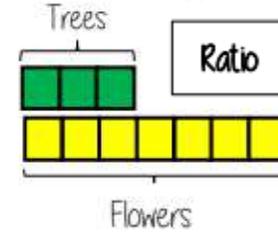
Hamish wants to make 24 gingerbread men. Work out how much of each of the ingredients he needs.

$$24 = 16 + 8$$



Ratio as a fraction

Trees: Flowers
3 : 7



There are 3 parts for trees

Fraction

Number of parts of in group $\frac{3}{10}$
Total number of parts

Tree parts 3 + Flower parts 7 = 10

Keyword/Skill	Definition/Tips
Ratio	Ratio compares the size of one part to another part . Written using the ':' symbol. 3 : 1
Proportion	Proportion compares the size of one part to the size of the whole .
Share	Split or divide.
Parts	One cube in the bar model represents one part
Direct proportion	As one amount increases, another amount increases at the same rate
Inverse proportion	When one value decreases at the same rate that the other increases.
Best Buys	The product which is the best value for money/cheapest 30

Standard Form

Converting Small Numbers into Standard Form

3×10^4 is a number written in standard index form.

Write 3×10^4 as an ordinary number.

3×10^4 can be written as:

$$\begin{aligned} 3 \times 10^4 &= 3 \times 10 \times 10 \times 10 \times 10 \\ &= 3 \times 10,000 \\ &= 30,000 \end{aligned}$$

Converting Large Numbers into Standard Form

Write **15,000,000** in standard index form.

15,000,000 can be written as:

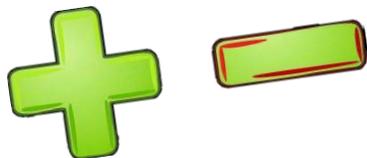
$$\begin{aligned} 15,000,000 &= 1.5 \times 10,000,000 \\ &= 1.5 \times 10 \\ &= 1.5 \times 10^7 \end{aligned}$$

Standard Index Form

$$\begin{aligned} 10^3 &= 1,000 \\ 10^2 &= 100 \\ 10^1 &= 10 \\ 10^0 &= 1 \\ 10^{-1} &= 0.1 \\ 10^{-2} &= 0.01 \\ 10^{-3} &= 0.001 \end{aligned}$$

Adding and Subtracting in Standard Form

In order to add and subtract numbers in standard index form, you need to convert them into ordinary numbers, do the calculation, and then change them back (if you want the answer in standard form).



$$\begin{aligned} &4.5 \times 10^4 + 6.45 \times 10^5 \\ &= 45,000 + 645,000 \\ &= 690,000 \\ &= 6.9 \times 10^5 \end{aligned}$$

$$\begin{aligned} &(4.7 \times 10^5) - (3.2 \times 10^4) \\ &= 470,000 - 32,000 \\ &= 438,000 \\ &= 4.38 \times 10^5 \end{aligned}$$

Multiplying and Dividing in Standard Form

To multiply powers – you add: $10^5 \times 10^3 = 10^8$

$$\begin{aligned} (2 \times 10^3) \times (3 \times 10^6) &= 2 \times 3 \times 10^3 \times 10^6 \\ &= 6 \times 10^9 \end{aligned}$$

To divide powers – you subtract: $10^5 \div 10^3 = 10^2$

$$\begin{aligned} (6 \times 10^6) \div (2 \times 10^2) &= \frac{6 \times 10^6}{2 \times 10^2} \\ &= \frac{6}{2} \times \frac{10^5}{10^2} = 3 \times 10^2 \end{aligned}$$



The Calculator Guide

Change numbers to standard form

Write the number 0.0005735 in standard form to two significant figures.

Press SHIFT, the SET UP, then press 7 for SCI mode.

Change the number of significant figures to 2.

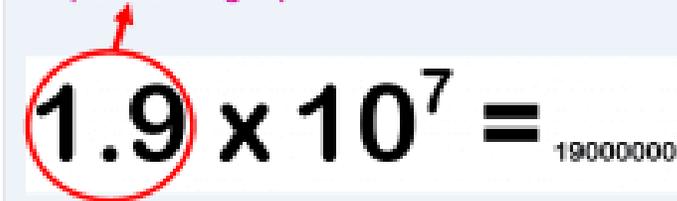
Input the number 0.0005735 and press \square .

The answer of 5.7×10^{-4} is displayed.

Keyword/Skill	Definition/Tips
Decimal Numbers	The numbers we use in everyday life are decimal numbers, because they are based on 10 digits (0,1,2,3,4,5,6,7,8 and 9)
Standard Form	A way of writing very large numbers or very small numbers using a number between 1 and 10, multiplied by a power of 10.
Power	The number of times a base number is multiplied by itself.
Index	A small number placed on the upper-right of a base number to inform how many times to multiply by itself.

What is Standard Form?

Always between 1 and 10
(not including 10)



Standard index form is also known as standard form. A number is said to be written in standard form when it is written as $A \times 10^n$, where

- **A** is a number greater than or equal to 1, but strictly less than 10, and
- **n** tells us how many places to move the decimal point.

Other Topics/Units this could appear in:

- Sequences
- Use of Calculator
- Estimation

Multiplication Law

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

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

Division Law

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

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

Brackets Law

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

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

Power of Zero

Anything to the power of zero is equal to 1.

$$a^0 = 1$$

$$8^0 = 1$$

$$129487893^0 = 1$$

Powers of 10

$$10^6 = 1,000,000$$

$$10^5 = 100,000$$

$$10^4 = 10,000$$

$$10^3 = 1,000$$

$$10^2 = 100$$

$$10^1 = 10$$

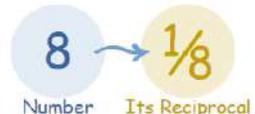
$$10^0 = 1$$

$$10^{-1} = 0.1$$

$$10^{-2} = 0.01$$

$$10^{-3} = 0.001$$

$$10^{-4} = 0.0001$$

Keyword /Skill	Definition/Tips
Indices	Powers e.g. 6^3 , 10^5 , x^4
Reciprocal	The reciprocal of a number is: 1 divided by the number. 
Index Form	Writing numbers in terms of powers E.g. $6 \times 6 \times 6 \times 6 = 6^4$ <- 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
Standard Index Form	A shorthand way of writing numbers (usually very large or very small numbers)
Powers of 10	A power of 10 is any of the integer powers of the number 10

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

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 $3(a + 4)$

$$3(a + 4) = 3a + 12$$

x	a	+ 4
3	3a	12

Example: Expand $y(3y - 5)$

$$y(3y - 5) = 3y^2 - 5y$$

x	3y	- 5
y	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:

$$4(a - 2) = 4a - 8$$

x	a	- 2
4	4a	- 8

$$3(2a + 5) = 6a + 15$$

x	6a	+ 5
3	6a	15

Then simplify: $4a - 8 + 6a + 15 = 10a + 7$

Factorising Expressions

Factorising is the opposite of expanding. You factorise an expression by first finding the highest common factor of the terms in the expression. This goes outside of the brackets. Divide each term by the highest common factor to find the new terms inside the brackets.

Example: Factorise $10x - 15$

$$\begin{aligned} \text{HCF of } 10x \text{ and } 15 \text{ is } 5. \quad & 10x \div 5 = 2x \\ & 15 \div 5 = 3 \\ & = 5(2x - 3) \end{aligned}$$

The highest common factor is not always a number. Sometimes it is a letter!

Example: Factorise $x^2 + 5x$

$$\begin{aligned} \text{The HCF of } x^2 + 5x \text{ is } x. \quad & x^2 \div x = x \\ & 5x \div x = 5 \\ & = x(x + 5) \end{aligned}$$

Exams!

- Check your answer by expanding it, you should get the expression from the question.

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 
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 -> $10 \times 10 \times 10$
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

Other Topics/Units this could appear in:

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

Expanding Double Brackets

When expanding double brackets, we can still use the grid method to help us. You will also need to simplify your answer at the end

Ex1: Expand $(a + 4)(a + 5)$

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

$$(a + 4)(a + 5) = a^2 + 4a + 5a + 20$$

$$= a^2 + 9a + 20$$

Make sure you are careful when you are simplifying your answer when negatives are involved.

Ex2: Expand $(y + 3)(y - 6)$

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

$$(y + 3)(y - 6) = y^2 - 6y + 3y - 18$$

$$= y^2 - 3y - 18$$

Factorising into Double Brackets

Factorising into double brackets will always involve quadratic expressions.

Ex1: Factorise $x^2 + 5x + 6$

When factorising into double brackets, you need to find two numbers that add together to make 5 and multiply to get 6.

$$x^2 + 5x + 6$$

$$\begin{aligned} _ \times _ &= 6 \\ _ + _ &= 5 \end{aligned}$$

List the factors of 6 and see which ones add to make 5.

$$1, 6 \quad 2, 3$$

Out of these pairs, 2 and 3 add together to make 5.

$$\begin{aligned} 2 \times 3 &= 6 \\ 2 + 3 &= 5 \end{aligned}$$

Once you have these numbers, you put them into double brackets.

The first term of each bracket is whatever the variable is in the question because you need them to multiply to make x^2 (if the variable is x).

In this example it is x.

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

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 
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 -> $10 \times 10 \times 10$
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

If you need any help with simplifying expressions, you can look back at the **'Working Towards Unit 6 – Expressions & Substitution'**

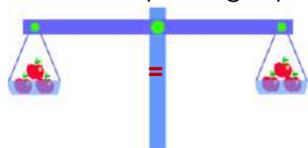
Other Topics/Units this could appear in:

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

When we are solving equations, you need to figure out the value of the variable in the equation

You need to carry out the inverse operations to find the value of the variable.

Remember whatever operation you do to one side of the equals sign, you must do the same to the other to keep it balanced. Think of it like a set of scales:



If I remove one apple from the left side, to keep it balanced I must do the same to the right side!
We need to think like this when we solve equations.

$$4x - 7 = 5$$

Variable
↓

One – Step Equations

These are equations where you only need to do one inverse operation to solve the equations:

Ex1

$$\begin{aligned} y + 14 &= 20 \\ -14 \quad -14 \\ \hline y &= 6 \end{aligned}$$

Ex2

$$\begin{aligned} x - 120 &= 80 \\ +120 \quad +120 \\ \hline x &= 200 \end{aligned}$$

Ex3

$$\begin{aligned} 3n &= 12 \\ \div 3 \quad \div 3 \\ \hline n &= 4 \end{aligned}$$

Ex4

$$\begin{aligned} \frac{k}{2} &= 16 \\ \times 2 \quad \times 2 \\ \hline k &= 32 \end{aligned}$$



Two – Step Equations

These are equations where you need to do two inverse operations to solve the equations:

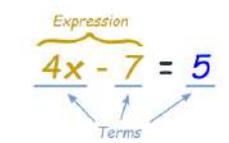
Ex1

$$\begin{aligned} 4x - 3 &= 25 \\ +3 \quad +3 \\ \hline 4x &= 28 \\ \div 4 \quad \div 4 \\ \hline x &= 7 \end{aligned}$$

Ex2

$$\begin{aligned} \frac{y}{5} + 6 &= 14 \\ -6 \quad -6 \\ \hline \frac{y}{5} &= 8 \\ \times 5 \quad \times 5 \\ \hline y &= 40 \end{aligned}$$



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. 
Variable	A symbol for a number we do not know yet
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

Expanding and Solving Equations

You will also need to use skills you have already learnt to solve some equations. (If you need help expanding brackets look back at the **Crossover Unit 19 – Expand & Simplify** knowledge organiser).

Ex1

$$\begin{aligned} 3(x + 4) &= 27 \\ \text{Expand the brackets first} \\ 3x + 12 &= 27 \\ -12 \quad -12 \\ \hline 3x &= 15 \\ \div 3 \quad \div 3 \\ \hline x &= 5 \end{aligned}$$

Other Topics/Units this could appear in:

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

Equations With an Unknown Variable on Both Sides

Sometimes equations may have variables on each side of the equals sign. There is one extra step you need to do before you apply the same method for solving two-step equations. The extra step is whichever side has the smaller unknown variable, subtract that from both sides of the equation. You can then continue with the same method of using the inverse operations to solve the equation

Ex1 $8x + 12 = 5x + 30$

Here we will subtract $5x$ from both sides as $5x$ is the smaller variable

$$\begin{array}{r} 8x + 12 = 5x + 30 \\ -5x \quad -5x \end{array}$$

$$\begin{array}{r} 3x + 12 = 30 \\ -12 \quad -12 \end{array}$$

$$\begin{array}{r} 3x = 18 \\ \div 3 \quad \div 3 \end{array}$$

$$x = 6$$



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:

$$\begin{array}{r} y + 81 = x + 100 \\ -81 \quad -81 \end{array}$$

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

$$y = x + 19$$

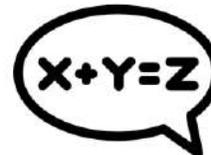
Ex2 Make x the subject of this formula:

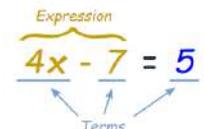
$$\begin{array}{r} C = 4x + 5y \\ -5y \quad -5y \end{array}$$

$$\begin{array}{r} C - 5y = 4x \\ \div 4 \quad \div 4 \end{array}$$

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

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



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. 
Variable	A symbol for a number we do not know yet
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

Other Topics/Units this could appear in:

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

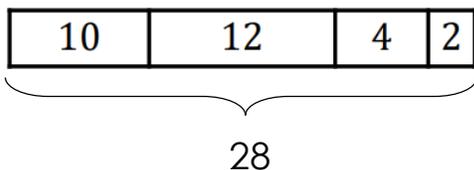
Calculating the Mean

The mean is the most commonly used measure of average. The mean is the total amount split evenly.

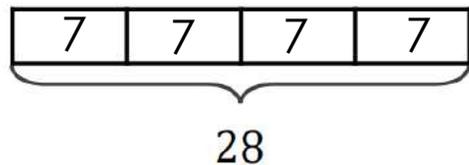
For example take this data set:

10, 12, 4, 2

I can represent this as a bar model:



The total is 28. I then want to split this amount evenly into how many values there are. In this case I need to split 28 into 4 even values.



Therefore the mean is 7!

You can also find missing values from data sets when given the mean.

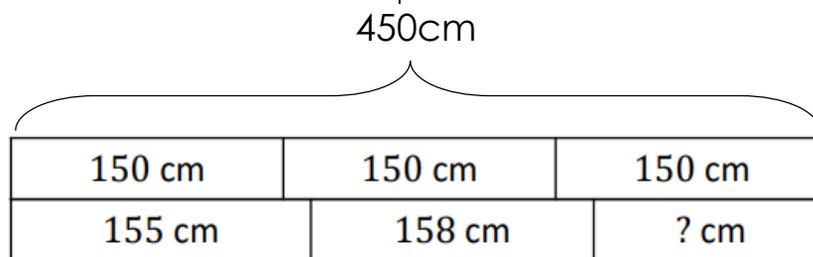
Example:

Three children have a mean of 150cm.

Two children have a height of 155cm and 158 cm.

What is the height of the third child?

I can draw a bar model to help me out:



I can see that the total would be 450cm so I can figure out the missing total:

$$155\text{cm} + 158\text{cm} = 313\text{cm} \quad 450\text{cm} - 313\text{cm} = \mathbf{137\text{cm}}$$

Calculating the Median

- If you place a set of numbers in order, the median number is the middle one.

10 12 13 15 16 23 26

15 is the middle number so it is the median.

- If there are two middle numbers the median is the mean of this

10 12 13 15 16 17 23 26

Here you need to find the number in the middle of 15 and 16:

$$15 + 16 = 31 \quad 31 \div 2 = 15.5$$

Therefore, 15.5 is the median.

Calculating the mode

- The mode is the value that occurs most often

Example:

1,3,3,4,7,8

The number 3 occurs the most so the mode is 3.

Calculating the Range

The range is the difference between the highest and lowest values in a set of numbers

Find the range of:

23, 27, 40, 18, 25

The largest value is 40 and the smallest value is 23.

$$40 - 23 = 17$$

Keyword/Skill	Definition/Tips
Discrete	Discrete data can only have a finite or limited number of possible values
Continuous	Continuous data can have an infinite number of possible values within a selected range
Quantitative	Quantitative data that can be counted (discrete), quantitative data 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.
Table	Information (such as numbers and descriptions) arranged in rows and columns.
Data	A collection of facts, such as numbers, words, measurements, observations or even just descriptions of things.
Proportion	A part, share, or number considered in comparative relation to a whole.
Univariate Data	Univariate means "one variable" (one type of data).

Other Topics/Units this could appear in:

- Averages
- Averages from Tables
- Sampling
- Histograms

Finding the mode from a table

- The mode is the value that occurs most often.
- The mode is the only average that can have no value, one value or more than one value.
- When finding the mode, it helps to order the numbers first.

In this frequency table, the mode is the value with the highest frequency:

Shoe size	5	6	7	8	9
Frequency	2	5	11	4	1

The modal size is 7 because more people wear size 7 than any other size.

Finding the modal class from a grouped frequency table

The following table shows the weights of children in a class.

Mass (<i>m</i>) kg	Frequency
$30 \leq m < 40$	7
$40 \leq m < 50$	6
$50 \leq m < 60$	8
$60 \leq m < 70$	4

The modal class is the class that has the highest frequency. In this case the modal class is:

$$50 \leq m < 60$$

Total Frequency

score	frequency
1	19
2	18
3	12
4	19
5	9
6	23

Andy throws a dice in an investigation. How would you work out the total number of times he has thrown the dice?

You can work out the **total frequency** by adding up each frequency.

100

Finding the median from a Table

The table below shows the average number of hours a group of 200 students spend watching TV per week to the nearest hour.

hours	frequency	cumulative frequency
0	8	8
1	16	24
2	33	57
3	75	132
4	44	176
5	8	184
6	16	200

The 105.5th value which is the **median** would be in this category.

To work out the median value, first work out the **cumulative frequency column**.

Keyword/Skill	Definition/Tips
Discrete	Discrete data can only have a finite or limited number of possible values
Continuous	Continuous data can have an infinite number of possible values within a selected range
Quantitative	Quantitative data that can be counted (discrete), quantitative data that can be measured (continuous)
Qualitative	Information that describes something
Average	A calculated 'central value' of a set of numbers
Mean	To calculate the mean, add up all of the numbers and then divide by how many numbers there are
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.
Table	Information (such as numbers and descriptions) arranged in rows and columns.
Midpoint	The middle point. The point halfway between.

- There are 200 data items, so **the median** must lie between items 100 and 101

$$\text{Median} = \frac{n+1}{2} \quad \text{Median} = \frac{200+1}{2} = \frac{201}{2} = 105.5$$

The median value would be the **105.5th value** in the table. Then use this to help you to work out where this data would lie using the **cumulative frequency column**

Calculating the Mean from a Table

- The **mean** is found by adding up all the numbers and dividing by how many numbers there are.

To find the mean in this example, the total number of goals must be found and then divided by the number of games.

	Number of Goals (x)	Frequency (f)	fx
	0	2	0 x 2 = 0
	1	2	1 x 2 = 2
	2	5	2 x 5 = 10
	3	1	3 x 1 = 3
Total		10	15

Total number of football games

Total number of goals.

- From the table, we can see that for 2 games, no goals were scored. This makes a grand total of zero goals so far.
- The rest of the total amount of goals can be worked out in this way, by multiplying goals (**x**) by the frequency (**f**). Call this column **fx** (*f multiplied by x*)

The total number of goals is 15. There were 10 football games so **15 ÷ 10 = 1.5**
The mean number of goals is 1.5 goals per game.

Remember to divide *fx* by the total of the frequencies, not by the amount of different items of data – the correct answer here is $\frac{15}{10}$ not $\frac{15}{4}$

x	f	fx
1	15	15
2	27	54
3	8	24
4	5	20
TOTALS:	55	113

Further Example
The table shows the number of parking spaces per house in a street. Work out the **mean number of spaces**

Mean = $\frac{113}{55} = 2.05...$

Finding the Range
The **range** is the **difference between the highest and lowest values** in a set of numbers.
-> Using this table as an example:
The highest value is 4 and the lowest value is 1. Range = 4 - 1 = 3

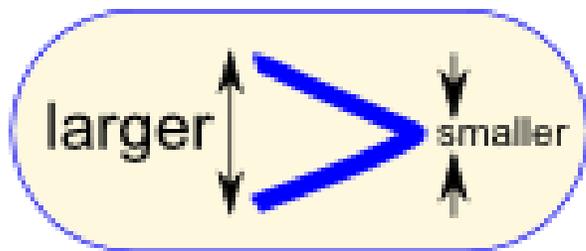
Keyword/Skill	Definition/Tips
Sample	A selection taken from a larger group 'the population' that will let you find out things about a larger group.
Population	The whole group being studied
Stem and Leaf	A plot where each data value is split into a 'leaf' and a 'stem'. 'Stem' values are listed down and 'leaf' values are listed next to them.
Pie Chart	Graph using a divided circle where each section represents part of the total.
Estimate	To make an approximate or rough calculation often based on rounding.
Primary	Primary data is data that is collected by a data researchers from first hand sources.
Secondary	Secondary data is data gathered from studies, surveys or experiments run by other people or for other research.
Interval	An interval is between two points of values. An interval may or may not include start and end points.
Survey	To gather information by individual samples so we can learn about the whole thing.
Sort	To arrange or group in a special way (such as by size, type or alphabetically).

Other Topics/Units this could come up in:

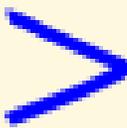
- Averages
- Mode, median, range and mean
- Cumulative frequency

Inequality Symbols

Equality and Inequality



 equal
 not equal

 greater than  greater than or equal
 less than  less than or equal

Examples:

$x < 5$ means x is less than 5

$p \geq 100$ means p is greater than or equal to 100

$y > -2$ means y is greater than -2

Other Topics/Units this could appear in:

- Numbers, powers, roots, decimals and rounding
- Expressions and substituting into a formula
- Expand and simplify
- Solving equations

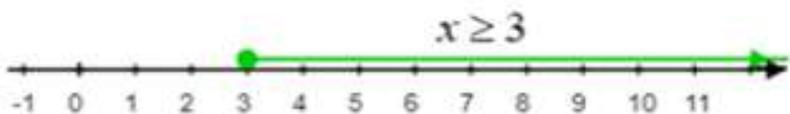
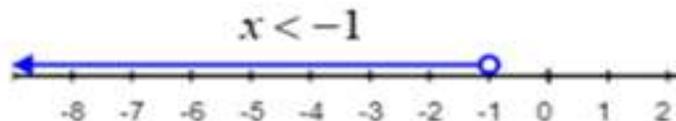
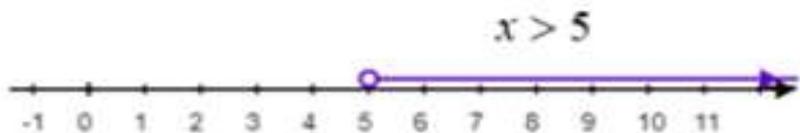
Keyword/Skill	Definition/Tips
Integer	Whole number including 0 and negative numbers. No fractions or decimals.
Inequality	Compares two values showing if one is less than, greater than or not equal to each other.
Greater than	One number is BIGGER than another number.
Less than	One number is SMALLER than 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. $6y = 6 \times y$. y is the variable and 6 is the coefficient.
Inverse	Opposite of (i.e. x and \div , $+$ and $-$)
Solve	Find all of the values that satisfy the inequality.

Inequalities Symbols on a Number Line

Symbol	Circle	Direction of Arrow
$<$	Open 	Left
$>$	Open 	Right
\leq	Closed 	Left
\geq	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.

Examples:



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 to each other.
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. $6y = 6 \times y$. y is the variable and 6 is the coefficient.
Inverse	Opposite of (i.e. x and \div , $+$ and $-$)
Solve	Find all of the values that satisfy the inequality.

Solving Inequalities

Solving an inequality means finding the range of values that **satisfy** the inequality.

$3x + 7 < 22$

$22 - 7 = 15$

$3x < 15$

$x < 5$

We can also use bar models to form new inequalities.

e.g.

$2b < 2a$
 $4c + 7 = 2a + 7$
 $3b > 4c$

Keyword /Skill	Definition/Tips
Product	Means multiply
Prime number	A number that has exactly two factors
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 to each other.
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. $6y = 6 \times y$. y is the variable and 6 is the coefficient.
Inverse	Opposite of (i.e. x and \div , $+$ and $-$)
Solve	Find all of the values that satisfy the inequality.

$2x + 3 < 17$

$17 - 3 = 14$

$2x < 14$

$x < 7$

$2x + 3 < x + 17$

$17 - 3 = 14$

$2x < x + 14$

$x < 14$

We can use bar models to represent the size of each side of the inequality. This allows us to see how much bigger/smaller one side is compared to the other. It also allows us to make changes to both sides in order to solve the inequality.

Frequency Diagrams

A **frequency diagram**, often called a line graph or a frequency polygon, shows the frequencies for different groups of data.

Line Graphs (for discrete data)

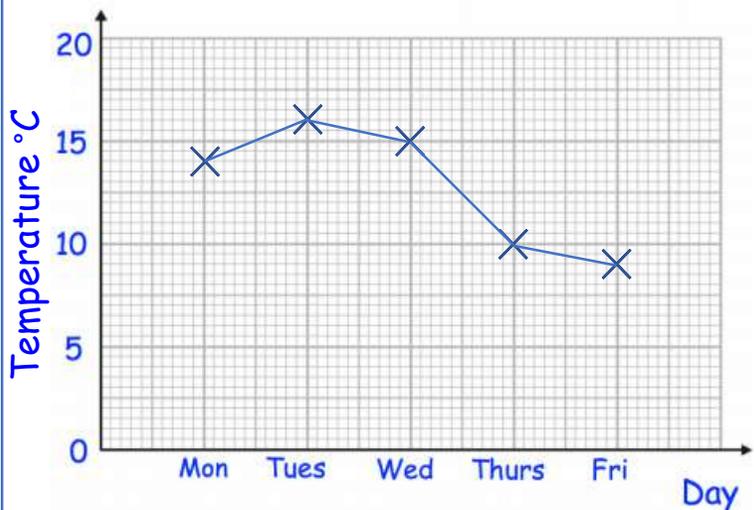
Example

The table below shows the average temperature in Belfast each day.

	Belfast
Monday	14°C
Tuesday	16°C
Wednesday	15°C
Thursday	10°C
Friday	9°C

The line graph below shows the results of the table.

A point has been plotted at the correct frequency for each day. And the points are joined with straight lines.



Frequency Polygons (for continuous grouped data)

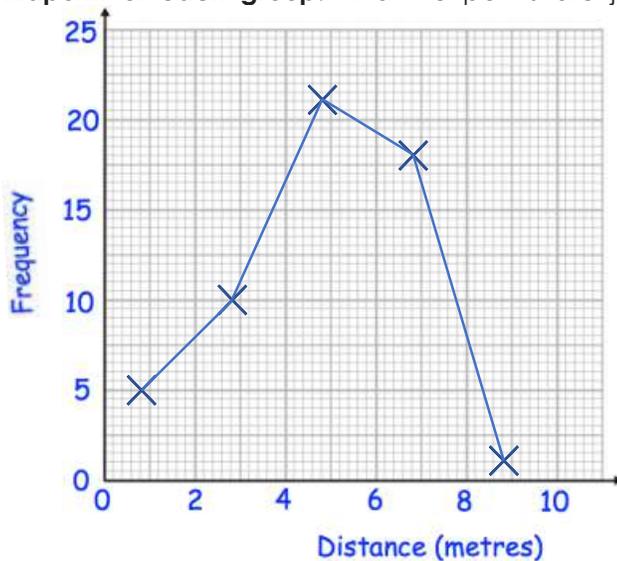
Example

The table gives information about the distances thrown, in metres, at a school sports day.

Time (seconds)	Frequency
$0 < d \leq 2$	5
$2 < d \leq 4$	10
$4 < d \leq 6$	21
$6 < d \leq 8$	18
$8 < d \leq 10$	1

The line graph below shows the results of the table.

A point has been plotted at the correct frequency for each day, above the **midpoint of each group**. And the points are joined with straight lines.



Keyword /Skill	Definition/Tips
Discrete	Discrete data can only have a finite or limited number of possible values.
Continuous	Continuous data can have an infinite number of possible values within a selected range.
Qualitative	Data categories like food, clothes and hobbies.
Quantitative	Data that can be counted or measured.
Data	Collection of information.
Sample	Section of a whole group.
Population	Whole set of individuals, items or data from which a statistical sample is drawn.
Frequency	The number of times an item appears in a set of data.

Exams!

When drawing line graph or frequency polygon you must draw straight lines between the points. Not curved lines. A polygon is a shape with straight edges, so your graph needs straight edges too. You **do not** join the first and last point together

Other Topics/Units this could appear in:

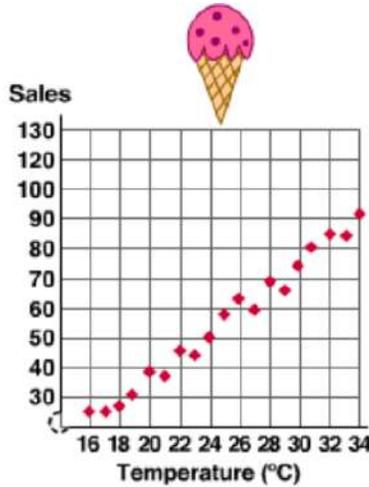
- Probability
- Probability Trees
- Cumulative Frequency & Box Plots
- Histograms
- Representations of Data

Scatter Graph

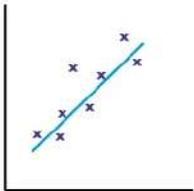
A scatter graph is a diagram where points are plotted to show the relationship (correlation) between two variables.

The value of one variable is shown along the x-axis and the values of the second variable is shown on the y-axis.

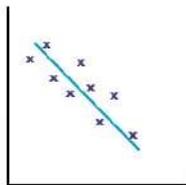
The scatter graph to the right shows the temperature compared with the number of ice-creams sold.



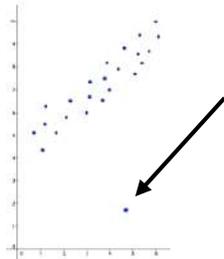
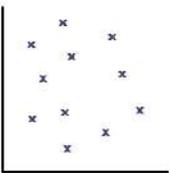
Positive Correlation



Negative Correlation



No Correlation



Outlier

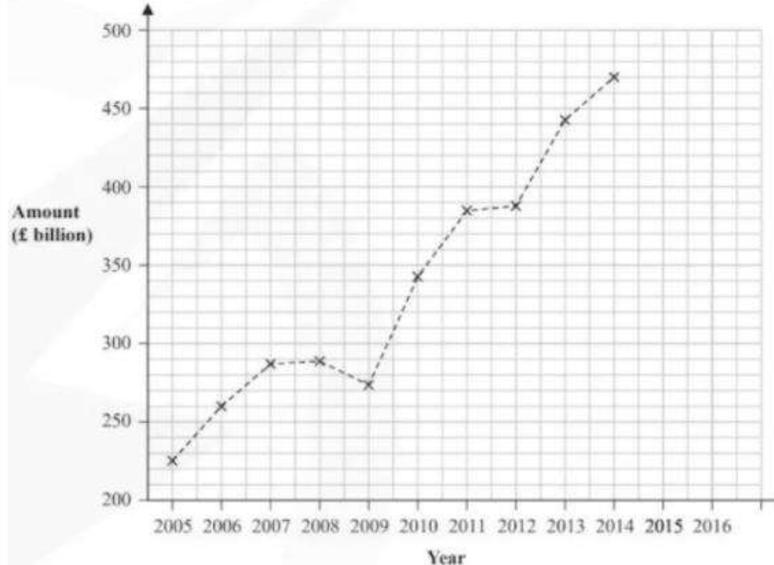
Time – series graph

Time series graphs show data fluctuations over time and are used to predict trends, cycles and seasonality.

Example

The time series graph below shows the amount of money invested by a company between 2005 and 2014.

The general trend of the graph is an increase in the amount of money invested over time.



Keyword/Skill	Definition/tip
Scatter graph	A diagram with points plotted to show a relationship between two variables.
Variable	A quantity that can change or vary, taking on different values.
Line of best fit	A straight line that best represents the data on a scatter graph.
Correlation	A relationship between two or more things.
Positive correlation	Both variables increase or both variables decrease.
Negative correlation	One variable increases and the other decreases or vice versa.
No correlation	There is no relationship between the two variables.
Outlier	A value that lies outside most other values.
Time-Series	A line graph of repeated measurements taken over regular time intervals.
Trend	A direction in which something is changing.

Exams!

- When interpreting scatter graphs always refer to what the graph is showing. For example "it has positive correlation so the hotter it is the more ice creams that are sold"

Exams!

- Once all points have been plotted, ALWAYS draw a line of best fit. (Scatter graph)
- Use line of best fit to estimate answers.

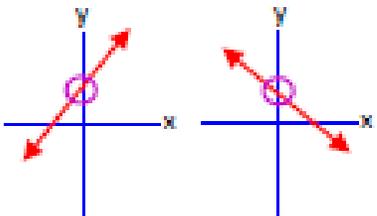
Other topics/Units this could appear in:

- Coordinate Geometry
- A-Level Statistics - Correlation

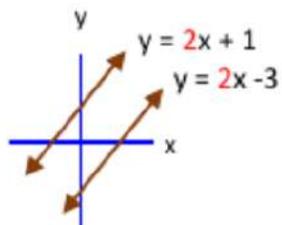
$$y = mx + c$$

Gradient **y-intercept**

When gradient is positive. When gradient is negative



Parallel Lines have the SAME gradient.

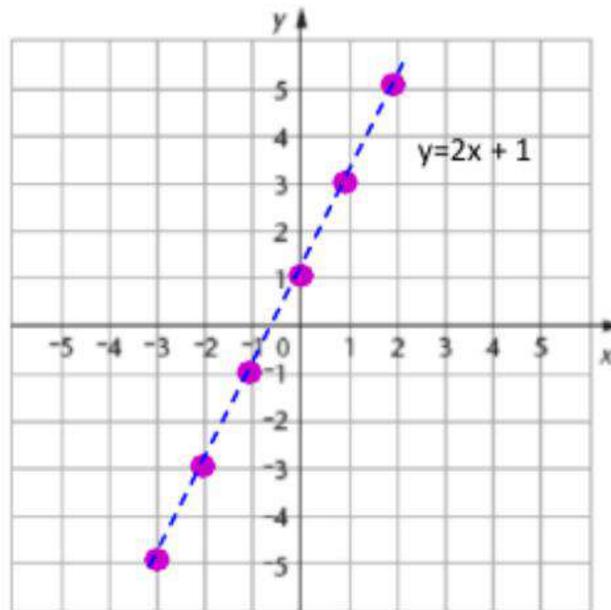


How to complete a table and plot a straight line graph.

- Complete the table by substituting the x values into the equation $y = 2x + 1$.
(This will give you the corresponding y values)

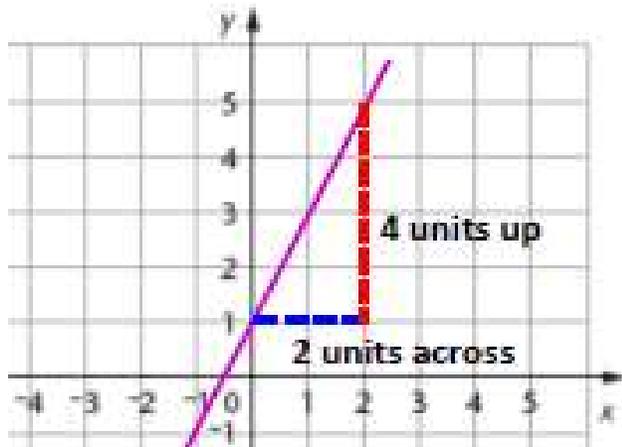
X	-3	-2	-1	0	1	2
y	-5	-3	-1	1	3	5

- Plot the co-ordinates: (2, 5) (1, 3) (0, 3) (-1, -1) (-2, -3) (-3, -5)



How to find the gradient of a line.

$$\text{gradient} = \frac{\text{change in } y}{\text{change in } x} = \frac{4}{2} = 2$$



Keyword /Skill	Definition/Tips
Linear	A graph that makes a straight line. Often written in the form $y = mx + c$
Graph	A drawing or diagram used to show information.
Distance	A measurement of how far.
Time	Minutes, Seconds, Hours, Days, Weeks, Months etc.
Coordinate	Shown as a pair (2, 4) to show a position on a set of axes.
Quadrant	Any of the 4 areas created by the x and y axes.
Real-Life Graphs	A graph that shows events of real life – distance and time.
Gradient	How steep a line is.
Y-Intercept	Where the line crosses y-axis
Function	A mathematical relationship between two values.
Solution	A value that makes an equation true.
Parallel	When two lines are always the same distance apart and never meet.

Other Topics/Units this could appear in:

- Coordinate Geometry
- A-Level – Core:
 - Algebra & Functions
 - Coordinate Geometry in the xy plane
- A Level – Statistics:
 - Correlation

$ax^2 + bx + c$

c = **y-intercept** (where the graph CUTS the Y axis)

A quadratic graph is called a parabola.

They are symmetrical.

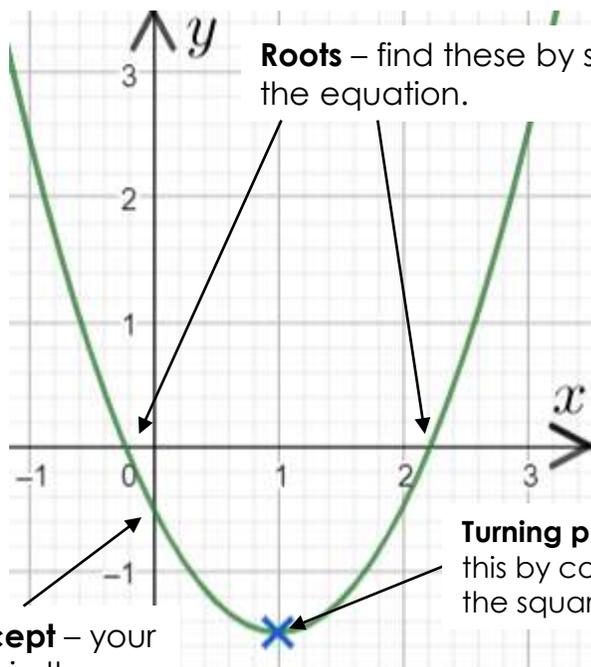
When a is positive



When a is negative



Features of a Quadratic Graph



Roots – find these by solving the equation.

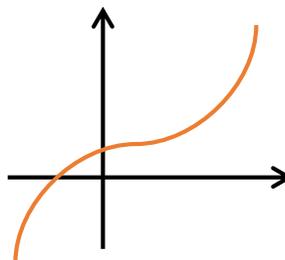
Turning point – find this by completing the square.

y-intercept – your c value in the equation

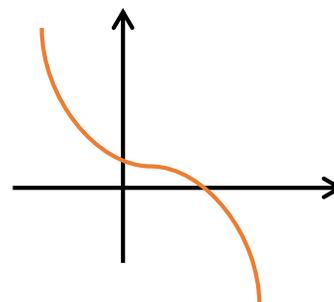
Other Graphs you Need to Know:

Cubic: $ax^3 + bx^2 + cx + d$

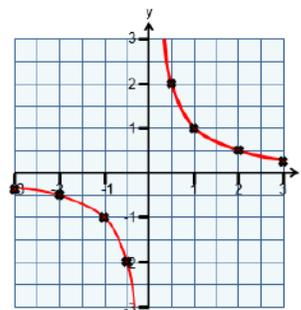
When a is positive



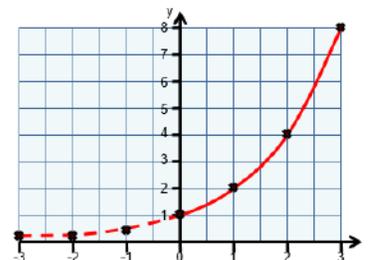
When a is negative



Reciprocal: $y = \frac{1}{x}$



Exponential: $y = 2^x$



Keyword/Skill	Definition/Tips
Quadratic	An equation that has an x^2 as the highest power.
Function	A mathematical relationship between two values.
Solve	To find a value that makes an equation true.
Expand	To multiply out one or more sets of brackets.
Factorise	To put the expression back into brackets.
Simplify	To make an expression easier by expanding or factorizing.
Graph	A drawing or diagram used to show information.
Curve	A line that is not straight
Coefficient	A number which multiplies a variable.....2 is the coefficient of x in $2x$.
Cubic	An equation that has an x^3 as the highest power.

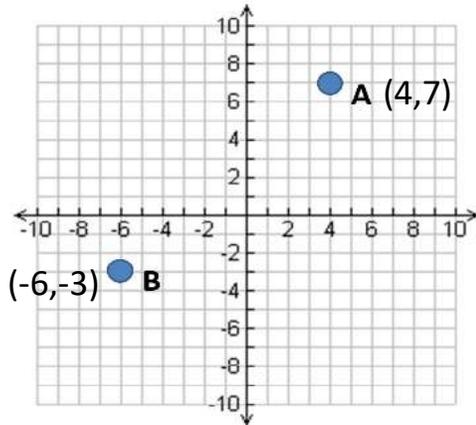
Other Topics/Units this could appear in:

- Graphs of Trig Functions
 - Using Graphs of Circles, Cubes and Quadratics
 - Gradient and Area Under Graphs
- A-Level – Core:
- Algebra & Functions

Crossover Unit 31 – Coordinate Geometry

The Four Quadrants.

When plotting coordinates, (x,y), x represents how far along the x-axis (left or right) the point is, and y represent how far along the y-axis (up or down) the point is. See the co-ordinates labelled below.



How to Find the Midpoint of a Line Segment

Add the x coordinates and divide by 2.
Add the y coordinates and divide by 2.

Example:

Find the midpoint between (2, 1) and (6, 9)

$$\frac{2+6}{2} = 4 \quad \text{and} \quad \frac{1+9}{2} = 5$$

So the midpoint is (4, 5).

Using the Gradient of a Line.

The gradient of a line is how steep it is.

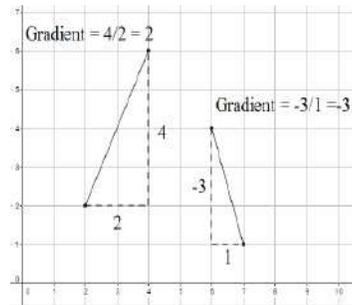
$$\text{Gradient} = \frac{\text{change in } y}{\text{change in } x}$$

The gradient can be positive (going up) or negative (going down).

In the equation $y = 2x + 5$, the gradient is 2.
In the equation $y = -3x - 10$, the gradient is -3.

If two lines are parallel, they will have the SAME gradient.

Example:
 $y = 2x + 5$ and $y = 2x - 6$ are parallel because they both have a gradient of 2

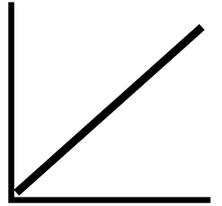


Finding the Equation of a Line

The general equation of a line looks like this:

$$y = mx + c$$

↓ Gradient ↓
y-intercept



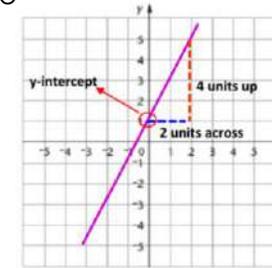
Example:

Find the equation of the line.

$$\text{Gradient} = \frac{\text{change in } y}{\text{change in } x}$$

$$\text{Gradient} = \frac{4}{2} = 2$$

$$y = 2x + c$$



The y-intercept is where the line crosses the y-axis, you can see this from the graph. Therefore the equation is:

$$y = 2x + 1$$

You may not be given the graph but instead get two points from the line.

Example:

A line passes through the points (4, 7) and (8, 19). Find the equation of the line.

$$\text{Gradient} = \frac{\text{change in } y}{\text{change in } x}$$

$$\text{Gradient} = \frac{19 - 7}{8 - 4} = \frac{12}{4} = 3 \quad y = 3x + c$$

Then substitute in one of the points to find the value of c

$$\begin{aligned} \text{Sub } (4, 7): \quad 7 &= 3(4) + c \\ 7 &= 12 + c \\ c &= -5 \end{aligned}$$

So the equation is: $y = 3x - 5$

Keyword /Skill	Definition/Tips
Linear	A graph that makes a straight line. Often written in the form $y = mx + c$
Graph	A drawing or diagram used to show information.
Coordinate	Shown as a pair (2, 4) to show a position on a set of axes.
Quadrant	Any of the 4 areas created by the x and y axes.
Gradient	How steep a line is.
Y-Intercept	Where the line crosses the y-axis
Function	A mathematical relationship between two values.
Solution	A value that makes an equation true.
Parallel	When two lines are always the same distance apart and never meet.
Midpoint	The point that is exactly mid way between to given points.

Other Topics/Units this could appear in:

- Coordinate Geometry
- A-Level – Core:
- Coordinate Geometry in the xy plane

Speed

Speed is a compound measurement combining **distance** and **time**

Example

A car travels **120 miles** in **2 hours and 30 minutes**. Calculate the average **speed** of the car in **mph**.

The units of **speed** are **miles per hour** so the **distance** must be in **miles** and the **time** must be in **hours**.

Distance = 120 miles
Time = 2.5 hours

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

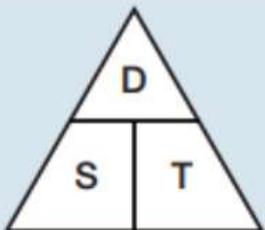
$$\text{Speed} = \frac{120}{2.5}$$

$$\text{Speed} = 48\text{mph}$$

The formula triangles can be used to help rearrange this equation to calculate distance or time.

Speed

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$



Density

Density is a compound measurement combining **mass** and **volume**

Example

The **mass** of a metal block is **1.2kg** its **volume** is **40cm³**. Calculate the **density** of the metal in **g/cm³**.

The units of **density** are **g/cm³** so the **mass** must be in **grams** and the **volume** must be in **cm³**.

Mass = 1200 grams
Volume = 40cm³

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

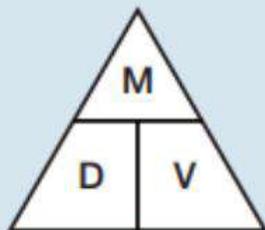
$$\text{Density} = \frac{1200}{40}$$

$$\text{Density} = 30 \text{ g/cm}^3$$

The formula triangles can be used to help rearrange this equation to calculate mass or volume.

Density

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$



Pressure

Pressure is a compound measurement combining **force** and **area**

Example

Find the **pressure** exerted by a **force** of **240 Newtons** on an area of **3000cm²**. Give your answer in **N/m²**.

The units of **pressure** are **N/m²** so the **force** must be in **Newtons** and the **area** must be in **m²**.

Force = 240 Newtons
Area = 0.3m²

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

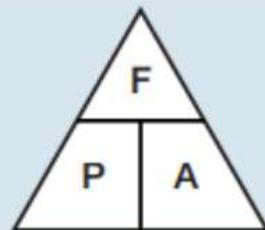
$$\text{Pressure} = \frac{240}{0.3}$$

$$\text{Density} = 800 \text{ N/m}^2$$

The formula triangles can be used to help rearrange this equation to calculate force or area.

Pressure

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$



Keyword/Skill	Definition/Tips
Speed	How fast something is moving.
Distance	A measurement of how far something travels.
Time	Time is the ongoing sequence of events taking place. The past, present and future.
Density	A measure of how much matter is in a certain volume.
Mass	A measure of how much matter is in an object.
Volume	The amount of 3-dimensional space something takes up.
Pressure	Pressure is the force per unit area. The pressure exerted by a solid object onto another solid surface is the weight of the object divided by the area of the object's surface.
Force	A push or pull that acts upon an object .
Area	The amount of space taken up by a 2D shape or surface
Compound Measure	Compound measures are ones that involve two other measures of different types; examples include measuring speed in metres per second, or defining density as mass divided by volume.

Exams!

- You need to know these formulae off by heart.
- You will get marks for substituting the values given in the question into the correct formula.

Other Topics/Units this could appear in:

- Coordinate Geometry
- Real-Life Graphs
- Mechanics

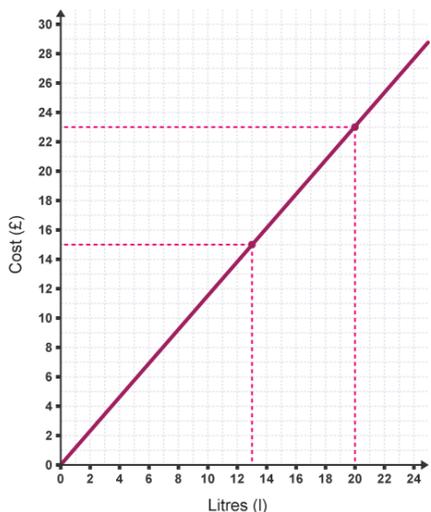
Real Life Graphs

All real-life graphs can be used to estimate or read-off values. The actual meaning of the values will depend on the labels and units shown on each axis.

Sometimes:

- the gradient of the line or curve has a particular meaning.
- The y-intercept (where the graph crosses the vertical axis) has a particular meaning
- The area has a particular meaning

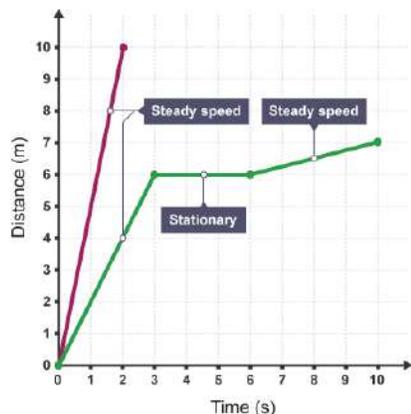
This graph shows the cost of petrol. It shows that 20 litres will cost £23 or £15 will buy 13 litres.



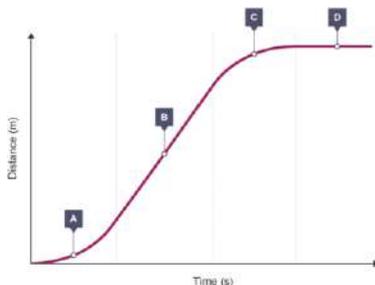
Distance – Time Graphs

A horizontal line on a **distance-time graph** shows that the object is **stationary** (not moving because the distance does not change)

A sloping line on a distance-time graph shows that the object is moving.



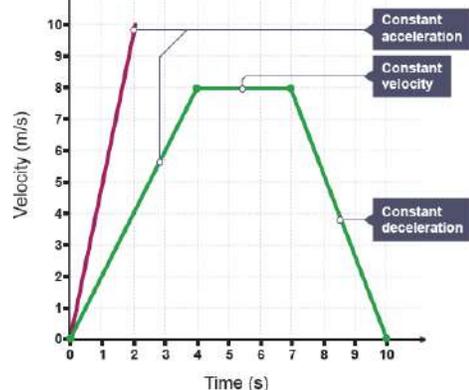
If the speed of an object changes, it will be **accelerating** or **decelerating**. This can be shown as a curved line on a distance-time graph.



Speed – Time Graphs

A velocity-time graph shows the speed and direction an object travels over a specific period of time. Velocity-time graphs are also called speed-time graphs.

The vertical axis of a velocity-time graph is the velocity of the object. The horizontal axis is the time from the start.



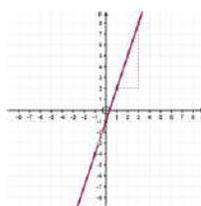
Gradient of a straight line

The gradient of a straight line describes the slope or steepness of the line.

$$\text{Gradient} = \frac{\text{change in } y}{\text{change in } x}$$

To determine the gradient of a line:

- choose any two points on the line
- draw a right-angled triangle from one to the other, using the line as the hypotenuse
- determine the height and width of the triangle
- gradient = height ÷ width



The triangle goes from 2 to 8 on the y-axis, so has a height of 6. It goes from 1 to 3 on the x-axis, so has a width of 2.

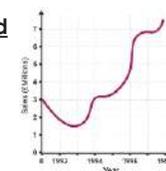
$$\text{Gradient} = \frac{6}{2} = 3$$

Keyword/Skill	Definition/Tips
Linear	Relating to a line; in a straight direction.
Graph	A drawing or a diagram to record information.
Distance	The length between two points or objects.
Time	Continuum of past to present to future.
Coordinate	Shown as pairs of letters and/or numbers to show position on a coordinate plane or map.
Quadrant	Any quarter divided by an x and y axis.
Gradient	How steep a line is.
Intercept	To cross over one another or overlap.
Function	A mathematical relationship between two values.
Solution	Solving a problem.
Parallel	Always the same distance apart and never touching.

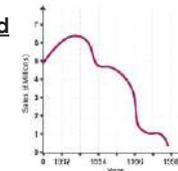
Trends

A trend is a pattern in a set of results displayed in a graph.

Upward Trend



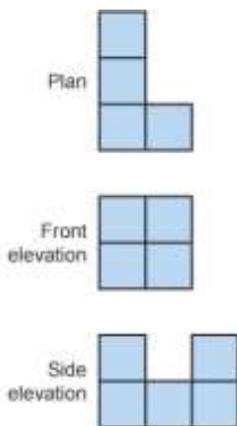
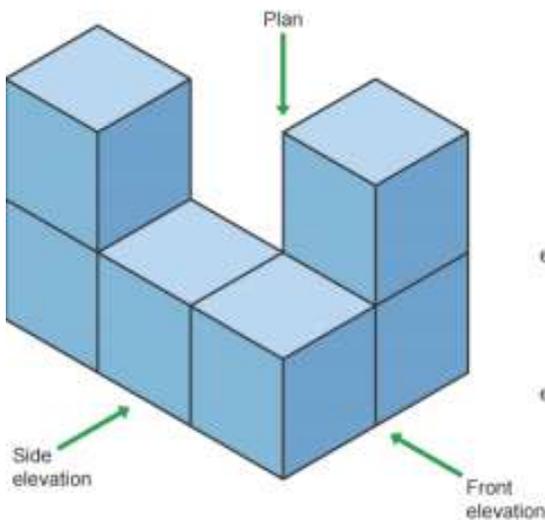
Downward Trend



Other Topics/Units this could appear in:

- Drawing and Interpreting tables/charts
- Straight line graphs
- Graphs of trig functions
- Gradient & Area under graphs
- Mechanics

Plans and Elevations



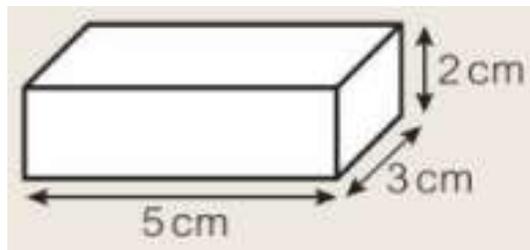
Plan
The view from above.

Front Elevation
The view from the front of the solid.

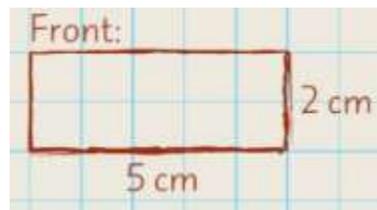
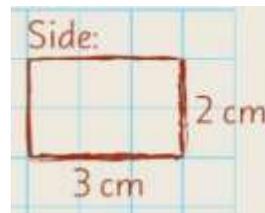
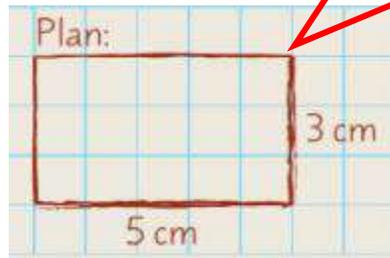
Side Elevation
The view from the side of the solid.

Worked Exam Question

Draw the plan, the front elevation and the side elevation of this cuboid on the grid below.

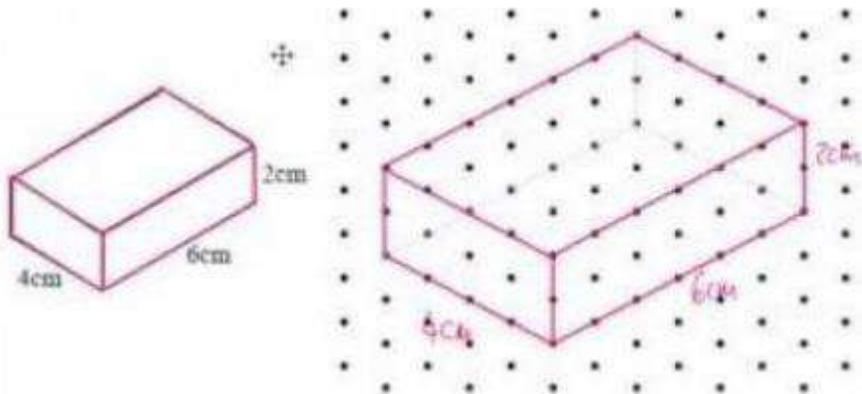


Use a ruler.
Measure accurately.
Label Lengths.



Isometric Drawing

A representation of a solid where all of the dimensions are drawn to scale.

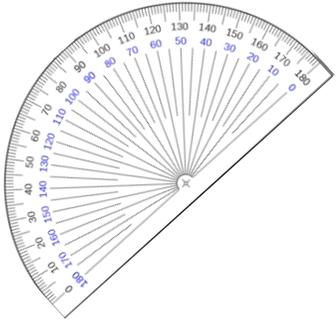


Keyword/Skill	Definition/Tips
Face	A flat surface that forms part of a solid.
Edge	The boundary of 2 faces.
Vertex	The point at which 2 or more edges meet (corner).
2D	Having only two dimensions, such as width and height but no thickness. Squares, circles, triangles etc are 2D shapes.
3D	Having three dimensions, such as height, width and depth, like any object in the real world. Cuboids, Cones, Spheres etc are 3D shapes.
Solid	A 3D object.
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.

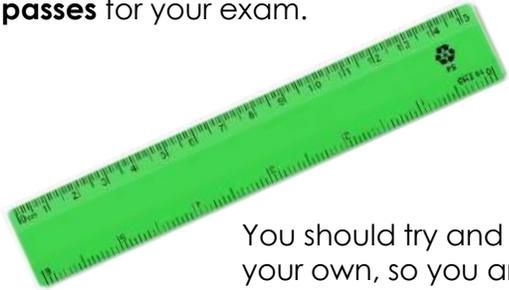
Other Topics/Units this could appear in:

- Surface Area and Volume
- Similarity in 2D and 3D

Construction Equipment



You will need a **ruler, protractor, eraser, sharpened pencil** and **pair of compasses** for your exam.



You should try and get your own, so you are used to using them all.

Using Compasses



Make sure your pencil is sharp and your compasses don't wobble.

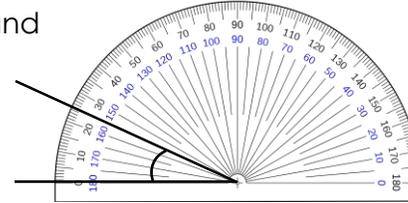
Tighten the compasses so the points of the pencil and compasses are as close together as possible.

Try to hold only the black part of the compasses when you are drawing so you don't change the gap you have set.

Using a protractor

Always position your protractor with the + over the end of the line and line up the 0 on the scale. Count from 0 on the scale when measuring an angle.

This angle measures 25° and is acute.

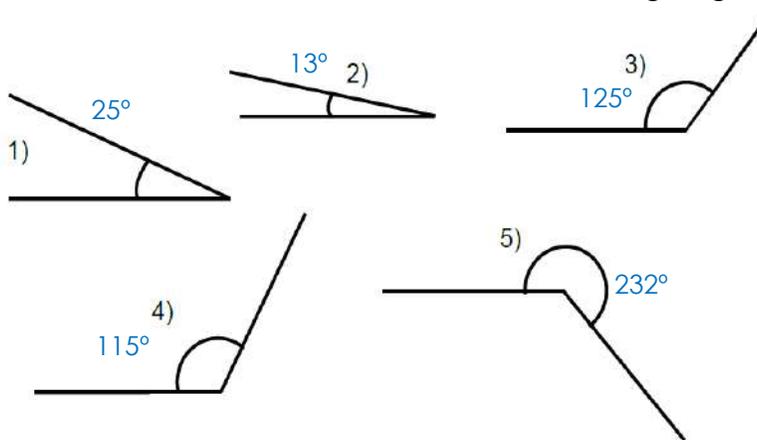


You may also want to look at the knowledge organisers for:

Year 7 Unit 7 - Angles
and
Working Towards Unit 5 - Angle Facts & Shape Properties

Check you can measure these angles correctly.

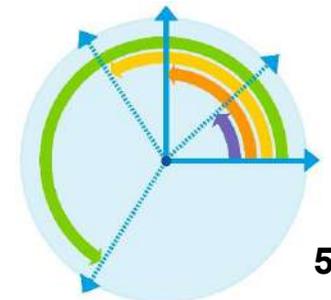
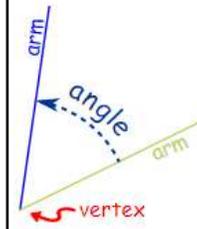
Measuring and Drawing Angles



Other Topics/Units this could appear in:

Crossover Unit 35 - Bearings

Keyword/Skill	Definition/Tips
Vertex	A corner where two edges meet at a point.
Line segment	A section of a line, usually between two letters, such as AB.
Angle	The corner point of an angle is called the vertex . And the two straight sides are called arms . The angle is the amount of turn between each arm.
Degree	The unit of measurement for turn, shown by the symbol $^\circ$ $90^\circ = \frac{1}{4}$ turn, $180^\circ = \frac{1}{2}$ turn, $270^\circ = \frac{3}{4}$ turn.
Adjacent	Next to one another.



Constructing Triangles – given 3 side lengths

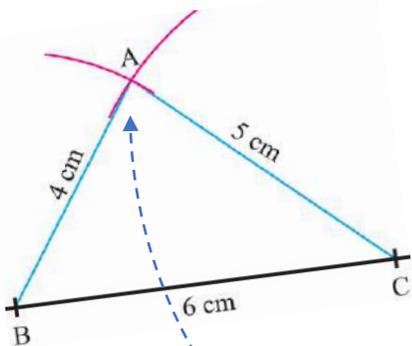
Using **ruler** and **compasses**, you can **construct** any triangle, given its three side lengths.

This triangle has side lengths 6cm, 5cm and 4 cm.

The 6cm line was drawn with a ruler.

Then arcs with radii 5cm and 4cm were constructed at either end of the 6cm line, using compasses.

The intersection point shows where the other vertex should be.



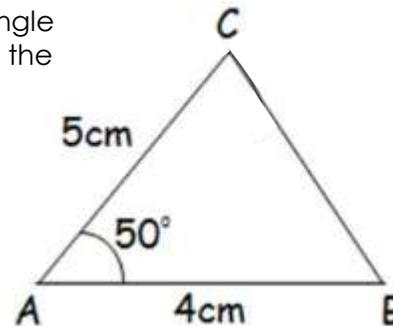
Constructing Triangles – given 2 sides and 1 angle

Using **ruler** and **protractor**, you can **construct** any triangle, given two of its side lengths and the angle between them.

This triangle has two side lengths 5cm and 4cm with a 50° angle between them.

The 4cm line is drawn first, then an angle of 50° is measured and marked from the end of the line.

A 5cm line is drawn at this angle.



don't rub these construction lines out – the examiner will want to see them!

Using **ruler** and **protractor**, you can **construct** any triangle, given two of its angles.

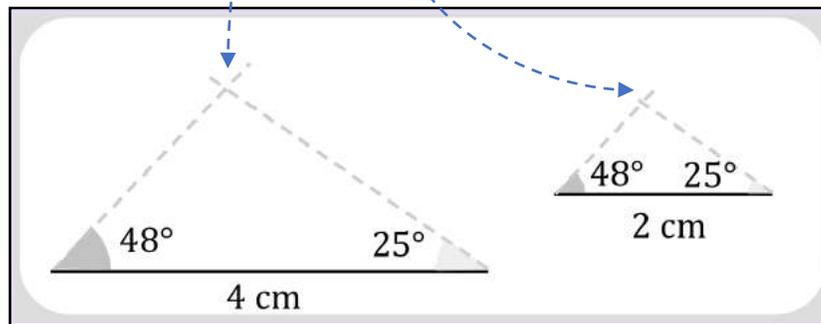
These triangles both have interior angles of 48° and 25°, but the side lengths are different.

Draw the side in between the two angles first; sometimes this is given to you in the question.

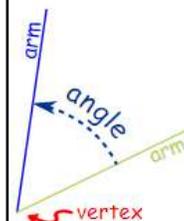
Then measure the angles from each end of the line – make sure the protractor is lined up correctly! Extend your construction lines until they intersect.

The intersection points show where the other vertex (corner) should be.

Constructing Triangles – given 2 angles



Keyword/Skill	Definition/Tips
Arc	Part of the circumference of a circle.
Vertex	A corner where two edges meet at a point.
Line segment	A section of a line, usually between two letters, such as AB.
Construct	Use ruler, pencil, protractor and/or compasses to accurately draw a given shape.
Angle	The corner point of an angle is called the vertex . And the two straight sides are called arms . The angle is the amount of turn between each arm.
Degree	The unit of measurement for turn, shown by the symbol ° 90° = ¼ turn, 180° = ½ turn, 270° = ¾ turn.
Adjacent	Next to one another.
Intersect (intersection)	Where two or more line segments cross or meet at a point.

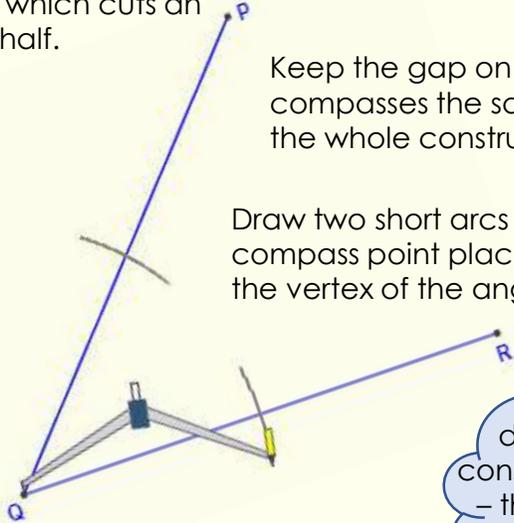


Using **ruler**, and **compasses**, you can **construct** an angle bisector, which cuts an angle in half.

Constructing Angle Bisectors

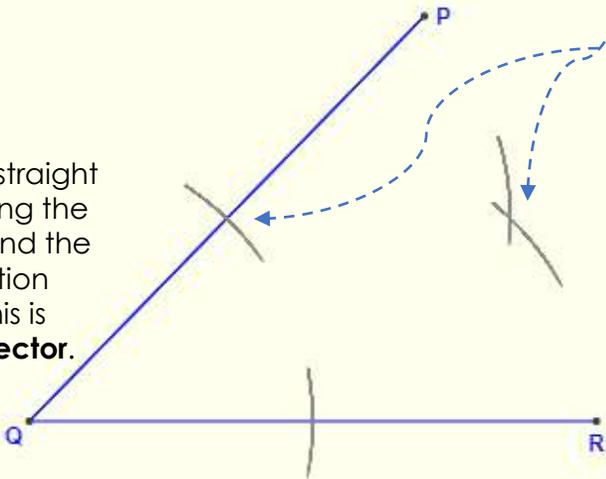
Keep the gap on your compasses the same for the whole construction.

Draw two short arcs with the compass point placed at the vertex of the angle.



Draw two short arcs with the compass point placed on your first pair of arcs.

Draw a straight line joining the vertex and the intersection point. This is your **bisector**.



don't rub these construction lines out – the examiner will want to see them!

Using **ruler**, and **compasses**, you can **construct** a perpendicular bisector, which cuts a line in half at a right angle.

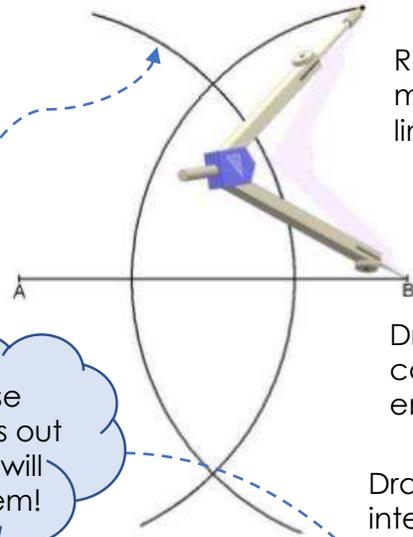
Constructing Perpendicular Bisectors

Remember to open the compasses more than half the length of the line you are bisecting.

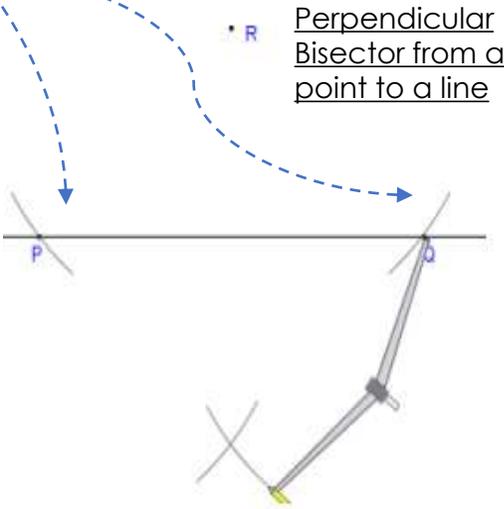
Keep the gap on your compasses the same for the whole construction.

Draw two long arcs with the compass point placed at either end of the line you are bisecting.

Draw a straight line joining the two intersection points. This is your **bisector**.



When constructing a perpendicular bisector from a point to a line, add this first step, then continue as above.



Keyword/Skill	Definition/Tips
Bisect	Cut exactly in half.
Loci/Locus of points	A locus is a path formed by a point which moves according to a rule. The plural is loci .
Perpendicular	Straight lines which meet or cross at right angles (90°) to one another.
Scale	The scale is the ratio of a distance on the drawing or model to the corresponding distance in real life, eg 1:20 means 1cm on the drawing represents 20 cm in real life.
Region	A specific part of something, usually shown by shading or labelling R.
Plan	A plan is similar to a map, usually showing a small area such as a playground or house.

Exams!

- You can use all these construction skills to construct loci or scale drawings.
- Any correct part of a construction scores a mark, so always have a go, even if you're not sure.

Diameter and Radius of a Circle

The diameter is double the size of the radius.

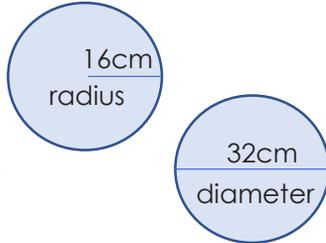
Example:

A circle has a radius of 16 cm. What is the diameter?

Radius = 16cm

$6\text{cm} \times 2 = 32\text{cm}$

Diameter = 32cm



Circumference of a Circle

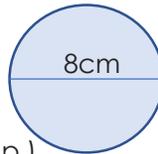
The circumference of a circle is the distance around the circle. It is the correct name for the perimeter of a circle.

Circumference = $\pi \times \text{diameter}$

Example: Find the circumference of this circle

Circumference = $\pi \times 8$

= 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).

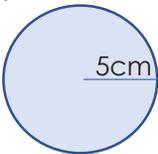
Example:

Radius = 5cm.

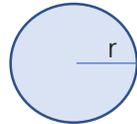
Diameter = 5cm x 2 = 10cm

Circumference = $\pi \times 10$

= 31.41cm (2d.p.)

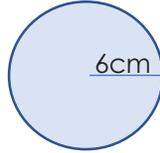


Area of a Circle



Area = πr^2
= $\pi \times \text{radius}^2$

Example: Find the area of the circle.



Radius = 6cm

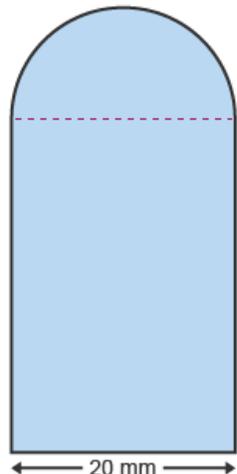
Area = πr^2
= $\pi \times 6^2$
= $36\pi\text{cm}^2 = 113.1\text{cm}^2$

Exam!

In an exam it may ask you for your answer in terms of π . This means instead of doing the final calculation you just leave it with π in the answer e.g. $10\pi\text{cm}$

The Area of a Compound Shape

This shape is made up of a rectangle and a semicircle. To find the total area we just find the area of each part and add them together.



Area of rectangle = $l \times w$

= 20×30
= 600mm^2
Area of circle = πr^2
= $3.14 \times 10 \times 10$
= 314mm^2

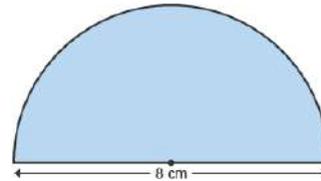
Area of semicircle
= $314 \div 2 = 157\text{mm}^2$
Total area = $600 + 157$
= 757mm^2

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.



$C = \pi d$
= 3.14×8
= 25.12cm

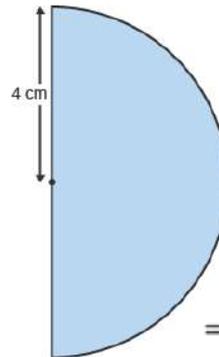
Remember this is the circumference of the whole circle, so now we need to half this answer and remember to add on the other edge.

$25.12 \div 2 = 12.56\text{cm}$

Total Perimeter = $12.56 + 8 = 20.56\text{cm}$

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

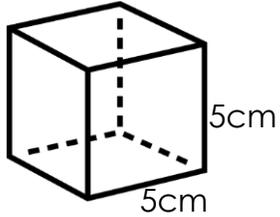
= $50.24 \div 2 = 25.12\text{cm}^2$

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 $\pi = 3.14159265358979323846...$ (the digits go on forever without repeating)

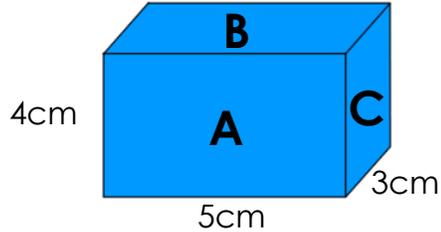
Other Topics/Units this could appear in:

- 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

Cubes and cuboids



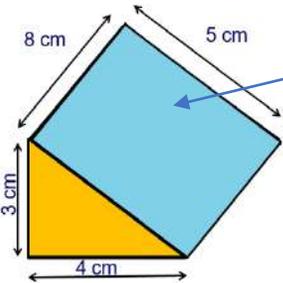
Each face has the same area.
 Area of one face:
 $5 \times 5 = 25\text{cm}^2$
 Total surface area:
 $25 \times 6 = 150\text{cm}^2$



A cuboid will have 3 pairs of equal faces:
 $2 \times A = 2 \times (5 \times 4) = 40\text{cm}^2$
 $2 \times B = 2 \times (5 \times 3) = 30\text{cm}^2$
 $2 \times C = 2 \times (3 \times 4) = 24\text{cm}^2$
 Surface Area = $40 + 30 + 24 = 94\text{cm}^2$

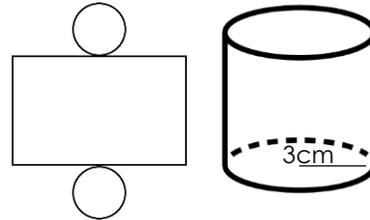
Triangular Prisms & Cylinders

Make sure you find the area of each face on a prism. They may not be all the same shape!



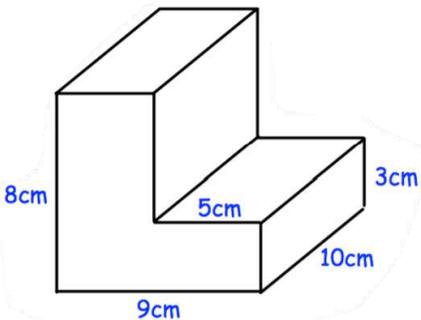
$5 \times 8 = 40\text{cm}^2$
 $3 \times 8 = 24\text{cm}^2$
 $4 \times 8 = 32\text{cm}^2$
 $(3 \times 4) \div 2 = 6\text{cm}^2$
 $(3 \times 4) \div 2 = 6\text{cm}^2$
 $40 + 24 + 32 + 6 + 6 = 108\text{cm}^2$

A cylinder's surface is made from two circles and a rectangle, you can see this from the net of a cylinder. The dimensions of the rectangle are the height of the cylinder and the circumference of one of the circles.



Area of the two circles:
 $2 \times (\pi \times 3^2) = 56.6\text{cm}^2$ (1 d.p.)
 Area of the curved surface:
 Circumference \times Height
 $(2 \times \pi \times 3) \times 10 = 188.5\text{cm}$ (1 d.p.)
 Total: $56.6 + 188.5 = 245.1\text{cm}^2$

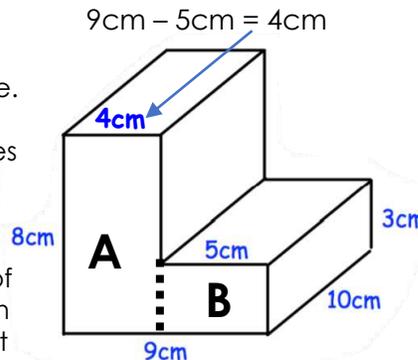
Compound Shape Prisms



The area of the bottom and the top of the shape will be the same.

The area of the left and right sides of the shape will also be the same.

You then need to split the face of the shape up into shape you can find the area of, in this example it will be two rectangles.



Area of the top and bottom:
 $2 \times (9 \times 10) = 180\text{cm}^2$
 Area of the left and right:
 $2 \times (8 \times 10) = 160\text{cm}^2$
 Area of rectangle A (front & back):
 $2 \times (8 \times 4) = 64\text{cm}^2$
 Area of rectangle B (front & back):
 $2 \times (5 \times 3) = 30\text{cm}^2$

Total Surface Area:
 $180\text{cm}^2 + 160\text{cm}^2 + 64\text{cm}^2 + 30\text{cm}^2 = 434\text{cm}^2$

Keyword /Skill	Definition/Tips
Prism	A 3D shape that has two identical ends and flat sides.
Cross Section	A view into the inside of something by cutting through it.
Diameter	The distance from one point of a circle to another passing through the centre. It is twice the radius.
Radius	The distance from the centre of the circle to the circumference. It is half the diameter.
Formula/Formulae	A rule or fact written with mathematical symbols. ($V = l \times w \times h$).
Compound Shape	A compound shape is made up of two or more basic shapes.
Face	A flat surface of any object.
Perimeter	The distance around the outside of a shape.
Area	The space inside a 2D shape.
Surface Area	The total area of the outside of a 3D shape.
Volume	The amount of 3-dimensional space something takes up.

Other topics/units this may appear in:

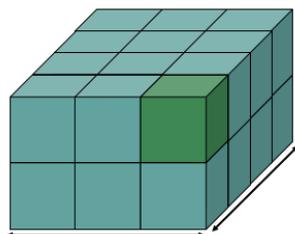
- Perimeter and Area
- 3D forms
- Mensuration

Volume Using Unit Cubes

This is a unit cube. It has a volume of 1cm^3 . You may get shapes made from unit cubes and you will need to find the volume of that shape by counting how many cubes there are.

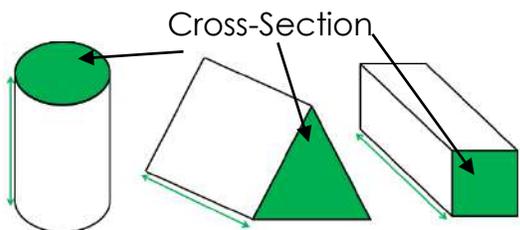


Example:



The volume of this cuboid would be 24cm^3 as there are 24 unit cubes altogether.

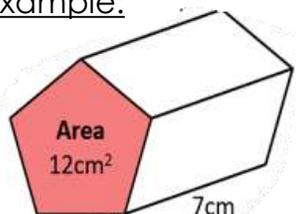
Volume of Prisms



A prism has a constant cross-section. To find the volume of it you first need to find the area of the cross section and multiply it by the height/depth of the shape.

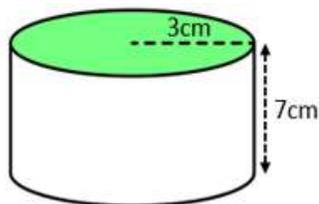
Formula for Volume of Prisms: **Area of Cross-Section x Height**

Example:



You are given the area of the cross-section so you need to multiply the area by the depth:

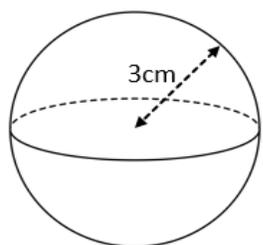
$$12\text{cm}^2 \times 7 = 84\text{cm}^3$$



$$\begin{aligned} \text{Area of cross-section} &= \pi \times r^2 \\ &= \pi \times 3^2 = 28.27\text{cm}^2 \end{aligned}$$

$$\begin{aligned} \text{Volume} &= \text{Area of Cross-Section} \times \text{Height} \\ &= 28.27 \times 7 = 197.89\text{cm}^3 \end{aligned}$$

Volume of Spheres



Formula for volume of a Sphere: $\frac{4}{3} \times \pi \times r^3$

You are given this formula in the exam, you just need to be able to use it!

Example:

$$\text{Volume} = \frac{4}{3} \times \pi \times 3^3 = 113.1\text{cm}^3 \text{ (1d.p.)}$$

Exam!

Make sure you use the correct units with your answer.

Area uses square units and volume uses cubic units.

Examples:

Area units: cm^2 , m^2 , mm^2 , km^2 , etc.

Volume: cm^3 , m^3 , mm^3 , km^3 , etc.

Keyword /Skill	Definition/Tips
Prism	A 3D shape that has two identical ends and flat sides.
Cross Section	A view into the inside of something by cutting through it.
Diameter	The distance from one point of a circle to another passing through the centre. It is twice the radius.
Radius	The distance from the centre of the circle to the circumference. It is half the diameter.
Formula/Formulae	A rule or fact written with mathematical symbols. ($V = l \times w \times h$).
Compound Shape	A compound shape is made up of two or more basic shapes.
Face	A flat surface of any object.
Perimeter	The distance around the outside of a shape.
Area	The space inside a 2D shape.
Surface Area	The total area of the outside of a 3D shape.
Volume	The amount of 3-dimensional space something takes up.

Other topics/units this may appear in:

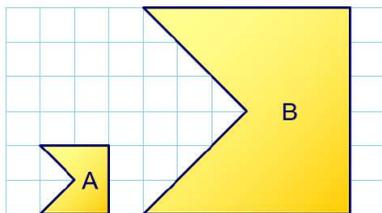
- Perimeter and Area
- 3D forms
- Mensuration

Before progressing through this section of work, you may find it useful to look back at **Crossover Unit 44 – Constructions** knowledge organiser.

DON'T FORGET

Enlargements make the object bigger or smaller.
Scale factors tell us how much bigger or smaller.

An enlarged shape will ALWAYS produce a **similar** pair of shapes.



Shape A has been enlarged by a scale factor of 3 (all sides multiplied by 3) but all the angles will remain the same.

Finding and Using a Scale Factor



In order to find length DF
 Write two of the corresponding sides as a ratio = $AB : DE$

$$5 : 20$$

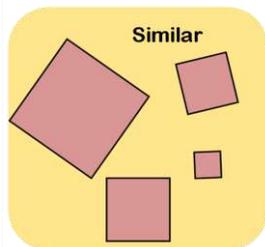
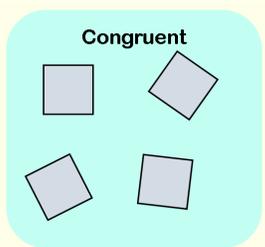
With a scale factor of 4

Simplify $\rightarrow 1 : 4$

To find DF- look at the corresponding length $AC = 6\text{cm}$
 $6 \times 4 = 24\text{cm}$

This is the scale factor

Similarity Vs. Congruence



Rules for Congruent Triangles

If each of the three identified measurements (in the diagrams below) are equal, then the triangles are congruent.

SSS (Side – Side – Side)



3 sides are respectively equal

SAS (Side – Angle – Side)



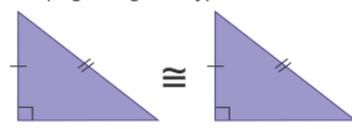
2 sides and the included angle are respectively equal

ASA (Angle – Side – Angle)



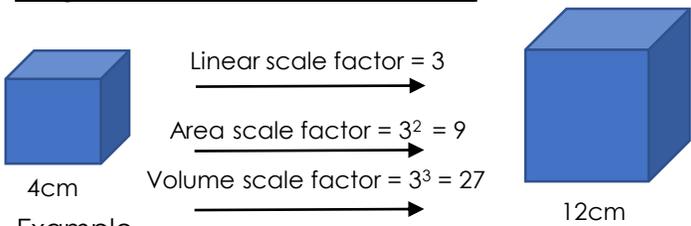
2 angles and the included side are respectively equal

RHS (Right angle – Hypotenuse – Side)



Hypotenuse and one side are respectively equal

Length, Area & Volume Scale Factor



Example

Volume = 64cm^3 $\xrightarrow{64 \times 27}$ Volume = 1728cm^3

Keyword/Skill	Definition/tip
Similar	Two shapes are similar when one can become the other after a resize , flip, slide or turn.
Congruence	Two shapes are congruent if they are exactly equal in size and shape.
Scale factor	The ratio by which a length or other measurement is increased or decreased.
Ratio	A ratio shows the relative sizes of 2 or more values.
Enlargement	When a shape/length changes size (bigger or smaller) using a scale factor.
Compass	Piece of mathematical equipment 
Construction	Use ruler, pencil, protractor and/or compasses to accurately draw a given shape.

Other topics/Units this could appear in:

- Transformation
- Construction

Exam Tips

- To help you start similarity questions you will need to find the scale factor.
- You will gain a mark for recognising and using area and volume scale factor.

Translations

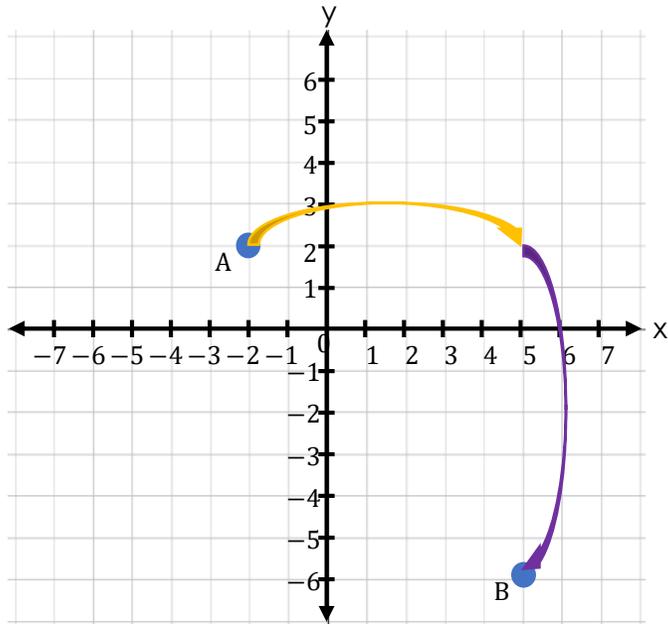
Translations are movements in a direction.
Column vectors can be used to describe translations.

7 units in the positive x -direction

From point A to point B
the translation is:

$$\begin{pmatrix} 7 \\ -8 \end{pmatrix}$$

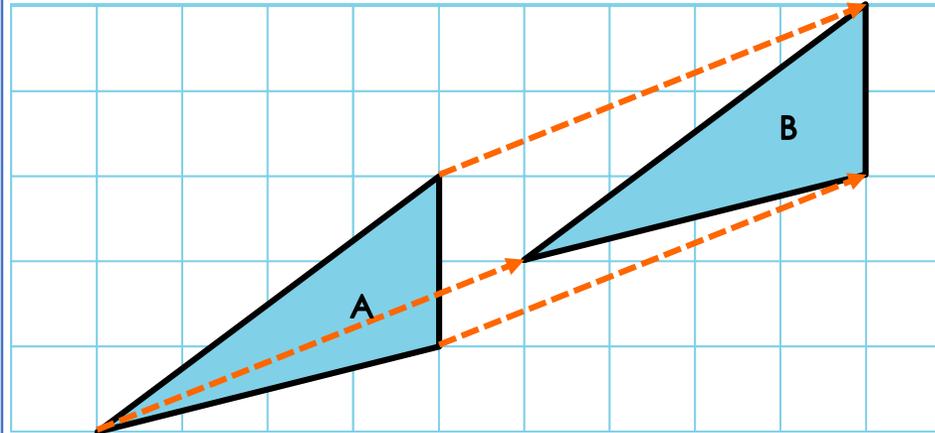
8 units in the negative y -direction



First count the number of squares moved in the x -direction and then count the number of squares moved in the y -direction.

When a whole shape is translated, every vertex (corner) moves by the **same** column vector.

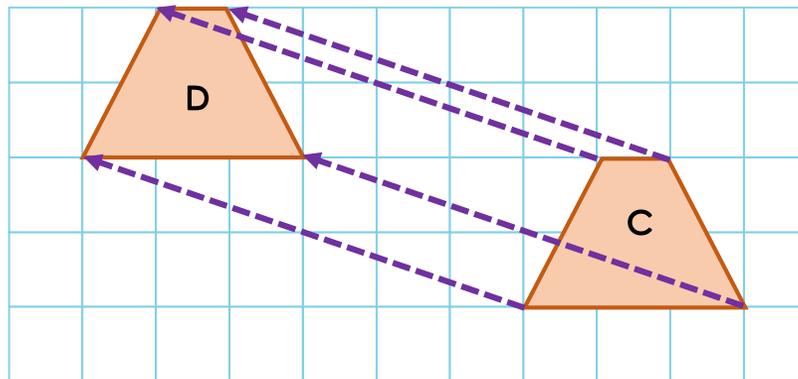
Translating a shape



The translation from triangle A to triangle B is $\begin{pmatrix} 5 \\ 0 \end{pmatrix}$

Every vertex (corner) has moved by exactly the same column vector.

Describing a Translation



When we **describe** this type of transformation, we state that from C to D is:
A translation with vector $\begin{pmatrix} -6 \\ 0 \end{pmatrix}$

We must always give both pieces of information to fully describe a translation.

Other Topics/Units this could appear in:
Crossover Unit 46 - Congruence/Similar Shapes
Working Above Unit 5 - Transformations
Working Above Unit 10 - Similarity in 2D & 3D
Working Above Unit 17 - Functions
A level Core - Graph Transformations

Keyword/Skill	Definition/Tips
Column vector $\begin{pmatrix} 4 \\ -3 \end{pmatrix}$	Used to describe the movement of a translation, eg 4 right, 3 down
Similar	Shapes that are have the same angles, but the side lengths on one have been enlarged by a scale factor.
Congruent	Shapes that are exactly the same, but may be rotated (turned around) or reflected (flipped over).
Invariant point	A point on the original shape which has not been affected by the transformation, so is in the same place on the transformed shape.
Describe	State exactly what single transformation has been performed on a shape.

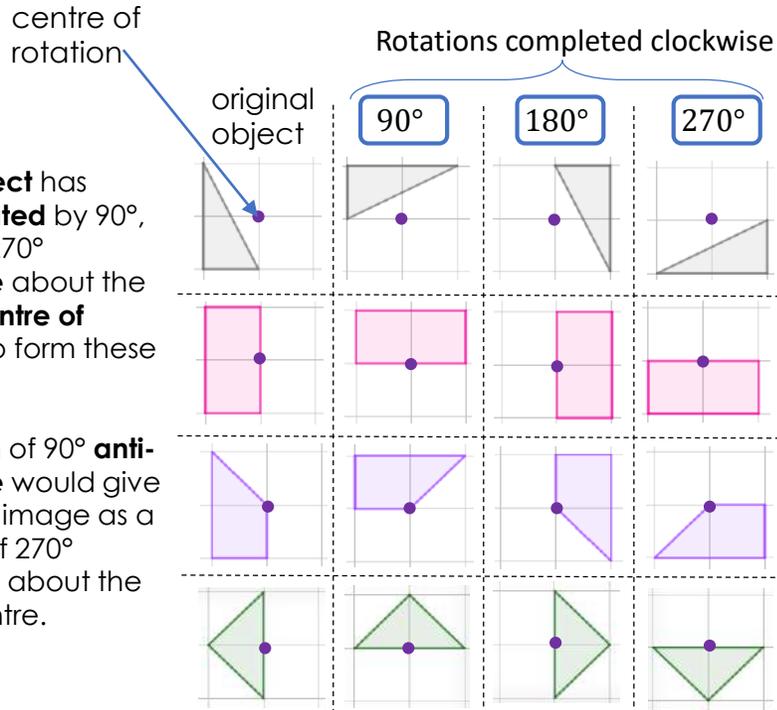
Crossover Unit 47 – Transformations

Rotations

Rotations are turns around a point, which is called the **centre of rotation**.

Each **object** has been **rotated** by 90° , 180° and 270° **clockwise** about the purple **centre of rotation** to form these **images**.

A rotation of 90° **anti-clockwise** would give the same image as a rotation of 270° clockwise about the same centre.

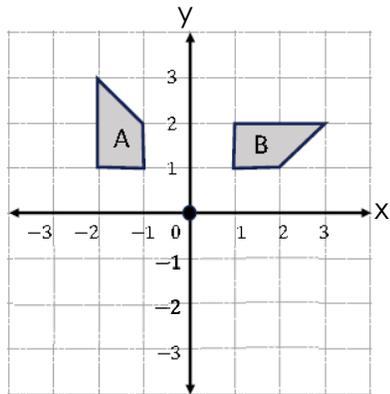


Describing Rotations

When we **describe** this type of transformation, we state that from A to B is:

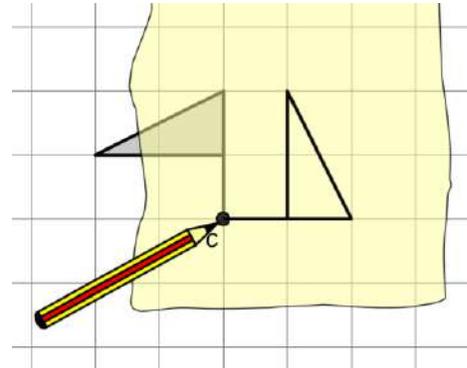
- A rotation
- From centre (0,0)
- By 90° clockwise

We must always give all three pieces of information to fully describe a rotation.



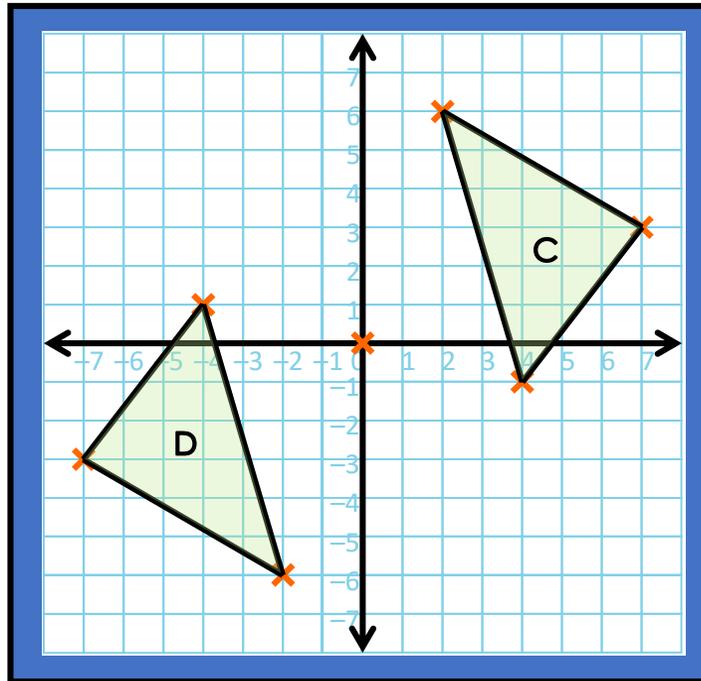
Equipment for Rotations

We can use tracing paper to help us perform rotations or find the centre of rotation.



Example

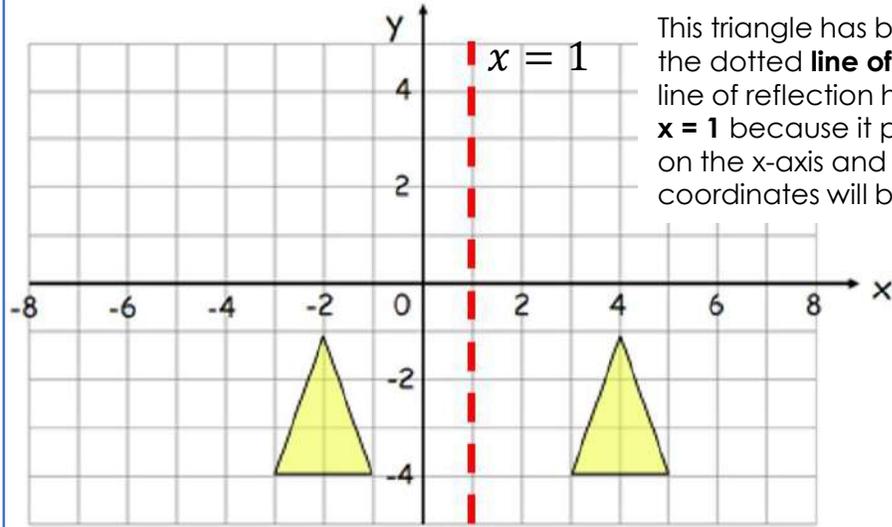
Triangle C has been rotated about the origin (0,0) by 180° to give triangle D. The direction does not matter because 180° is a half turn, and a half turn clockwise has the same effect as a half turn anti-clockwise.



Other Topics/Units this could appear in:
Crossover Unit 46 - Congruence/Similar Shapes
Working Above Unit 5 - Transformations

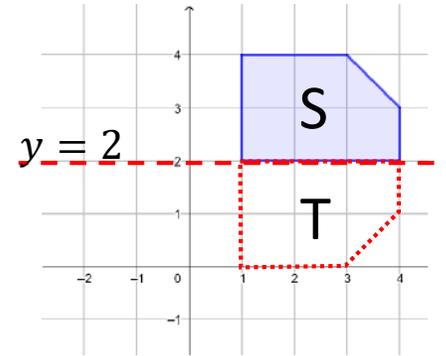
Keyword/Skill	Definition/Tips
Origin	The centre of the axes, where the x-axis and y-axis cross at the point with coordinates (0,0)
Similar	Shapes that are have the same angles, but the side lengths on one have been enlarged by a scale factor.
Congruent	Shapes that are exactly the same, but may be rotated (turned around) or reflected (flipped over).
Centre of rotation	The point from which a rotation has taken place - where you would put your pencil point to keep the tracing paper still when rotating a shape.
Angle	How many degrees (90° , 180°) for rotations.
Direction	Clockwise or anti-clockwise turn around the centre of rotation.
Invariant point	A point on the original shape which has not been affected by the transformation, so is in the same place on the transformed shape.
Describe	State exactly what <u>single</u> transformation has been performed on a shape.

Reflections flip an object, but its size and shape remain the same. The mirror line is called the **line of reflection**.



This triangle has been **reflected** in the dotted **line of reflection**. The line of reflection has the equation $x = 1$ because it passes through 1 on the x-axis and all its x-coordinates will be 1.

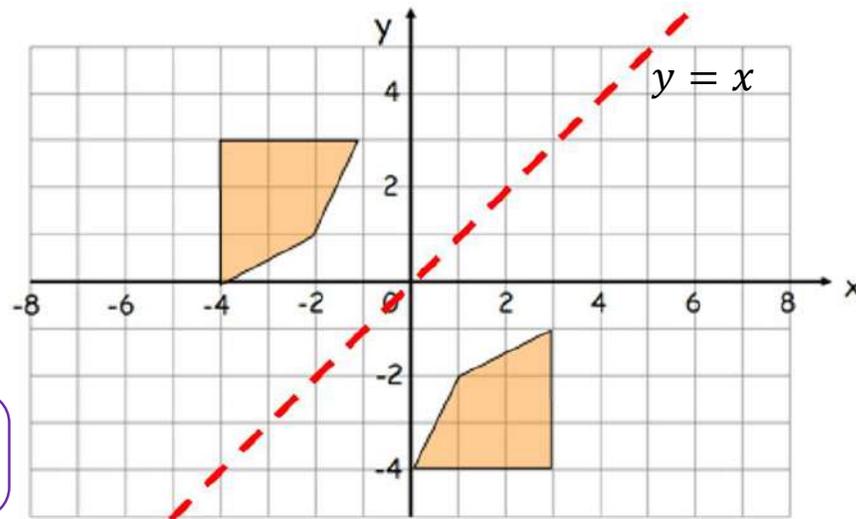
Reflections



This shape has been **reflected** in the dotted **line of reflection**. The line of reflection has the equation $y = 2$ because it passes through 2 on the y-axis and all its y-coordinates will be 2.

Diagonal lines of reflection

This shape has been **reflected** in the dotted **line of reflection**. The line of reflection has the equation $y = x$ because it passes through the origin and all its pairs of coordinates will have matching x and y values, such as (1,1), (2,2), (-4,-4)...



There are two diagonal lines you need to know. They are:
 $y = x$ (shown on the diagram)
 and $y = -x$ (slopes the opposite direction)

Other Topics/Units this could appear in:
 Crossover Unit 46 - Congruence/Similar Shapes
 Working Above Unit 5 - Transformations

Keyword/Skill	Definition/Tips
Similar	Shapes that are have the same angles, but the side lengths on one have been enlarged by a scale factor.
Congruent	Shapes that are exactly the same, but may be rotated (turned around) or reflected (flipped over).
Invariant point	A point on the original shape which has not been affected by the transformation, so is in the same place on the transformed shape.
Equidistant	Two points are the same distance away from the line of reflection.
Mirror line/line of reflection	The line that is equidistant from both the original shape and its reflection.
Describe	State exactly what single transformation has been performed on a shape.

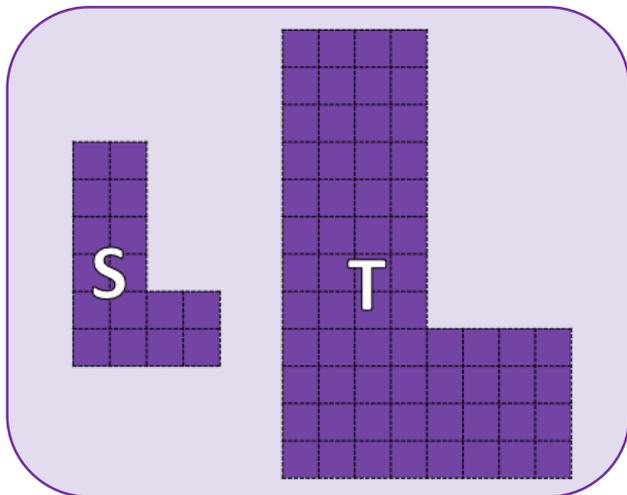
Enlargements

Enlargements make the object bigger or smaller.
Scale factors tell us how much bigger or smaller.

S is an enlargement of T
 by scale factor $\frac{1}{2}$

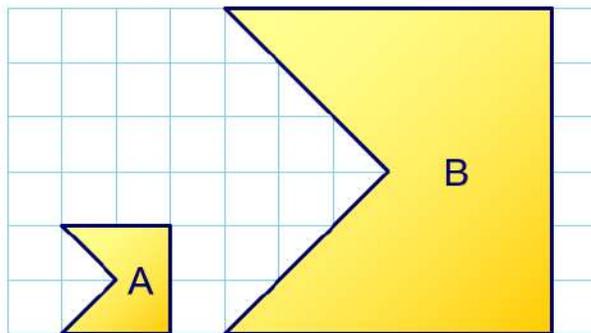
T is an enlargement of S
 by scale factor 2

Each side of the shape gets multiplied by the scale factor to make it longer or shorter.



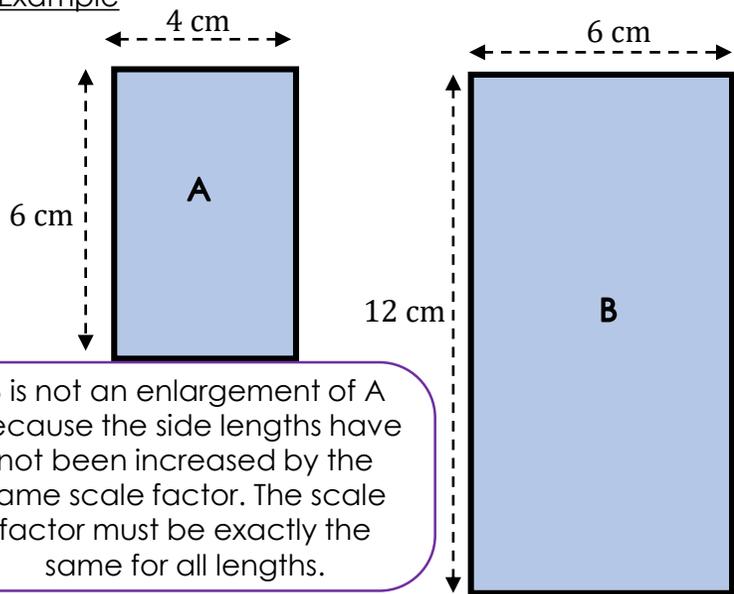
Example

A is an enlargement of B
 by scale factor $\frac{1}{3}$



B is an enlargement of A
 by scale factor 3

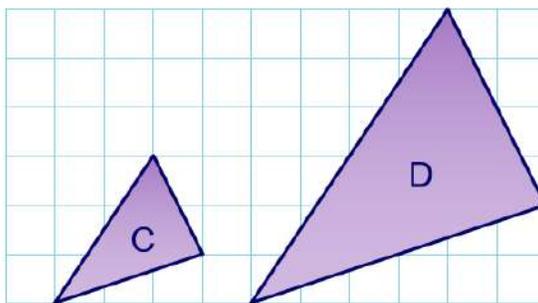
Non-Example



B is not an enlargement of A because the side lengths have not been increased by the same scale factor. The scale factor must be exactly the same for all lengths.

C is an enlargement of D
 by scale factor $\frac{1}{2}$

Example

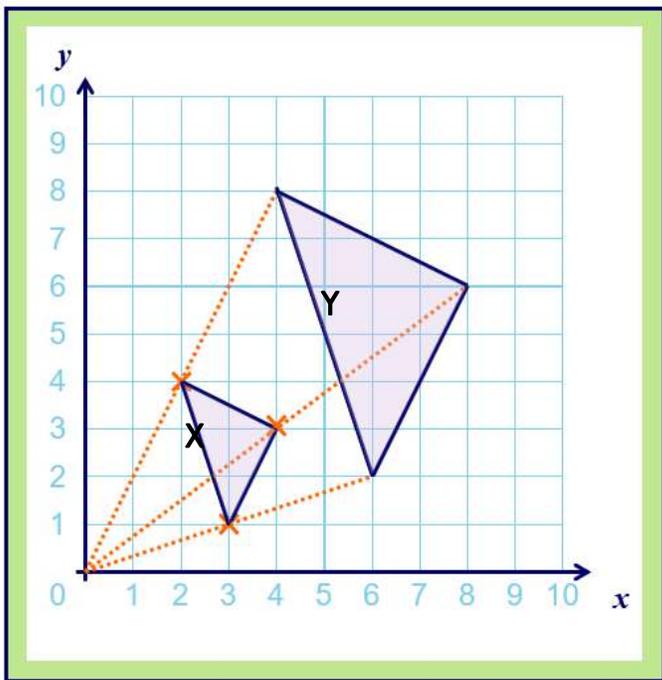


Even when the scale factor makes a shape smaller, the transformation is still called an enlargement.

D is an enlargement of C
 by scale factor 2

Other Topics/Units this could appear in:
 Crossover Unit 46 - Congruence/Similar Shapes
 Working Above Unit 5 - Transformations

Keyword/Skill	Definition/Tips
Scale factor	The multiplier used to change the side lengths of a shape being enlarged. If it is less than 1, the shape will get smaller.
Centre of enlargement	The point from which all distances have been enlarged. The distances from this centre to each vertex on the shape are multiplied by the scale factor to enlarge them.
Origin	The centre of the axes, where the x-axis and y-axis cross at the point with coordinates (0,0)
Similar	Shapes that have the same angles, but the side lengths on one have been enlarged by a scale factor.
Invariant point	A point on the original shape which has not been affected by the transformation, so is in the same place on the transformed shape.
Describe	State exactly what single transformation has been performed on a shape.



When a centre of enlargement is given, you need to measure the distance from this point to each vertex of your shape.

This distance then gets multiplied by the scale factor as well.

Y is an enlargement of X by scale factor 2, from centre (0,0)

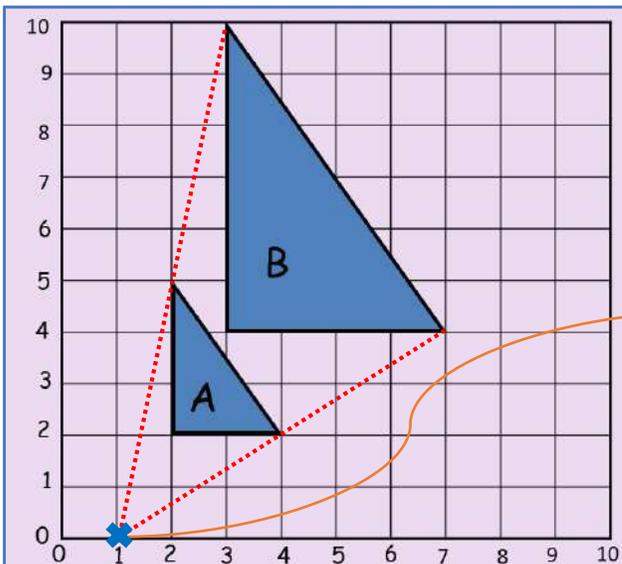
The vertex (3,1) on shape X is 3 right, 2 up from the centre of enlargement at (0,0).

This distance has been multiplied by the scale factor 2 to give the vertex (6,2) on shape Y.

Enlargements from a centre

Other Topics/Units this could appear in:
Crossover Unit 46 - Congruence/Similar Shapes
Working Above Unit 5 - Transformations

Keyword/Skill	Definition/Tips
Scale factor	The multiplier used to change the side lengths of a shape being enlarged. If it is less than 1, the shape will get smaller.
Centre of enlargement	The point from which all distances have been enlarged. The distances from this centre to each vertex on the shape are multiplied by the scale factor to enlarge them.
Origin	The centre of the axes, where the x-axis and y-axis cross at the point with coordinates (0,0)
Similar	Shapes that are have the same angles, but the side lengths on one have been enlarged by a scale factor.
Invariant point	A point on the original shape which has not been affected by the transformation, so is in the same place on the transformed shape.
Describe	State exactly what single transformation has been performed on a shape.



To find the centre of enlargement, draw lines joining each vertex of the enlargement to the same vertex on the original shape and extend to the edge of the grid.

The point where they cross is the centre of enlargement.

Describing an enlargement

When we **describe** this type of transformation, we state that from A to B is:

- An enlargement
- By scale factor 2
- From centre (1,0)

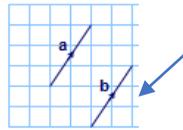
We must always give all three pieces of information to fully describe an enlargement.

Vectors have a quantity that has size or magnitude and direction. E.G Velocity, force.

A scalar only has size or magnitude E.G length, mass.

A vector can be represented using a line segment with an arrow on it.

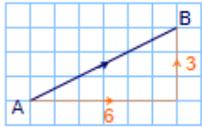
The **magnitude** of the vector is given by the length of the line. The **direction** of the vector is given by an arrow on the line.



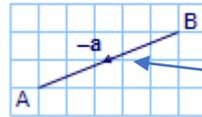
These vectors are equal as they have the same length and are parallel

Representing Vectors

The vector goes from point a to point b. So we can write this as \vec{AB} . We have moved 6 units right and 3 units up so we can write this as a column vector.



this is the vector $-\vec{a}$.



$$\vec{AB} = \begin{pmatrix} 6 \\ 3 \end{pmatrix}$$

This is the horizontal component. It tells us the number of units in the x-direction.

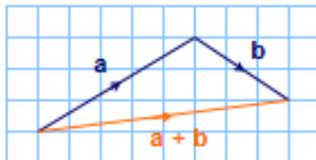
This is the vertical component. It tells us the number of units in the y-direction.

A negative vector is the same length, but the arrow is in the opposite direction

Adding Vectors

Example. Find $\vec{a} + \vec{b}$
Add the horizontal components and add the vertical components.

$$\vec{a} = \begin{pmatrix} 5 \\ 3 \end{pmatrix} \quad \text{and} \quad \vec{b} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$$



$$\vec{a} + \vec{b} = \begin{pmatrix} 8 \\ 1 \end{pmatrix}$$

This can be shown on a diagram.

When two or more vectors are added the result is called the resultant vector.

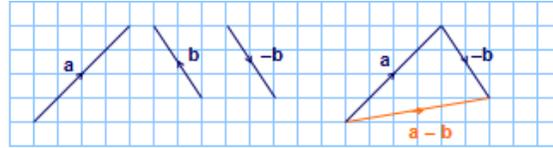
Subtracting Vectors

Example: Find $\vec{a} - \vec{b}$.
Subtract the horizontal components and subtract the vertical components

$$\vec{a} = \begin{pmatrix} 4 \\ 4 \end{pmatrix} \quad \text{and} \quad \vec{b} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$$

To show in a diagram, think $\vec{a} - \vec{b}$ as $\vec{a} + (-\vec{b})$

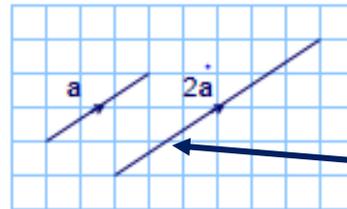
$$\vec{a} - \vec{b} = \begin{pmatrix} 4 \\ 4 \end{pmatrix} - \begin{pmatrix} -2 \\ 3 \end{pmatrix} = \begin{pmatrix} 4 - (-2) \\ 4 - 3 \end{pmatrix} = \begin{pmatrix} 6 \\ 1 \end{pmatrix}$$



$$\vec{a} - \vec{b} = \begin{pmatrix} 6 \\ 1 \end{pmatrix}$$

Multiplying Vectors by scalars.

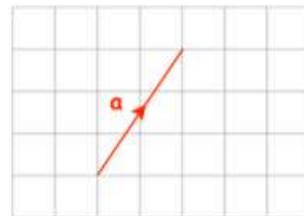
A scalar quantity has size but not direction. A scalar can be written as a single number. A vector can be multiplied by a scalar.



$$\vec{a} = \begin{pmatrix} 3 \\ 2 \end{pmatrix} \quad \text{The vector } 2\vec{a} \text{ is twice as long as } \vec{a}, \text{ so } 2\vec{a} = \begin{pmatrix} 6 \\ 4 \end{pmatrix}$$

Exam Type Question

Mark has been asked to draw the vector $\vec{a} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$



What mistake has Mark made?

Mark has mixed up the directions of the vector

Mark has drawn 2 right and 3 up, rather than 3 right and 2 up.

Keyword/Skill	Definition/Tips
Vector	A quantity that has both size and magnitude. (E.G. velocity, force)
Velocity	How fast something is moving but with a direction.
Magnitude	A number that gives the size of something. (E.G. the magnitude of 6 is 6).
Direction.	Where something is pointing. (left, right, up, down north south are all directions).
Scalar	A single number used with vectors. (E.G. vector (5,2) can be multiplied by scalar 3 to give (15,6).
Horizontal	Going from side to side like the horizon.
Vertical	Goes up and down
Parallel	Always the same distance apart, never touching.
Parallelogram	A 4-sided shape where opposite sides are equal. Angles A are the same, angles B are the same. $A + B = 180$
Column Vectors	Components are written down vertically. $\vec{AB} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$ The top number is the x axis The bottom number is the y axis
Components	Each part of the vector is a component

Other Topics/Units this could appear in:

- Pythagoras
- Transformations

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:

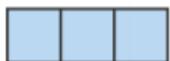
Substitute $n = 10$ into the nth term

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

$$10^{\text{th}} \text{ Term} = 25$$

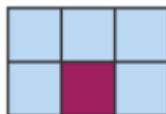
Recognising Patterns from Diagrams

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.



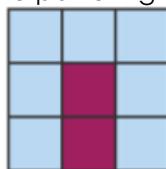
Pattern 1

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

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 **5n**

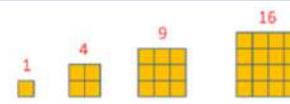
Then see what you need to do from the 5 times table to get to the number in the sequence

n(position)	1	2	3	4	5
	x5	x5	x5	x5	x5
5n	5	10	15	20	25
	+2	+2	+2	+2	+2
5n + 2	7	12	17	22	27

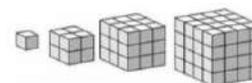
Therefore, the nth term of the sequence = **5n + 2**

Special Sequences

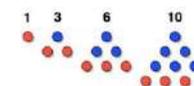
Square numbers – 1, 4, 9, 16, 25, 36, ...



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, ...

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. 1, 3, 6
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 4x

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.

Before starting work with forming and solving equations, you may find it useful to look back at the **Crossover Unit 21 – Solving Equations** knowledge organiser.

Solving Linear Equations

A good example of this is the simple equation $3y = 12$.

If we want to find out the value of y we need to divide both sides of the equation by 3. Dividing both sides gives $y = 4$.

$$\begin{array}{r} 3y = 12 \\ \div 3 \quad \div 3 \\ \hline y = 4 \end{array}$$

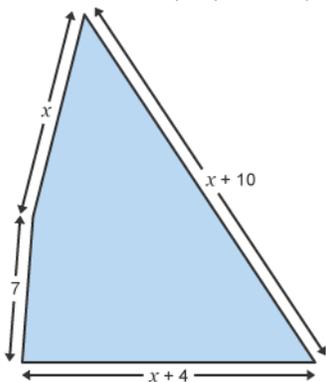


Forming and Simplifying Equations - Perimeter

Usually, when we are asked to form an equation, it is based on some knowledge of area, perimeter or angles.

EXAMPLE

Write and simplify an expression for the perimeter of the shape below.



SOLUTION

To calculate perimeter, you simply add up all the sides. This will give the result:

$$x + 7 + x + 10 + x + 4$$

We can then simplify this expression to give:

$$3x + 21$$

Other questions may then involve being given a value for the perimeter and having to solve for.

EXAMPLE

The perimeter for the above shape is measured to be 33 cm. Calculate the value of x .

SOLUTION

Start by setting our expression equal to 33

$$\begin{array}{r} 3x + 21 = 33 \\ -21 \quad -21 \\ \hline 3x = 12 \\ \div 3 \quad \div 3 \\ \hline x = 4\text{cm} \end{array}$$

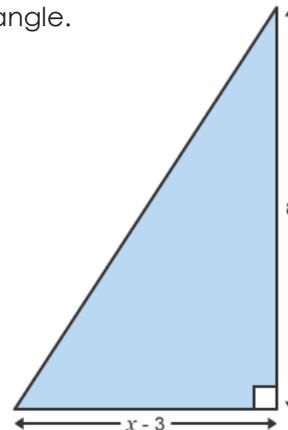
Subtract 21 from both sides:

Divide both sides of the equation by 3:

Forming and Simplifying Equations - Area

EXAMPLE

Write a simplified expression for the area of the following triangle.



As this question is asking for an expression for the area we need to recall how to calculate the area of a triangle.

$$\text{Area of a triangle} = \frac{\text{base} \times \text{height}}{2}$$

Substituting in our base and height into the equation:

$$\text{Area of a triangle} = \frac{(x-3) \times 8}{2}$$

Expanding the brackets:

$$\text{Area of a triangle} = \frac{8x - 24}{2}$$

Simplifying:

$$\text{Area of a triangle} = 4x - 12$$

Keyword/Skill	Definition/Tips
Form	The way in which something is written. Combine parts to create an expression/equation.
Solve	To solve something is to find the solution.
Linear	A linear function traces a straight line.
Quadratic	An equation that has an x^2 as the highest power.
Rearrange	To change the subject or move the subject.
Expression	An expression is a sentence with at least two numbers and one mathematical operation.
Equation	A mathematical statement including an equals sign to show that two expressions are the same.
Integer	A positive or negative number or zero. Not a fraction or a decimal.
Proof	To show a mathematical statement to be true.

expression

$$4x + 2$$

equation

$$4x + 2 = 100$$

An **EXPRESSION** can only be **SIMPLIFIED**.

An **EQUATION** can be **SOLVED**.

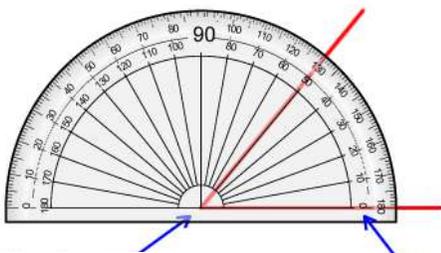
Other Topics/Units this could appear in:

- Algebra
- Expand & Simplify
- Factorising
- Solving Equations
- Subject of
- Expanding & Factorising
- Rearranging Equations
- Mechanics

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.



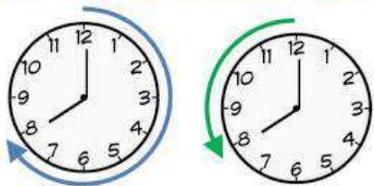
Make sure the vertex (corner) of the angle is lined up with the center of the protractor.

Start at zero and read up.

Angle Direction

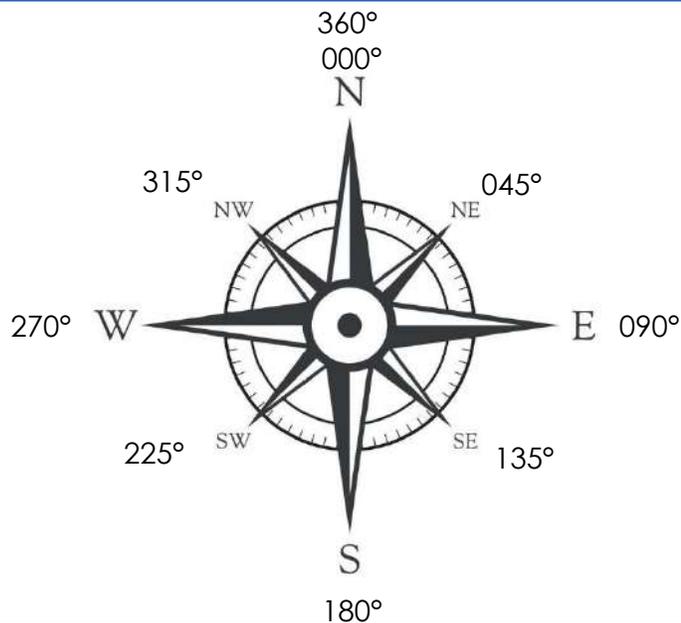
You may need to describe the direction of an angle

Clockwise and Anti-Clockwise



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°).



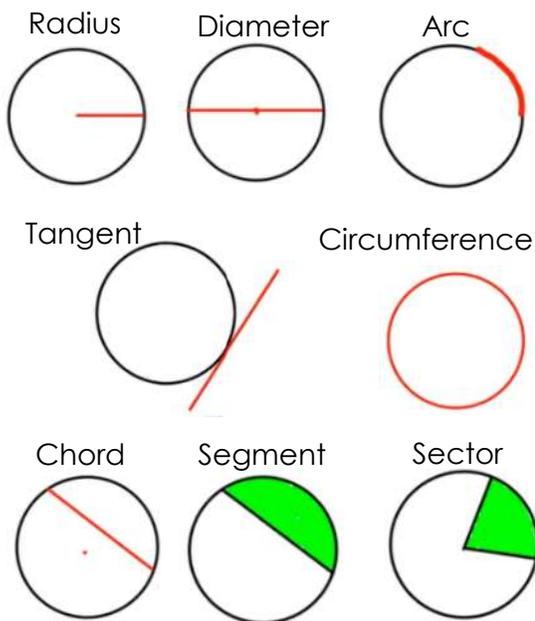
If you get asked to draw/construct/sketch, always make sure to use a pencil and any other equipment you need i.e. ruler, protractor!



Keyword/Skill	Definition/Tips
Mensuration	The act or process of measuring
Compass	A mathematical instrument that shows direction
Pair of Compasses	A mathematical instrument that is used to draw circles and arcs
Arcs	A part of a curve, or a part of the circumference of a circle
Circumference	The perimeter of a circle
Radius	A straight line from the centre of the circle to the circumference of a circle
Diameter	A straight line passing side to side through the centre of a circle
Tangent	A line that hits the circle at only one point
Chord	A straight line joining two points on a circle
Segment	The section of a circle made from a chord
Sector	A pie shaped part of the circle
Quadrilateral	A shape that has four straight sides
Polygon	A 2D shape with only straight edges .
Regular	A shape is regular if all the sides and all the angles are equal .
Irregular	A shape is irregular when the sides and angles are not all the same size
Parallel Lines	Lines that are always the same distance apart

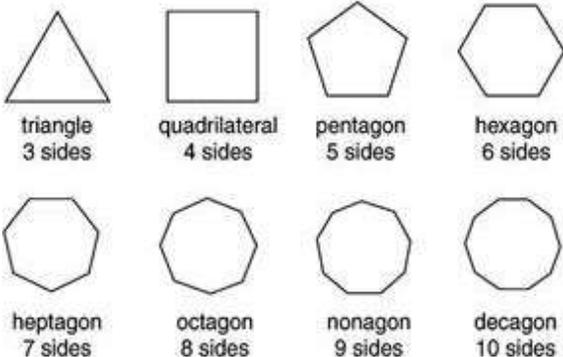
Other Topics/Units this could appear in:

- Circles, Arcs and Sectors Bearings
- Plans and elevations
- Constructions
- Surface Area & Volume – cylinders, cones, spheres & frustums
- Similarity in 2D & 3D
- Circle Geometry
- Circle Theorems

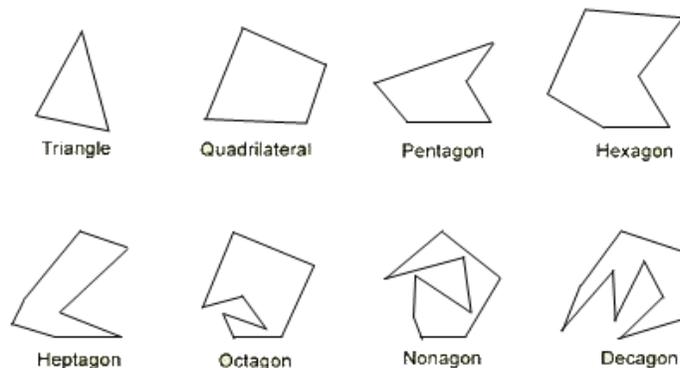


Name of Quadrilateral	Properties of the Shape	Example
Square	<ol style="list-style-type: none"> All of its sides are the same length. All of its angles are equal-90° It has 2 pairs of parallel sides 	
Rectangle	<ol style="list-style-type: none"> Opposite sides are the same length All of its angles are equal-90° It has 2 pairs of parallel sides 	
Rhombus	<ol style="list-style-type: none"> All sides are the same length None of its angles are 90° It has 2 pairs of parallel sides 	
Parallelogram	<ol style="list-style-type: none"> Opposite sides are the same length None of its angles are 90° It has 2 pairs of parallel sides 	
Kite	<ol style="list-style-type: none"> Adjacent sides are the same length 1 pair of opposite angles are equal It has 0 pairs of parallel lines 	
Trapezium	<ol style="list-style-type: none"> It has 1 pairs of parallel lines 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:

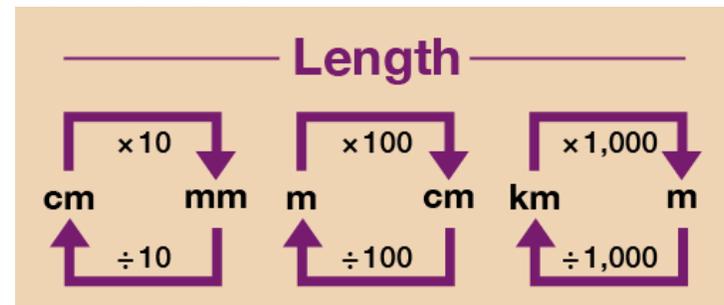
- mm – millimetre
- cm – centimetre
- m – metre
- km – kilometre
- ft – foot/feet
- yds – yards

Some units you may see in

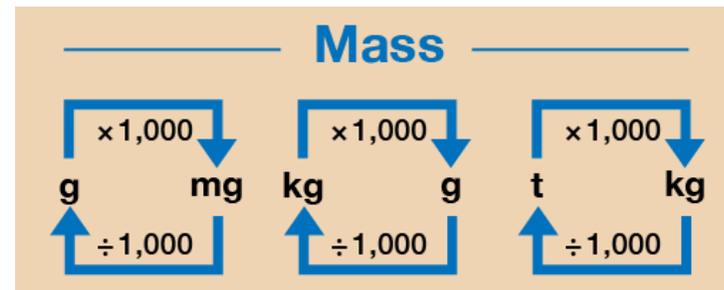
volume and capacity:

- mg – milligrams
- g – grams
- kg – kilograms
- ml – millilitres
- l - litres

Converting Units (Lengths)



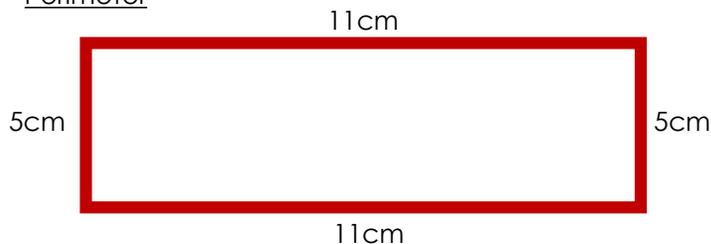
Converting Units (Mass)



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

Perimeter



To find the perimeter of this rectangle, you would need to add each length together.

$$11 + 5 + 11 + 5 = 32 \text{ cm}$$

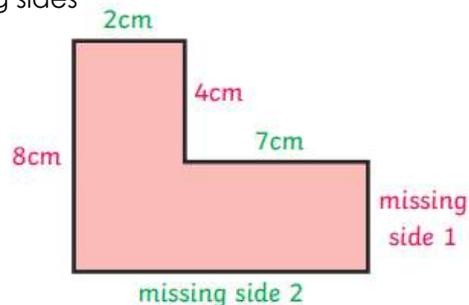
$$\text{Perimeter} = 32\text{cm}$$

Area Formulas

Shape	Name	Formula for Area
	Square	Base x Height
	Rectangle	Base x Height
	Triangle	Base x Perpendicular Height ÷ 2
	Trapezium	$\frac{(a + b) \times \text{height}}{2}$
	Parallelogram	Base x Perpendicular Height

Perimeter of Compound Shapes

Here is a compound shape. We want to find the perimeter of this shape. Before we can find the perimeter we need to find the lengths of the two missing sides



$$\text{Missing side 1} + 4\text{cm} = 8\text{cm},$$

$$\text{so missing side 1} = 4\text{cm}.$$

$$\text{Missing side 2} = 2\text{cm} + 7\text{cm} = 9\text{cm}$$

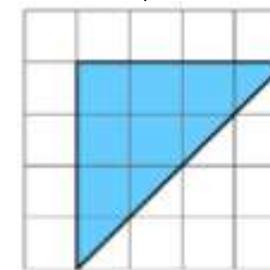
$$\text{Perimeter} = \text{sum of all sides} =$$

$$2\text{cm} + 4\text{cm} + 7\text{cm} + 4\text{cm} + 9\text{cm} + 8\text{cm} = 34\text{cm}$$

Keyword/Skill	Definition/Tips
Perimeter	The total distance around the outside of a shape Units – mm, cm, m, ...
Area	The total space inside a shape Units – mm ² , cm ² , m ² , ...
Perpendicular Height	The height from the base of the shape to the top.
Compound Shape	A shape made up of two or more known shapes
Units of measure	What you are measuring in - mm, cm, etc.

Area on Squared Paper

Some area questions are on CM square grids. For these questions we count how many squares are taken up by the shape.



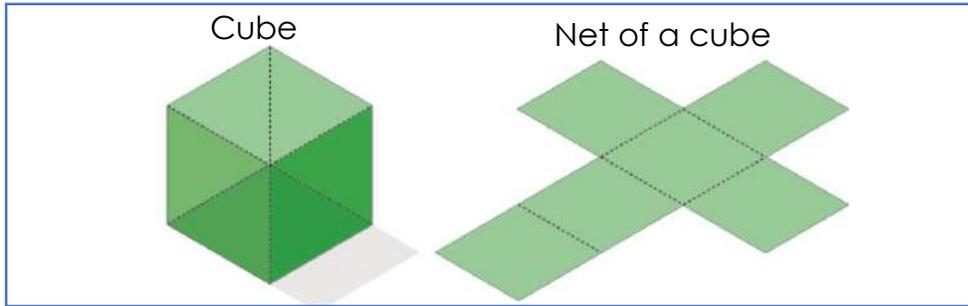
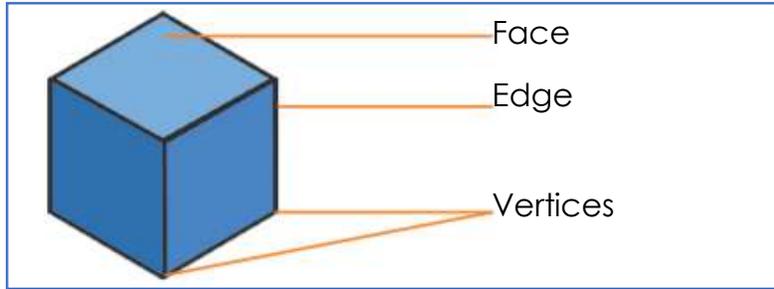
For this example, I would first count the whole squares and then count the half squares, before adding together to find the total area:

$$6 \text{ whole squares} + 4 \text{ half squares} = 8 \text{ whole squares}$$

$$\text{AREA} = 8 \text{ square CM}$$

Other Topics/Units this could appear in:

- Surface Area & Volume
- Simplifying Expressions
- Similarity in 2D & 3D
- Plans & Elevations



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. Singular term is vertex
Net	A pattern that you can cut and fold to make a model of a 3D shape
Solids	A general name for 3D shapes
Properties of Solids	You need to say how many faces, edges and vertices the 3D shape has.

<p>Cube</p> <p>Faces: 6 Edges: 12 Vertices: 8</p>	<p>Cuboid</p> <p>Faces: 6 Edges: 12 Vertices: 8</p>	<p>Triangular Prism</p> <p>Faces: 5 Edges: 9 Vertices: 6</p>
<p>Square-based Pyramid</p> <p>Faces: 5 Edges: 8 Vertices: 5</p>	<p>Cone</p> <p>Faces: 1 Edges: 0 Vertices: 1</p>	<p>Cylinder</p> <p>Faces: 2 Edges: 0 Vertices: 0</p>

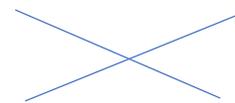
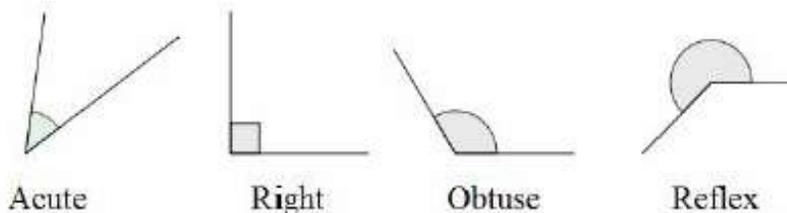
Sphere

Faces: 0
Edges: 0
Vertices: 0

- Other Topics/Units this could appear in:
- Surface Area & Volume
 - Simplifying Expressions
 - Similarity in 2D & 3D
 - Plans & Elevations

Types of angles

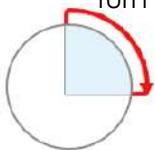
Look at the keywords for definitions!
You need to be able to recognise each type of angle



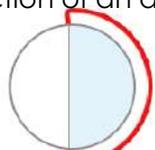
Intersecting Lines – Lines that cross each other

Angle Turns

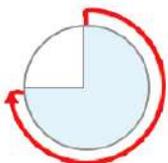
You may need to describe the turn or direction of an angle



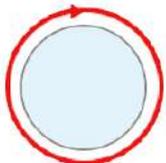
1 right angle
quarter turn
90°



2 right angles
2 quarter turns or half turn
180°

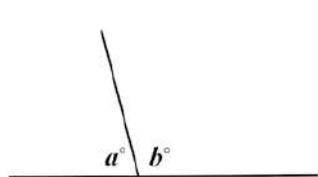


3 right angles
3 quarter turns
270°



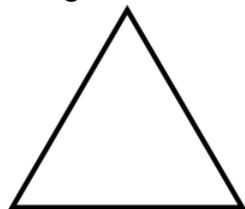
4 right angles
4 quarter turns or full turn
360°

Angles on a straight line = **180°**

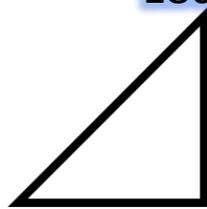


180°

Angles in a triangle = **180°**



180°



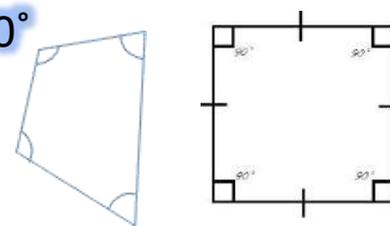
Angles about a point = **360°**

360°



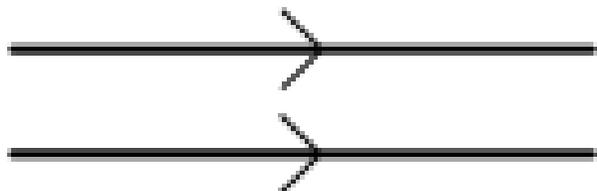
Angles in a Quadrilateral = **360°**

360°

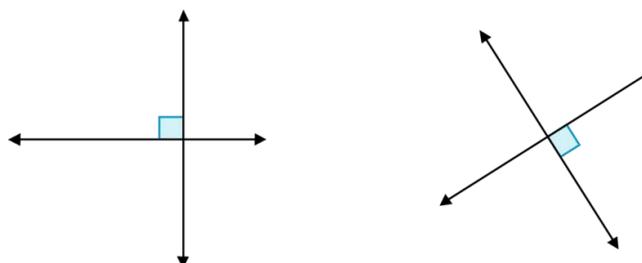


Keyword/Skill	Definition/Tips
Acute angle	angles are less than 90°.
Right angles	are exactly 90°.
Obtuse angles	greater than 90° but less than 180°.
Reflex angles	greater than 180° but less than 360°.
Polygon	A 2D shape with only straight edges .
Regular	A shape is regular if all the sides and all the angles are equal .
Triangle	A 3 sided shape
Quadrilateral	Any shape with 4 sides
Protractor	Used to measure angles
Clockwise	A turn to the right (same direction as the hand on a clock)
Anti clockwise	A turn to the left (opposite direction to the hand on a clock)

Parallel Lines – Lines that do not touch. They are always the same distance apart. (Notice the arrows on the lines)



Perpendicular Lines – Lines that meet or cross at right angles (90°)



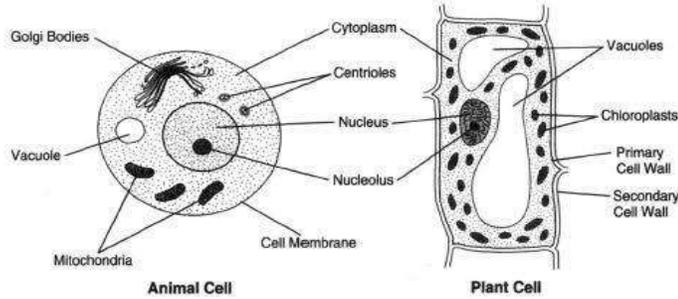
Other Topics/Units this could appear in:

- Surface Area & Volume
- Simplifying Expressions
- Similarity in 2D & 3D
- Plans & Elevations

Biology Knowledge Organisers

1. Magnification

2. Plant and animal cells : compare and contrast

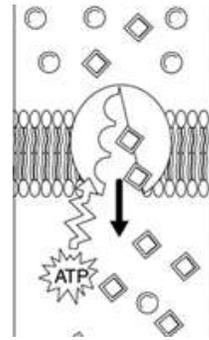


$$\text{Image} = \text{Actual} \times \text{Magnification}$$

3. Enzymes and food tests

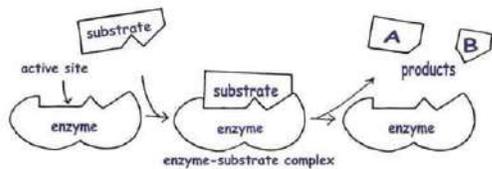
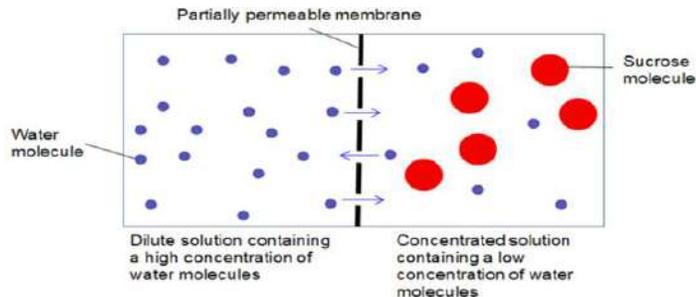
6. Active transport

Name of large biological molecule	Name of enzyme that digests it	Digested molecule	Food test	Positive result
Carbohydrates – Starch 	Carbohydrase	Glucose 	Starch – Iodine solution Glucose – Benedict's solution	Blue/black colour Green, yellow, orange, brick red colour
Proteins 	Protease	Amino acids 	Biuret reagent	Violet colour
Lipids 	Lipase	Glycerol and three fatty acids 	N/A	N/A

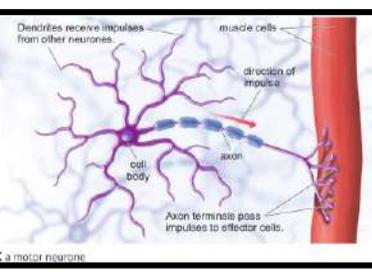
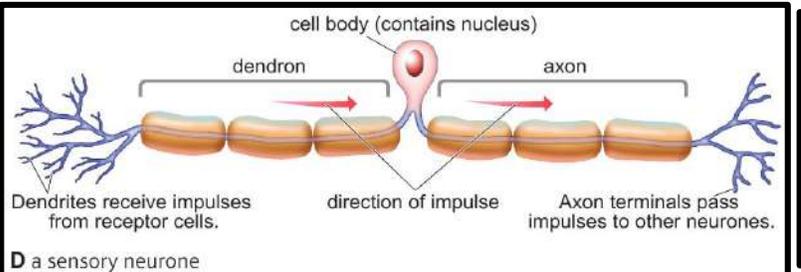
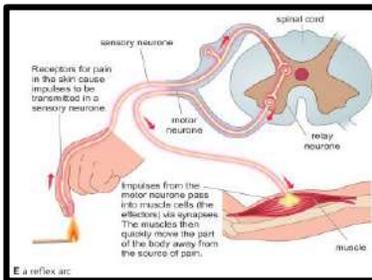
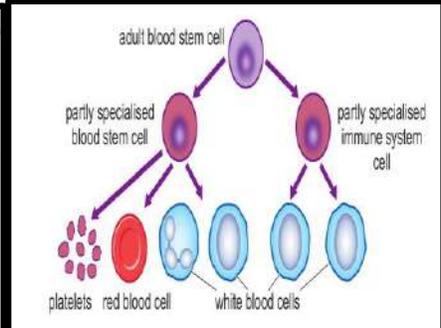
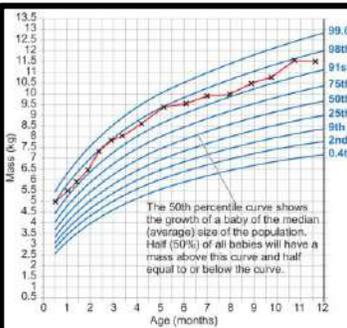
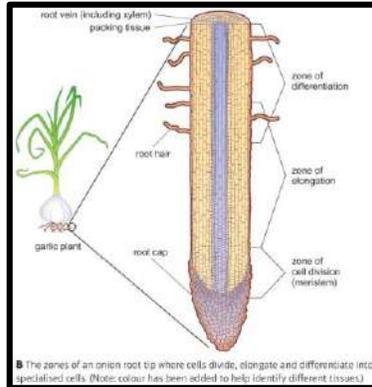
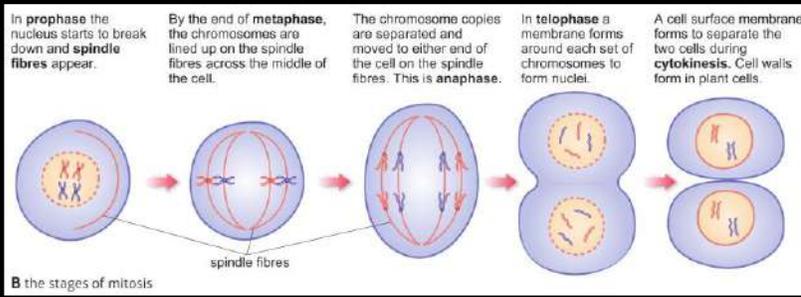


5. Osmosis

4. Enzyme substrate complex

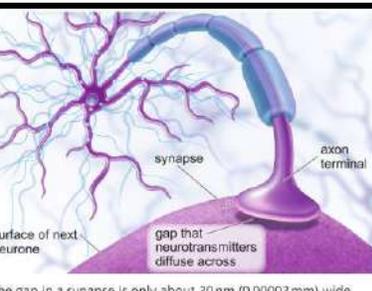


Keyword	Definition
Magnification	The number of times larger an image is than the initial object that produced it
Objective lens	The part of the microscope that is closest to the specimen
Resolution	The smallest change that can be measured by an instrument
Nucleus	The control centre of the "eukaryotic cell"
Eukaryotic	A cell with a nucleus
Microvilli (us)	A tiny fold in the cell surface membrane of a cell, increase the surface area of the cell
Adaptations	The features of something that enable it to do a certain function
Gametes	A haploid cell produced by meiosis used for sexual reproduction
Haploid	A cell or nucleus that has one set of chromosomes. Gametes are haploid
Epithelial cells	A cell found on the surface of internal organs
Chromosomal DNA	The main bulk of DNA found in a cell. In humans, this DNA is found in chromosomes
Prokaryotic	A cell with no nucleus is prokaryotic
Monomers	A small molecule that can join with other molecules like itself to form a polymer
Polymers	A long-chain molecule made by joining many smaller molecules (monomers)
Biuret test	A test that uses copper sulfate solution and potassium hydroxide solution to test for proteins. It turns from blue to purple in the presence of proteins
Benedicts solution	A solution used to detect the presence of reducing sugars (eg. Glucose) in foods
Calorimeter	Apparatus used to measure the energy content of substances by burning them and measuring the temperature increase
Ethanol emulsion test	A test using ethanol to detect lipids (fats) in food
Active site	The space in an enzyme where the substrate fits during an enzyme-catalysed reaction
Denatured	A denatured enzyme is one where the shape of the active site has changed so much that the substrate no longer fits and the reaction can no longer happen
Optimum temperature	The temperature at which an enzymes rate of reaction is greatest, or at which a population of microorganisms grow most rapidly
Osmosis	The movement of water from a high concentration to a low concentration through a partially permeable membrane
Active Transport	The pumping of particles across a cell membrane from a low concentration to high concentration (requires energy)

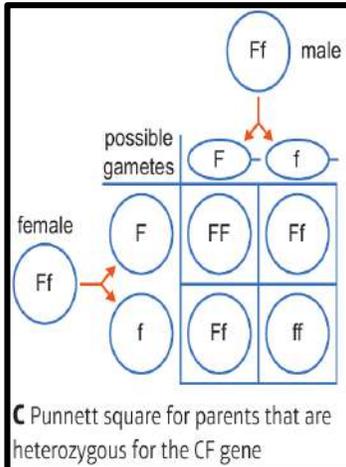
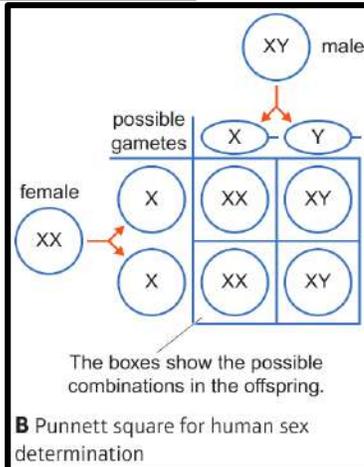
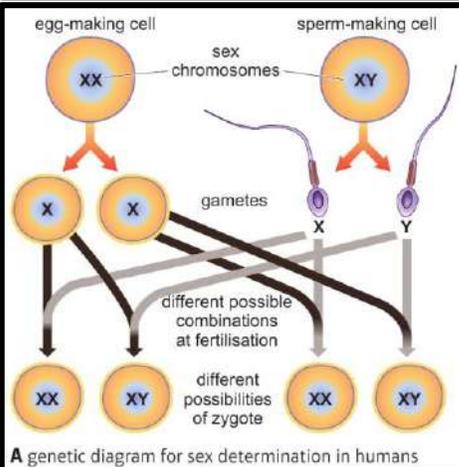
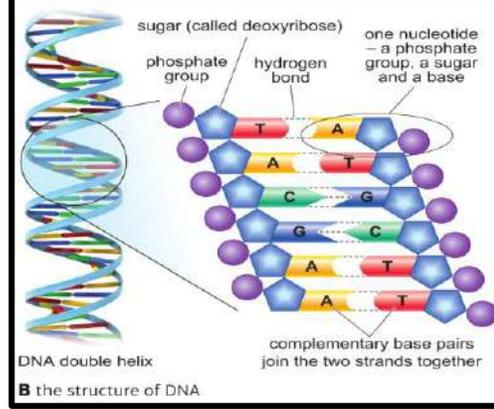
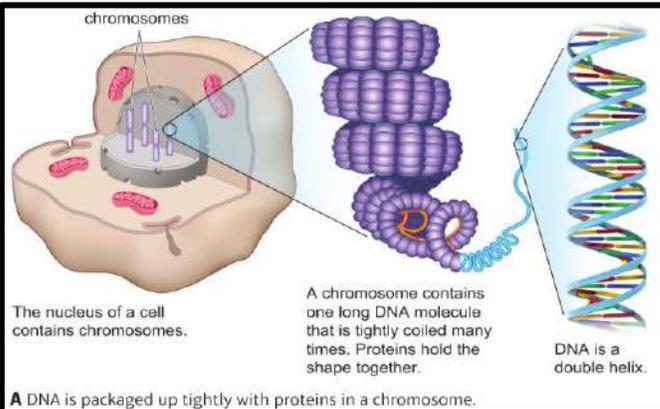
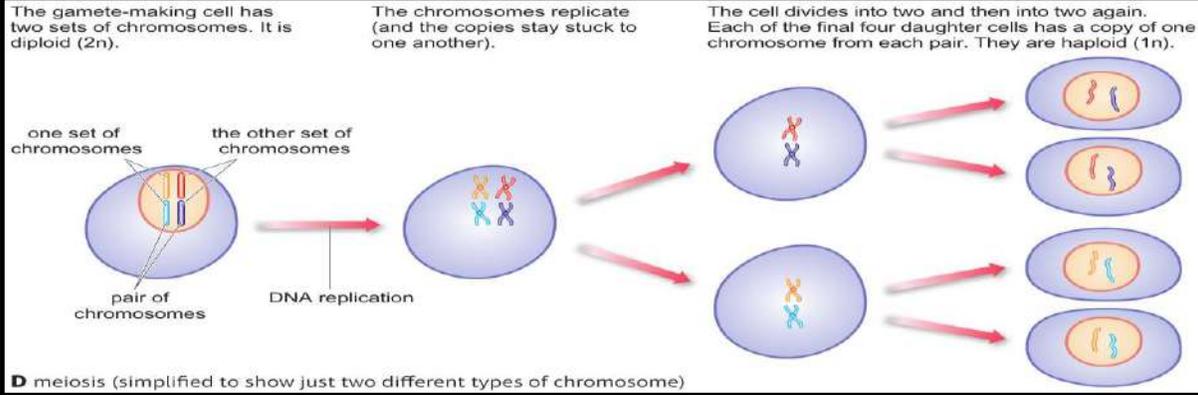


Cell differentiation

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**.



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.



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.

1. Evidence for human evolution

Ardi (Ardipithecus ramids)	<ul style="list-style-type: none"> Human like female fossil Walked upright Long arms and short legs Small skull and brain
Lucy (Australopithecus afarensis)	<ul style="list-style-type: none"> More human like female fossil than Ardi Walked upright better than Ardi Arm and legs were the length between ape and human Skull and brain slightly larger than Ardi
Turkana Boy (Homo erectus) discovered by Richard Leakey	<ul style="list-style-type: none"> More human like female fossil than Lucy Walked upright better than Lucy Arm and legs were human length Skull and brain larger than Lucy

Evidence for human evolution can also be gained from looking at stone tools, which become more sophisticated overtime



2. Darwin's Theory of Evolution

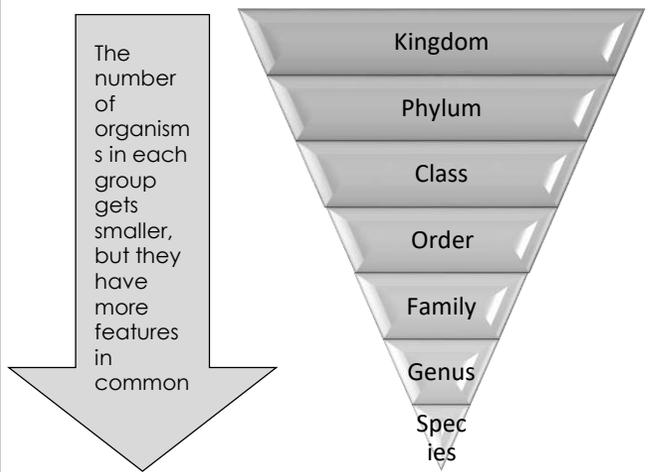
Evolution is a change in the inherited characteristics of a population over time. This occurs through a process called natural selection.

- The differences in a population gives some individuals an advantage.
- This individual is more likely to survive for longer and be able to breed to pass on desirable genes.
- Nature is selecting the individual with the phenotypes most suited to survival ('survival of the fittest'). This is called natural selection.

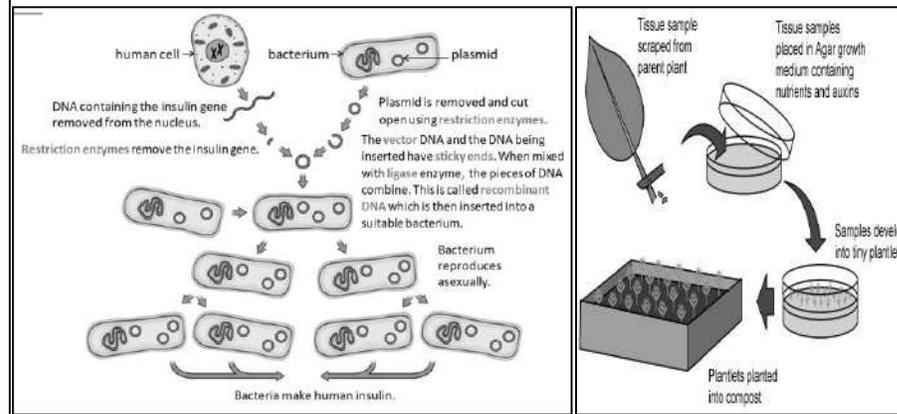
Our understanding of evolution has also been helped by the study of antibiotic resistance in bacteria.



3. Classification



4. Genetic Engineering and Tissue Culture



Keyword	Definition
Binomial system	The system of naming organisms using two Latin words
Evolution	A change in one or more characteristic of a population over a long period of time
Genetic variation	Differences between organisms caused by differences in the alleles they inherit from their parents, or differences in genes caused by mutation. Also called inherited variation
Natural selection	A process in which certain organisms are more likely to survive and reproduce than other members of the same species because they possess certain genetic variations
Resistance	When an organism has resistance to something, it is unaffected by it, or not affected very much
Pentadactyl limb	A limb that has five digits (fingers and thumbs). Amphibians, reptiles, birds and mammals share this characteristics
Classification	The process of sorting organisms into groups based on their characteristics
Kingdoms	There are five kingdoms into which organisms are usually divided: plants, animals, fungi, protists and prokaryotes
Selective breeding	When humans choose an organism that has a certain characteristic and breed more of these organisms, making that chosen characteristic more and more obvious
Varieties	Groups of plants of the same species that have characteristics that make them different to other members of the species
Genetic engineering	Altering the genome of an organism, usually by adding genes from another species.
GMOs	An organism that has had its genome genetically altered (genetic modification)
Yield	The amount of useful product that you can get from something
Disease resistance	Unaffected or less affected by a certain disease
Stem cells	An unspecialised cell that continues to divide by mitosis to produce more stem cells and other cells that differentiate into specialised cells
Tissue culture	Growing tiny pieces of tissue, or cells, in the lab
Pests	Animals that cause problems, such as damaging crops
Biological control	Using organisms to kill problem organisms, such as pests or weeds
Insecticides	A substance used to kill insect pests

In **genetic engineering**, genes from the chromosomes of **humans** and other organisms are **cut out** of the **DNA** using **enzymes**. The **genes** are then **transferred** to the **cells of the organism** to be genetically modified.

Transmission of Disease

Disease	Symptom	Method of transmission	Control spread of disease by:	Caused by:
Malaria	Recurrent fever	Animal vector	Preventing breeding of mosquitoes or use of a net to prevent being bitten.	Protist
Chalara ash dieback	Leaf loss and bark lesions	Airborne	Remove infected leaf litter. Clean all tools, vehicles and footwear.	Fungus
Cholera	Diarrhoea	Waterborne	Clean drinking water and good hygiene and sanitation.	Bacteria
Tuberculosis	Lung damage	Airborne	Vaccination programme. Treat infection with antibiotics.	Bacteria
HIV	Flu like illness	Sexual contact or bodily fluids. Direct contact.	Use of condoms / clean needles. Treat infection with antiretroviral drugs.	Virus
Ebola	Haemorrhagic fever	Bodily fluid - direct contact	Avoid contact with people infected with Ebola.	Virus

Defence Against Disease

The human body has several **non specific** ways of defending itself from pathogens getting in.

Physical barriers

Nasal hairs, sticky mucus and cilia prevent pathogens entering through the nostrils.

Physical barriers

Respiratory system is lined with **mucus** to trap dust and pathogens. **Cilia** move the mucus upwards to be **swallowed**.

Chemical defence

Hydrochloric acid (pH1) kills most ingested pathogens.

Chemical defence

Tears, saliva and mucus contain an enzyme called **lysozyme** which destroys microorganisms.

Physical barriers

Hard to penetrate waterproof barrier. **Glands** secrete **oil** which kill microbes.

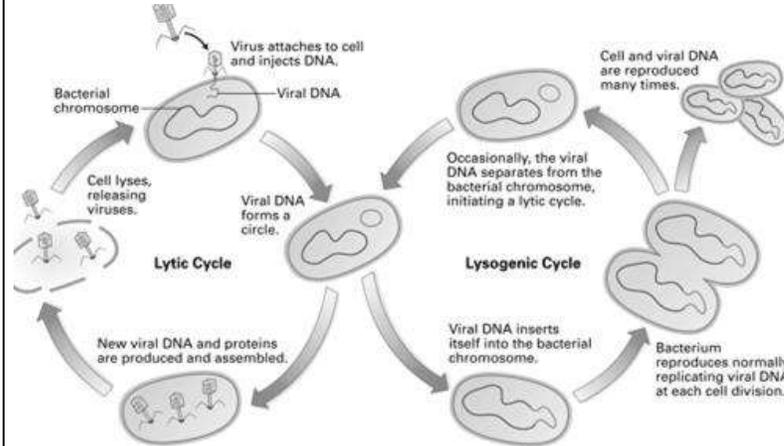
Communicable diseases:

Common cold
Influenza
STDs

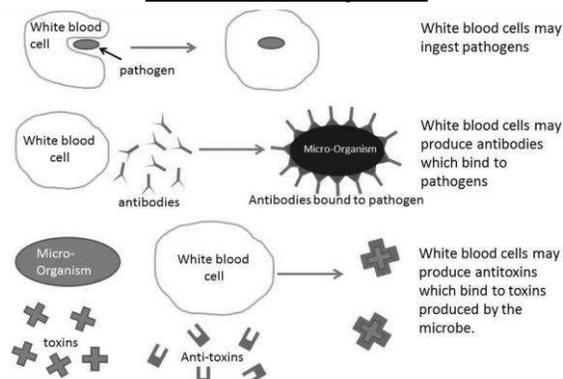
Non-communicable diseases:

Diabetes
Cancer
Cardiovascular disease

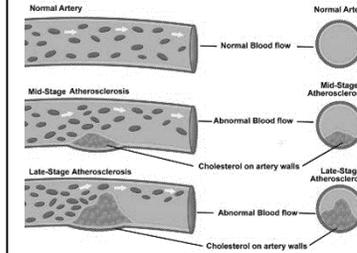
Lysogenic Vs Lytic Virus Lifecycle



The Immune System

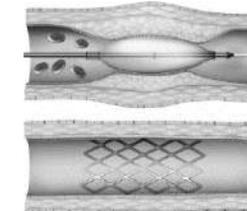


Cardiovascular Disease



Cardiovascular disease (CVD) is a general term for disease which involve the **heart** or **blood vessels**. **Atherosclerosis** is a cause of **coronary heart disease** where **layers of fatty material** build up inside the coronary arteries, **narrowing** them. This **reduces** the flow of blood through the coronary arteries, resulting in a **lack of oxygen** for the **heart muscle**.

Atherosclerosis can be **treated** in two main ways by placing a **stent** in the coronary artery and/or using **lifelong medication** called **statins**. Lifestyle changes such as a healthy diet, exercise and no smoking are also vital in reducing the risk of CVD.



Stents are metal cylinder grids which can be **inserted** into an artery to maintain blood flow by **keeping the artery open** so that the heart continues to receive **enough oxygen** to function effectively.

Statins are drugs that lower harmful **cholesterol** in the blood and stop the **liver** producing too much cholesterol and reduce the rate at which it is deposited. Patients should change their **lifestyle** and have a healthy **diet**. This **reduces** the risk of heart disease.

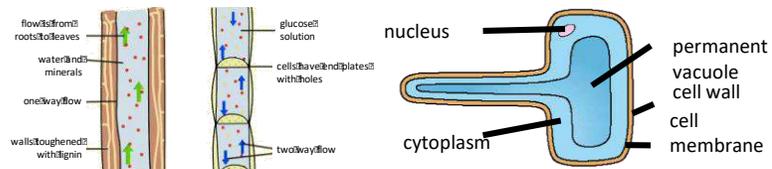
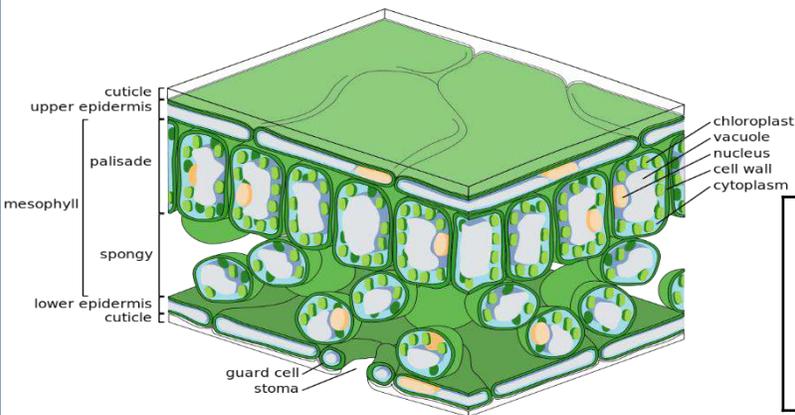
Obesity

Excess weight (obesity) can make a person at **risk of cardiovascular disease**, a stroke and Type 2 diabetes. A tool called the **Body Mass Indicator (BMI)** can be used to calculate whether a persons weight lies within a healthy range.

$$BMI = \frac{\text{mass (kg)}}{(\text{height (m)})^2}$$

The use of **BMI** has **limitations** because it simply shows if a person is carrying too much weight. It does not calculate if this is excess fat, muscle or bone. The **waist to hip ratio** should be considered alongside the BMI figure.

KS4 Biology - Plant Structures and their Functions



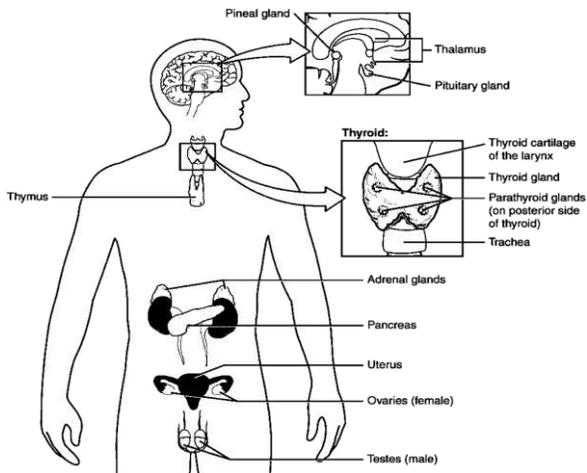
Photosynthesis	Plants make use of light energy from the environment (ENDOTHERMIC) to make food (glucose)	Carbon dioxide + Water → Oxygen + Glucose
		$CO_2 + H_2O \rightarrow O_2 + C_6H_{12}O_6$

Epidermal tissues	Waxy cuticle (top layer of the leaf)	Reduces water loss from the leaf
	Guard cells and stomata	Guard cells open and close the stomata to control water loss and allow for gas exchange (oxygen and carbon dioxide).
Palisade mesophyll	Palisade cells	Cells near the top surface of the leaf that are packed with chloroplasts that contain chlorophyll. Both adaptations maximize photosynthesis.
Spongy mesophyll	Air spaces in the leaf between cells	Increased surface area for gas exchange so that carbon dioxide can diffuse into photosynthesising cells.
xylem	Hollow tubes strengthened by lignified dead cells adapted for the transportation of water and mineral ions through the plant in the transpiration stream	Allows transport of water and mineral ions from the roots to the stem and the leaves.
phloem	Cell sap moves from one phloem cell to the next through pores in the end walls	Transports dissolved sugars from the leaves to the rest of the plant for immediate use or storage (translocation).
Meristem tissue	New cells (roots and shoot tips) are made here including root hair cells	Root hair cells have an increased surface area for the uptake of water by osmosis, and mineral ions by active transport.

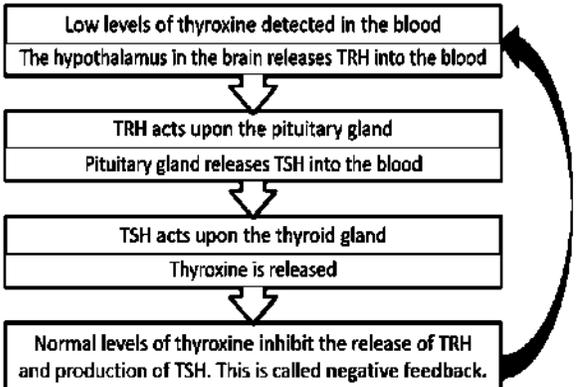
Factors affecting the rate of photosynthesis	Factor	How the rate is affected	Limiting factors (why the rate stops going up)
	Temperature	As the temperature of the environment the plant is in increases rate of photosynthesis increases (up to a point) as there is more energy for the chemical reaction.	Photosynthesis is an enzyme controlled reaction. If the temperature increases too much, then the enzymes become denatured and the rate of reaction will decrease and stop
	Light intensity	Light intensity increases as the distance between the plant and the light sources increases. As light intensity increases so does the rate of photosynthesis (up to a point) as more energy is available for the chemical reaction.	At point X another factor is limiting the rate of photosynthesis. This could be carbon dioxide concentration, temperature or the amount of chlorophyll
	Carbon dioxide concentration	Carbon dioxide is needed for plants to make glucose. The rate of photosynthesis will increase when a plant is given higher concentrations of carbon dioxide (up to a point).	At point X another factor is limiting the rate of photosynthesis. This could be light intensity, temperature or the amount of chlorophyll

Keyword	Definition
Active Transport	Active transport moves substances from a more dilute solution to a more concentrated solution (against a concentration gradient). The energy is provided by respiration
Xylem	Form hollow tubes made of dead tissue. Long cells with walls toughened by waterproof lignin. Water and minerals flow from the roots towards the leaves in one direction in a process called TRANSPIRATION. Xylem vessels also provide support to the stem of the plant.
Phloem	Form tubes made of living tissue. Cells have end plates with holes in them. Sucrose in solution move from the leaves to growing tips and storage tissues in both directions. This process is called TRANSLOCATION. There are no forces causing translocation to occur and so the sucrose is moved along using active uptake which requires energy.
Stoma	
Guard Cell	Cells either side of the stoma that
Gibberellins	End seed dormancy, promote flowering, increase fruit size.
Ethene	Control ripening of fruit during storage and transport.
Auxins	Weed killers, rooting powders, promoting growth in tissue culture.

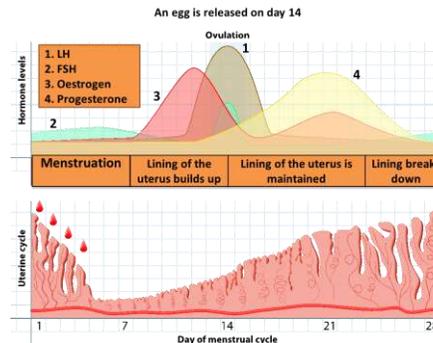
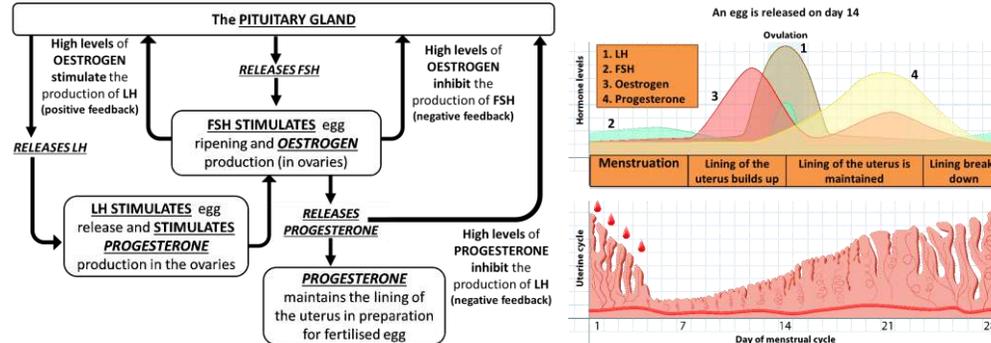
The Human Endocrine System



Anti-diuretic hormone (ADH)	Kidney	Controls water levels in the blood
Thyroid-stimulating hormone (TSH)	Thyroid	Stimulates the thyroid gland to secrete thyroxine
Luteinising hormone (LH)	Ovaries	Stimulates egg release and progesterone production in the ovaries
Follicle-stimulating hormone (FSH)	Ovaries	Stimulates egg ripening and oestrogen production (in ovaries)
Prolactin (PRL)	Breasts	Stimulates the breasts to produce milk
Growth hormone (GH)	All cells in the body	Stimulates growth and repair



The Menstrual Cycle



Hormone	Produced in...	Causes...
FSH Follicle stimulating hormone	Pituitary Gland	Stimulates egg ripening and oestrogen production (in ovaries)
Oestrogen	Ovaries	Lining of the womb to develop. Stimulates pituitary gland to make LH
LH Luteinising hormone	Pituitary Gland	Stimulates egg release and progesterone production in the ovaries
Progesterone	Ovaries	Maintains the lining of the womb

Contraception

The pill - oral contraceptives that contain oestrogen to inhibit FSH production so that no eggs develop and mature. After taking for a while egg development and release will stop completely.

The **mini pill** and **injections** contain progesterone. High levels stimulate the cervix to produce a thick mucus which stops sperm entering the uterus.

Implant or **skin patches** of slow release progesterone inhibit the maturation and release of eggs for a number of months or years.

Spermicidal agents which kill or disable sperm.

Barrier methods such as **condoms and diaphragms** prevent the sperm reaching an egg

The **'coil'** or other **intrauterine devices** which prevent the implantation of an embryo

Sterilisation or vasectomy - surgical methods of male and female sterilisation.

Keyword

Definition

Endocrine system	Collection of organs/glands in the human body that release hormones
Hormones	Chemical messengers released from endocrine glands that cause a change in bodily responses
Target organ	The organ where a particular hormone is released and effects
Metabolic rate	The rate at which the energy stored is transferred by all the reactions that take place in your body
Glycogen	How glucose is stored as a polymer
Fight or flight response	When the body prepares to fight or run away from a perceived danger. This response is caused by the hormone adrenaline
Menstrual cycle	A roughly 28 day cycle of changes that occurs in the female reproductive system
Menstruation	When the lining of the uterus breaks down and passes out through the vagina, Also known as a period
Ovulation	When an egg is releases from its follicle in the ovary, happens roughly on day 14 of the menstrual cycle
Contraception	A method that prevents fertilisation and therefore pregnancy. Contraception can be hormonal or physical/barrier methods
ART	Assisted reproductive technology that uses hormones and other techniques to increase the chance of pregnancy in infertile women. Clomifene therapy is an example of ART

Control of Blood Glucose

Blood glucose concentration **TOO HIGH**



The **PANCREAS** releases the hormone **insulin**

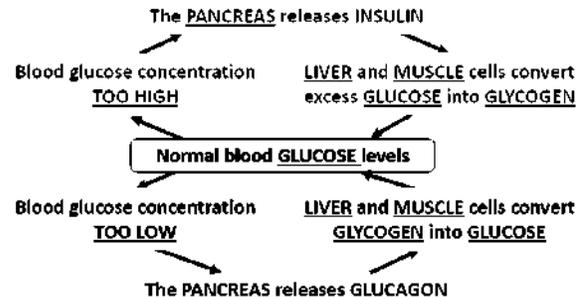


Insulin stimulates the movement of **GLUCOSE** from the blood into cells



Liver and **muscle** cells convert excess **glucose** into **glycogen**

The control of blood glucose concentration is an example of **NEGATIVE FEEDBACK**. This ensures that, in any control system, changes are reversed and returned back to the set level.



Diabetes- a condition that causes a person's blood sugar level to become too high.

Type 1 diabetes

A disorder in which the pancreas fails to produce enough insulin.

The lack of insulin causes uncontrolled high blood glucose levels.

Type 1 is normally treated with insulin injections.

Type 2 diabetes

A disorder where the body cells no longer respond to insulin produced by the pancreas.

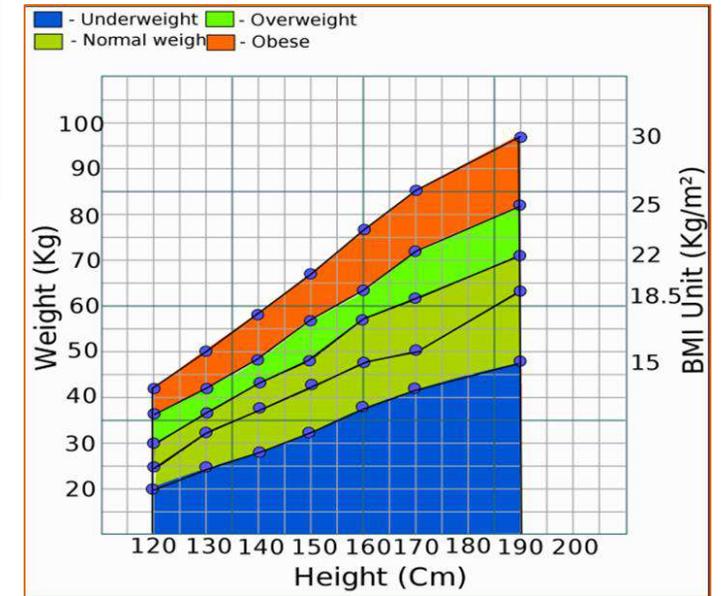
Obesity is a risk factor for Type 2 diabetes.

Type 2 is normally treated by controlling the carbohydrate in the diet and by exercise.

Excess weight (obesity) can make a person have a greater risk of developing type 2 diabetes.

A tool called the **Body Mass Indicator (BMI)** can be used to calculate whether a person's weight lies within a healthy range.

$$BMI = \frac{\text{mass (kg)}}{(\text{height (m)})^2}$$



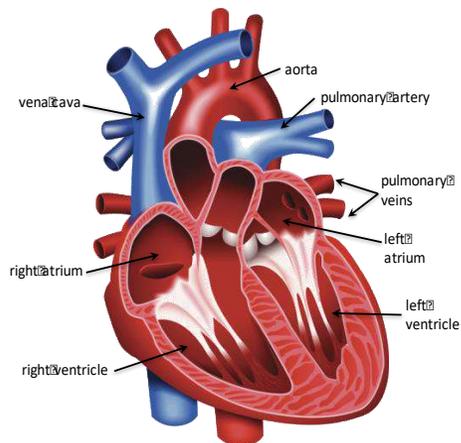
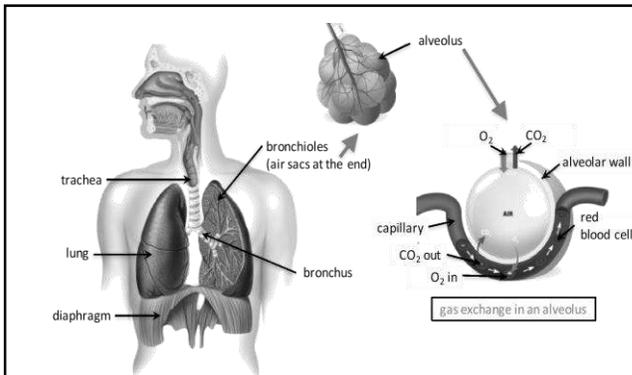
The use of BMI has **limitations** because it simply shows if a person is carrying too much weight. It does not calculate if this is excess fat, muscle or bone.

Very muscular adults and athletes may be classed as overweight or obese even though their body fat is low.

The **waist to hip ratio** should be considered alongside the BMI figure.

Male (waist : hip ratio)	Female (waist : hip ratio)	Health risk based on Waist : hip ratio
0.95 or below	0.80 or below	Low risk
0.96 to 1.0	0.81 to 0.85	Moderate risk
1.1 or more	0.86 or more	High risk

KS4 - Biology Exchange and Transport

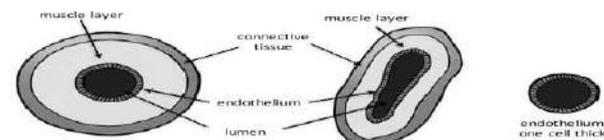
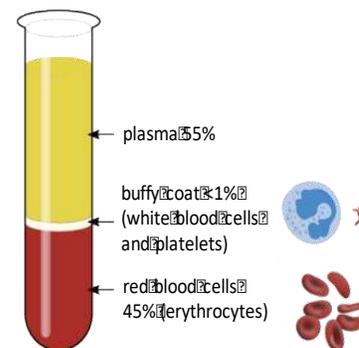


Trachea	Carries air to/from the lungs	Rings of cartilage protect the airway.
Bronchioles	Carries air to/from the air sacs (alveoli)	Splits into multiple pathways to reach all the air sacs.
Alveoli	Site of gas exchange in the lungs	Maximises surface area for efficient gas exchange.
Capillaries	Allows gas exchange between into/out of blood	Oxygen diffuses into the blood and carbon dioxide diffuses out.

Aerobic respiration
Respiration with oxygen. Occurs inside the mitochondria continuously
Glucose is oxidised by oxygen to transfer the energy the organism needs to perform it's functions.
$\text{Glucose} + \text{oxygen} \rightarrow \text{carbon dioxide} + \text{water}$

Anaerobic respiration
Respiration when oxygen is in short supply. Occurs during intensive exercise
During hard exercise, muscle cells are respiring so fast that blood cannot transport enough oxygen to meet their needs. Glucose is partially oxidised to produce lactic acid which builds up in muscle tissue causing them to become painful and fatigued.
$\text{Glucose} \rightarrow \text{lactic acid}$

Factors affecting rate of diffusion (Biology only)		
Surface area	Concentration gradient	Diffusion distance
Increased surface area on exchange surface increases diffusion.	Diffusion is from area of high concentration to low concentration. A large difference in concentration will increase rate of diffusion.	The smaller the diffusion distance to faster the rate of diffusion,



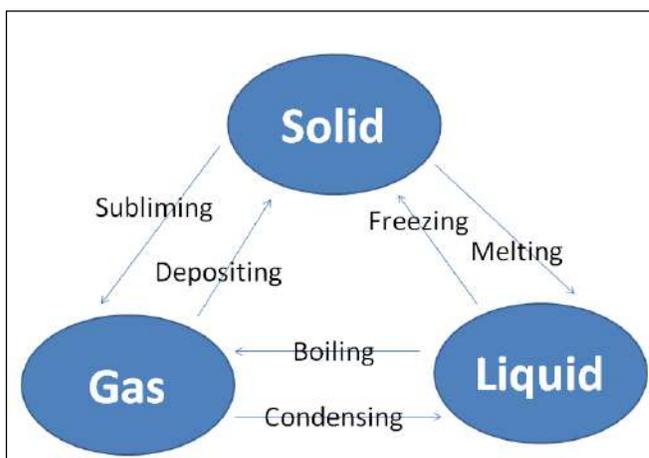
Artery	Vein	Capillary
Carry blood away from the heart	Carry blood to the heart	Connects arteries and veins
Thick muscular walls, small lumen, carry blood under high pressure, carry oxygenated blood (except for the pulmonary artery).	Thin walls, large lumen, carry blood under low pressure, have valves to stop flow in the wrong direction, carry deoxygenated blood (except for the pulmonary vein).	One cell thick to allow diffusion, Carry blood under very low pressure.

Keyword	Definition
Diffusion	The spreading of the particles of a gas or substances in solution, resulting in a net movement of particles from a region where they are of a higher concentration to an area of lower concentration
Surface areas to volume ratio	The surface area to volume ratio can be calculated by dividing an object's surface area (SA) by its volume
Cardiac Output	Cardiac output = stroke volume x heart rate
Stroke Volume	Cardiac output is the volume of blood pumped by a ventricle per minute. The units are $\text{cm}^3 \text{min}^{-1}$
Heart Rate	Heart rate is the number of beats per minute (bpm)
Stroke Volume	Stroke volume is the volume of blood pumped by one ventricle per contraction (cm^3)

Plasma (55%)	Pale yellow fluid	Transports CO_2 , hormones and waste.
Red blood cells (erythrocytes) (45%)	Carries oxygen	Large surface area, no nucleus, full of haemoglobin.
White blood cells (phagocytes and lymphocytes) (<1%)	Part of the immune system	Some produce antibodies, others surround and engulf pathogens.
Platelets (<1%)	Fragments of cells	Clump together to form blood clots.

Chemistry Knowledge Organisers

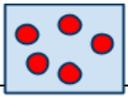
	Solids	Liquids	Gases
			
Arrangement	Particles are close together, next to each other. Particles are in rows. Regular arrangement.	Particles touch each other and are next to each other. Particles are not in a regular pattern.	Particles are not in a regular arrangement. The particles are spaced out.
Movement	Very little movement, particles vibrate in their fixed positions. They do not move from one place to another.	Particles have some movement. The particles are able to rollover each other.	Particles in gases have lots of movement and move in all directions.
Challenge – energy and attraction of particles	Particles have very little energy. The particles are attracted to each other.	Particles have some energy. The particles are attracted to each other.	Particles have lots of energy and there is no or very little attraction between the particles.



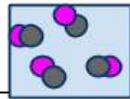
Physical change (Reversible)	Chemical change (Irreversible)
For example – melting chocolate Freezing water into ice	For example – frying an egg - rusting
No new substances or products formed. There has just been a change of state (solid, liquid, gas)	One or more new substances has been formed.

Chromatogram	The end product in chromatography (paper with separated components).
Solute	The solid that dissolves.
Solvent	The liquid that dissolves the solute.
Solution	Formed when a solvent dissolves a solute.
Dissolve	The act in which a solution is made (forming a solution).
Saturated	When no more solute can be dissolved in a solvent.
Unsaturated	When more solute can be dissolved in a solvent.
Atom	Smallest component of an element.
Molecule	A group of atoms chemically bonded together.
Compound	Two or more different atoms chemically bonded together.
Evaporation	Change of state where a liquid turns to a gas.
Condensation	Change of state where a gas turns to a liquid.
Filtration	Separation technique where insoluble particles are separated from soluble particles and liquid.
Crystallisation	Separation technique where the solvent in a solution is left to evaporate, leaving the solute behind.
Distillation	Separation technique where liquid mixtures or soluble solutions can be separated based on their boiling points.
Soluble	Can dissolve in water.
Insoluble	Cannot dissolve in water.
Baseline	The pencil line drawn at the base of the chromatography paper during chromatography.
Mixture	Two or more different atoms not chemically bonded together.
Boiling point	The temperature that a liquid turns into a gas.

A pure substance contains atoms of one single element only.

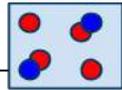


pure substance - 1 element

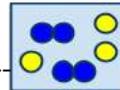


pure substance - 1 compound

An impure substance is 2 or more different elements and/or compounds together that are not chemically bonded. AKA, a mixture.



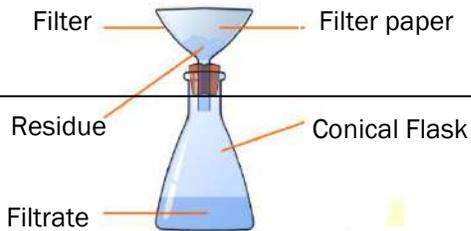
mixture - 1 element & 1 compound



mixture - 2 elements

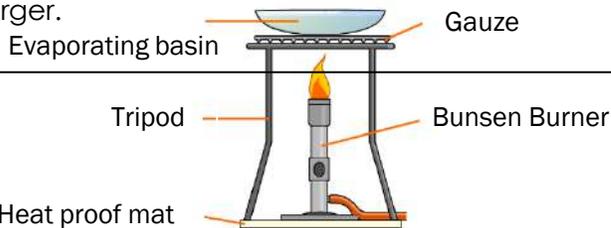
Filtration

- Filtration separates insoluble from soluble.
- Soluble substances and liquid are allowed through the small holes in the filter paper and form filtrate.
- Insoluble particles cannot fit through the small holes and are kept in the filter papers as the residue.



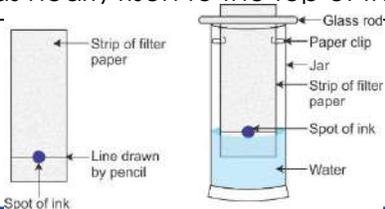
Crystallisation

- Heat the solution.
- Evaporate off the solvent, leaving the solute behind.
- Crystallisation forms crystals of different sizes.
- If the solvent takes longer to evaporate, the crystals have more time to form an order and therefore larger.



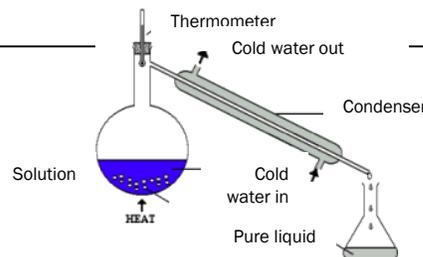
Chromatography

- Draw a horizontal line, using pencil and ruler, 2cm up from the bottom filter paper (pencil is insoluble).
- Add a dot of ink mixture to each 'x' mark evenly spaced on the baseline.
- Measure 1cm depth of water (or other solvent) in a beaker.
- Stand the filter paper up in the water, making sure the waterline is UNDER the baseline (to ensure the solvent moves up the stationary phase).
- Take out the chromatogram when the mobile phase has nearly risen to the top of the paper.



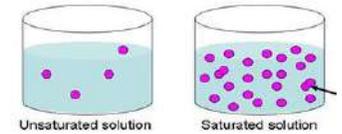
Distillation

- Heat the mixture until one solution evaporates to become a gas (one with the lowest boiling point).
- The evaporated liquid will rise up as a gas.
- The gas will enter the condenser.
- In the condenser delivery tube, energy will be taken from the solution by the circulating water outside.
- The gas will turn to a liquid- condensation.
- The pure liquid will fall into a separate beaker.
- The other liquid in the mixture will be left in the round-bottom flask.



Solutions

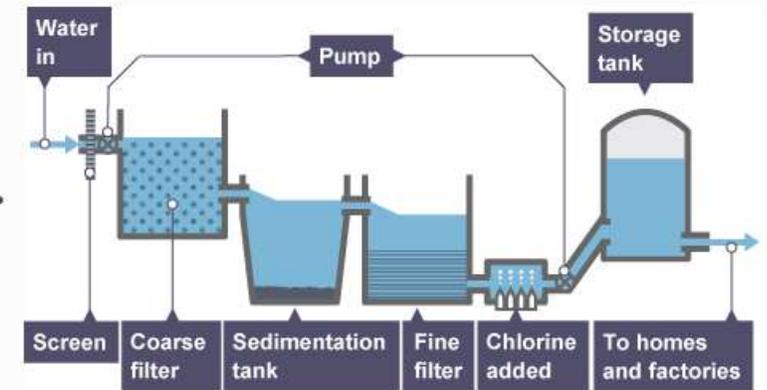
Solvent + Solute → Solution



Making a saturated solution

1. Add solute to a solvent and stir.
2. Continue to add the solute until it no longer dissolves.

Making drinking water potable



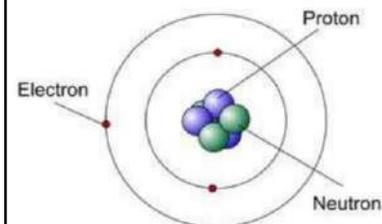
Water is essential for life. Water that is safe for humans to drink is called potable water. Potable water is not pure water because it almost always contains dissolved impurities.

For water to be potable, it must have sufficiently low levels of dissolved salts and microbes. This is because:

dissolved salts can sometimes be harmful for humans
microbes can cause illnesses

Atomic Structure

Dalton's atomic model



Sub-atomic particles

Atoms are made from smaller particles called subatomic particles. There are three type:

Particle	Relative mass	Relative charge	Found?
Proton	1	Positive, +1	In nucleus
Neutron	1	Neutral, 0	In nucleus
Electron	Negligible ($\frac{1}{1840}$)	Negative, -1	In shells orbiting nucleus

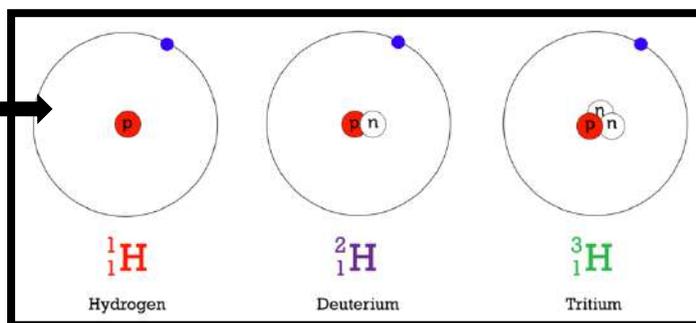
Isotopes

- Versions of an element with same atomic number but different atomic mass.
- Number of protons is the same, but number of neutrons is different.
- Relative Atomic Mass is average of the masses of the isotopes, weighted by their **relative abundance**
- For example, Neon has three isotopes

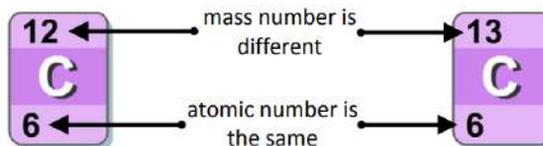
Neon Isotope Mass	Relative Abundance (%)
20	90.5
21	0.3
22	9.2

$$\frac{20 \times 90.5 + 21 \times 0.3 + 22 \times 9.2}{90.5 + 0.3 + 9.2} = 20.2$$

- This is why some atoms have a relative atomic mass with a decimal point.



- For example, two isotopes of carbon:



- The existence of isotopes results in relative atomic masses not being whole numbers

Reading the Periodic Table

19
F
fluorine
9

Relative Atomic Mass (aka nucleon number):
The total number of protons and neutrons added together.

Atomic number (aka proton number):
The number of protons or electrons.

Note: on some periodic tables, they are the wrong way up, just remember that the smaller number is the proton number.

What's in my atom?

Protons = atomic number

Electrons = atomic number

Neutrons = relative atomic mass subtract atomic no.

19
F
fluorine
9

Atomic number = 9
Relative Atomic mass = 19

Protons = 9
Electrons = 9
Neutrons = 19 - 9 = 10

32
S
sulfur
16

Atomic number = 16
Relative Atomic mass = 32

Protons = 16
Electrons = 16
Neutrons = 32 - 16 = 16

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.

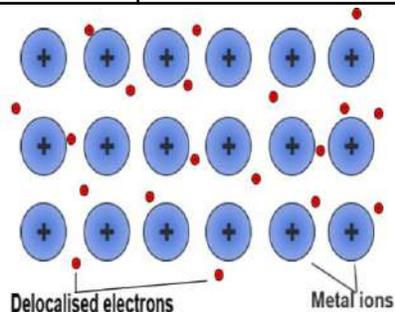
Keyword	Definition
Ionic bond	<i>A strong electrostatic force of attraction between oppositely charged ions.</i>
Covalent bond	<i>The bond formed when a pair of electrons is shared between two atoms.</i>
Metallic bond	<i>The type of bonding found in metals. Positively charged ions in a 'sea' of negatively charged electrons.</i>
Lattice Structure	<i>An arrangement of many particles that are bonded together in a fixed, regular, grid-like pattern</i>
Melting point	<i>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.</i>
Boiling point	<i>The temperature at which a substance changed from a liquid to a gas.</i>
Charge	<i>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.</i>
Electrical conductivity	<i>Allowing electricity to pass through.</i>
Aqueous solution	<i>A mixture that is formed when a substance is dissolved in water.</i>
Molten	<i>A substance that has been liquefied by heat.</i>
Electron pair	<i>Two electrons occupying the same orbital in an atom or molecule, especially forming a nonpolar covalent bond between atoms.</i>

Keyword	Definition
Ion	<i>An atom with an electric charge, caused by the loss or gain of electrons.</i>
Cation	<i>A positively charged ion.</i>
Anion	<i>A negatively charged ion.</i>
Electrostatic force	<i>The attractive or repulsive force between two electrically charged objects.</i>
Attraction	<i>The electric force that acts between oppositely charged bodies, tending to draw them together.</i>
Intermolecular force	<i>Forces of attraction which act between molecules.</i>
Atom	<i>The smallest unit into which matter can be divided without the release of electrically charged particles.</i>
Element	<i>An element is a substance whose atoms all have the same number of protons.</i>
Compound	<i>A substance formed when two or more chemical elements are chemically bonded together.</i>
Transfer	<i>Movement of a particle from one place to another.</i>
Share	<i>Two bodies having equal portions distributed between the two.</i>
Delocalised electron	<i>An electron that is not associated with a particular atom within a shell, or held in a covalent bond.</i>
Proton	<i>A particle found in the nucleus of an atom, having a positive charge and the same mass as a neutron.</i>
Neutron	<i>A particle found in the nucleus of an atom having zero charge and a mass of 1.</i>
Electron	<i>A tiny particle with a negative charge and very little mass.</i>
Shell	<i>Area around a nucleus that can be occupied by electrons and usually drawn as circles.</i>
Nucleus	<i>The central part of an atom or ion.</i>

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

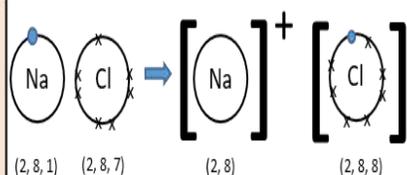
Non metals atoms gain electrons to become negatively charged ions

Group 6 non metals form -2 ions
Group 7 non metals form -1 ions

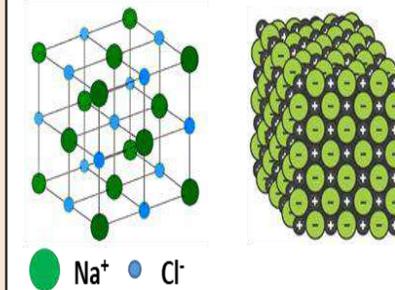
Structure

- 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.

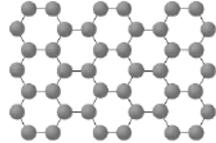
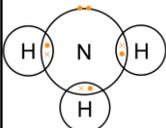
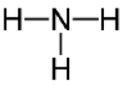
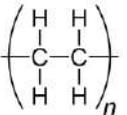
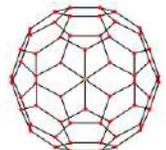
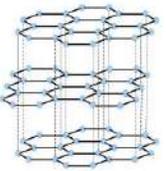
For example:
calcium + oxygen → calcium oxide

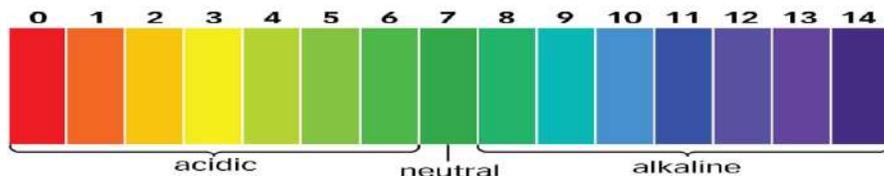
-ate

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

Covalent bonding

Simple molecular compounds		Giant covalent structures								
Low melting and boiling points	Small amounts of energy needed to overcome the intermolecular forces.	Diamond		Graphene and fullerenes						
Poor conductors of electricity	No free electrons to transfer energy.	Each carbon atom is bonded to four others 	Very hard.	Rigid structure.	Graphene 	Excellent conductor.	Contains delocalised electrons.			
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.		Very high melting point.	Strong covalent bonds.		Single layer of graphite one atom thick	Very strong.	Contains strong covalent bonds.		
			Does not conduct electricity.	No delocalised electrons.						
Atoms share pairs of electrons	Can be small molecules e.g. ammonia	 <p>Dot and cross : + Show which atom the electrons in the bonds come from - All electrons are identical</p>  <p>2D with bonds: + Show which atoms are bonded together - It shows the H-C-H bond incorrectly at 90°</p>  <p>3D ball and stick model: + Attempts to show the H-C-H bond angle is 109.5°</p>	Used for cutting tools due to being very hard.							
	Can be giant covalent structures e.g. polymers	 <p>Simple polymers consist of large chains of hydrocarbons.</p>	Graphite		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.			
			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.	Diamond, graphite, silicon dioxide	Very high melting points
			Very high melting point.	Strong covalent bonds.						
			Does conduct electricity.	Delocalised electrons between layers.						
			Used for electrodes as is inert.							



The pH scale and indicators

Acids	Acids produce hydrogen ions (H ⁺) in aqueous solutions.	Universal indicator	Red in acid, green in neutral and blue in alkali
Alkalis	Aqueous solutions of alkalis contain hydroxide ions (OH ⁻).	Litmus	Red in acid, purple in neutral and blue in alkali
Base	A base is any substance that reacts with an acid to form a salt and water only	Methyl orange	Red in acid, yellow in neutral and yellow in alkali
Examples of soluble bases	Alkalis e.g. sodium hydroxide, potassium hydroxide	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 than 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 (part 2)

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.

Titration is 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, except 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.

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	$\frac{10.0}{40} = 0.25$	$\frac{17.8}{35.5} = 0.50$
5. Divide answers by smallest number	$\frac{0.25}{0.25} = 1$	$\frac{0.50}{0.25} = 2$
6. Empirical formula	CaCl ₂	

2. How to deduce the molecular formula from the empirical formula and relative formula mass:

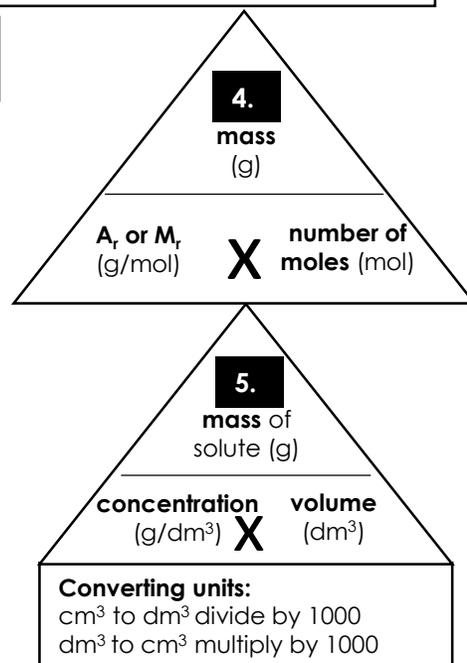
Example: The empirical formula for glucose is CH₂O and its relative formula mass is 180. Deduce the molecular formula for glucose.

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	$\frac{180}{30} = 6$
3. Multiply the numbers in the empirical formula to get the molecular formula	<ul style="list-style-type: none"> • CH₂O x 6 • So C₆H₁₂O₆

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 -> 2AlCl ₃
2. Calculate M_r of substances in the question	<ul style="list-style-type: none"> • M_r Cl₂ = 2 x 35.5 = 71 • M_r AlCl₃ = 27 + (3 x 35.5) = 133.5
3. Calculate the ratio of masses	<ul style="list-style-type: none"> • 3Cl₂ makes 2AlCl₃ • (3 x 71) Cl₂ makes (2 x 133.5) AlCl₃ • 213g Cl₂ makes 267g AlCl₃
4. Divide to work out the mass for 1g of product	<ul style="list-style-type: none"> • $\frac{213g}{267}$ Cl₂ makes $\frac{267g}{267}$ AlCl₃ • 0.798g Cl₂ makes 1g AlCl₃
5. Multiply to scale up	<ul style="list-style-type: none"> • (0.798g x 53.4) Cl₂ makes (1g x 53.4) AlCl₃ • 42.6g Cl₂ makes 53.4g AlCl₃



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 x 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/dm ³ .
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 x 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 that a liquid takes up. Units include cm ³ and dm ³ .

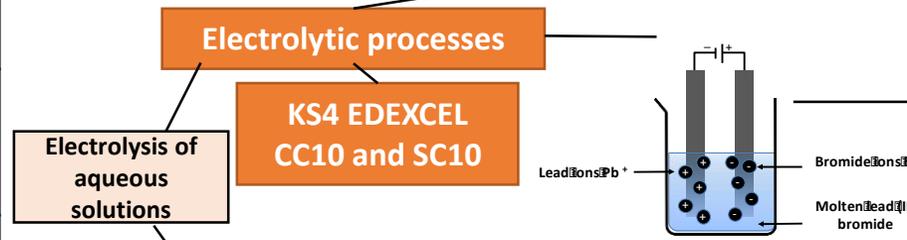
KS4 Chemistry – Electrolytic Processes

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.

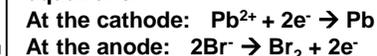
Process of electrolysis	<i>Splitting up using electricity</i>	When an ionic compound is melted or dissolved in water, the ions are free to move. These are then able to conduct electricity and are called electrolytes. Passing an electric current through electrolytes causes the ions to move to the electrodes.
Electrode	<i>Anode Cathode</i>	The positive electrode is called the anode. The negative electrode is called the cathode.
Where do the ions go?	<i>Cations Anions</i>	Cations are positive ions and they move to the negative cathode. Anions are negative ions and they move to the positive anode.

Oxidation Is Loss, Reduction Is Gain

Extracting metals using electrolysis	<i>Metals can be extracted from molten compounds using electrolysis.</i>
	<i>This process is used when the metal is too reactive to be extracted by reduction with carbon.</i>
	<i>The process is expensive due to large amounts of energy needed to produce the electrical current. Example: aluminium is extracted in this way.</i>



Higher tier: You can display what is happening at each electrode using half-equations:



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.

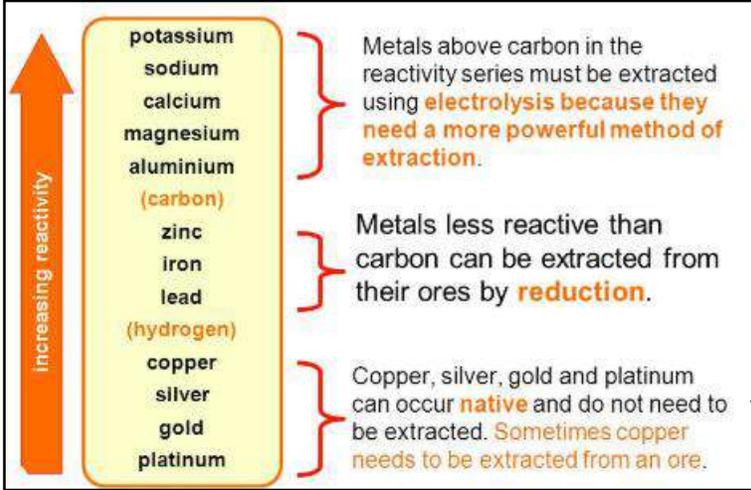
Using copper	<i>Copper is a very good electrical conductor</i>	Much of the copper available isn't pure enough for this use so it is purified using electrolysis.
Copper sulfate solution	<i>The anode is made of impure copper and the cathode is made of pure copper</i>	Both electrodes are placed in copper sulfate solution. Copper ions (Cu ²⁺) leave the anode and are attracted to the cathode.
Electrodes	<i>The cathode of pure copper builds up</i>	The anode decreases in size. The impurities left behind form a sludge.

potassium	most reactive	K
sodium	↑ ↓	Na
calcium		Ca
magnesium		Mg
aluminium		Al
carbon		C
zinc		Zn
iron		Fe
tin		Sn
lead		Pb
hydrogen		H
copper	Cu	
silver	Ag	
gold	Au	
platinum	least reactive	Pt

negative ion in solution	element given off at positive electrode
chloride, Cl ⁻	chlorine, Cl ₂
bromide, Br ⁻	bromine, Br ₂
iodide, I ⁻	iodine, I ₂
sulfate, SO ₄ ²⁻	oxygen, O ₂

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.



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.

Extraction of metals and reduction

Reactions with acids *metal + acid → metal salt + hydrogen*

magnesium + hydrochloric acid → magnesium chloride + hydrogen

zinc + sulfuric acid → zinc sulfate + hydrogen

Reactions of acids and metals

Acids react with some metals to produce salts and hydrogen.

Obtaining and Using Metals CC11 and SC11

The reactivity series

	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.



Metal	Reaction with water	Reaction with dilute acids	Reactivity
Potassium	Violent with cold water	Violent	↑ Most reactive Least reactive
Sodium	Violent with cold water	Violent	
Calcium	Slow with cold water Rapid with steam	Rapid	
Magnesium	Slow with cold water Rapid with steam		
Aluminium	Usually no reaction	Slow	
Zinc	Usually no reaction		
Iron	Rusts slowly	Slow	
(Hydrogen)			
Copper			
Silver	No reaction	No reaction	
Gold	No reaction	No reaction	

Metals form positive ions when they react	<i>The reactivity of a metal is related to its tendency to form positive ions</i>	The reactivity series arranges metals in order of their reactivity (their tendency to form positive ions).
Carbon and hydrogen	<i>Carbon and hydrogen are non-metals but are included in the reactivity series</i>	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	<i>A more reactive metal can displace a less reactive metal from a compound.</i>	Silver nitrate + Sodium chloride → Sodium nitrate + Silver chloride

Physics Knowledge Organisers

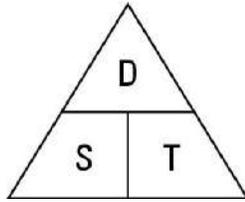
Motion

Scalar	Vector
Distance	Displacement
Speed	Velocity
Power	Momentum
Mass	Acceleration
Volume	Weight
Temperature	
Force	
Pressure	

Calculating speed/velocity

$$\text{Speed (m/s)} = \text{distance (m)} \div \text{time (s)}$$

How to remember the equation?
 "Don't Step on Turtles"



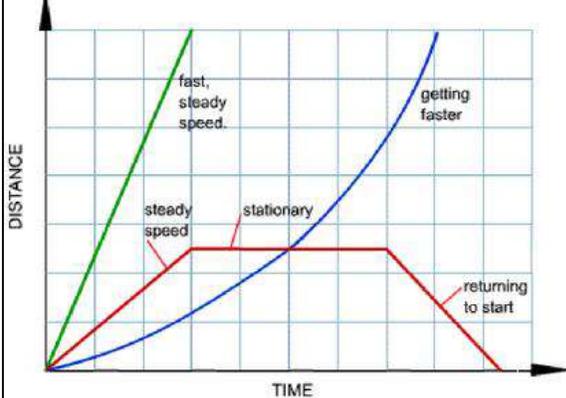
$$D = S \times T$$

$$S = D \div T$$

$$T = D \div S$$

Distance-time graph

Key features:

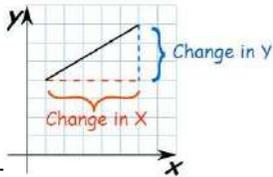


You can calculate speed from this distance-time graph.

Steeper gradient = faster speed.

Calculating a gradient

$$\text{Gradient} = \frac{\text{Change in } y}{\text{Change in } x}$$



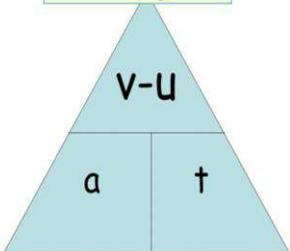
Calculating acceleration

Acceleration is the rate of change of velocity

$$\text{Acceleration (m/s/s)} = \frac{\text{Change in velocity (m/s)}}{\text{time taken (s)}}$$

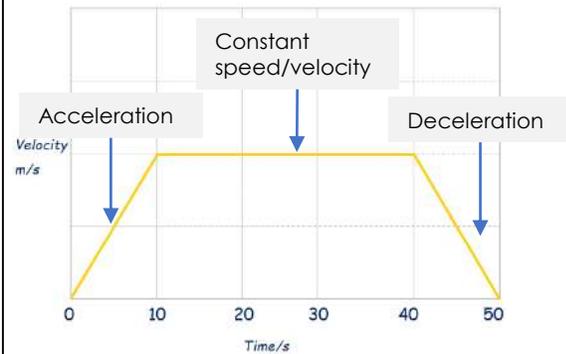
$$a = \frac{v - u}{t}$$

a = acceleration
 v = final velocity
 u = initial velocity
 t = time



Velocity-time graph

Key features:



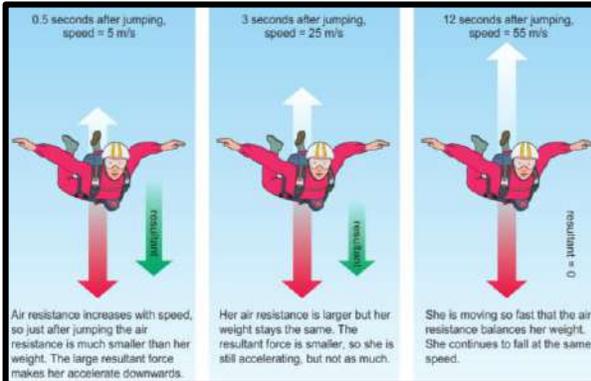
You can calculate acceleration from this velocity-time graph.

Calculating the **area beneath the lines**, is the same as the **overall distance travelled**

Steeper gradient = faster acceleration.

Speed	Scalar measurement that shows how fast an object is moving. Measure in m/s (meters per second).
Velocity	Vector measurement that shows how fast an object is moving in a specific direction. Measured in m/s (meters per second).
Distance	Measurement of how far an object is moving/has moved. Measured in m (meters).
Time	Measurement of time. Measured in s (seconds).
Acceleration	When an objects speed increases over time.
Conversion	Changing a measurement to another form.
Deceleration	When an objects speed decreases over time.
Scalar	A measurement that shows magnitude only.
Vector	A measurement that shows magnitude and direction.
Plateau	A straight horizontal line on a graph.
Gradient	Difference between two values, shown by a incline or decline on a line graph.
Constant	When something does not change. Shown by a straight line on a line graph.
Magnitude	Another term used for size.
Direction	The course which an object is moving. We show North, West, East, South or a combination of two.
Initial	The beginning.
Final	The end.
Displacement	A vector measurement to show the shortest distance to the final place a 95 object ends up.

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:

$$\text{weight (N)} = \text{mass (kg)} \times \text{gravitational field strength (N/kg)}$$

This is often written as: $W = m \times g$

Momentum is calculated using this equation:

$$\text{momentum (kg m/s)} = \text{mass (kg)} \times \text{velocity (m/s)}$$

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:

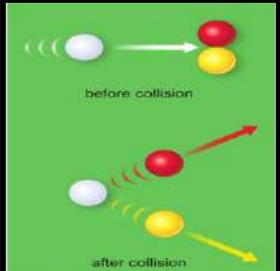
$$\text{force} = \frac{\text{mass} \times \text{change in velocity}}{\text{time}} \quad \text{or} \quad \frac{m(v - u)}{t}$$

where v is the final velocity and u is the starting velocity.

As mass \times 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.

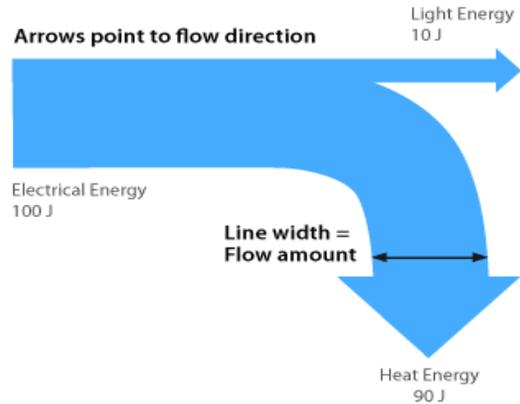


D The total momentum of the two coloured balls will be the same as the momentum of the white ball that hit them.

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).
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.

Conservation of Energy

Energy Type	Example
Light Energy	Sun, light bulb, torch
Thermal Energy (heat)	Oven, electric fire
Sound Energy	Radio, speakers, TV
Electrical Energy	Electric car, laptop
Nuclear Energy	Nuclear power station, nuclear bomb
Chemical Energy	Food, batteries, coal
Gravitational Potential Energy	Book on a shelf, boulder on a cliff
Elastic Potential Energy	Bow, wind-up toy, stretch spring
Kinetic Energy (movement)	Person running, rolling ball



Energy Efficiency = Useful energy/total energy input

heating	Put more jumpers on and turn off central heating
Hot water	Take showers, only boil the amount of water you need
Electrical appliances	Turn off devices that are on standby
Washing clothes	Air dry clothes, wash on a lower temperature
Heat lost from home	Install insulation – double glazing, loft/floor insulation

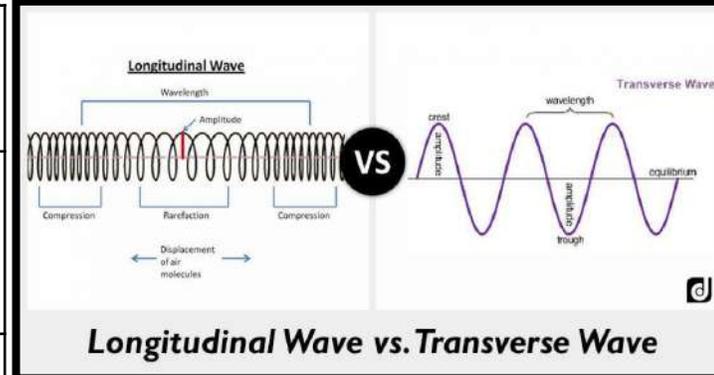
Renewable Energy	Quickly replenishes its energy used. Infinite	Wind power, solar power, hydroelectric power, tidal power, geothermal power, biomass
Non-renewable Energy	Is finite (will run out). Does not quickly replace energy used	Fossil fuels – coal, oil and natural gas Nuclear power

Energy Source	Advantages	Disadvantages
Fossil Fuels	Cheap to set up, power stations already present	Limited (will run out), causes pollution – greenhouse gases and gases that make acid rain, running costs
Nuclear power	Does not produce carbon dioxide or sulphur dioxide	Finite (will run out) danger from radioactive material
Wind power	Infinite, cheap to run, no pollution, cheap to run	Costly to build, only works when windy, noisy and ugly
Tidal power	Good for islands, potential to generate lots of energy, reliable – tide will always go in and out, doesn't release pollution	Costs a lot to build, hard to find suitable locations, could damage environment
Solar power	Infinite, building can have their own power supply, doesn't release pollution, cheap to run	Expensive to set up, only works when sunny
Geothermal power	Doesn't create any pollution, potentially infinite	Expensive to set up, only works in volcanic areas, volcanic activity may stop making station useless
Hydroelectric power	Doesn't create pollution, creates water reserves	Costly to build, can cause flooding, can have major ecological impacts
Biomass	Cheap, if replaced can be sustainable	Burning releases atmospheric pollution, replanting required

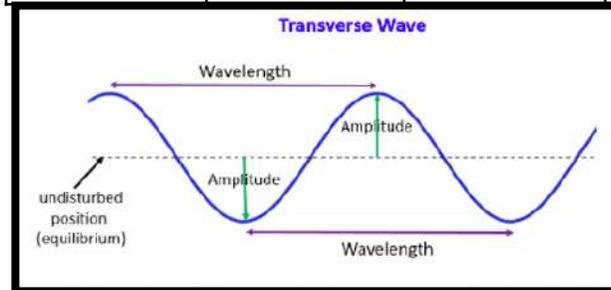
Keyword	Definition
Chemical	Energy store that is emptied during chemical reactions when energy is transferred to the surroundings.
Conduction	The transfer of heat by passing on energy (or electrical charge) to nearby particles.
Convection	The process by which heat travels through fluids (gases and liquids).
Elastic potential	An energy store that is filled when a material is stretched or compressed.
Electrical	Energy store resulting from the movement of electrical charge (electrons).
Energy	This is the ability to make something happen when it is transferred.
Gravitational potential	Energy store that is filled when an object is raised.
Joule	Unit of energy, represented by the symbol J.
Kinetic	An energy store filled when a moving object speeds up.
Light	A form of radiation that can transfer energy in a wave.
Non-renewable	An energy resource that will be used up, and not replenished in our lifetime.
Nuclear	An energy store associated with nuclear interactions.
Radiation	Radiation is the transfer of internal energy in the form of electromagnetic waves. This radiation lies in the infrared region of the electromagnetic spectrum. It does not require particles to move, it can travel through a vacuum.
Renewable	An energy resource that can be readily replenished in our lifetime.
Sound	A form of energy transferred by sound waves.
Thermal	An energy store that is filled when an object is heated.
Transformation	Energy transformation is the process of changing one form of energy to another.

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 its resting position when a wave 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	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



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)
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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

	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.	

Assessment Objectives.

Each component is marked based on four assessment objectives. In presenting your personal intentions and response, you need to show you have met all the assessment objectives for each component

Assessment Objective 1:

AO1 is about developing your ideas from a starting point to a final piece. This is done through sketches and studies relating to the work of other artists, designers and craftspeople as well as analysing the work they create.



Assessment Objective 2:

AO2 is about refining your ideas through selecting and experimenting with appropriate resources, media, materials, techniques and processes and should be linked to the artists you have studied. You should also annotate your work explaining the connections.

Useful Art Websites:

Use the list of websites below to help you research artists and understand the GCSE qualification.

www.art2day.co.uk
www.thisiscolossal.com
www.tate.org.uk
www.nationalgallery.org.uk
<https://bbc.co.uk/arts>
<http://www.juliasubbbs.co.uk/>
www.studentartguide.com
www.bbc.co.uk/bitesize/subjects/z6hs34j
<https://artsandculture.google.com>
<https://art21.org/>



The **GCSE** course is **60% Coursework** and **40% Exam**. The art department will set regular practical/research homework tasks in order to cover the Assessment Objectives fully.

Assessment Objective 3:

AO3 is about recording your ideas, observations and insights. These can be visual, shown through your use of media, materials and processes, as well as in the ways you develop your ideas, skills and techniques with written annotations explaining the development process.



Assessment Objective 4:

AO4 is about presenting a personal, informed and meaningful response, from your initial research through to your final piece. This should be visible through suitable source material and media, the connections you make to your chosen artists and your ability to record your ideas through your chosen media. Your work should be seen as a 'visual journey' from your starting point through to your final piece that demonstrates your understanding of your particular area of study.



AO1 DEVELOP

DEVELOP ideas through investigations informed by **ARTISTS** and other sources, showing analytical and cultural **UNDERSTANDING**

AO2 EXPERIMENT

REFINE ideas through **EXPERIMENTING** and **SELECTING** appropriate resources, media, techniques and processes

AO3 RECORD

RECORD ideas, observation and insights **RELEVANT** to your **INTENTIONS**

AO4 PRESENT

Present a **PERSONAL** response, showing analytical understanding and realising **INTENTIONS** for your project, making connections in your work

How do I identify the formal elements of my major project: Cakes, Biscuits & Sweets?

- Artist's information/Inspiration
- What specific theme/genre are you going to study.
- Name a well known artist to take influence from within your chosen genre.
- Define Form/shape/pattern/experiment.
- Apply numerous techniques during development.

How do I create a response to chosen Artists work?

- Use the ideas behind an artists work to inspire your own designs.
- Watch a demonstration by your teacher.
- Use decorative/dyeing/printing/experimental Textiles techniques with skill and control.
- Create a response to your chosen artists work using influence from their work.

What needs to be included to ensure a successful final piece?

- Commit to design throughout project.
- Use shape, scale and proportion accurately.
- Make your work as detailed as possible using the Textiles techniques explored.
- Take inspiration from your chosen artist and show clear development in response to their work.
- Create a mock-up of a final product.
- Create final product signifying the conclusion to the journey you have created throughout your sketchbook.

<u>Keyword</u>	<u>Definition</u>
Observation	The action or process of closely observing or monitoring something or someone.
Silk Printing	A design is cut out of paper or another thin, strong material and then printed by rubbing, rolling, or spraying paint or ink through the cut out areas.
Fabric Manipulation	Experimenting with the fabric to change its appearance, drape or shape.
Influence	Something or someone that influences a person or thing, then, has an influence on that person or thing.
Moodboard	An arrangement of images, materials, pieces of text, etc. intended to evoke or project a particular style or concept.
Batik	A method (originally used in Java) of producing coloured designs on textiles by dyeing them, having first applied wax to the parts to be left undyed.
Applique	Layering pieces of fabric that are sewn or stuck on to a larger piece to form a picture or pattern.
Toile	An early version of a finished garment made up in cheap material so that the design can be tested and perfected.

Artist Response

Responding to the work of other **artists** is a great way to generate ideas. ... Starting with a direct **response** showing their understanding of the ideas and aesthetic of an **artist**.



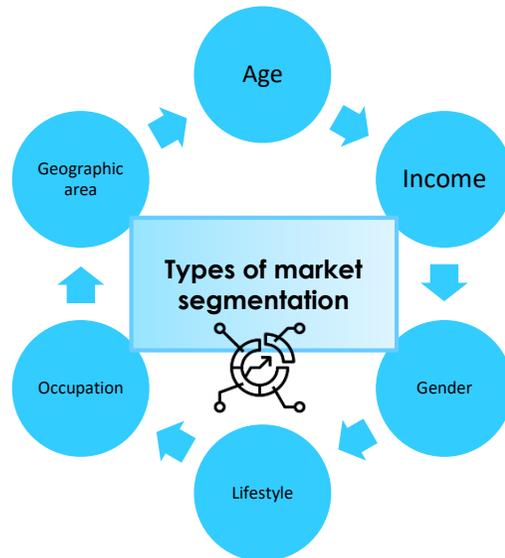
- **Learning Aims 1.1+1.2+1.3:** The need for customer segmentation

Why businesses segment their market.

Target market



Businesses sell a wide range of products and services. In order to decide which products and services to offer, a business divides the market into segments. This allows the business to produce goods and services to meet the needs of each of the different segments, known as their target market.



Key Term



Market segmentation: the division of a market into groups or segments.

Target market: a particular group of customers at which a good or service is aimed.



The benefits of market segmentation

Ensuring customer needs are matched and met: by focusing on one particular area, a business is more likely to meet the needs of their customers. For example: A shoe shop dedicated to children's shoes with have appropriately qualified staff, good customer service and specialist advice on the stock. There will be a range of shoe options and the equipment will be specialist for children such as chairs, measuring equipment. Customers are more likely to purchase the shoes, increasing profits

Increased customer retention: when a business is focused on their customers, it is more likely that customers will return to the business to make more purchases (customer retention)

Targeted marketing and increase in market share: when a business is aware of the market which it is aiming its products at, it is then able to deliver its marketing and advertisements to customers who have a key interest in the product being offered. This means the right customers are reached and marketing costs incurred will be less. With careful monitoring this could increase market share.

Learning outcome 1 – understand how to target a market

Knowledge Organiser – RO64

- **Learning Aims 1.4+1.5+1.6** : The purpose of market research

Key Term



Market Research: A place where buyers and sellers come together to trade goods and services.

It is vital to gather information about the market in which a business operates, the market changes over time. Research helps reduce risk, allows us to understand the market, aid in decision making and product development whilst taking into account customer views.

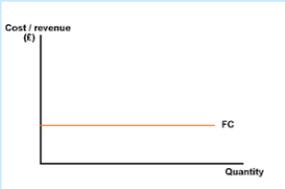
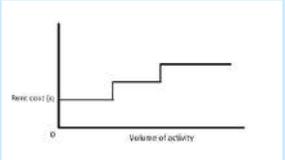
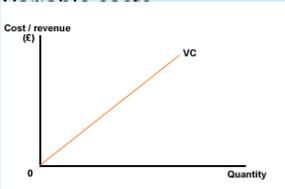
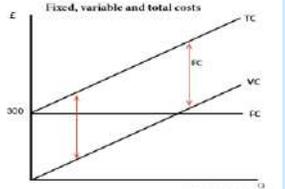
Primary	Secondary
<p>This is research which is collected first hand from the customer by the enterprise. The enterprise should always gain the respondents consent before conducting research.</p> <p><u>How can primary research benefit an business?</u> <input checked="" type="checkbox"/></p> <ul style="list-style-type: none"> • Gain new customers • Gather information about existing customers to keep them loyal • Tailor the wants and needs of the customer to make sure they leave satisfied • The enterprise is in control of the research, what they research and how they research; the data collected is then owned by the SME. <p><u>What might the drawbacks of primary research be?</u> <input type="checkbox"/></p> <ul style="list-style-type: none"> • It takes a lot of time and can cost an lot of money; • It may not be accurate (Ex: Sample size/Honesty) • It may be biased – the enterprise may word the questions in a way in which they get the answers they want. <p><u>What can these things lead to?</u></p> <ul style="list-style-type: none"> • Overall improved performance of the enterprise; • More satisfied customers; • The ability for the enterprise to enter new markets • Increase their products. <p><u>How can an enterprise gather primary research?</u></p> <ul style="list-style-type: none"> • Questionnaires; • Visits/observations; • Interviews; • Focus groups; • Surveys 	<p>Secondary research is research which has already been collected by someone else and you're using it to save you time and money. It may be freely available research or it may be research which it bought.</p> <p><u>How can secondary research benefit an business?</u> <input checked="" type="checkbox"/></p> <ul style="list-style-type: none"> • It is instantly available as it already exists; • It is publically available and often free to use; • If details of how it was collected are included it can help the secondary research understand the data better, including any challenges, making it more useful. <p><u>What might the drawbacks of secondary research be?</u> <input type="checkbox"/></p> <ul style="list-style-type: none"> • It is not possible to check the quality of the research • It may not be perfectly relevant to your enterprise • It may be out of date • The method of collection or the source of the research may not be relevant to your enterprise. <p><u>How can an enterprise gather secondary research?</u></p> <ul style="list-style-type: none"> • Online research, internet searches • Company materials • Market reports • Reports in trade journals and magazines • Government reports
<p>Qualitative – OPEN questions</p> <p>Collection of information such as ideas, feelings and thoughts. QUALITative research give QUALITY answers (i.e. the respondent can expand on their answer to give you lots of information).</p>	<p>Quantitative – CLOSED questions</p> <p>QUANTITative research is much easier to measure as it uses statistics. It can be used to spot patterns of identify trends.</p> <p>This research can tell you the Quantity of times something has happened, but not why (problem?) as it only deals in numbers.</p>



Learning outcome 2 – understand what makes a product or service financially viable

Knowledge Organiser – RO64

- Learning Aims: 2.1 + 2.2** – Cost of producing a product and revenue generated.

Type of cost 	Description	Examples
Fixed costs 	Costs that remain unchanged when the output of a business organisation changes. For example, the rental cost of a factory will not change regardless of making 10 units or 100 units.	<ul style="list-style-type: none"> Rent Loan repayments Advertising Insurance Salaries Utilities
Stepped costs 	It is likely that fixed costs will increase when a business organisation is working at full capacity. For example, if a clothes factor requires extra space to product its goods, its rental costs will increase	<ul style="list-style-type: none"> Premises rent Insurance
Variable costs 	Variable costs are costs that vary directly with the level of output. This means that the costs will be totally dependent on the level of output.	<ul style="list-style-type: none"> Stock Raw materials Components Packaging costs Wages
Total costs 	Total costs are calculated by adding together all of the businesses organisations costs for any particular level of output.	<ul style="list-style-type: none"> Fixed costs + variable costs

Key Term

Costs: expenses that businesses incur when producing and selling their different products.
Semi variable costs: is an expense which contains both a fixed-cost component and a variable-cost

Revenue is the amount of money that a business organisation earns from selling its goods or providing its services

Quantity	Price	Total Revenue
1	100	100
2	95	190
3	90	270
4	85	340
5	80	400
6	75	450
7	70	490
8	65	520
9	60	540
10	50	500

Important formulae

The formulae to work out variable costs is:
Total variable costs = variable cost per unit x output level

The formulae to work out total costs is:
total costs = fixed costs + variable costs

The formulae to work out total revenue is:
Total revenue = selling price per unit x number of sales

Learning outcome 2 – understand what makes a product or service financially viable

Knowledge Organiser – RO64

- **Learning Aims: 2.3 + 2.4** – Break even and profit level

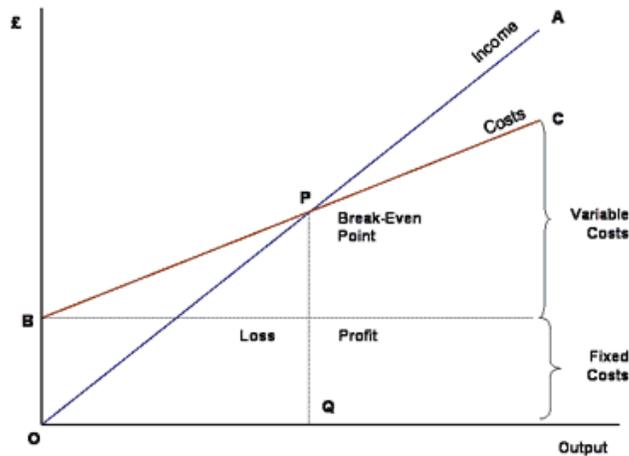
Break-even

Most businesses exist to make a profit. Profit is the reward for investing in the business organisation. However there are circumstances where this is not the case and the aim is simply to break-even.

Break even is the level of outcome at which total costs equal total revenue. At this point, a business organisation makes no profit and no loss.

The formulae to work out break even is:

$$\text{Break Even Point} = \frac{\text{Fixed Costs}}{\text{Total Sales Revenue} - \text{Cost to Make Product (Contribution Margin)}}$$



Key Term



Profit: a financial gain, the difference between revenue and costs

Contribution: is the amount left over after variable costs has been taken away from sales revenue.

Using break-even information



Break even is used by a business to determine how many units it needs to see in order to cover its costs and not make a loss.

Accountants may use this information to see how different sales levels will affect an organisation's profits. By determining how much should be sold, targets can be set for the sales team.

When launching a new business or trying to secure finance, a business owner may calculate break even information in order to persuade a bank to lend them money. Break even can form part of a business plan.

Profit level



How profit is calculated: business organisation often want to know how much profit a particular product or service is making. This can be calculated as:

$$\text{Selling price per unit} - \text{total costs per unit} = \text{profit or loss per unit}$$

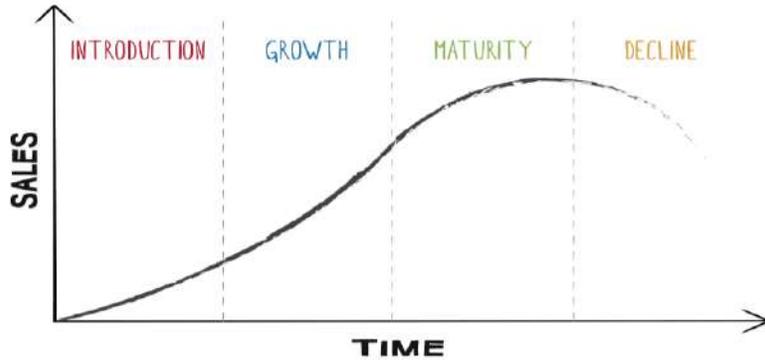
Cash flow



Cash flow is the money paid by the customer and then spent by the business. Cash comes into a business in the form of receipts. These receipts are known as cash flows. Cash goes out of a business in the form of payments, these are known as cash outflows.

$$\text{Net cash flow} = \text{cash inflow} - \text{cash outflow}$$

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Lifecycle Stage	Description	
Development	The business is researching and developing the product. Product testing and trials take place. The product is not yet ready for sale.	
Introduction	The business launches the new product on the open market and makes it available for sale. During this stage, the business advertise the product to encourage sales.	
Growth	Customers are familiar with the product and sales are increasing. At this time, sales are increasing at its fastest rate. If the product is a success, competitors may enter the market.	
Maturity	During this stage, sales of a product have reached their highest. It is likely that the number if new customers is reducing and growth is limited.	
Decline	In the decline phase, sales of the product will begin to fall. The business organisation will not actively advertise the product and will eventually remove the product from sale.	



Star: these products have high market share in a fast growing market.

Cash Cows: these products have a high market share in a slow growing market. They tend to be successful products that stay in the market for many years.

Question Mark: these products have a low market share in a fast growing market. These will be a concern for the business owners and may need to be retired. AKA problem children

Dogs: these products have a low market share in a slow growing market. A business will often remove these products from the market (unless needed to ensure sales of another more successful product).

Key Terms



Product Lifecycle: traces the journey of a product from its development and its launch to its removal from sale to the public.

Extension Strategies: Actions a business can take to extend the life of a product and increase sales.

Attracting new customers: Is when a business makes use of eye-catching advertisements or sales promotions to encourage customers to buy a product or service.

Adding Value: Added value is the difference between the selling price and the cost price of a good or service. This business can do this by adding new features to an existing product

- **Learning Aims 4.1+4.2:** Pricing a product, strategies and appropriateness of each

Factors to consider when pricing a product to attract and retain customers

Target market 	Price of competitor products	Cost of production
When deciding on a price, a business will need to understand: <ul style="list-style-type: none"> • The income levels of targeted customers • Whether or not the customers can afford the product Example: family car versus sports cars	 <p>Research of similar products currently on the market will enable a business to sell their products at a lower price and attract customers away from competitors. Remember the price needs to be high enough to make a profit</p>	<p>A business needs to make sure that the costs involved when making the product are covered when pricing the product for sale. Otherwise, they will make a loss.</p> <p>Example, if it costs 49p to make a product and you charge 99p, a profit of 50p will be made each time the product is sold.</p> 

Key Term 

Pricing Strategies - various methods that a business uses to attract customers to a particular product by changing the regular price to one that is often cheaper to gain an edge against their competitors 

Pricing strategies

Type of strategy	Advantages 	Disadvantages 
<p>Competitive pricing: this is when a business sets the price of the product which is similar to their direct competitors</p>	<ul style="list-style-type: none"> • Will attract new customers to the business and retain existing customers • Competitors sales could decrease as they may not be able to compete with the low prices 	<ul style="list-style-type: none"> • Businesses must think of other ways to attract customers, not just price. • Profit could be low as the price may only cover the production costs of the product
<p>Psychological pricing: aimed at customers who like a bargain by setting a price for a product that appeals to customers because of the value for money that it appears to show</p> <p>Example: £299 instead of £300 </p>	<ul style="list-style-type: none"> • Could attract new customers which would increase revenue and profit for the business. • Items could be sold for a little less than their actual value • Attracts customers as the price appears to be a good deal 	<ul style="list-style-type: none"> • If customers are purchasing online, the price may appear to be good value, but when shipping costs are added, the purchase could be abandoned. • Most people are aware of this strategy so may not be convinced that it is a good deal.
<p>Price skimming: A business can charge a higher price due to a lack of competitors. Aimed at customers who like to have the latest product</p> <p>Example: Apple iPhone </p>	<ul style="list-style-type: none"> • High profits can be achieved by a business when there is no competition in the same market • High prices give an impression of a good quality product. 	<ul style="list-style-type: none"> • Competitors can produce a similar products for a cheaper price • Customers may be put off by a higher price, as not value for money. • Some customers may not be able to afford the new product.
<p>Price penetration: often used when a product launches, where a low price is set first to attract new customers and they gradually increased. </p>	<ul style="list-style-type: none"> • Achieves high sales for the duration of the offer. • Attracts customers to the product because of the price • Increase market share 	<ul style="list-style-type: none"> • Profit margins will be reduced during the offer period. • Not all products will suit this pricing method, such as short-term fashions.

LEARNING OUTCOME 4: Attracting and retaining customers

Key Term



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Learning Aim 4.3: Types of advertising methods and the appropriateness of each

Businesses will use a variety of different method of advertising to inform customers of the different products that they are selling and to persuade them to purchase their products.

Advertising –how a business promotes the products and services that it sells to its customers using a variety of different ways depending on the budget they have to spent.

Leaflets

Often used by small businesses to target customers in the local area – for example, menus at fast food take-away

Advantages	Disadvantages
<ul style="list-style-type: none"> • Easy and cheap to produce • Inform customers about their products • Can target specific local areas • Large or small distribution • Attractive and eye catching 	<ul style="list-style-type: none"> • Are often discarded once read • Are a form of junk mail, which may not be read by customers • May be of poor quality, giving a poor impression of the business <ul style="list-style-type: none"> • Poor impact of sales.

Websites

Website inform customers of the products they sell and allow purchasing online

Advantages	Disadvantages
<ul style="list-style-type: none"> • Can increase sales by ordering directly from the business • Can target customer for special offers • Pay to put adverts on search engine results pages and for pop ups. • International customers 	<ul style="list-style-type: none"> • Customers who do not have internet access will not be informed about products. • Customer feedback could be negative • Customer details or company data could be hacked

Magazines

Usually issued on a weekly or monthly basis and are aimed at a specific target market

Advantages	Disadvantages
<ul style="list-style-type: none"> • They often compliment the content of the magazine • Readers tend to keep magazines longer than newspapers • Magazines will be given to others 	<ul style="list-style-type: none"> • Adverts can be very expensive in specialist magazines • They contain lots of other adverts, so businesses need to make sure their advert stands out.

Radio

Radio reaches local, national and worldwide audiences, therefore the adverts could be heard by a large audience, depending on the radio station

Advantages	Disadvantages
<ul style="list-style-type: none"> • Local radio adverts are cheap and easy to produce • Local radio adverts target a specific geographical audience • Music and words can grab the attention of the listener • National and international radio stations have a wide audience • 'listen again' enables listeners to hear a specific radio show again, including the adverts. 	<ul style="list-style-type: none"> • Peak listening times between 7-9am and 5-7pm will often be more expensive due to the increase in listeners. • The radio is often a background sound so some may not hear the adverts • 'listen again radio shows have an expiry date – normally 7 days.

Social Media

Social media is a useful method of informing users of new or existing product offers.

Advantages	Disadvantages
<ul style="list-style-type: none"> • Users can access the material often • A cheap method of advertising • Fast communication with customers <ul style="list-style-type: none"> • Proven to increase sales • Could generate international customers. 	<ul style="list-style-type: none"> • Information needs to be update frequently • Customers must be social media savvy • Limited to a specific age group of customers • Resources for monitoring is needed daily

Newspapers

Adverts appear in various sizes, colours and shapes. Can be placed daily or weekly. Free and local papers are cheap

Advantages	Disadvantages
<ul style="list-style-type: none"> • Specific target groups per paper. • Free or low cost for local papers • Middle ages/ older target market • National papers have wide audience 	<ul style="list-style-type: none"> • Newspaper reading has fallen in the last 10 years. • National papers are more expensive • Younger readers are less likely to read.

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Learning Aim 4.4: Sales promotion techniques

Sales Promotion – offers that a business promotes to encourage more sales for their business.

Discounts are a good way to get customers to notice a product, such as:
Why a business reduces the price of a product for example 10% off
After a seasonal period has ended, further discounts could be offered which would be good for customers but not for profits



Competitions can general sales, if the prizes are something the customer wants to try and win. Usually appear on the side of packaging.



Buy one get one free (BOGOF) is where a customer purchases one product at normal price and then gets another for free, making the value to the customer greater.



Point of sale advertising is when customers go to the checkout to pay for items and the advertising of other items entices the customer to purchase an extra item.

Example: supermarkets which confectionary items



Advantages	Disadvantages
Products are noticed more by new customers which would generate more sales in the long term.	Profit made on the item is reduced during the promotion.



Advantages	Disadvantages
Competitions have been around for many years and can be a way of gaining new customers.	Often people do not see the competitions on the packaging or may not be interest in the prize.



Advantages	Disadvantages
Businesses use this strategy to generate more sales of a product to sell off old stock or if they are going to rebrand a product with new packaging	The products profit margins are reduced as a result of this promotion method



Advantages	Disadvantages
Impulse purchases are made by customers and the products are easily accessible for customers	It can encourage customers to buy unhealthy food choices and generate bad publicity for a business.



Free gifts can provide an incentive for a customer to purchase a particular product compared to a competitor. For example a free toy, quiz book or shower gel.



Advantages	Disadvantages
Free gifts can increase sales and profits at the time of the offer for the business.	Customers may expect to receive a gift every time they make a purchase and there is a time limit for the promotion before returning to normal offering.



Product Trials is when business want the views of customers about a new product For example taste testing



Advantages	Disadvantages
Instant feedback is gained from customers New sales can be generated increasing business sales	If the product is not liked, money will have been wasted on producing it. There may be regional variation



Loyalty schemes are popular with supermarkets. Customer collect points which can be exchanged at a later date for other goods.

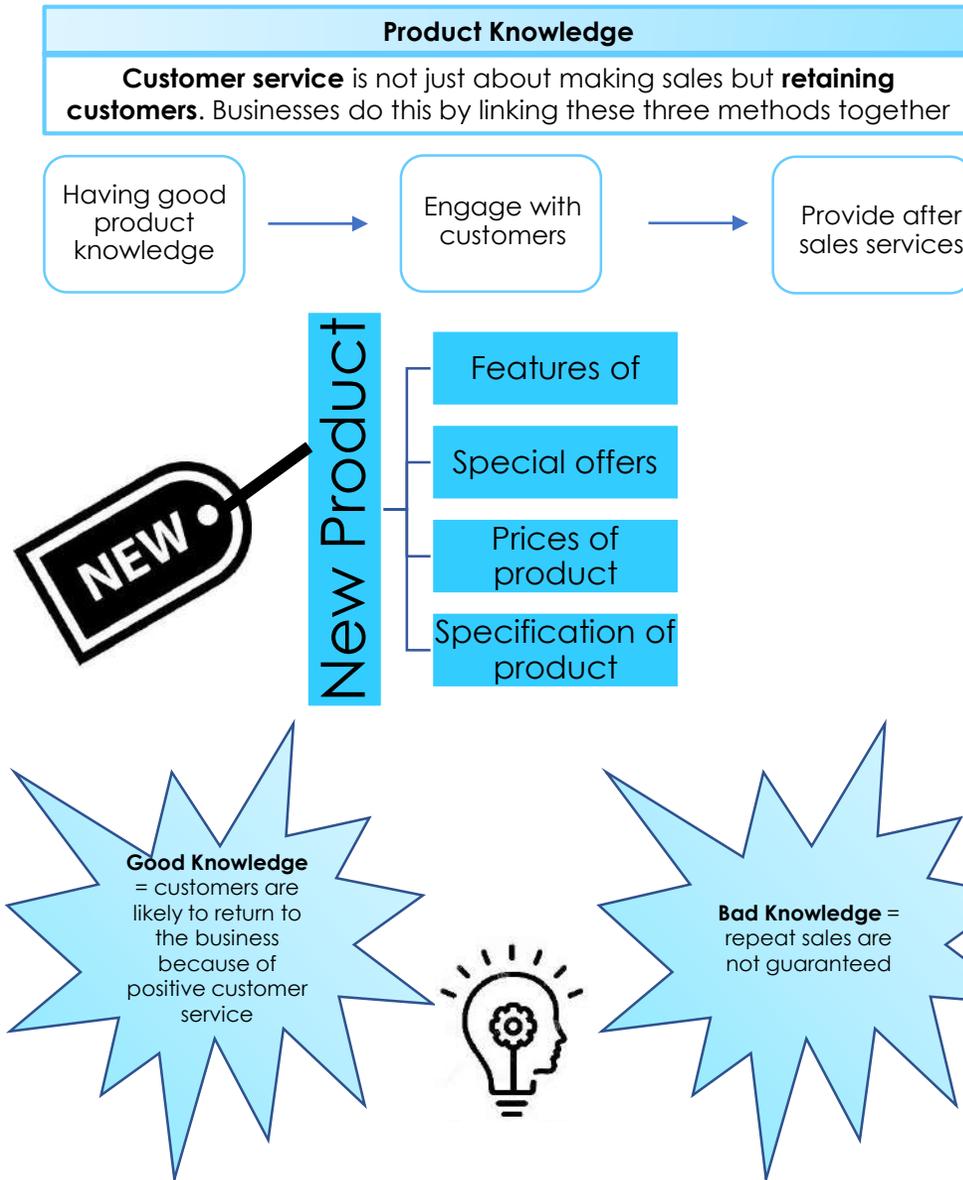


Advantages	Disadvantages
Encourages repeat customer for the business Market research can monitor shopping habits Special offers can be targeted to specific customers.	Customers may not be interest in a loyalty scheme Customers may forget their loyalty card, missing out on gaining points Loyalty cards are not as popular as they once were.

LEARNING OUTCOME 4: Attracting and retaining customers

- **Learning Aim 4.5:** How customer service attracts and retains customers

Knowledge Organiser - RO64



Key Terms



Customer service – a key functional area which deals with a variety of different needs and questions from customers, before, during and after sales have been completed.

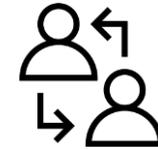
Retaining customers – methods adopted to encourage customers to return to the business to purchase more products in the future.

Product Knowledge – is a detailed understanding of the product that a business sells.

Customer Engagement

Customer engagement means that staff needs to:

- Have good listening skills
- Be patient to understand the customers' needs and wants
- Know the customer requirements
- Have good product knowledge
- Have excellent personal presentation
- Remain professional at all times



After-sales service

After-sales service will be used by customers if there is an issue with the product that they have purchased. Businesses hire staff to deal with issues such as deliveries, faulty products, damaged goods, exchanges or advice on how to use the product.

It is important that they staff are trained to:

- Deal with angry or upset customers
 - Resolve an individual's issue
- They must remain helpful, friendly, calm and professional at all times



- **LO5: Understanding factors for consideration when starting up a business**

There are several different types of business ownership. In this section, we will learn about what these are, the main features, the responsibilities of the owners and how the type of ownership usually relates to the size and scale of the business.

Limited Company

A limited company is a business owned by shareholders and run on a day-to-day basis by directors

Private Limited Company (LTD)



Public Limited Company (PLC)

Both LTD and PLC have the same advantages and disadvantages

Advantages

- Each Shareholder has limited liability
- Easier to raise finance
- It is easier for the business to borrow money

Disadvantages

- Expensive to set up
- Less control over the company
- The company must pay an annual fee and product yearly documents

The **main difference** between a LTD and a PLC is that in a **private limited company the shares are not offered for sale to the general public** where as in a **public limited company they are!**

- **OWNERSHIP FOR BUSINESS START-UPS**

The Private Sector



The private sector includes businesses that are owned by private individuals. Business in the private sector include:

- **Sole Traders**
- **Partnerships**
- **Private limited companies (LTD)**
- **Public limited companies (PLC)**

The Public Sector



The public sector is made up of::

- **Central government**
- **Local government**
- **Business that are owned by the government – Post office**

Unlimited Liability

The owners of the business are personally responsible for the debts of that business. This applies to sole traders and partnerships.

Limited Liability

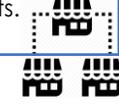
The owners of the business are **NOT** personally responsible for the debts of that business. If the business goes bankrupt the owners are not personally liable.

Knowledge Organiser – L05

- **L05: Understanding factors for consideration when starting up a business**

- **OWNERSHIP FOR BUSINESS START-UPS**

Sole trade	Partnership	Franchise
<p>An individual person owns a business. unlimited liability</p> <p>They can employ other people. Some examples include – hairdressers, plumbers or electricians.</p>	<p>Two or more people own a business. unlimited liability</p> <p>Jointly responsible for the business. Some examples are solicitors, small restaurants, dentists, vets</p>	<p>A franchise is when one business, the franchisor.</p> <p>Gives permission to an entrepreneur, the franchisee, to set up a business using its brand name and its products.</p>



Advantages

- Shared responsibility
- Shared workload
- Partner – brings different skills and attributes
- More capital – investment from different partners



Advantages

- Easy to set up with low cost
- Decide what happens to the profit
- Choose their own working hours and holidays
- Limited legal requirements in relation to accounting



The franchisee:

- Pays a start-up cost – this covers equipment and sometimes a premises.
- Pays a royalty each year – this is a percentage of the revenue earned.
- Must follow the rules laid down by the franchisor.

The franchisor:

- Provides equipment and resources
- Provides training

Disadvantages

- Growth slow – due to amount of money available
- Limited amount of work one person can do
- Long working hours (hard to take holidays)
- Unlimited liability – must pay for all debts



Disadvantages

- Cannot make a decision without all partners agreeing – time consuming
- Problems agreeing can lead to disagreements and conflict
- Share profits
- Partners reputation affects business



Advantages

- Easier to raise finance as the brand is well known
- Support and training is offered
- Easier to gain customers as brand is already established



Disadvantages

- Rigid rules to be followed
- Start-up costs and operating fees are expensive



- **LO5: Understanding factors for consideration when starting up a business**

- **SOURCE OF CAPITAL FOR BUSINESS START-UPS**



When starting and setting up a new business, it is vital that the owner is able to secure the capital (finance or money) required to fund the businesses.



The appropriateness of each source of finance will depend on a number of factors:

- Purpose – what does the business require the money for?
- Time period – how long does the business need the money for?
- Amount – how much money is required?
- Type of business – the size and ownership of the business will affect the type of finance that is available.



Source of Finance	Description
Bank Loan 	An amount of money is borrowed from the bank, then repaid (with interest) over a set period of time
Crowd funding 	Groups of investors that join together to offer funding to a business
Small Business Grant 	Money given to the business by the government or charity Used to help finance new projects – especially those that create new jobs
Business Angel 	Finance invested in small, risky business e.g. new business start-ups by experienced and wealthy entrepreneurs
Owners Savings 	Money put into the business by the owner

Knowledge Organiser - LO5

- **LO5: Understanding factors for consideration when starting up a business**

- **SOURCE OF CAPITAL FOR BUSINESS START-UPS**

Source of Finance	Advantages	Disadvantages
Borrow money from friends / family 	<ul style="list-style-type: none"> • May charge little or no interest • Do not have to provide security 	Could lead to disputes between family members and friends <ul style="list-style-type: none"> • May not be able to lend large amounts
Own savings 	<ul style="list-style-type: none"> • Does not have to be paid back 	There may be a limit to the amount of money which can be invested
Crowd funding 	<ul style="list-style-type: none"> • It can be a fast way to raise finance with no upfront fees • Can be a valuable form of marketing and result in media attention 	If the target is not reached, all the money will have to be paid back <ul style="list-style-type: none"> • Someone can steal your idea if it is not protected
Small business grants 	<ul style="list-style-type: none"> • Does not have to be paid back • Do not need to lose control of your Business 	there may be strict rules and not every business is eligible
Bank Loans 	<ul style="list-style-type: none"> • The repayments can be spread out over a long period of time • Access to larger amounts of finance 	Must be paid back with interest <ul style="list-style-type: none"> • Lender may require security for the loan
Business angels 	<ul style="list-style-type: none"> • BA have lots of experience which helps with decision making • Can bring in large amounts of finance • No repayments or interest 	the owners lose a certain percentage of the business

Knowledge Organiser - LO5

- **LO5: Understanding factors for consideration when starting up a business**

- **THE IMPORTANCE OF A BUSINESS PLAN**



What should a business plan include?

A simple description of the business or idea
 Business aims and objectives – the goals the business would like to achieve
 Key business targets – goals that need to be met
 Business strategies – long term plan of action
 Plans and forecasts – demonstrates how the business will operate e.g.

What is a purpose of a business plan?



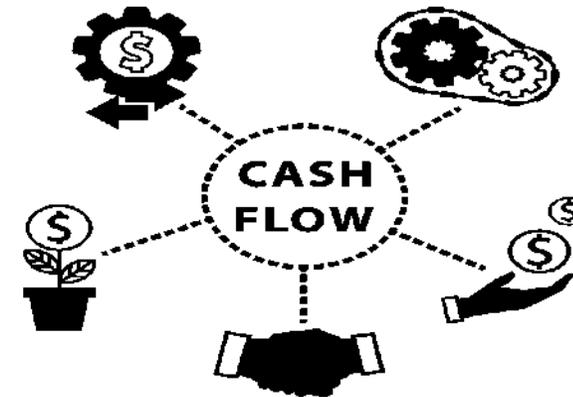
1. It helps the business to manage its cash flow – breakeven analysis, profit forecasts – how much to spend on, where to spend money on, when to spend money
2. It explains a business idea to others – you can show a business plan to a bank to help get a bank loan
3. It measures progress towards goals – e.g. time scales, sales forecasts, when will we the business get money back
4. It helps to identify potential problems – e.g. any financial shortages



Importance of cash flow?

If a business runs out of cash, it will not be able to pay for its workers or stock. If this happens, the business is then classed as insolvent. The owners will either have to raise additional money or close the business.

To prevent this from happening, a business will carefully monitor its cash flow to ensure it has sufficient money to pay its liabilities. The business will often plan ahead by preparing a cash flow forecast.



LEARNING OUTCOME 6:

- **Learning Aim 6.1** The purpose of each of the functional activities that may be needed in a new business and the main activities of each functional area

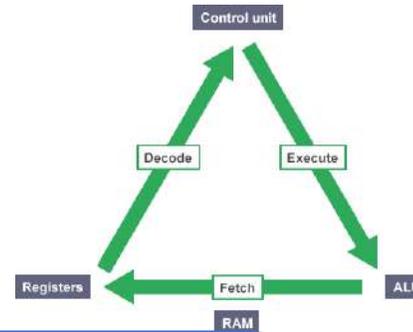
Functional Areas		Key Terms				
<p>Marketing Identifies the needs and wants of their customers. Develop products that customers would want to purchase</p>		<p>Functional activities- The range of tasks that each functional area will complete within their area of specialism.</p>				
<p>Finance Manage all the finances for the business and record and report on financial performance.</p>		<p>Functional areas The different sections of a business which are divided into different areas of expertise.</p>				
<p>Human Resources (HR) Responsible for managing individuals work for the business.</p>		<p>4P's-stands for Product, Price The different sections of a business which are divided into different areas of expertise.</p>				
<p>Operations Organise and cost how the products will be processed, made and delivered to their customers.</p>		<p>Logistics How a business manages the production of their product from manufacture to point of sale</p>				
		<p>Quality control Ensuring the finished product meets the standards that are expected</p>				
		<p>In a small business, some of the tasks may be completed by one or two people. In a larger business, they will have many people working within each functional area due to the size of the business.</p>				
		<table border="1"> <thead> <tr> <th>Advantages of having a small business</th> <th>Disadvantages of having a small business</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> • Staffing costs are small • Communication is often much easier if information needs to be sought </td> <td> <ul style="list-style-type: none"> • may not have the knowledge all skills to complete all the tasks well • Vital mistakes could be made • Mistakes can cost the business their reputation or financial fines, for example if bills are not paid in time. </td> </tr> </tbody> </table>	Advantages of having a small business	Disadvantages of having a small business	<ul style="list-style-type: none"> • Staffing costs are small • Communication is often much easier if information needs to be sought 	<ul style="list-style-type: none"> • may not have the knowledge all skills to complete all the tasks well • Vital mistakes could be made • Mistakes can cost the business their reputation or financial fines, for example if bills are not paid in time.
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		<p>Marketing Responsible for completing market research, developing the 4p's, understanding and services that the business produces. This is sometimes known as the marketing mix. Satisfying the needs and wants of the business' customers</p>				
		<p>Finance Responsible for all things finance related.</p> <ul style="list-style-type: none"> • Paying employees ▪ Making and receiving payments ▪ Recording financial transactions ▪ Preparing annual financial accounts including statement of financial position and income statement ▪ Cashflow forecasts and financial performance 				
		<p>Human Resources (HR) HR recruit and select employees who will work for the business. They manage the performance of the employees and ensure that health and safety and employment legislation is complied with. Focus: Training, Health, Employment (legislation) Safety, Recruitment, Performance</p>				
		<p>Operations Responsible for managing the production processes (logistics). They plan this process making sure that they have:</p> <ul style="list-style-type: none"> • All the necessary raw materials <ul style="list-style-type: none"> • Working machinery • Staff to operate equipment • Quality control (ensuring the finished products meet the standards that are expected) 				

Year 10 – Computer Science – 1.1 System Architecture

VON NEUMANN ARCHITECTURE

describes a system where the CPU runs programs stored in memory. Programs consist of instructions and data which are stored in memory addresses as binary digits

In short this is the internal, logical structure and the organisation of the computer hardware



Possible Careers

- Computer hardware engineer
- Computer developer
- System Engineer

CPU - summary

- Fetches instructions (from memory)
- Fetches data (from memory)
- Decodes instructions
- Executes instructions

PROGRAM COUNTER (PC)

STORES THE LOCATION OF THE NEXT INSTRUCTION IN A PROGRAM WAITING TO BE FETCHED

MEMORY ADDRESS REGISTER (MAR)

STORES THE LOCATION FOR DATA TO BE FETCHED FROM OR SENT TO MEMORY

MEMORY DATA REGISTER (MDR)

STORES THE DATA THAT HAS BEEN FETCHED FROM OR IS WAITING TO BE SENT TO MEMORY

ACCUMULATOR

STORES THE RESULT OF THE CALCULATION PERFORMED BY THE ALU

CURRENT INSTRUCTION REGISTER

STORES THE INSTRUCTION READY TO BE DECODED BY THE ALU

ARITHMETIC LOGIC UNIT (ALU)

part of a (CPU) that carries out arithmetic and logic operations in computer instruction

CONTROL UNIT (CU)

WORKS WITH THE CPU TO CONTROL THE FLOW OF DATA WITHIN THE SYSTEM AND TO DECODE INSTRUCTIONS

CACHE

SMALL TEMPORARY VOLATILE MEMORY, STORES FREQUENTLY USED INSTRUCTIONS. QUICKER FOR CPU TO ACCESS THAN MAIN MEMORY

MAIN MEMORY (RAM)

This the volatile memory that stores data and programs **currently in use**.

Fetch- Decode – Execute cycle – How the CPU processes instructions:

FETCH:

The processor checks the program counter to see which instruction to run next.

The program counter gives an **address value** in the memory of where the next instruction is.

The processor fetches the instruction value from this memory location.

DECODE:

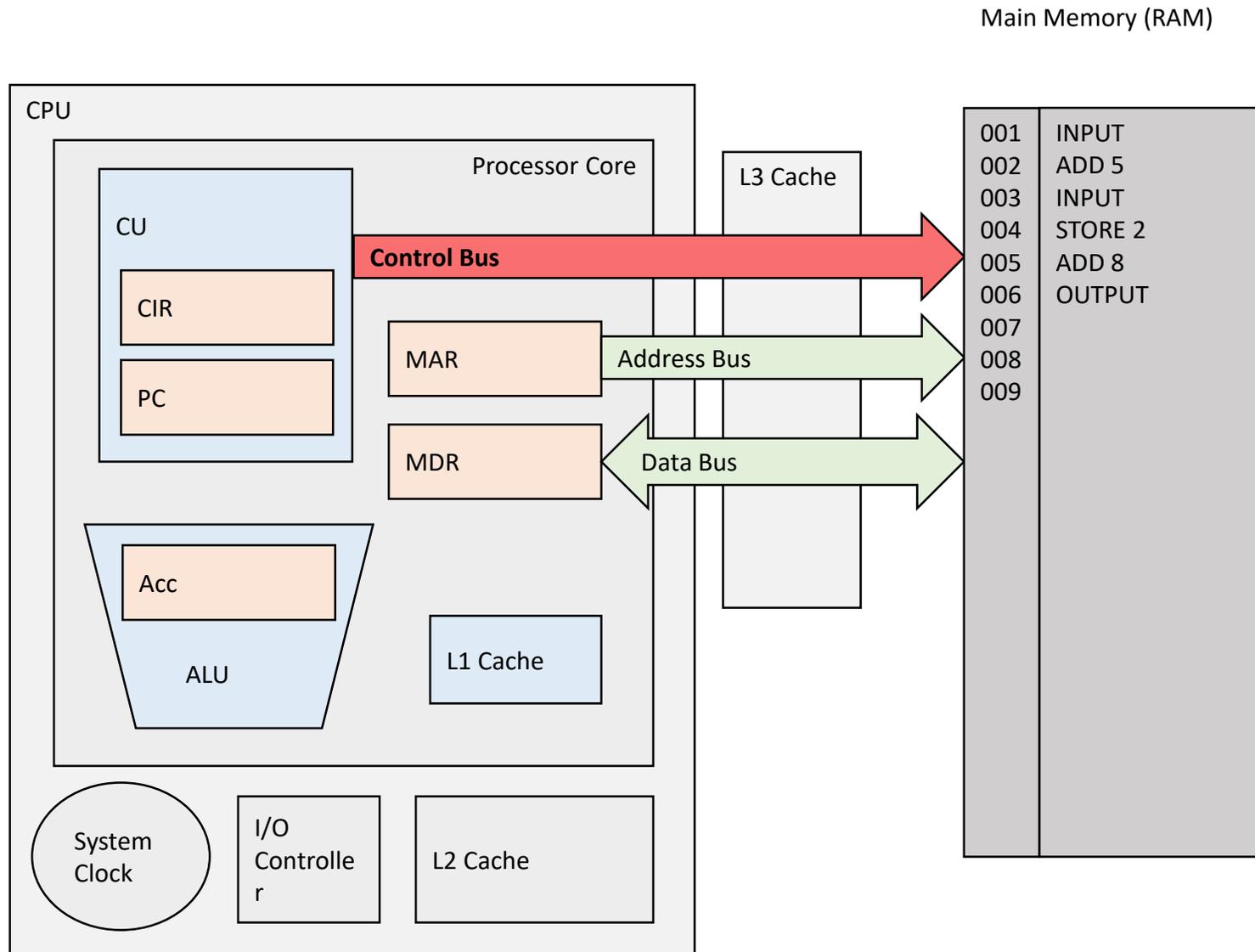
Decoding the instructions in the the ALU, storing the result of this in the CIR.

EXECUTE:

The instruction is performed. Once this is complete, the processor goes back to the program counter to find the next instruction.

This cycle is repeated until the program ends.

Year 10 – Computer Science – 1.1 System Architecture



1. Contents of Program Counter (PC) assigned to Memory Address register (MAR)

2. PC incremented by 1 and assigned to PC.
AT THE SAME TIME the addressed contents of memory is assigned to the MDR (memory Data register)

3. Then the contents of MDR is assigned to CIR (current Instruction register) the instruction is decoded and executed

4. The Instruction is decoded in the ALU where all logical and arithmetic calculations are performed. The results of this are stored in the Accumulator.
The instruction is then executed and the cycle starts again

Year 10 – Computer Science – 1.1 System Architecture

What is the purpose of the CPU?

It Processes Data by fetching, decoding and executing instructions.

HINT: when you answer this type of exam question – you need to EXPLAIN WHY - putting more cores = better performance isn't enough!

FACTORS AFFECTING PERFORMANCE OF CPU:

Clock Speed (measured in Hertz)

- Represents the number of fetch execute cycles / instructions the CPU can process in a given time
- The higher the clock speed the faster the CPU will run **WHY? – Because it will be doing more Fetch-Decode and Execute cycles per second which means more instructions are being processed.**

Cache Size

- The holding area for data from the RAM – stores frequently used instructions. More cache then the better the performance. **WHY? The more cache the CPU has the less time is spent accessing memory (RAM) this means it can retrieve instructions quicker and programs can run faster.**
Level 1 Cache – Quicker to access, doesn't store as much, Level 2 = slightly slower to access, holds slightly more than L1, Level 3 = Even slower to access than L2, but can hold even more

Number of Cores

- Number of Independent processors within the CPU.
- Multiple Instructions able to be processed simultaneously in the same cycle
- The more cores the quicker the performance – **WHY? Quad Core = 4 cores. Can perform 4 instructions at same time in same cycle, 8 cores can perform 8 instructions simultaneously so more cycles/instructions are being processed per second**

EMBEDDED SYSTEMS:

They are dedicated systems that are designed for a fixed purpose. They are a system within a larger system
e.g. Washing machines, car park barriers, microwaves, car engines, MP3 etc

GENERAL PURPOSE SYSTEM:

A machine that is capable of carrying out some general data processing under program control. Your PC /laptop is an example of this but also it could be something far more basic too.

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 – 1.3 Storage

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:

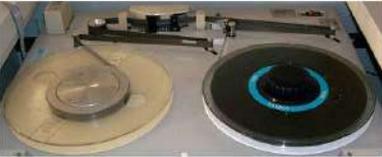
Allows you to save and store things that you need/use on a regular basis or need to use at a later date.

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 – 1.3 Storage

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 – 1.3 Storage

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

$$2 * 10 * 2 * 30 = 1200 \text{ bytes or...}$$
$$..1200/1024 = 1.17 \text{ KB}$$

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 ...

... $811008/1024 = 792\text{KB}$

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?

$1100/1024 = 1.07 \text{ KB}$

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)

$$1 \times 0.10 = 0.1$$

So we now know that 10% of 1 is 0.1

Lets add this to 1

$$1 + 0.1 = 1.1 \text{ overhead}$$

Year 10 – Computer Science – 1.3 Storage

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

$12,540 / 1024 = 12.24$ kb

In short:

**$(6+20+15+8+4+4) * 200 * 1.1 = 57 * 200 * 1.1 = 12540$
bytes = 12.24 KB**

Year 10 – Computer Science – Programming Techniques

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

Careers

- Software development
- Programing
- Software Engineering

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 – Programming Techniques

Comparison Operators

==	Equal to
!=	Not equal to
<	Less than
<=	Less than or equal to
>	Greater than
>=	Greater than or equal to

Aritmetic Operators

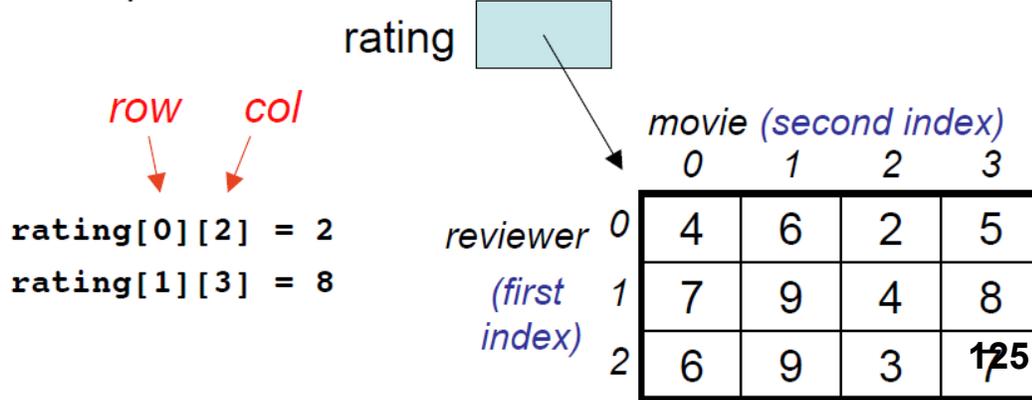
+	Addition eg x=6+5 gives 11
-	Subtraction eg x=6-5 gives 1
*	Multiplication eg x=12*2 gives 24
/	Division eg x=12/2 gives 6
MOD	Modulus eg 12MOD5 gives 2
DIV	Quotient eg 17DIV5 gives 3
^	Exponentiation eg 3^4 gives 81

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:



Year 10 – Computer Science – Data Representation

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 – Data Representation

Binary to Hex

00111010

8	4	2	1	8	4	2	1
0	0	1	1	1	0	1	0

3 A

Hex to Binary

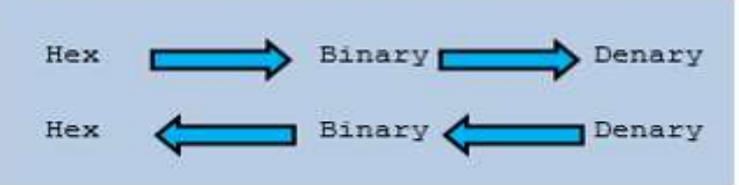
4B

8	4	2	1	8	4	2	1
0	1	0	0	1	0	1	1

128	64	32	16	8	4	2	1
0	1	0	0	1	0	1	1

- 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



HEXDECIMAL
BASE 16. Uses 0-9 and then A-F
 Notice that we use the values A-F to represent 10-15

- Careers**
- Software development
 - Programing
 - Software Engineering

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

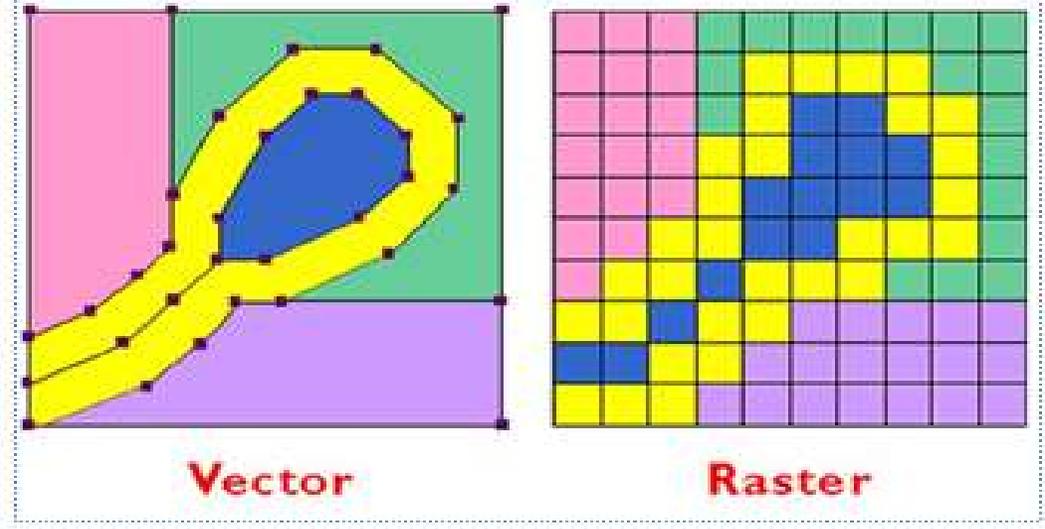
Year 10 - iMedia (ICT) - LO1

You must know file formats used for audio, video and images and to describe their features

Common bitmap (raster) image file types		
File Type	Advantages	Disadvantages
.JPG (bitmap)	Compresses well, so creates smaller file sizes. Reproduces millions of colours Good for web and printing	Lossy file format Variable picture quality Cannot be used for animation
.TIFF (bitmap)	Lossless file format Reproduces millions of colours Standard format for print/publishing industry	Large files Limited compression Doesn't support transparent background
.GIF (bitmap)	Lossless file format Enables animations (very popular use) Sharp edges to images	Large file size Only 256 colours can be reproduced
.PNG (bitmap)	Lossless file format Reproduces millions of colours Excellent transparency in images	Compresses well Not suitable for digital photos No animation
.BMP (bitmap)	Works in many devices Millions of colours Lossless file format	Uncompressed Large file formats No compression

Common vector image file types		
File Type	Advantages	Disadvantages
.EPS (vector)	Most common vector type Standard for sharing in print publishing industry	Not widely supported in editing software Generally Adobe only software
.SVG (vector)	Scalable without image quality reduction International standard for vector graphics High quality printing possible Good web browser support	Not widely supported in software File sizes can be large with many elements
.PDF (vector)	Widely supported by many devices Free to view PDF files Small file size	Not free to edit PDF files Too difficult to edit, text is treated as images
.AI (vector)	Scalable without image quality reduction Industry standard for professional vector graphics	Requires Adobe software to edit Cannot be viewed on websites
.DXF (vector)	Standard format used for Computer Aided Design (CAD) Well supported in many software applications	Large file sizes Data can be lost when shared across different software

File size compression	
Lossy compression	<ul style="list-style-type: none"> Data is removed from the file to reduce the size of the file The process cannot be reversed, data loss is permanent Increased compression introduces a greater reduction of image quality Ideal for communication over the internet and viewing on small screens
Lossless compression	<ul style="list-style-type: none"> All original image quality is retained, hence no loss Slight decrease in file size Ideal for archiving images to retain original quality Used for large images, such as posters and billboards



Year 10 - iMedia (ICT) - LO1

You must be able to identify a wide range of hardware, software and peripherals required to create and view multimedia.

Hardware Requirements	Use and purpose
CPUs	Central Processing Unit (CPU) is an essential part in any computer. It is considered as the brain of computer, where processing and synchronization of all activities takes place. The efficiency of a computer is judged by the speed of the CPU in processing of data. For a multimedia computer the latest processor is preferred because of its higher efficiency.
Monitors	The text or graphics in a monitor is created as a result of an arrangement of tiny dots, called pixels. Resolution is the amount of details the monitor can reproduce. Resolution is defined in terms of horizontal and vertical pixels (picture elements) displayed on the screen.
Video Cards	Video cards convert the information from the CPU into images that can be displayed on the monitor. They have their own specialist high speed processors (Graphics Processor Unit or GPU) and have their own high speed memory.
Sound Cards	Sound cards convert the digital representation of sound into an analogue signal that we can hear. The quality of sound reproduction is also depended on how fast and accurately the sound card converts digital to analogue.
Storage	Secondary storage, such as hard disk drives (HDD) and Solid State Disk Drives (SSD) are required to store the computer software and to save multimedia files. Peripheral storage is used to back up multimedia files, such as USB drives, CD-ROMs, DVDs or Blu-ray discs. More recent Blue-ray discs can store larger files.
Touchpads	Touchpads are commonly used for controlling photo editing by professionals. They are touch and pressure sensitive and are more accurate than mice.

- This list contains some examples. You should be able to use your notes to identify other items.
- Hardware, software and peripherals that are used to create multimedia is typically different to that which is used to view the final product.



Monitors are required to reproduce the multimedia. Photographic monitors are able to reproduce most of the colours accurately.



Video cards use high speed GPUs and fast memory to do the maths needed to create high resolution, high colour depth images in fractions of a second.



SSD drives are the latest technology for storing computer files and software. They use computer chips that are faster at reading and writing data than conventional HDDs which use magnetic spinning disks.



High speed (clock speed) and multiple core CPUs will reduce the time taken to edit and produce multimedia products.



High quality sound cards are needed for professional audio recording and playback. They will have several inputs for instruments, microphones and outputs for monitors.



Touchpads are specialist input devices that are used predominantly for photo editing. They use a pen to select and markup edits. They are more flexible than mice and sense how hard the pen is pushed.

Year 10 - iMedia (ICT) - LO1

You must be able to identify a wide range of multimedia products, where they are used and give details of their design principles

Multimedia Elements	Design principles.
Colour Scheme	Colour scheme must be chosen to suit the purpose for the target audience. The choice of colours cannot be accidental and there should be serious consideration of the reasons that a specific range of colours have been chosen. A consideration of combination of colours in a multimedia product must also be considered should be chosen to meet the purpose of the multimedia product. All choices must be compatible with the scenario and the users needs are the important considerations for choosing the colour scheme.
House Style	The house style is a consistent use of multimedia elements throughout the whole multimedia product. House styles maintain a common layout, colours and fonts. A house style is typically maintained by creating a template. An organisation will wish to maintain the house style across all their documentation and multimedia products so for their customers can immediately recognise it.
Layout	Layout is how the design of certain multimedia elements are positioned within a multimedia product. The position of headings, images, font size, colours and other multimedia elements have been decided after planning using visualisation drawings to assess the most appropriate layout. The layout will be completed after taking into consideration users needs and the target audience. The layout must operate for every platform the users access the multimedia product, e.g. PC, tablet or smartphone.
GUI	Graphical User Interface must be easy to use by everyone who access the multimedia product, whether it is a DVD interface, kiosk interface, touchscreen or mouse controlled user interface. The GUI will have a layout that the user finds accessible and easy to navigate. A GUI design will be assessed with visualisation diagram to determine where navigation the best button size and placement or if hyperlinks are used.
Accessibility	Accessibility is about making a multimedia product available to a wide range of the community through good design. A range of multimedia elements come together to improve accessibility; such as, colour scheme, size of fonts, GUI design, layout. The multimedia product, such as a website or DVD, might be able to display the content in different languages to make it available to a wider community.
Navigation methods	The choice of navigation method is important to enable the user to be able to use the multimedia product. This could be using different forms of input technology such as voice control, hand gesture, touch screen, keyboard or mouse. It is also about how the multimedia product interacts with the users input to enable the user to be able to easily use the multimedia product.

Year 10 - iMedia (ICT) - LO1

You must be able to identify a wide range of multimedia products, where they are used and give details of their design principles

Multimedia Products	Design principles.
Websites	<p>Websites are an interactive multimedia product that can be accessed by users who have a connection to the internet. Websites are built using a wide range of multimedia elements (see previous page). A computing device that is able to run a web browser with an internet connection is required. Navigation is either through touchscreen or mouse control. Performance is related to the speed of the internet connection and the quantity and size of the multimedia elements built into the web page.</p> <p>Websites are used extensively for on desktop and mobile computers to access a wide range of multimedia elements. Websites can provide audio streams (e.g. Spotify) and video (e.g. YouTube and iPlayer). Generally the more multimedia elements that are present requires higher speed internet connections to make their operation smoother.</p>
Information Kiosks	<p>Information kiosks are a wide range of multimedia products such as bank ATMs, supermarket self service checkouts, hospitality kiosks, airport check in kiosks, tourist information kiosks, railway ticket machines and fast-food order points. These multimedia products are usually single purpose machines that need special hardware and software to make them operate. Generally they have a large touch screen and some have audio capabilities. They can also have peripheral technologies printers for tickets, and cameras or small keypads. Information kiosks are usually limited by being positioned in a fixed location and wired to a network connection to provide information from a database system.</p>
Mobile phone applications	<p>Smartphones are able to support a wide range of multimedia elements. With high performance touchscreens, WiFi, Bluetooth, motion sensors, speakers, microphones, they provide smartphone applications a wide range of possibilities. The majority of smartphone applications rely on an internet connection and use the touchscreen to operate the software. The GUI can use buttons or hyperlinks as well as other integrated sensors. The hardware is usually fixed at purchase with the exception of some allowing the addition of memory cards. Smartphones are able to produce a range of multimedia elements, such as audio, video and still images. Smartphone applications can have different layouts, GUIs and do not always have the same appearance. Touchscreen technology makes accessibility difficult with visual impairments.</p>
E-learning products	<p>E-Learning products will use a wide range of multimedia elements such as video, audio. E-Learning can be provided on DVD, where the user navigates by selecting the content and viewing a video or some software that is included on the DVD disk. The user is limited to using a computer with a DVD drive to see the video content and to run any software. More recently, e-Learning is also provided through websites which can be accessed from a wider range of devices.</p>

Year 10 - iMedia (ICT) - LO2

You must be able to demonstrate a through understanding of legislation in relation to multimedia assets and products.

The Data Protection Act (1998)

The Data Protection Act is a law that controls how your personal information is used by organisations, businesses or the government.

Everyone responsible for using data has to follow strict rules called 'data protection principles'.

They must make sure the information is:

- ⇒ used fairly and lawfully
- ⇒ used for limited, specifically stated purposes
- ⇒ used in a way that is adequate, relevant and not excessive
- ⇒ accurate
- ⇒ kept for no longer than is absolutely necessary
- ⇒ handled according to people's data protection rights
- ⇒ kept safe and secure
- ⇒ not transferred outside the European Economic Area without adequate protection

There is stronger legal protection for more **sensitive information**, such as:

- ⇒ ethnic background
- ⇒ political opinions
- ⇒ religious beliefs
- ⇒ health
- ⇒ sexual health
- ⇒ criminal records

Intellectual Property Act (2014)

Intellectual property refers to creations of the mind: inventions; literary and artistic works; and symbols, names and images used in commerce.

Having the right type of intellectual property protection helps you to stop people stealing or copying:

- ⇒ the names of your products or brands
- ⇒ your inventions the design or look of your products
- ⇒ things you write, make or produce

Intellectual property is divided into two categories copyright and Industrial Property.

Industrial Property includes patents for inventions, trademarks, industrial designs and geographical indications.

Intellectual property rights are like any other property right. They allow creators, or owners, of patents, trademarks or copyrighted works to benefit from their own work or investment in a creation. These rights are also outlined in Article 27 of the Universal Declaration of Human Rights, which provides for the right to benefit from the protection of moral and material interests resulting from authorship of scientific, literary or artistic

TM

Unregistered trademark



Registered trademark

Copyright Designs and Patent Act (1998)

Copyright protects your work and stops others from using it without your permission.

You get copyright protection automatically- you don't have to apply or pay a fee. There isn't a register of copyright works in the UK.

You automatically get copyright protection when you create:

- ⇒ original literary, dramatic, musical and artistic work, including illustration and photography
- ⇒ original non-literary written work, such as software, web content and databases
- ⇒ sound and music recordings
- ⇒ film and television recordings
- ⇒ broadcasts
- ⇒ the layout of published editions of written, dramatic and musical works

You can mark your work with the copyright symbol (©), your name and the year of creation.

Whether you mark the work or not doesn't affect the level of protection you have.



Copyright icon is displayed when a creator wants to enforce their copyright.

Year 10 - iMedia (ICT) - LO2

You must be able to demonstrate a through understanding of legislation in relation to multimedia assets and products.

Copyright Protection

- ⇒ Copyright protection starts as soon as a work is created.
- ⇒ Once your copyright has expired, anyone can use or copy your work
- ⇒ The length of copyright depends on the type of work.

Type of Work	How long Copyright Lasts
Written, dramatic, musical and artistic work	70 years from when it's first published
Films	70 years after the death of the director, screenplay author and composer
Broadcasts	50 years from when it's first broadcast
Layout of published editions of written, dramatic or musical works	25 years from when it's first published

Copyright Infringement

Copyright is infringed when any of the following acts are done **without permission**, whether directly or indirectly and whether the whole or a substantial part of a work is used:

- ⇒ copying the work in any way
- ⇒ issuing copies of the work to the public
- ⇒ renting or lending copies of the work to the public
- ⇒ performing, showing or playing the work in public
- ⇒ broadcasting the work or other communication to the public by electronic transmission
- ⇒ making an adaptation of the work.

- ⇒ Conviction in the magistrates' court the maximum term of incarceration in the UK for copyright infringement is 6 months and/or a fine of up to £50,000.
- ⇒ Conviction in the Crown Court the maximum term of incarceration in the UK for copyright infringement is 10 years and/or an "unlimited" fine.

Creative Commons Marks



Some creators **Creative Commons** to release and enable free distribution of work that would otherwise be regarded as eligible for copyright protection.

There are sometimes conditions (additional logos) associated with the creative commons licences (see table.)

Icon

Right

Description



Attribution (BY)

You may copy, distribute, display and perform the work and make derivative works and remixes based on it only if they give the author or licensor the credits (attribution).



Share-alike (SA)

You may distribute derivative works only if it is not modified.



Non-commercial (NC)

You may copy, distribute, display, and perform the work and make derivative works and remixes based on it only for non-commercial purposes.



No Derivative Works (ND)

You may copy, distribute, display and perform only verbatim copies of the work, not derivative works and remixes based on it.

Creative Commons Marks



Creative commons **Zero Mark** is a way to release as many copyright restrictions possible to anyone internationally.



The creative commons **Public Domain Mark** indicates works that is already released for public use and is free of any known copyright restrictions.

Year 10 - iMedia (ICT) - LO2

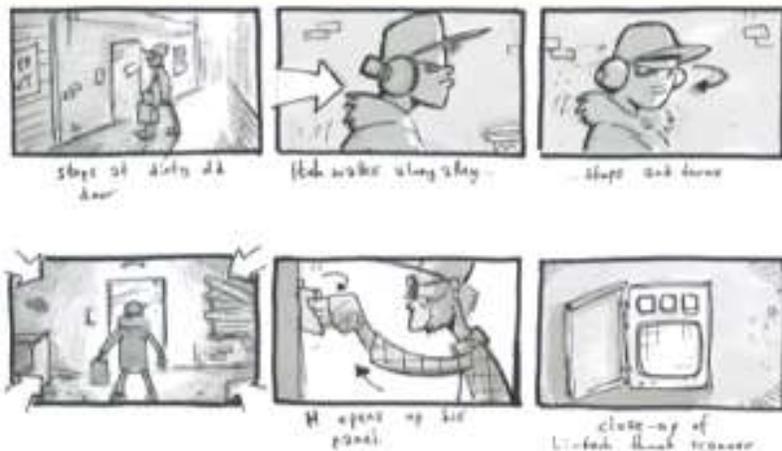
You must be able to demonstrate complex planning techniques to show what the product will look like.

The stages and some relevant consideration for the development of a Project Plan

1. Research	2. Plan	3. Create	4. Review
⇒ Refer to client specification	⇒ Layout	⇒ Assets	⇒ Quality
⇒ Target Audience	⇒ Colours	⇒ Templates	⇒ Testing
⇒ Identify existing solutions.	⇒ Fonts	⇒ Images	⇒ Fix errors
⇒ Is the project achievable	⇒ Media	⇒ Logos	⇒ Obtain feedback
⇒ Target audience	⇒ Content	⇒ Text	⇒ Check fit for purpose
⇒ Technology needed to complete the project	⇒ User needs	⇒ Media	⇒ Improvement
	⇒ House Style	⇒ Hyperlinks	⇒ Meets client requirements
	⇒ Charts	⇒ Forms	⇒ Use target audience and client feedback
	⇒ Equipment	⇒ Testing plan	



Using the planning techniques should enable you to be able to produce a **visualisation diagram** or **storyboard** of the multimedia product that is in your client brief. It should represent the full consideration of the client brief.



Visualisation diagrams and storyboards are always produced prior to creating the multimedia project. They assist in the development of the project ensuring that all the clients requirements have been fulfilled before the expressive task of creating the media begins.

Storyboards and visualisation diagrams are never edited once the multimedia product has been completed, so some differences are expected to be seen.

Required Evidence	Examples of evidence
Written and presentation files	<ul style="list-style-type: none"> • Electronic files/evidence • Written report/presentation
Client requirements	<ul style="list-style-type: none"> • Written report, presentation, audio commentary
Planning Documents	<ul style="list-style-type: none"> • Work plan, asset table, visualisation diagram and test plan
Finished product	<ul style="list-style-type: none"> • An interactive multimedia product.
Review	<ul style="list-style-type: none"> • Written report, presentation or recording.

Year 10 - iMedia (ICT) - LO2

You must be able to demonstrate complex planning techniques to show what the product will look like.

Testing Interactive Multimedia

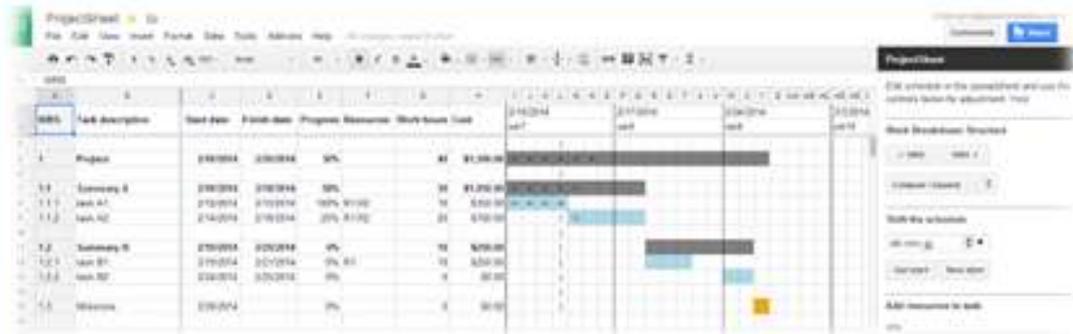
Testing is about identifying areas for improvement and further development with a view to meeting the clients requirements.

It is essential that you produce a clear and detailed test plan for the interactive multimedia product. The test plan must

- fully test the functionality, listing all the tests that you will carry out,
- describe the expected and the actual outcomes after a test has been completed.
- identify any corrections needed and the re-testing that is needed after corrections are made.

You might consider the following tests (this is not a complete list):

- **Size:** Is it suitable for web and print use? How to test? What is the expected outcome?
- **Blurriness:** Do you need a higher resolution image? Does it look right if printed or viewed on a larger screen?
- **Readable:** Is text readable? Would changing the font, colour or size improve this?
- **Contrast:** Do the colours clash making it difficult to see?
- **Audio:** Is it appropriate for the target audience? Is it clear? Loud enough? Background noise interfering?
- **Resizing:** Does the multimedia look clear and sharp when viewed on large screens as well as small screens? How can you test? What can cause problems in this area?



A Gantt chart is a type of bar chart that illustrates a project schedule. Gantt charts illustrates the start and finish dates and the steps of a project.

You can use a spreadsheet (such as above) or free software such as [Toms Planner](#) to create a Gantt Charts.

Test Plan:

Ensure your test plan has all the information expected to produce a clear and detailed test plan that fully tests the functionality, listing the test, expected and actual results and actions required if retesting.

Test Plan

Test No.	Test Type	Target File or Screen	Test Name	Purpose of Test	Test Data or Situation	Expected Result	Actual Result	Outcome and Actions Required
1	Browser	%CD%\info.php	Rendering of arrivals table	Test that table renders as expected for arrivals	Date set: 2 nd July 2007 1. Internet Explorer 7.0.6000 2. Mozilla Firefox 3.0.0.6 3. Safari for Windows 3.0.3	Six rows for arrivals, five coloured blue, one coloured red, displayed in ascending order by time. Column sequence: flight number, from, time expected, status, gate. Row 1 should contain an image arrivals.jpg. Last row should contain an image in right-most cell (corner.jpg)	1. As expected 2. As expected 3. As expected	All screens rendered as expected. No actions required.
2								
3								

Year 10 - iMedia (ICT) - LO2

You must be able to produce a work interpretation from a client brief, and then create a plan which fully meets the client requirements

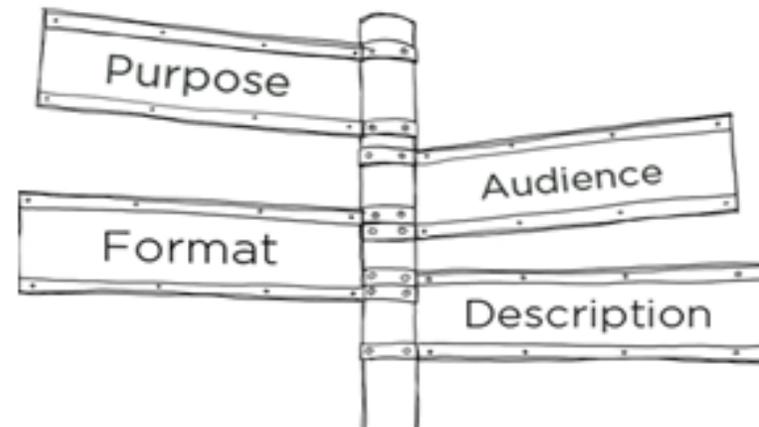
Client Briefs and Work Plans

A client will release a document that clearly describes a product or service that a client would like someone to produce or create for them. A client brief might be made available to many production organisations or people who could compete to win the project for the client. For example, many programs that are broadcast by the BBC, Sky or ITV have been produced by companies employed by the broadcaster to create the radio or TV programmes for them.

A client brief is an essential document that will contain all the elements of a multimedia product that an organisation requires in a product they want. It will detail precisely and clearly the specifications to inform the producer of the multimedia of important and useful information about such things as; who the target audience is, what must be included in the product, the duration of product and the costs for producing the product.

Client **requirements** in the brief must all be achieved to satisfy the client. The client brief is agreed at the beginning of a project and between you and your client. An accurate client brief will produce a product that more accurately meets the clients needs. It is from the client brief that all other tasks will follow, such as planning, deciding what resources are needed, the costs of the project, e.t.c. All subsequent activities must be focused on meeting the clients requirements and must not add too or miss out any elements from their requirements.

Once you have agreed to become a producer of a multimedia product from a client, and you have agreed the requirements from the client specification, then the next step will be for you to produce a clear and detailed **work plan** for the creation of the multimedia product. The plan must be fully compatible with meeting the needs of the client and the target audience.



Thoughts for Interpreting a Client Brief

- Start by describing the topic of the project, summarise what is needed to make the purpose of the project clear at the outset.
- What is the audience that you are trying to reach? What would be appropriate styles, colours, and illustrations that would be suitable for this audience. Are you addressing a social group, age group or a wider audience. Is there something specific that they'd be expecting from you?
- What would be the most appropriate size of the multimedia? Is it for print, web or both? How will this affect the choices you make for hardware and software needed to produce this? What image types, video size and resolutions are appropriate?
- Is there specific branding requirements that define which colours, fonts and logos that must be used? If so, are there any special rules for the use of a house style, such as where items must be placed in a document?
- What freedom do you have to influence the design without missing all the clients requirements?

Year 10 - iMedia (ICT) - LO2

You must be able to produce a work interpretation from a client brief, and then create a plan which fully meets the client requirements

Work Plan		
Task	Duration	Resources
RESEARCH		
Research video technique	1 hour	Computer, Internet, Keyboard, Mouse
Research existing videos	1 hour	
PLAN		
Plan initial ideas for video	30 mins	Computer, Microsoft Word, Keyboard, Mouse
Create a storyboard		
List equipment needed	30 mins	Computer, Microsoft Word, Keyboard, Mouse
Target audience analysis	1 hour	Computer, Survey Monkey, Keyboard, Mouse
CREATE		
	2 hours	
Import footage to computer	30 mins	Video Camera, Computer, Adobe Premiere
Review video footage		
Edit video footage	2 hours	
Add titles to video		
Add music to video		Computer, Adobe Premiere, Keyboard, Mouse
Export final video		Computer, Adobe Premiere, Keyboard, Mouse
REVIEW		
Test the video	30 mins	Computer, Microsoft Word, Keyboard, Mouse
Get feedback from client	1 hour	
Review the video		

Work Plan Content	Items to consider
Tasks	List all activities in chronological order would be expected to complete the project. Such as, adding slide transitions, creating a script, hiring equipment.
Activates	Consider all activities that are needed to complete the tasks. Such as, setting up the studio, researching the internet, taking additional photos, creating photoshop images or logos.
Resources	What additional equipment is needed and what additional costs might this introduce? Maybe you don't have the right lens for a video camera or DSLR. Do you need to involve more people? If so, how any and when?
Workflow	What order do things need to be done? Producing the plans (Gantt Chart) before starting the project. Capturing images before editing. Do you need a storyboard or visualisation diagram first? What time is needed to do this?
Timescales	When does the project need to be finished and how much time does this give you for each task. Which tasks can cause others to be delayed too much?

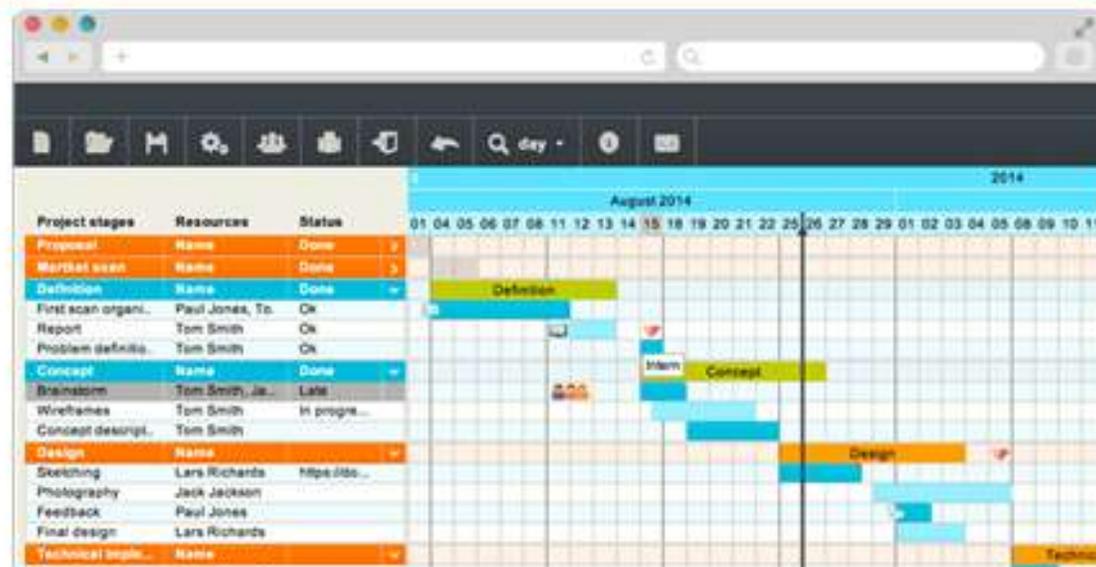
Gantt Charts

A Gantt chart is a visual representation of a project plan schedule. It graphically shows the duration of each task in the order that they have to be completed. It gives a clear representation of the time needed to complete each stage and will show if the project can be completed on time. It can also allocate work to different people or groups.

Other considerations

Contingency planning - You must consider planning for the unexpected; do you need more time, more cost, what if there are unexpected delays?

Schedule (definition): A plan of tasks with associated time for each task.



Year 10 - iMedia (ICT) - LO3

You must be able to consistently prepare and use appropriately use assets for interactive multimedia

What is 'Interactive Multimedia'?

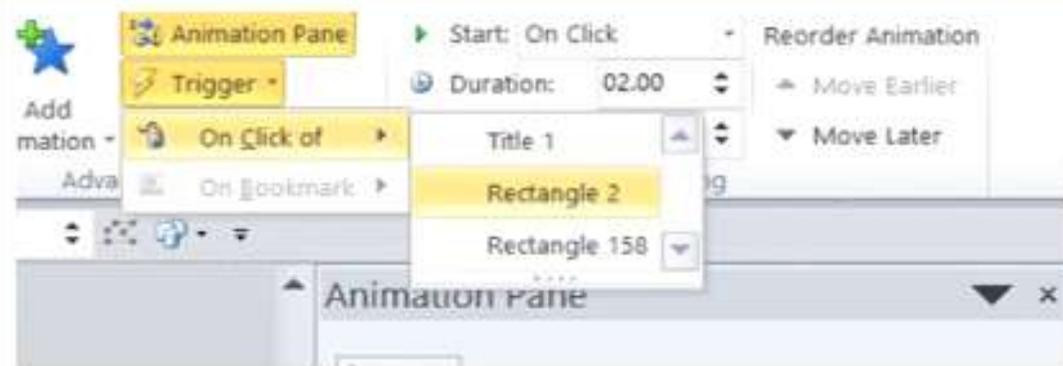
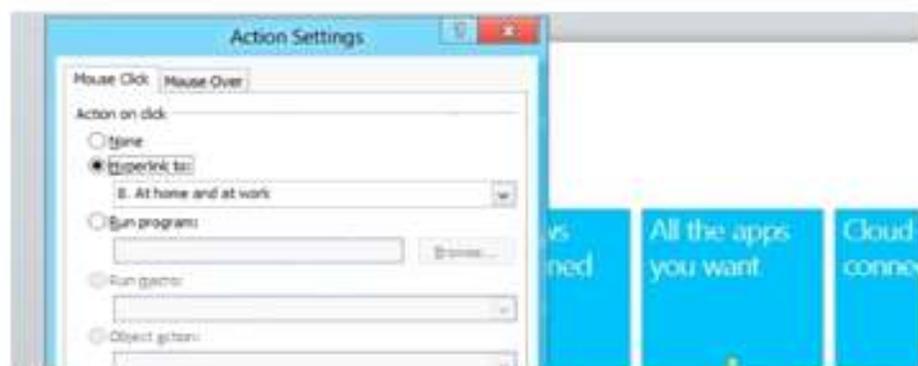
Interactive multimedia is a method of communication in which the program's outputs depend on the user's inputs, and the user's inputs in turn affect the program's outputs. Interactive media engage the user and interact with him or her in a way that non-interactive media do not. Websites, presentations and video games are three common types of interactive media. Movies and most TV shows are generally not considered interactive media; however, shows that require audience participation could be considered interactive media.

Social networking websites are an example of interactive media. The sites use graphics and text to allow users to share photos and information about themselves, chat and play games. Video games are another type of interactive media. Players use controllers to respond to visual and sound cues on the screen that are generated by a computer program.

Consistent use of Multimedia Products

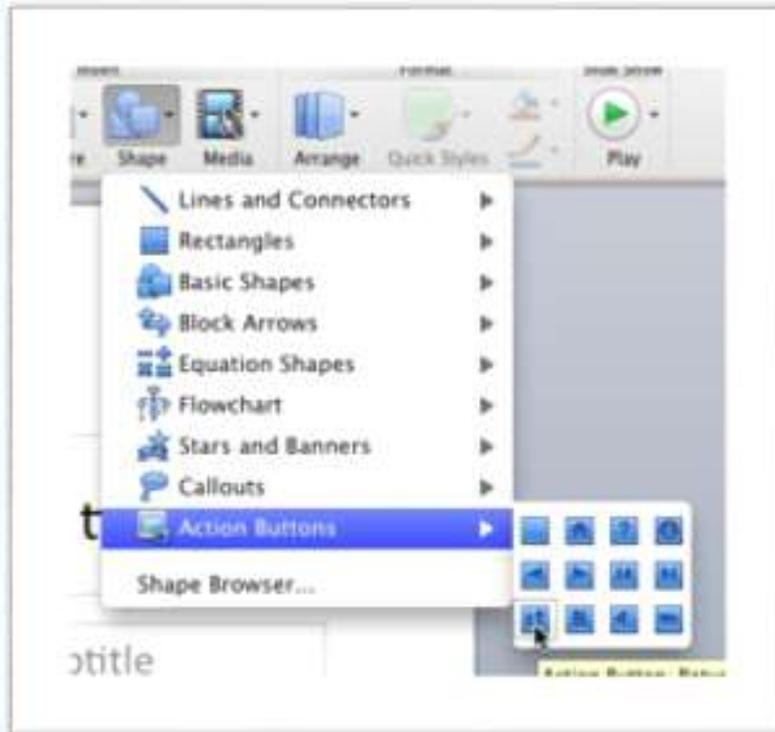
Using a multimedia product consistently is about demonstrating how well you have used the capabilities of the software that you have chosen to develop your multimedia product. For example, if you choose to use presentation software then you will have to demonstrate your use of the build in features, such as;

- ⇒ Using **Master Slides** in presentation software to prepare background and font styles
- ⇒ Using the **Home Tab** in presentation software to apply fonts to all pages
- ⇒ Use **Special Effects** icons with added text to create navigation buttons
- ⇒ Appropriate use of text boxes, images, movie elements and sound
- ⇒ Maintaining a **consistent** theme throughout the multimedia product
- ⇒ Employing a design with assets that fully **reflects** the design
- ⇒ Appropriate use of transitions and animations
- ⇒ Using **hyperlinks** and/or **animation triggers** to interact to user inputs
- ⇒ Navigation buttons should enable the user to jump to **any** part of the product, not just the next page.
- ⇒ Multimedia products should be exported to a file which does **not** require the user to buy or need specialist software.



Year 10 - iMedia (ICT) - LO3

You must be able to consistently prepare and use appropriately use assets for interactive multimedia



- ⇒ Your multimedia product must combine a **wide range** of different assets.
- ⇒ Your multimedia product must also have a clear and easily understandable **navigation system** to create an **interactive** multimedia product.
- ⇒ All the multimedia interactivity must work as intended, so it should be fully **tested**.

Action buttons are built-in button shapes you can add to a presentation and set to link to another slide, play a sound, or perform a similar action.

When someone clicks or moves over the button, the selected action will occur. Action buttons can do many of the same things as hyperlinks. Their easy-to-understand style makes them especially useful for self-running presentations.

You can insert action buttons on one slide at a time, or you can insert an action button that will show up on every slide. The second option can be useful if you want every slide to link back to a specific slide, like the title page or table of contents.

The appearance of action buttons can be selected to meet the design requirements of the project.

Examples of slides which use interactive buttons to enable the user to navigate the presentation



Year 10 - iMedia (ICT) - LO4

You must produce a review of the interactive multimedia product which demonstrates what worked and what did not

Review:

Evaluating the finished product and assessing the strengths and weaknesses

Constraints:

The limitations or restrictions that have affected the project overall.

Requirement:

Individual elements of the project that must be completed to finish the project successfully.

Know the requirements of the client brief

- ⇒ How did you meet the requirements?
- ⇒ What software did you use and why?
- ⇒ What techniques have you used?
- ⇒ Where did your assets come from (sources table)?
- ⇒ What legal issues have you considered?

Understand how to identify problems faced

- ⇒ How have you tested the product?
- ⇒ What changes were needed during the project?
- ⇒ Is the product fit for purpose?
- ⇒ How does the product meet the needs of the target audience?
- ⇒ How did you identify the target Audience?
- ⇒ How did you cope with any unexpected issues?
- ⇒ How did you overcome any problems you encountered?

Be able to critically review your multimedia product

- ⇒ Did you demonstrate a high level of skill?
- ⇒ Does the product look attractive?

Be able to demonstrate appropriate use of assets

- ⇒ Why are your assets suitable for the project?
- ⇒ What process did you use to select the assets?
- ⇒ Did you create any assets yourself?
- ⇒ What methods did you use to create assets? Hand drawn, software or photography

Format and layout

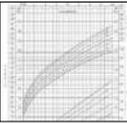
- ⇒ Why have you used your chosen design style?
- ⇒ How does the house style meet the client requirements?
- ⇒ Were there any constraints from the client requirements to meet the design?
- ⇒ What works well in the design? How can you improve it?
- ⇒ What does not work well in the design?

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 through 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... <ul style="list-style-type: none"> •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... <ul style="list-style-type: none"> •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 reading, 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.

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

0-18 months

3-5 years

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

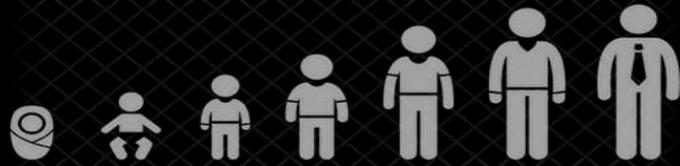
Increase in independence – exploring the environment independently, development of self-soothing skills



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.

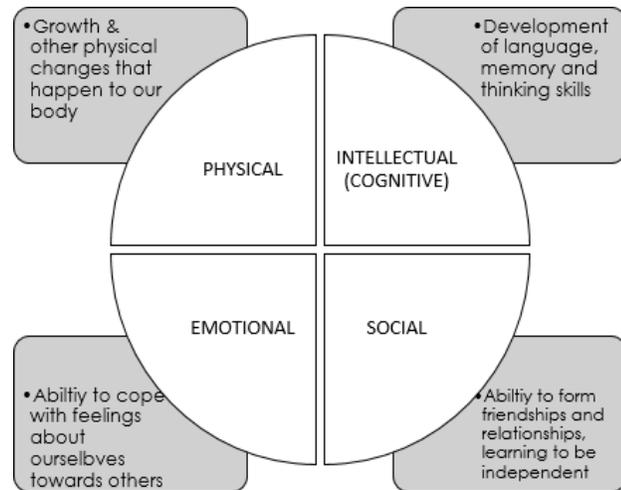
Component 1 Learning Aim A – Human Growth and Development

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.
Emotiona	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.
Socia	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 a ctivity of mixing socially with others.

Life Stage – PIES development

		Physical Development	Intellectual Development	Emotional Development	Social Development
Life Stage – PIES development	Infancy 0-2	Growth and develop rapid Gross Motor Skill Development: <i>control their head, roll, crawl, stand alone, climb onto furniture, walk.</i> Fine Motor Skill Development: <i>grasp a rattle, palmer/pincer grasp, hold cutlery, draw lines and circles</i>	Rapid growth in language and intellectual skills. <i>Babbling, imitation of sounds, tow-word sentences.</i>	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. <i>Children develop:</i> Gross Motor Skill Development: <i>run, balance, ride a bike, kick, throw, body coordination.</i> Fine Motor Skill Development: <i>write, draw, dress themselves, tie shoelaces, build a tower of cubes.</i>	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: <i>Female:</i> Develop breasts, Grow pubic hair, hips widen, periods start <i>Male:</i> 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	<i>Variety of jobs throughout Memory might not be as quick Life events develops stronger knowledge May have new knowledge</i>	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.

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.

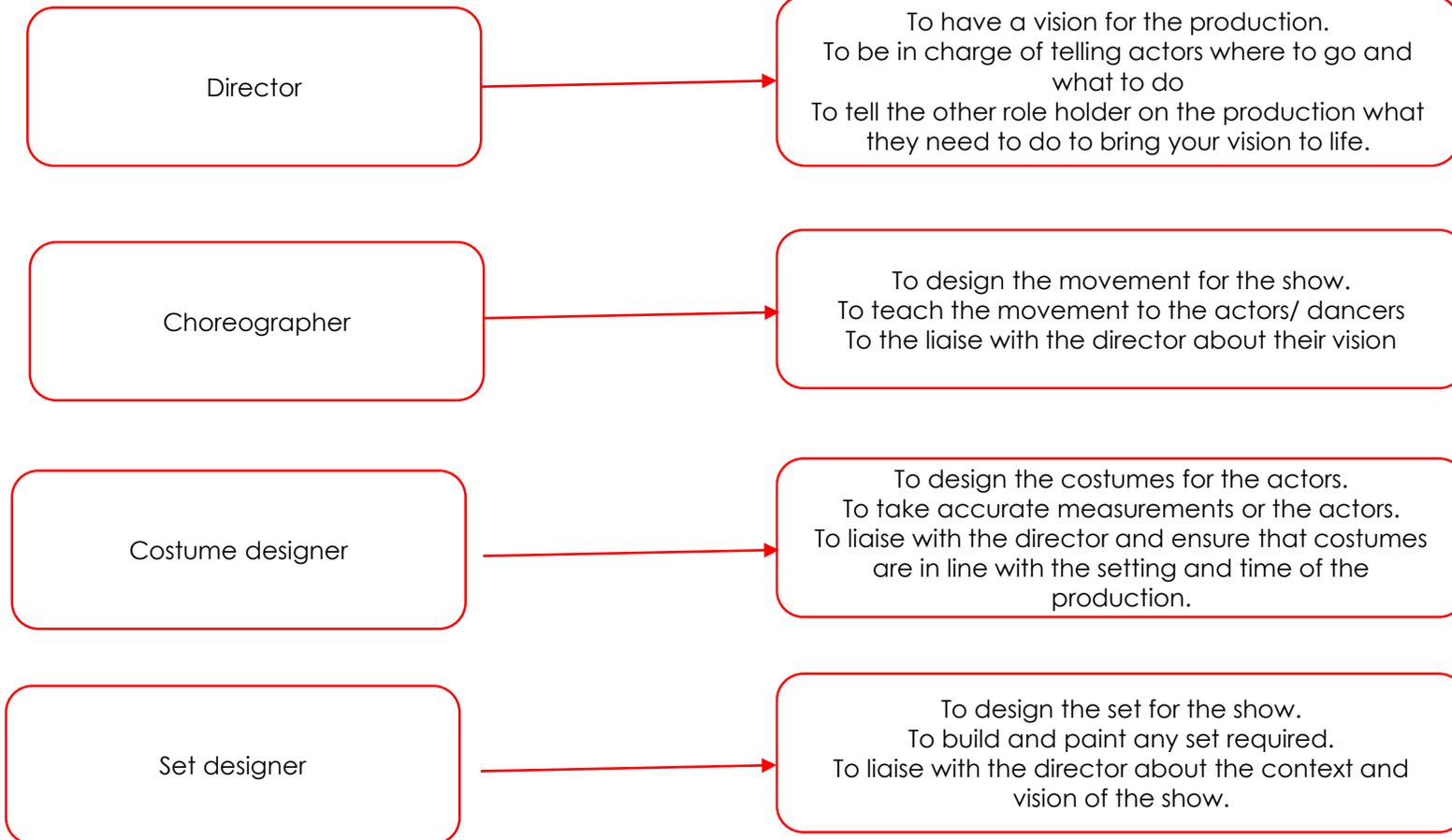


Practitioner	Style	Key Stylistic Features
Bertolt Brecht	Epic Theatre	<p>Alienation: Using sing, placards, pitch and pace to make the audience distance from the action on stage.</p> <p>Gestus: To give a character a clear and over exaggerated gesture they must use when they come on stage</p> <p>Political themes: Brecht wanted the audience to think about the corruption of the world they live in.</p>
Frantic Assembly	Physical theatre	<p>Chair Duets: Using two chairs create a continuous string of movements. Add emotion. Add pace to speed up or slow down sections.</p> <p>Hymn Hands: Use hands to mirror what your partner is doing– or grab the hands or shoulders for effect.</p> <p>Round-by-through: Moving around the body. Go through another actors' arms to create a spiral effect.</p>
Jerome Robbins	Book Musical	<p>Allegory for Romeo and Juliet: based on this story- however focusses on the love of a Jew and a Catholic</p> <p>Theme of Love: The love Tony felt for Maria and Romeo for Juliet made them defy their families, their friends and their social world. Their love is strong and forceful, so much so that it made them revolt against the very world they revolved in and, sometimes, even against themselves</p> <p>Theme of Society: Racial inequality Jets Vs Sharks= Jews vs Catholics Gender Roles in the song "America" we see how men and women view America very differently.</p>

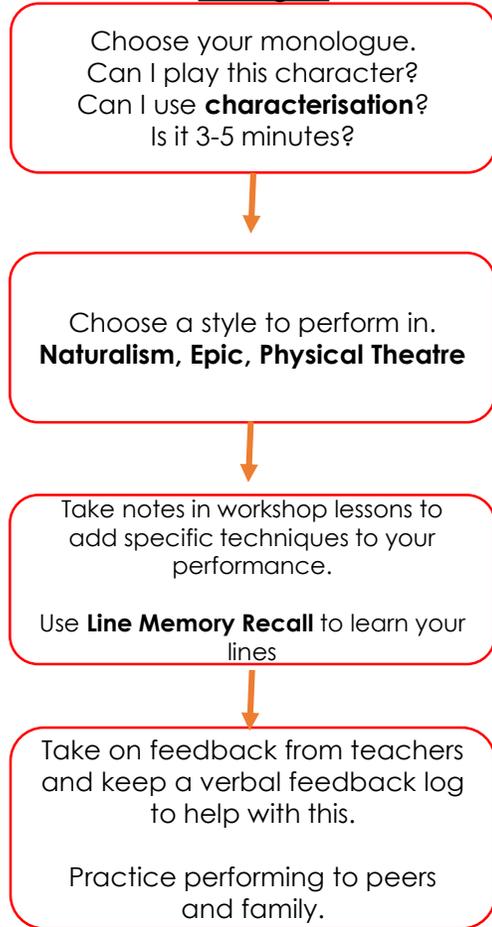


Keyword	Definition
Book Musical	A musical where the music, lyrics and script follow a well thought out narrative.
Creative Intentions	The theme, issues within a play or the style. Why did the director choose each of these?
Epic Theatre	A form of didactic theatre where the scenes are episodic and follow no narrative. Often political.
Focus	Not laughing while you are on stage and staying in character.
Genre	The style of a theatre.
Physical Theatre	a form of theatre which emphasizes the use of physical movement, as in dance and mime, for expression.
Practitioner	A person who pioneered a style of theatre.
Purpose	The reason a piece of theatre exists. Example: to put across a political message.

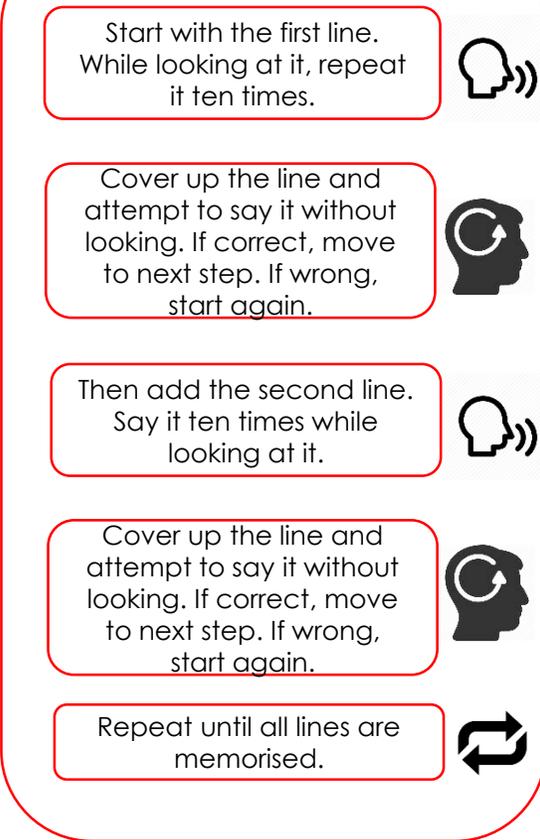
Keyword	Definition
Responsibilities	What someone in the theatre is required to do. Director- have a vision and tell the actors what to do on stage.
Role	A job role within theatre: director, actor, stage manager, lighting designer etc.



Steps to a good monologue or duologue.



Steps to use Line Memory Recall.



Keyword	Definition
Articulation	Pronouncing the consonants and vowels in your words clearly so you can be understood.
Characterisation	Creating a believable character on stage. Becoming the character.
Facial Expression	Showing your emotion through your face.
Focus	Not laughing while you are on stage and staying in character.
Gesture	Using your hands to show the audience where to look through pointing, waving etc.
Line Memory Recall	A technique used to remember lines. Repeat one line with the rest covered up.
Mannerism	A movement which your character would do without thinking. Example: A twitch or playing with hair.
Pace	The speed at which you say something or do a movement to convey the emotion of your character.
Pause	To use your breath to create suspense within a line or a key moment.
Pitch	How high or low your voice is to convey emotion.
Projection	Using a loud volume to make sure you are heard.
Reaction	What did they say? How would your character respond?
Vocal Tone	Showing emotion through your voice.

Milestone 1- Ideas Log:

1. What is the concept and style of your performance?
2. What is your target audience and why did you decide on this?
3. What resources do you think you will need to develop and perform your performance?
4. How do your ideas for the performance meet the brief ?
5. How has the work of Pantomime, Stanislavski, Frantic Assembly or any other practitioners influenced your performance?
6. What ideas have you contributed to the performance plan? Were these successful? Why?
7. How did you come up with the ideas you have

Milestone 2- Skills Log:

1. What was your role in the group? (director, performer etc)
2. Which style did you choose? Why?
3. Which techniques and skills did you choose? Why did you choose them?
4. What work have you done individually to help the group? (research, rehearsal leading, choreographing movement etc)
5. How did the resources you chose aid your performance?
6. What would you change or improve?

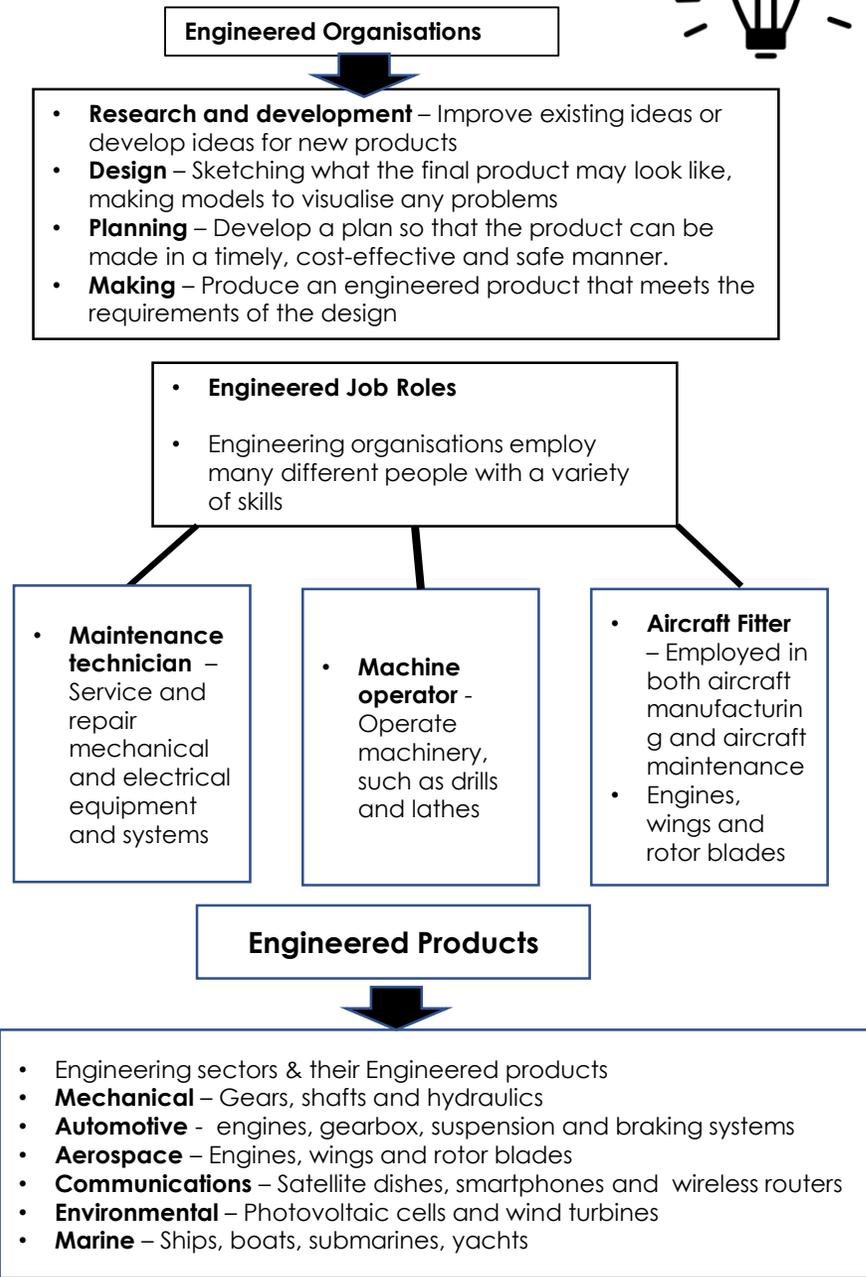
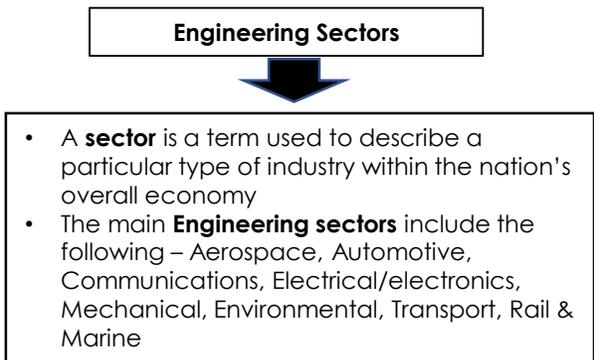
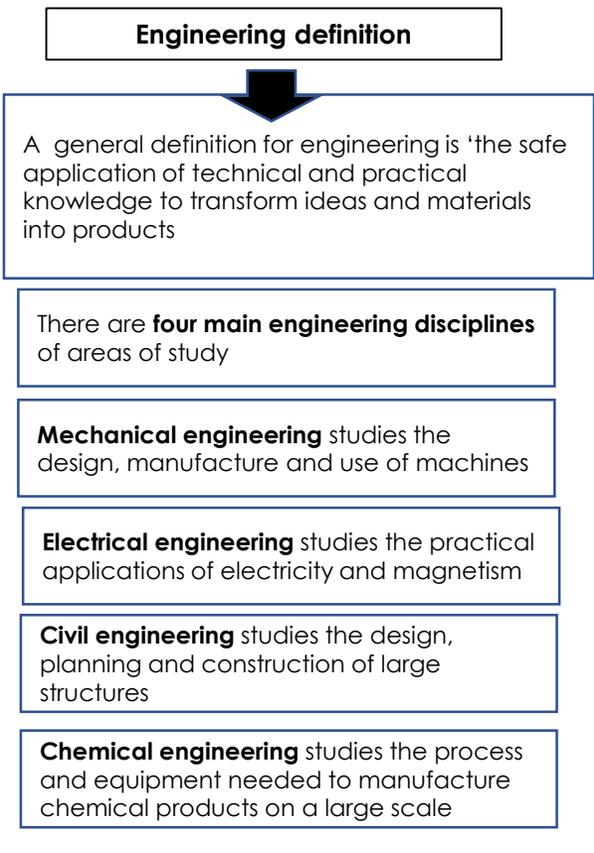
Milestone 3- Workshop Performance:

- You must present your group workshop performance or pitch/presentation to an invited audience.
- The group workshop performance must be between 10 and 15 minutes long.
- You will need to perform as part of a group and work well together.
- You will be assessed on your individual skills and techniques, collaboration with others and communication of creative ideas to the audience through your role.

Milestone 4- Evaluation Report:

1. How did the result of your performance meet the brief?
2. How did you process and ideas develop through this project?
3. Was the outcome of the performance what you wanted? What did the audience learn?
4. What were the key strengths of your group's performance?
5. What were the key strengths in your individual performance?
6. What would you improve upon given the chance again? Why would you change this? How would that help your performance meet the brief?

Keyword	Definition
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Reaction	What did they say? How would your character respond?
Vocal Tone	Showing emotion through your voice.



Keyword	Definition
Annotations	Labels used by engineers to give information about designs
Assembly	A process where engineers and machines assemble a product in a specified sequence
Axis	The name of either the horizontal or the vertical line that is used to show the scale of the graph or chart
Capacitors	Electronic devices that store electrical charge
CNC	CNC stands for 'computer numerical control'. A CNC lathe is one that runs automatically
Compressible	When the volume of a liquid can change when pressure is applied to it
Diodes	Electronic devices that can be used to allow electrical charge to flow in only one direction
Ergonomics	The science associated with the design and arrangement of equipment so that it is more comfortable and safer for people to use
Ferrous	Contain Iron. Typical types of ferrous metals include mild steel, wrought iron and stainless steel.
Galvanising	The process of providing a protective zinc coating of steel. Products tend to be hot-dipped to provide the coating
Integrity	The quality of having moral principles
Justification	The reason of evidence to support an idea or design
Logistics,	The organisation and implementation of an operation, usually involving a lot of detail
Orientation	Orientation of an object is its direction or relative position
Patent	The sole right of a person or company to make or sell a product

Identify a wide variety of tools and machines



- Using tools that are designed for the job
- Fits your hand size and is comfortable to hold
- Requires minimum of force to use
- Doesn't exceed the minimum weight required to do the job
- A hand tool is only ergonomic if it fits YOUR hand AND is right for the work YOU are performing

To develop skills in communicating design ideas and technical drawing methods

Freehand sketches are often done without a ruler or template and instead are produced quickly and freely. They can be shown in 2D or 3D.

Formal drawings are a more precise or less messy style of drawing; they can be done by hand or with **computer aided design (CAD)** packages

use models to help test, evaluate and develop design ideas and prototypes



- Making a model allows designers to visualise and test how a product looks and performs in 3D.
- Changes can be made quickly and easily
- Materials such as cardboard can be found cheaply and easily

To understand health and safety when working in engineering work places

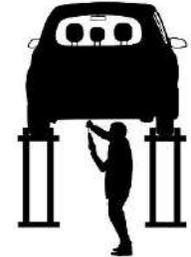


Businesses need to ensure they are following the rules and regulations outlined in current employment legislation

The Health and Safety at Work Act 1974 is the main piece of legislation covering health and safety in the workplace.

Maintain a safe working environment by ensuring equipment is properly maintained and safe to use, that appropriate warning signs are displayed and that adequate first aid facilities are available

To develop an understanding of the set up and safe operation of a variety of workshop machines and manufacturing techniques



The use of machines and hand tools are generally to remove material for shaping and forming or connecting.

Each machine has a different set of safety rules for them which should be clearly indicated on or close to the machine. These are generally about

Personal Protective Equipment that should be used such as goggles, gloves, and aprons.

All machines in a workshop will have guards designed to reduce the risk of contact with moving parts. You should be familiar with how these work before operating the machine

Keyword	Definition
Precision	The depth of information that is included in the data: how far the information is broken down
Recycling	The process of converting waste material into other usable products
Reliability	Reliability depends on there being small variations in data and that measurements and within tolerance
Resistor	Electronic devices that restrict the flow of an electric current
Permanent	Something intended to last unchanged forever
Shear force	Arises from forces that act in opposite directions
Sustainability	The ability of something to be maintained at a specific level
Tensile	Something is capable of being stretched
Thermosetting polymers	Materials that can be reshaped with the application of heat
Tolerances	The allowable variations of a specified dimensions, normally associated with machining operations
Trouble shooting	The identification and correction of faults and problems
Vanishing Point	Points on an imaginary horizon where all projection lines in a perspective drawing and drawn from.
Welding	Heating the surfaces of two objects to the point of melting and then joining together

Design Brief: A Design Brief is a short paragraph explaining the situation you have been given and the problem you need to solve.

Purpose:

- Identify a Problem
- Identify the client
- How to go about solving the problem
- Solutions

Client Needs/Brief: What the client requires of a product, here are some examples:

- Function
- Disabilities
- Social
- Anthropometrics/Measurements
- Material/Finishes
- Health and Safety
- Costing

Design Specification: A list of points to state what the product must have to meet the needs:

Possible Sections: Material, Safety, Ergonomics, Environmental, Costing, Manufacture, Finishes, Age Range, Functions, Secondary Function and Quality Assurance.

Sustainability:

What does it mean?

To preserve resources, materials and processes for future generations.

Examples:

- Recycled wood allows afforestation to occur
- If you have to incinerate a material it causes Co2 emissions
- Re-using electronic components saves on the processing of materials and saves on wastage and energy.

6R's

Recycle - Take an existing product that has become waste and re-process the material for use in a new product.

Reuse - Take an existing product that's become waste and use the material or parts for another purpose, without processing it.

Reduce - Minimise the amount of material and energy used during the whole of a products life cycle.

Refuse - Don't accept a product at all if you don't need it or if its environmentally or socially unsustainable.

Rethink - Our current lifestyles and the way we design and make.

Repair - When a product breaks down or doesn't function properly, fix it.

Timbers



Softwoods:

- Coniferous trees
- Pale in Colour
- Soft/Easy to Cut
- Used for Furniture and Construction Trade
- More sustainable

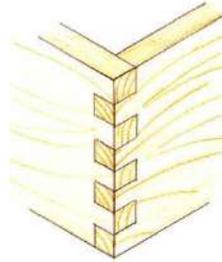
Hardwoods:

- Deciduous trees
- Durable
- Hard to shape and cut
- Long time to Mature
- Furniture
- Some are rare to find



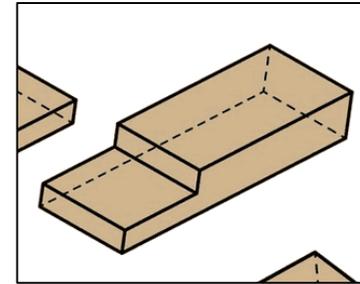
Manufactured Boards:

- made through human intervention
- consist of recycled woods part
- mixed with a liquid for example Glue or resin
- Flat Pack Furniture
- Cheap to manufacture



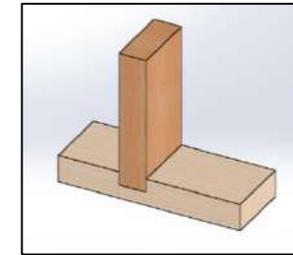
Finger Joint

If the joint is cut accurately the 'fingers should fit together without any gaps and the glue ensures that they are virtually indestructible. They are used for a wide range of products including jewellery boxes



Lap Joint

The shoulder can be seen clearly and has been pushed into the shoulder and this means it is level with the sides. It is very common and is used for furniture and box constructions such as jewellery boxes.



Housing Joint

A housing joint is a very simple, very strong woodworking joint that joins two work-pieces at right angles. It is done by cutting a slot into one piece and fitting the other piece into it.

Metals

Non Ferrous: A metal that does not contain Iron.

Ferrous: A metal that does contain iron.

Alloy: a metal that is made of 2 or more metals combined with improved properties.

Polymers

Thermo-plastics: A plastic that can be heated and changed shape without breaking. It can also be reheated and remoulded many times as it has a memory structure, once set becomes rigid.

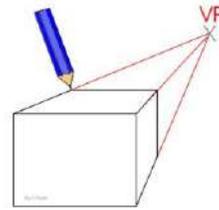
Thermo-Setting Plastics: A plastic that once set it cant be remoulded as it has a very rigid structure once set. If heated it will become flammable.

3d Drawing Techniques

3D drawings are used to present ideas so clients are able to understand features more clearly.

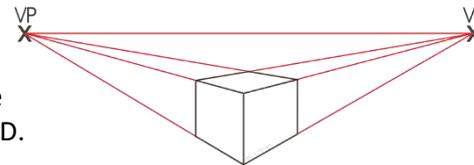
One-Point Perspective:

- Uses one vanishing point
- Used for Room interiors
- Front surface 2D and flat



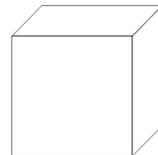
Two-Point Perspective:

- Uses two vanishing points
- Connected by a horizontal line
- Used for developing ideas in 3D.



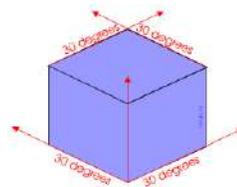
Oblique Projection:

- Horizontal going backwards drawn at 45 degrees
- Front surface is drawn in 2D
- Looks out of proportion
- Simpler process to isometric drawing



Isometric Projection:

- 30 degree angle is applied to its sides
- In proportion
- All vertical lines parallel to paper
- Drawing Board and isometric set square needed



Material Properties

- **DURABLE:** able to withstand wear, pressure, or damage; hard-wearing (Wood for a bench)
- **PLASTICITY:** The ability of a material to change in shape permanently (Plastic in a vac former)
- **ELASTICITY:** The ability of a material to absorb force and flex in different directions, returning to its original position (Elastic band)
- **STRENGTH:** The ability of a material to stand up to forces being applied without it bending, breaking, shattering or deforming in any way (Metal when being shaped for a product)
- **TOUGHNESS:** A characteristic of a material that does not break or shatter when receiving a blow or under a sudden shock (Wood work bench)
- **BRITTLENESS:** absorb relatively little energy prior to fracture (Glass table top)
- **MALLEABILITY:** The ability of a material to be reshaped in all directions without cracking (Metal when casted into a shape)
- **FATIGUE:** weakness in materials caused by repeated variations of stress (this happens to all materials depending on their ability to withstand)

Assemble Products:

Below are a number of different methods to assemble products



The structure of the H&C industry

Commercial	Non-Commercial	Residential
<ul style="list-style-type: none"> • Fast food • Pubs • Restaurant 	<ul style="list-style-type: none"> • Prisons • Hospitals • Armed Services 	<ul style="list-style-type: none"> • Hotels • B&B's • Holiday parks

Styles of Service

Counter Service	Table Service	Personal Service
<ul style="list-style-type: none"> • Cafeteria • Fast Food • Take away 	<ul style="list-style-type: none"> • Family • Silver • Gueridon • Plate 	<ul style="list-style-type: none"> • 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

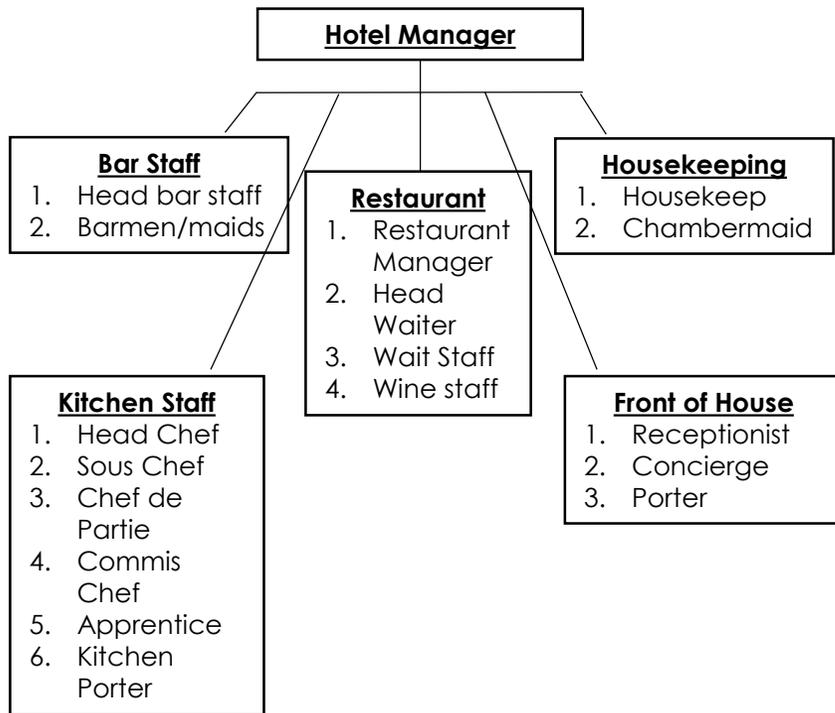
Reasons for Unsuccessful Businesses

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

$$\text{Selling Price Per Portion} = \frac{\text{Cost of one portion}}{100} \times \frac{100}{40}$$

Staff Structure in a Hotel



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

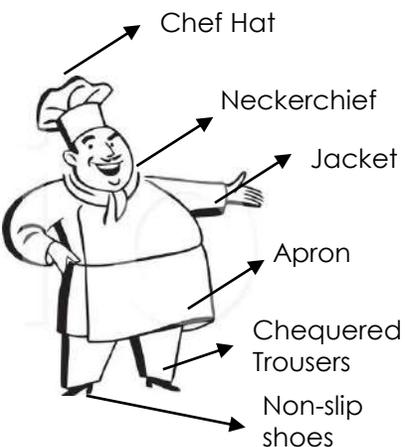
Kitchen Workflow

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:

- o Turned off before cleaning
- o Use correct cleaning materials
- o Any attachments should be stored correctly
- o If equipment is not working correctly it must be reported
- o Ensure there is no food left on the equipment as it will contaminate future use

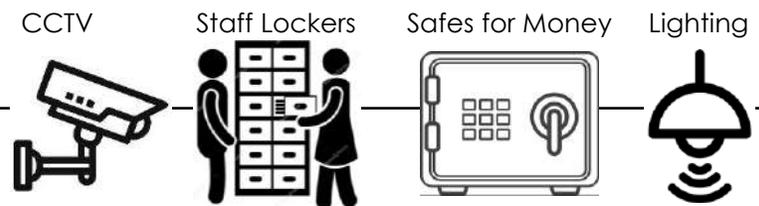


Types of Customer

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:



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

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:



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



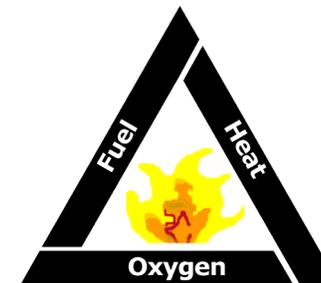
Risk/Hazard	Location	Who is at risk? (Employer, Employee, Supplier, Customer).	Level of risk.
Incorrect storage of food.	Kitchen	Customer	High
Faulty Wiring	Bedroom	Employee, Customer.	High

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

What does bacteria need to multiply?

- Moisture
- Warmth
- Food
- Time



Sources of food poisoning bacteria

- People
- Raw food
- Rodents
- Packaging

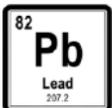


Symptoms of food poisoning bacteria

- 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 **moist** 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.

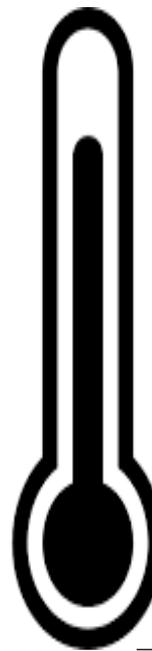
EHO

- 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 way 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 158

AC 1.1 – Functions of Nutrients	AC 1.3 – Nutritional Deficiencies (-)	AC 1.3 Nutritional Excesses (+)
<p>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.</p>	<ul style="list-style-type: none"> ❖ Lack of energy/ tiredness ❖ Weight loss ❖ Severe weakness 	<ul style="list-style-type: none"> ❖ Tooth decay (simple sugars) ❖ Raised blood sugar levels ❖ Weight gain 
<p>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.</p>	<ul style="list-style-type: none"> ❖ Weak nails ❖ Hair loss ❖ Weakened immune system ❖ Poor growth (children) ❖ Food is not digested properly 	<ul style="list-style-type: none"> ❖ Weight gain ❖ Strain on kidneys and liver 
<p>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.</p>	<ul style="list-style-type: none"> ❖ Weight loss ❖ Bruising of the bones ❖ Lack of vitamin A, D, E and K 	<ul style="list-style-type: none"> ❖ Weight gain ❖ Type 2 diabetes ❖ High blood pressure (adults) ❖ High cholesterol (adults) ❖ Heart disease (adults) ❖ Organ failure
<p>Fibre helps food to move through our bowels and prevent constipation. Foods such as vegetables, wholemeal bread and beans are high in fibre.</p>	<ul style="list-style-type: none"> ❖ Constipation ❖ Bowel cancer 	<ul style="list-style-type: none"> ❖ Children feel full and so miss out on other nutrients
<p>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.</p>	<ul style="list-style-type: none"> ❖ Dehydration ❖ Headaches ❖ Kidney stones 	<ul style="list-style-type: none"> ❖ Water intoxication
<p>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.</p>	<p>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)</p>	<p>Vit A night blindness. Vit D kidney damage</p> 
<p>Iron to make red blood cells to carry oxygen around the body. Calcium Along with vitamin D, calcium helps make strong bones and teeth.</p>	<ul style="list-style-type: none"> ❖ Iron deficiency anaemia ❖ Calcium same as Vit D 	<p>Iron nausea, stomach pain. 159</p>

AC 1.4 – 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

AC 2.2 – 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

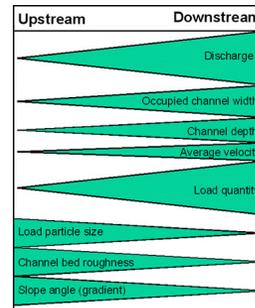
Formation of a Spit

1. Prevailing wind blows at an angle to the coastline.
2. Waves come in at an angle, resulting in longshore drift.
3. Longshore drift moves sediment along the coastline.
4. A spit is formed when the material is deposited.
5. Over time, the spit grows and can develop a hook if wind direction changes further out.
6. Where the spit meets a river, or where there is faster water, the spit stops forming as deposition no longer occurs.
7. There is a sheltered area behind the spit. Silt (fine sediment) is deposited and mud flats or salt marshes form.



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
- Long duration of rainfall
- Impermeable rocks
- Steeper relief of land
- Deforestation
- Urbanisation



Strategies to Reduce River Flooding

Strategy Type	Strategy	Advantages and Disadvantages
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

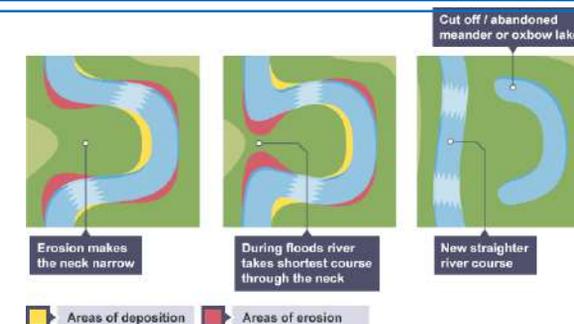
Formation of Caves, Arches, Stacks and Stumps

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 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

Waterfalls form when there are horizontal bands of resistant rock (hard rock) positioned over exposed, less resistant rock (soft rock).

1. The soft rock is eroded quicker than the hard rock and this creates a step.
2. As erosion continues, the hard rock is undercut forming an overhang.
3. Abrasion and hydraulic action erode to create a plunge pool.
4. Over time this gets bigger, increasing the size of the overhang until the hard rock is no longer supported and it collapses.
5. This process continues and the waterfall retreats upstream.
6. A steep-sided valley is left where the waterfall once was. This is called a gorge.

Global Atmospheric Circulation

Three atmospheric cells (Hadley, Ferrell, Polar) in which heat circulates (moves) globally.

- Hadley cells: warm, moist air rises at equator creating rainforests. Tropical air flows north and south creating areas of desert.
- 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 transfer heat energy across the globe

Global Climate Change

We live in the quaternary period (the last 2 million years).

The climate is changing naturally:

- Eccentricity/orbit: Our orbit changes shape every 100,000 years. Circular orbit = interglacial period (warmer). When the Spherical = glacial period (colder)
- Precession: the earth wobbles on its axis creating warmer summers/colder winters as it wobbles towards/away from the sun.
- Large volcanic eruptions can block out solar radiation and cause glacial periods.



Humans are causing climate change.

- Transport: cars become more affordable, people's disposable income increases. Burning fossil fuels release greenhouse gases.
- Industry: more disposable income means more goods need to be made by factories. More fossil fuels are burnt.



Negatives of Climate Change

- Sea level rise: melting ice in Antarctica adds to the amount of water in oceans.
- Flooding: money lost as tourism reduces. Beaches close, coastal businesses close. Eg: The Maldives.
- Coral reefs: are bleaching which affects animal habitats.
- Food production: will be lower in some areas. Can cause malnutrition in developing countries.



UK Climate

- Climate is temperate (mild temperatures, steady rainfall).
- Temperature is warmer in the south of England (nearer the equator).
- Precipitation is higher in the north and west of the UK because of the mountainous relief.
- The UK has gone through 2 major changes: medieval warm period (the year 1,000) and the little ice age (the year 1,700).



The UK's climate is affected by its location:

- Maritime influence: the UK is surrounded by sea, meaning air over the UK is moist.
- Altitude: if air has to rise over mountain, it has to drop water as rainfall first.
- North Atlantic Drift: this warm ocean current from Mexico is driven by the prevailing wind. This makes our winter colder than expected.



Keyword	Definition
Altitude	The height of the land from sea level
Bleach(ing)	When the water is too warm, coral (below) loses its colour and is more likely to die
Circulates	Continuously moves
Coral	A hard stony material underwater in warm locations that is living
Disposable income	The money people have to spend on what they choose, not what they need
Fossil fuels	Coal, oil, gas. Are non renewable
Glacial	Colder periods of time when ice spreads on the land
Greenhouse gases	Gases such as carbon dioxide which cause global warming
Interglacial	Warmer periods of time where there ice is melting on the land
Malnutrition	A serious lack of food
Maritime	Describes anything related or connected to the sea
Orbit	The movement of the earth around the sun
Precipitation	Rainfall from clouds
Solar radiation	Energy that the sun gives out
Tourism	Travel for pleasure. For example, holidays
Transfer	The movement of one thing to another

Tropical Cyclones

- Large rotating storms that start over oceans.
- Features: eye (center, 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.



EVAPORATION



Storms need:

- Warm air, over 27 degrees.
- Winds at the surface of the ocean.
- 30 degrees north and south from the equator.

Causes of Drought

- Arid areas are based on dry climatic conditions whereas drought is an extreme weather condition.
- Causes of drought can be meteorological, hydrological or human.

Meteorological:

- A lack of precipitation (rainfall).
- Climate change can affect and change patterns of rainfall.



Hydrological:

- A lack of water stored. If water isn't stored and kept for when a country is in drought, more people will be without water.



Human:

- Dams: they stop water moving down the river.
- Deforestation: means tree roots can't absorb water from underground, nor can the water be evaporated through transpiration.



Impacts of Tropical Storms

- High winds – can damage buildings.
- Intense rainfall – can cause flooding.
- Storm surges – these tall waves can destroy coastal areas.
- Coastal flooding – can affect farming and tourism.



The impacts are worse in developing countries because:

- They are slower to respond.
- There are no well trained response teams.
- Buildings are weak and easily collapse.
- The government can't track the tropical storm so they don't know when it will hit.
- People don't own vehicles so find it difficult to evacuate.



Impacts of Drought

- Social: people become ill due to drinking poor quality water. Migration as people move away from affected areas.
- Economic: unemployment rises as businesses close. Food prices increase as there is a lack of food.
- Environmental: river habitats are destroyed. Endangered species become extinct.



The impacts are worse in developing countries because:

- They don't have water stored.
- There aren't enough hospitals to help the ill people. The government can't predict when the drought will start.
- People are too poor so can't afford the higher food prices.



Keyword	Definition
Arid	Little or no rain, dry
Climatic	The weather over a long period of time
Coriolis	A force that causes rotation
Cyclone	A storm created by the weather. Also called hurricanes (around America) and typhoons (around south east Asia)
Dams	A barrier built on rivers to hold back water
Deforestation	The cutting down of trees
Endangered	At serious risk of being lost forever (extinct)
Evaporation	The sun heating up water and it turning into a gas (water vapour)
Hydrological	Water and the way it moves around the land
Meteorological	The weather high in the atmosphere
Migration	Permanent movement of people or animals from one place to another
Rotating	Spinning
Storm Surge	A rising of the sea and waves at approximately 3m higher than usual
Transpiration	Water evaporated from leaves on plants/trees
Unemployment	The loss of a job

The World's Ecosystems

- Biomes are large ecosystems spread across the world.
- Each biome has a different climate and type of vegetation.



Examples of Biomes

- Tropical Rainforest: hot & wet all year, tall trees.
- Deserts: very hot all year, very dry all year, plants have deep routes to find water.
- Tundra: freezing temperatures for most of the year, low precipitation. Very few plants grow.



The Biosphere (The Earth's Surface)

- Humans use the biosphere for water, for fossil fuels and minerals like gold, silver and metal.
- Humans have exploited the biosphere.



The Nutrient Cycle

- Nutrients move around the biosphere.
- Nutrients move between soil, biomass and litter.
- As animals die the nutrients fall into the litter store. As the animal body decomposes the nutrients move into the soil. As plants take nutrients from the soil the nutrients move back into the biomass (it's a cycle).
- The climate affects how quickly this cycle happens.



UK Ecosystems

- UK terrestrial ecosystems are: woodland (deciduous trees), moorland (upland areas), wetlands (areas around rivers and lakes), heathland (sandy soil, can't be farmed).
- UK marine ecosystems are used for tourism and leisure activities.

The Benefits of UK Ecosystems

- Bring in £3bn into the economy and provide 200,000+ jobs.



Marine Ecosystems – Human Exploitation

- Chemicals used by farmers are being washed into rivers/lakes/seas.
- Large windfarms change bird migration routes.

Tropical Rainforests

- High temperatures & rainfall = high biodiversity (lots of plant and animal species).
- Trees grow tall but have shallow routes because only the top layer of the soil is fertile.
- Nutrient cycle: biomass is the biggest store of nutrients. Small litter store because of decomposition.



Tropical Rainforests – Importance

- They provide goods: timber, oxygen, medicine.
- They provide services: store carbon dioxide, provide animal habitats, bring in tourists.



Adaptations To The Rainforest

- Buttress roots – think roots that spread across the soil to give tallest trees stability.
- Poison dart frog – its poison skin helps protect it from predators.



Tropical Rainforests Are Changing

- Climate change: creating drier conditions which is increasing the risk of forest fires.
- Climate change: drier conditions are reducing biodiversity and causing animals to migrate away.



Deforestation

- Trees are cut down for social and economic reasons.
- Social: population is increasing which means we need more space for housing and farming (growing food).
- Economic: more money can be made from farming animals, trees need to be removed so we humans can extract minerals.



Deforestation Affects Animals

- Habitats are destroyed which might cause extinction of plant and animal species.
- Food chains are affected which means the number of animals is affected.



Keyword	Definition
Biodiversity	The number of plant and animal species
Biomass	Living things. Eg plants, animals
Biomes	A large area where plants and animals live together
Climate	The weather over a long period of time
Decomposes	Breaks down, usually an animal body
Economy/Economic	The number of jobs and money in an area
Fertile	Land that is good for growing crops
Fossil Fuels	Coal, oil, natural gas. When burnt, they create electricity
Litter store	Nutrients that are in dead plants or animals
Migration	The movement of plants or animals
Reduce	A less or smaller amount
Terrestrial	Land
Timber	Wood from trees for building
Tourism	Businesses and companies that support people going on holiday, eg hotels or restaurants.
Tundra	The Arctic area that is flat and permanently frozen
Vegetation	Trees and plants

Managing & Protecting The Rainforest

- Selective logging: only older trees are cut down to allow younger trees to grow taller.
- Agribusiness: growing crops in between the trees of the rainforest.
- Reforestation/afforestation: re – planting trees.

Governmental policies: where the government encourage the protection of the rainforest.



Temperate Deciduous Woodland - Importance

They provide goods.

- Timber used to build with.
- Fuel: some UK power stations now burn wood to create electricity.



They also provide services.

- Recreation: woodland is popular for dog walking, cycling, horse riding.
- Carbon capture: trees absorb and store carbon. This helps stop global warming.
- Conservation: forest areas are protected by law and protect animal/plant species.



Case Study: Amazon Rainforest

- The Amazon rainforest, Brazil, is being cut down for: logging, minerals, building roads, houses and farming.



The rainforest is being protected by:

- Agribusiness: farmers are encouraged to plant crops amongst the trees.
- Education: local people are being educated about why the rainforest needs protecting.
- Afforestation: trees are being replanted.



Temperate Deciduous Woodland Are Changing

- Climate change: if winters become milder (slightly warmer) then diseases amongst trees can spread.
- Climate change: climate becomes drier = more droughts and forest fires.



Deforestation of the Woodland

- 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.



Temperate Deciduous Woodland

- Climate: 4 seasons. Cool summers. Mild winters. Rainfall all year.
- High biodiversity – lots of plants and animal species.
- Mostly deciduous trees. Nutrient Cycle In The Deciduous Woodland
- Summer: warm temperatures mean rapid decomposition = soil full of nutrients.
- Winter: decomposition is slow = soil lacks nutrients.



Deciduous Trees

- Drop leaves in the winter because of the lower temperature.
- Deep roots to find water and nutrients.



Case Study: The New Forest in the south of England

- Tourism in the area brings in £500m.
- The 15m visitors damage the area by:
 - Walking, cycling, driving, horse riding.



The Area is Protected and Managed

- Conifer trees cut down are replaced by deciduous trees.
- Chemicals are rarely used in The New Forest.



The New Forest is used Sustainably

- 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.



Keyword	Definition
Carbon	A gas produced when burning fossil fuels
Conifer	A tree that has needle like leaves
Conservation	Protect or look after, make last longer
Deciduous	A tree that drops its leaves every year
Decomposition	Breaks down, usually an animal body
Drought	A severe lack of water and rainfall in an area
Logging	Trees being cut down
Policies	Something that is recommended by a government
Rapid	Very quick
Recreation	Activities that people do to have fun or relax
Seasons	Autumn, Winter, Spring, Summer. Changes in temperature and weather
Selective	Chosen, in this example chosen trees
Timber	Wood from trees for building
Tourism	Businesses and companies that support people going on holiday, eg hotels or restaurants.

Mumbai's Location

- Coastal city in the west of India.
- Has an international airport with major connections.
- Good road + rail connections to all of India.



Mumbai's History

- Was a British colony called Bombay.
- City developed because of its textiles industry, coastal location and its port.
- The CBD is the historic center of the city.



Quality of Life in Mumbai

- Urbanisation brings in migrants, they move to the slums, eg Dharavi.
- Rapid increase in population has led to huge unemployment.
- Richer people live in gated communities because of the drug + crime problems in the city.



Mumbai's Rapid Growth

- Population: 20m in 2014. Predicted to be 30m in 2021.
- Industry: now a global financial hub and home to Bollywood.
- Birth rate is declining as women work.
- Life expectancy now higher as healthcare improves.



Dharavi Slum (Informal Housing)

- Rapid growth has led to land being very expensive.
- Cost of housing is high in Mumbai – led to 9m people living in slums. 1m people live in Dharavi.
- Dharavi slum is Asia's 2nd largest slum.



Negatives of Dharavi

- Health issues. Diphtheria + typhoid spread.
- 1 toilet per 1, 4440 people.
- Poverty. Many live on less than \$1 a day.



Positives of Dharavi

- Strong community, people help each other.
- Slum businesses create \$40m for local economy.
- 85% of people have a job in the slum.



Improving the Quality of Life in Mumbai

- The Dharavi Slum Redevelopment Project
- \$2bn development project planned for the land Dharavi is built on.
 - The people of Dharavi will be relocated to apartment blocks so the land can be used for gardens and shopping centers.
 - The people do not want this as it will break up their communities. The people would prefer small improvements.
 - Bottom up development.
 - Build green outdoor spaces for local people.
 - Build clean water pumps and toilet blocks.



Keyword	Definition
Birth rate	The number of babies born (usually per person)
Bollywood	The Indian movie business
Bottom up Development	Where local people and/or charities are involved with improving something
British Colony	An area of land, or a country, that was owned by Britain
CBD	Central business district (the centre of the city, full of businesses and offices)
Coastal	Where the land meets the ocean
Connections	Where two or more things meet
Diphtheria	A serious infection of the nose and throat, can be deadly if not treated
Economy	The jobs, money and resources in a country
Industry	A type of business
International	From one country to another
Life Expectancy	The average age people are expected to live to
Migrants	People who have moved to a new area, usually looking for work, for at least 6 months
Population	The total number of people
Rapid	Very fast
Relocated	Moved to somewhere else
Textiles	Either a type of cloth or jobs around the making of clothes
Typhoid	A serious disease spread through contaminated (dirty) food and water
Unemployment	Without a job
Urbanisation	The movement of people into cities

Birmingham's Location

History

- 1700s went from a small market town to creating industries in jewellery and guns.
- 1830s – canals and railways were built. This connected Birmingham to the country.
- Was an industrial city – secondary industry.



Today

- CBD – is redeveloped. Expensive land. Lots of offices, theatres, hotels and shops
- Housing – tower blocks and terraced housing in the inner city. Larger semi detached housing in the suburbs.



Birmingham – Changes in the 1900s

*Urbanisation: happened in the 1800s because of the jobs in the city.

1920s/30s

- Suburbanisation happened.
- Semi detached homes built with greenery.



1970s - 1990

- Counter urbanisation happened.
- People left the city for a quieter lifestyle in rural areas.
- People could afford cars so they could commute back into the city for work.



After 1990

- Re – urbanisation happened.
- New apartments were built in the city center.
- Old factories were changed into apartments.



Population

- 1.1m people live in Birmingham.
- Birmingham is ethnically diverse. 42% from non – white backgrounds.



Migration

- Young people move into the city for work or for university (there are 78,000 students in Birmingham).
- 1950s – migrants came from old colonies such as India + Pakistan to work in transport and steel.
- 2000 – migrants came from eastern Europe to work.



Industry in Birmingham

- Secondary industries are now in decline.
- Factories are moving abroad because of cheaper wages, land and better global transport.
- This has created unemployment and brownfield sites.



Deprivation in Birmingham

- Areas are deprived because of deindustrialisation. Eg: South West of the city.
- Sparkbrook: deprived area, high unemployment, poor housing, health issues.
- Sutton Coldfield: wealthy area.



Retail (Shopping) in Birmingham

- 1970s: decentralisation. Shops moved to the suburbs for space and cheaper land.
- 1980s onwards: CBD is redeveloped. The Mailbox has expensive shops and restaurants in.
- The Bullring shopping center is built in 2003 to attract people back into the city.



Birmingham – trying to become sustainable

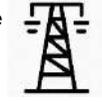
- The city is recycling 30% of waste. This is increasing.
- Bus + cycle lanes are being built to reduce greenhouse emissions.
- More schools are being built to improve education.
- Homes are built more energy efficient with insulation



Keyword	Definition
British Colony	An area of land, or a country, that was owned by Britain
Brownfield site	An area of land that has been built on before
CBD	Central business district (the centre of the city, full of businesses and offices)
Connections	Where two or more things meet
Decentralisation	Shops moving out of the city center (CBD)
Deindustrialisation	Factories and businesses moving abroad
Deprived	An area without basic things, eg good schools, good housing
Housing	Terraced – rows of smaller houses Semi detached – 2 houses joined together Detached – houses that aren't joined together Apartments – expensive flats
Industry	A type of business
International	From one country to another
Mailbox	A building in Birmingham that was turned from a Royal Mail building into expensive apartments and shops/restaurants
Migrants	People who have moved to a new area, usually looking for work, for at least 6 months
Re – urbanisation	The movement of people back into the city center
Redeveloped	When something is improved
Secondary Industry	Jobs that were in manufacturing/making things using materials, eg turning steel into guns.
Suburbanisation	The movement of people into the suburbs (edge of the city)
Sustainable	Improving something for the future, eg a city
Urbanisation	The movement of people into cities

Development – an Introduction

- About improving people's quality of life.
- Examples:
 - Levels of literacy improve because teachers are trained.
 - Rural areas get electricity because there are more power lines.
- Factors that affect development:
 - Economic – average income, the unemployment rate.
 - Social – life expectancy, literacy rate.
 - Technological – % of people with internet access, % of people with electricity.



Measuring Development

- Gross Domestic Produce (GDP): the total value of what is made in a country. Eg: if 2 cars are made and they cost £20,000 each. GDP = £40,000.
- GDP per capita: divide the GDP by the population.
- Human development index is a score between 1 – 0. 1 = most developed. It looks at:
 - Life expectancy
 - Literacy rate
 - Gross national income
- Single indicators are not as reliable as composite indicators. Composite indicator = HDI.
- Political corruption: the corruption index grades countries from highly correct to very clean.



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.
 - People in developed countries are consuming (eating) too much.



Water Security

- People don't have access to clean water because:
- Water is being wasted in the developed world for industry and food production.
 - Water in oceans, rivers, lakes and reservoir is being polluted.



Uneven Development - World

- There is a development gap between the wealthiest and poorest countries.
- The Brandt Line – shows the developed north and the developing south. Now outdated, Made in 1980s.
- Countries have variation in development. Urban areas are more developed than rural areas.
- Gini coefficient: shows income inequality in countries.



Reasons why there is a gap in development:

- Physical environment: landlocked countries can't trade, some countries have natural disasters.
- Demography: a lower birth rate = economic growth.
- Politics: open economies (eg UK) encourage foreign investment. Closed economies (eg Russia) don't.
- History: European countries exploited the world's resources through colonialism.
- Social investment: countries that invest in education and health develop fastest.



Uneven Development - UK

- The UK: has a north Vs south divide. London has the highest income per house. The south east has the highest average household price.
- Why:
 - Mountainous areas in northern Scotland, Southern England is quite flat (easy to build).
 - De – industrialisation happened in the north as factories moved abroad for cheap labour.



The Impact of Uneven Development

- 30% of the world's population live in slums
- 6.6m children under 5 die every year
- 775m people cannot read or write
- 805m people are undernourished



Keyword	Definition
Capita	Person
Colonialism	Taking over another country and taking its resources (gold, diamonds, oil etc)
Corruption	People using their power for themselves
Composite	Made up of more than 1 thing
Demography	Population and its birth/death rate
De – industrialisation	Factories leaving to go abroad
Development (gap)	The difference between rich and poor
Domestic	Produced in that country. The home country
Exploited	Taken advantage of
Industry	Businesses and/or factories
Landlocked	Surrounded by land/other countries
Life expectancy	The age you are predicted to live until
Literacy rate	The amount of people that can read + write
Rural	Countryside, open green fields
Undernourished	Without proper food
Unemployment rate	The number of people without a job
Urban	City
Variation	Differences

Reducing Uneven Development

- Fair trade: retailers in developed countries pay more for a product.
- Giving aid: developed nations give aid. Countries can buy resources, build infrastructure.
- Cancelling debts: helps countries develop as they can spend more on infrastructure.



Top Down Development

- Experts from developed countries plan large projects.
- Doesn't involve local people.
- Eg: dam and reservoir project.



Bottom Up Development

- Done by non government organisations.
- Involve local people and spend money where it is needed most.
- Eg WaterAid. More sustainable.



India – An Emerging Country That Is Developing

Introduction

- 7th largest country in the world.
- Population: 1.2 billion.
- Climate: tropical south, monsoon weather.



Uneven Development

- Western India is most developed. Industries: Finance, ICT.
- Eastern India is least developed because of physical geography (mountains, desert).



Mumbai: core region.

- Largest + wealthiest city.
- Home to Bollywood, ICT and TNCs such as Bank of America.
- 40% of houses are slums.
- 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 in education + health.
- Poor quality leadership by the government.



India's Changing Economy

- Quaternary's GDP contribution is increasing (research + development).
- India's low cost labour force is providing ICT services. Makes \$100bn for India a year.
- Since 1990, its economy has opened up and allows foreign investment (2014: \$34bn).



India's Demographic and Social Change

- Fertility rates have fallen.
- Mortality rates have fallen.
- Life expectancy improved to 68 years.
- Literacy rate has improved to 74%.



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 Vs China

- Both countries have nuclear weapons.
- Arguing over shortages of water from the Himalayan mountains.



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 – gives off greenhouse gases.



The Smart Cities Mission:

- Is 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 + education.

Keyword	Definition
Affordable	Not expensive
Core area	The central area
Deforestation	The cutting down of trees
Fertility rate	The number of babies born per person
Himalayan	Mountains that are in India and Pakistan
independence	Being controlled by your own government, not of another country
infrastructure	Roads, bridges, schools, hospitals
Investment	Money spent in an area, eg schools
Mortality rate	The number of people that die
Non government organisations	Charities and businesses that aren't controlled by the government
Nuclear power	Very powerful weapons created by atoms and science
Periphery area	The areas outside the core area (see core)
Population	The total number of people
Quaternary	Jobs that are around research and development
Reservoir	A man made lake built to store water
Slums	Informal housing, usually built by the people themselves on illegal land
Sustainable	To look after future generations
Undernourished	Without proper food

Types of Resources

- Abiotic: found from things that can't reproduce. Eg: soil, water.
- Biotic: found from things that can reproduce. Eg animals and plants.
- Non – renewable: resources that either cannot be remade or would take millions of years to make again. Eg: fossil fuels.
- Renewable: resources than can be used again and again or re-created in a short amount of time. Eg: wind, solar, hydro electric power.



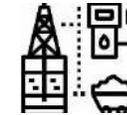
Why are we using more resources?

- People are richer and can afford more cars.
 - The population is increasing.
 - People are buying more technology.
- All of this means we need to build/make more which takes up resources.



Where do we get our electricity from?

- In the past, we have always burnt fossil fuels (non renewable energy sources).
- Recently, we have started to use renewable energy sources.
- All energy sources have positives & negatives



The Energy Mix (where countries get there electricity from)

- 80% of the world's energy comes from non renewable sources.
- 60% of the UK's energy comes from non renewable sources.
- Factors that affect a country's energy mix: size of population, wealth of the country, what energy resources are nearby.



The Location of Natural Resources Around the world

- Gold and diamonds are found near volcanoes.
- Fossil fuels are found where there is sedimentary rock.
- Oil is found in countries such as America, Iraq, United Arab Emirates.



In the UK

- Iron and coal helped Britain in the industrial revolution but there is little left in Britain.
- Oil and gas are found in the north sea but these supplies are running out.

Problems in the UK

- Rainfall is higher in the north and west of the UK but this isn't where people live.
- The water is in the wrong place. The supply of water cannot meet the demand.



Consumption of Resources Around the world

- People are using more resources everywhere in the world, but the biggest increase is in Asia.
- America is eating up the most calories. This leads to undernourishment in other countries.



Coal – a fossil fuel

Advantages

- ✓ Should last for another 200 years.
- ✓ Cheap and easy to mine.
- ✓ Creates large amounts of electricity.

Disadvantages

- Releases greenhouse gases, polluting the air.
- Destroys animal habitats.



Wind energy – renewable energy

Advantages

- ✓ Does not pollute greenhouse gases.
- ✓ Creates cheap electricity for customers.

Disadvantages

- Can ruin the look of the landscape.
- Doesn't work when it isn't windy.
- Can be expensive to build.



Keyword	Definition
Calories	Energy that comes from eating food
Expensive	Costs a lot of money
Fossil fuels	Coal, oil, natural gas. All non renewable
Greenhouse gases	Harmful gases that are released into the air. For example when burning fossil fuels
Habitats	Places where something lives
Hydro electric power	Electricity that is made from water powering machines
Industrial revolution	Happened in the 1700s where people had jobs in factories
Landscape	The land, the environment. Eg fields
Population	The total number of people in an area
Reproduce	Make more of
Sedimentary rock	Layers of rock that have fossils (dead plants/animals) in them
Undernourishment	People that do not have enough food to eat

Nuclear Power Plants

Advantages

- ✓ Produce electricity all year round.
- ✓ Produces huge amounts of electricity.
- ✓ Produce less carbon dioxide than fossil fuels.



Disadvantages

- Expensive to build.
- Can be dangerous if they explode.

Fracking Natural Gas

- This is a new way of finding natural gas.
- Involves drilling down to shale rock.
- Blasting water, sand and chemicals into the rock.



This breaks the rock and allows the gas to come out.

Advantages

- ✓ Produces large amounts of gas.
- ✓ Has made natural gas cheaper to use/buy.
- ✓ Produces less greenhouse gases than coal.

Disadvantages

- Can be dangerous as gas enters the water supply and can come through kitchen taps.
- The use of chemicals can damage animal habitats.



Managing & Protecting Our Energy

Individuals can:

- Measure their carbon footprint.
- Use public transport like buses, not private transport like cars.
- Insulate homes and use solar panels.



Companies can:

- Restaurants can re use cooking oil as fuel for lorries.
- Use LED lights which use less electricity.

Governments can:

- Use smart meters in homes.
- Build renewable energy sources.
- Improve renewable energy sources by improving technology.



Case Study: China, an emerging country

- 70% of its energy comes from burning coal.
- 7 cities in China are classed as 'heavily polluted'.



Why does China have pollution problems?

- More people are owning cars.
- China's roads are heavily congested.
- Poor quality petrol causes air pollution.



What has China done to solve these problems?

- 2006: China introduced the 'China Renewable Energy Law'. Which aims to minimise the use of coal and use more nuclear and wind power.
- China built the 'Three Gorges Dam' to create hydro electric power.
- Solar farms (rows of solar panels) have been built in the Gobi desert.



Case Study: Germany, a developed country

- Germany wants to use less nuclear power because of the Fukushima disaster in Japan, 2012.
- By the end of 2020 Germany plans to reduce greenhouse emissions by 40%, and by 80% in 2050.



How will it meet these targets?

- Germany has built the Bavaria solar park with 60,000 panels. This will reduce carbon emissions by 100,000 tonnes.
- Germany has invested in new wind turbines in the north sea, called Norsesee Ost farm. This will increase how much energy is created.



Keyword	Definition
Carbon dioxide	A gas that is given off when burning fossil fuels
Carbon footprint	The amount of carbon dioxide each person emits (gives out) because of their lifestyle. Eg, a person who drives will have a larger carbon footprint than someone who walks
Congested	Heavy traffic
Dam	A barrier built on rivers to hold back water
Emissions	Gases released into the air
Fossil fuels	Coal, oil, natural gas. All non renewable
Fukushima	An area of Japan where a nuclear power plants exploded because of a powerful earthquake
Greenhouse gases	Harmful gases that are released into the air. For example when burning fossil fuels
Hydro electric power	Electricity that is made from water powering machines
Invested	Money spent in a new area to improve something
LED lights	The best lights for the environment
Minimise	Reduce, make less
Nuclear	Electricity created by using atoms
Shale rock	A type of rock where natural gas can be found
Smart meters	A small computer that tells you how much electricity you are using each hour
Wind turbines	Large wheel that is turned by wind which creates electricity

The UK's Population

- Is increasing. 2020: 67m. 2050: 77m people.
- This increase will put pressure on resources:**
- More housing means more greenfield sites are needed to be built on.
- More food will mean natural habitats are destroyed to make space for farms.
- More energy might mean more greenhouse gases if fossil fuels are burnt.



To solve these problems:

- Use brownfield sites for building.
- Encourage people to limit their food intake and have a healthy lifestyle.
- Use sustainable, renewable energy sources for electricity.



Transport in the UK

- Global transport releases emits huge amounts of greenhouse gases.
- The UK is trying to reduce greenhouse gases:
- Improve public transport so people leave their cars at home.
- London has created cycle routes and Boris bikes for people to rent for the day or longer.
- Congestion charges: charging people for driving through city centers has reduced traffic and pollution.



Greenfield Sites

Advantages:

- Cheaper and quicker to build on.
- Environment is usually cleaner and more pleasant to look at.



Disadvantages:

- Valuable farms or open spaces are lost.
- Animal habitats are destroyed.

Brownfield Sites

Advantages:

- Less countryside is lost.
- Old dis – used urban areas are cleaned up.

Disadvantages:

- Often more expensive because old buildings need to be destroyed/rebuilt.
- Higher levels of pollution in these areas.



The UK's Economy

The 2 speed economy: London and the south east's economy grows faster than the north of England.



Why is this?

- More government money is invested in the south to attract more businesses.
- The big businesses in London attract the brightest people from the north of England. These people move south to work.



How is the government trying to stop the north Vs south divide?

- A high speed railway (HS2) is being built from London to northern cities. This will create jobs in the north.
- Airports in the north are improving to encourage travel and businesses to set up in the north.



Migration

- Immigrants: mainly from India + China.
- Emigrants: mainly leave to Australia.
- Reasons for migration: better jobs, better education, family reasons or to retire.



Advantages of migration nationally:

- Brings more workers so more taxes are paid.
- Different cultures bring different music and food.



Disadvantages of migration locally:

- More people means we need more hospitals, schools and doctors. This costs money.
- Some people think migrants take jobs from British people.

Keyword	Definition
Boris bikes	Bikes that can be rented by the day in London. Boris Johnson, now the Prime Minister, introduced them when he was the Mayor of London
Brownfield	Land that has been built on before
Congestion	Heavy traffic
Culture	People's way of life, the music they listen to or the food they eat or the activities they enjoy
Economy	The jobs and money in an area
Emigrants	People that move out of a country. Eg: Jack has emigrated to Australia
Greenfield	Land that has not been built on before
Greenhouse gases	Gases that damage the environment and cause global warming
Immigrants	People that move into a country. Eg: Jack has immigrated into the UK
Urban	Cities and built up areas

UK's Landscape Challenges

How can we protect national parks?

- Employ young people to work in the park so they grow up seeing its importance.
- Encourage public transport into the national park.



The UK is at risk from river flooding because:

- The population is increasing so more people have to live nearer rivers.
- More urban areas means more impermeable surfaces.
- More extreme rainfall because of climate change.



The UK government is planning to:

- Reduce the number of buildings near rivers.
- Build flood defences – hard/soft engineering.
- Help people prepare through warnings.



Specific example: Somerset floods, 2013/14.

- Heavy rainfall flooded 600 homes.
- Flood defences failed to protect people.
- Rivers were blocked with silt which meant rivers couldn't hold much water.



UK's Coastal Challenges

- Storm surges cause severe flooding because of the wave height and wind power.
- Storm surges can destroy some coastal defences.



Reducing coastal flooding in the UK:

- Build sea walls to reduce flooding and erosion.
- Use managed retreat in certain areas.

Specific example: 2013, across east England.

- The Thames flood barrier protected London from flooding.
- Flood barriers were quickly built in Norfolk.
- Advice was passed out through social media which meant that 800,000 homes were protected.



UK's Climate Change Challenges

The UK will become:

- Warmer in winter and summer by 3 – 5 degrees.
- 30% wetter in winter, 30% drier in summer.
- Extreme rainfall will be more severe and often.



Climate change will impact the UK:

- More flooding near rivers and the coast.
- More drought and less water in rivers may affect animal habitats and numbers of species.
- More heatwaves could mean more illnesses like heatstroke. This puts pressure on the NHS.



Responding to climate change

Individual people can:

- Walk or cycle to reduce greenhouse emissions.
- Recycle waste to reduce resource consumption.
- Build solar panels and insulate homes to conserve heat.



Governments can:

- Place limits on carbon emissions from businesses.
- Create adverts which encourage recycling.
- Sign agreements like the Paris agreement to work with other governments.



Problems governments face:

- Encouraging economic growth and development usually means using more resources.
- Reducing climate change can damage economic growth.



Keyword	Definition
Drought	Little or no rainfall for a long time, usually months or years
Economic growth	An increase in the number of jobs in an area and an increase in the number of money spent in an area
Emissions	When gases are released into the atmosphere (air)
Extreme rainfall	Very heavy rain
Flood defences	Things that aim to try and stop rivers from flooding
Greenhouse gases	Gases that damage the environment and cause global warming
Heatwaves	Very hot weather for a few days or possibly weeks
Heatstroke	An illness that makes the body weak. Is caused by being in hot temperatures for too long without drinking enough water
Impermeable surfaces	Building materials that don't allow water to pass through them. Eg concrete, tarmac
Insulate	Keep warm
Managed retreat	Allowing certain parts of the land to become flooded
National parks	Parks that cannot be built on. They are protected by laws
Severe	Very dangerous
Storm surge	This is when the wind 'picks up' the waves and makes them higher. About 6 feet higher than usual
Thames flood barrier	A barrier on the Thames river that protects London from flooding

Crime, punishment and law enforcement in Anglo Saxon England

- Anglo Saxon kings ruled the unified Kingdoms of England. They wrote codes of law and enforced those laws
- The king was supported by nobles who maintained the law
- Anglo Saxon society aimed to keep the peace through community law enforcement
- Physical punishments and maiming were used as a deterrent
- The wergild system of fines was introduced as an alternative to blood feuds
- Some serious crimes were punished by death
- The church was also powerful, it was responsible for trials by ordeal



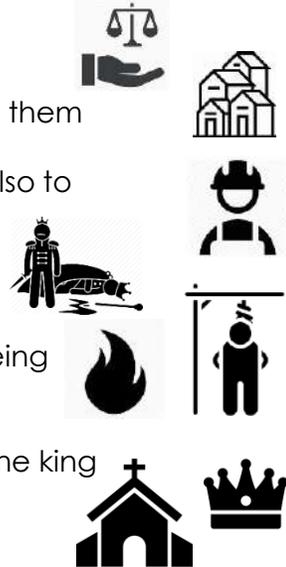
Crime, punishment and law enforcement in Norman England

- William I's harsh response to the Anglo Saxon rebellion and the building of castles strengthened his power
- The Normans introduced the murdrum fine which gave Normans a higher position in society than Anglo Saxons
- The Forest Laws bought most of the land under the Kings control and made hunting and gathering wood illegal there
- Norman punishment included physical punishment, fines and execution.
- Trial by combat was introduced
- It was the community's responsibility to deal with crime through the use of the hue and cry and tithings



Crime, punishment and law enforcement in the later Middle Ages

- Henry II centralised the legal system
- Towns grew, which meant a need for a better way to police them
- The Statute of Labourers showed a desire for new laws but also to maintain old order
- New punishments were introduced for heresy and treason
- These included being hanged drawn and quartered and being burnt at the stake
- These were introduced to deter criminals from challenging the king and church's power



Case study: the influence of the Church on crime and punishment

- 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
- Sanctuary and trial by ordeal demonstrate that medieval justice relied on God as a judge
- Changes in Church law sometimes directly affected the countries laws – for example the end of trial by ordeal and the use of juries



Key Word	Definition
Crime	An action that breaks the law.
Punishment	A consequence given out to a person who has committed a crime.
Progress	When things get better
Turning point	When a significant change happens
Factors	These are the things that affect/cause change e.g. poverty, wealth, attitudes, institutions (e.g. the church, government), individuals, science and technology, travel and towns.
Law Enforcement	Methods of policing and upholding the law
Retribution	A punishment where someone takes revenge on the criminal
Deter	A punishment to stop other crimes being committed
Reparation	A punishment that means to repay or 'make good' the damage caused by a criminal.
Capital Punishment	The death penalty.
Corporal Punishment	Physical harm caused to a criminal, e.g. cutting off a hand
Treason	Crime against the King
Kings Peace	King's duty to take care of law and order
Trial by Ordeal	A trial held in/near a church. The accused person is set a difficult/ dangerous task. God would decide whether they passed.
Murdrum Fine	The whole community pays a heavy fine if a Norman was murdered there.
Stocks and pillories	Stocks attached ankles while the pillory secured the arms and neck.
Heresy	Questioning/disagreeing with the Church
Sanctuary	Safe places/protection from the law

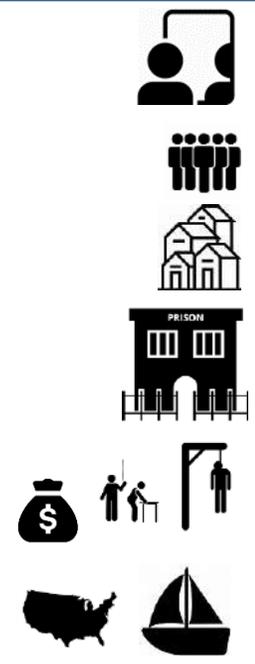
Changing definitions of crime 1500-1700

- Religious change led to a change in definitions of crimes as each ruler imposed their own religions
- Increasing wealth in some areas of society led to new crimes
- Economic changes led to more vagrants in the 16th and 17th century. People became scared of the unemployed and poor
- The Game of Law 1671 made it illegal for poor people to hunt. The public did not take this seriously and it was hard to enforce
- Cromwell brought in many new moral crimes during the 1650s
- In the 17th century, the government introduced import taxes on some goods – this led to smuggling



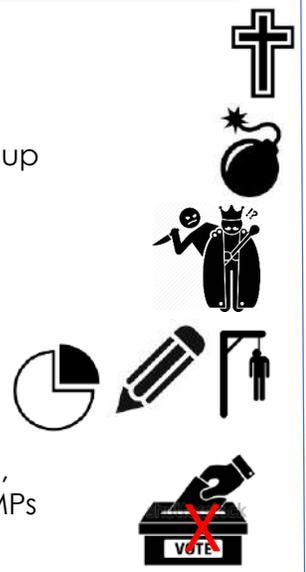
Law enforcement and punishments 1500-1700

- Law enforcement in 1500-1700 was similar to the medieval period
- Community policing was still widely used
- Growth of towns meant that more co-ordination in law enforcement was needed
- The earliest prisons were built in the 16th century and after 1601 more 'houses of correction' were established
- The usual punishments at this time were fines, corporal punishment and execution
- During the reign of James I, transportation to America was introduced as an alternative to execution



Case Study: The crimes and punishments of the Gunpowder plotters 1605

- English Catholics were persecuted in various ways and were not free to worship as they chose
- The Gunpowder Plot, led by Robert Catesby, aimed to blow up the king and those close to in 1605
- The plot was uncovered and the conspirators found guilty of treason
- They were sentenced to death to be hanged drawn and quartered
- Following the plot, Catholics experienced more persecution, and were excluded by the law from voting and becoming MPs



Witchcraft and the law 1500-1700

- People greatly feared the idea of witchcraft
- James I's interest in witches, attitudes towards women and uncertainty caused by Civil Wars all increased fear of witchcraft
- In 1645, Matthew Hopkins, a 'Witchfinder General' began hunting down witches in Essex and East Anglia



Key Word	Definition
Crime	An action that breaks the law.
Punishment	A consequence given out to a person who has committed a crime.
Progress	When things get better
Turning point	When a significant change happens
Factors	These are the things that affect/cause change e.g. poverty, wealth, attitudes, institutions (e.g. the church, government), individuals, science and technology, travel and towns.
Law Enforcement	Methods of policing and upholding the law
Retribution	A punishment that intends to take revenge on the criminal
Deter	A punishment that intends to stop other crimes being committed
Reparation	A punishment that intends to repay or 'make good' the damage caused by a criminal.
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
Witchcraft	The crime of practising magic and worshipping the devil
Stocks and pillories	Stocks secured ankles while the pillory secured the arms and neck.
Smuggling	Bringing goods into country without paying import tax
Sanctuary	Safe places/protection from the law

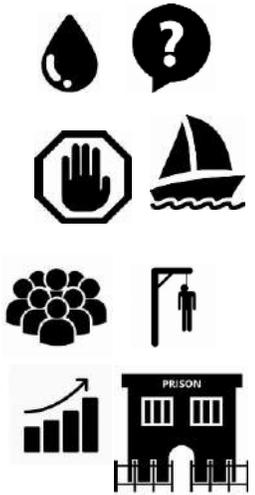
Changing definitions of crime 1700-1900

- Smuggling increased in the 18th century whilst there were profits to be made
- It then decreased in the 19th century when it became less profitable
- Highway robbery became less common as new patrols clamped down on robbers
- Harsh laws and unpopular laws were passed against poaching – but were later repealed in the 1820s
- The case of the Tolpuddle martyrs shows how attitudes were changing over what was considered a crime



Changing attitudes to punishments 1700-1900

- People began to question the Bloody Code and wanted punishments to match the severity of the crime committed
- Transportation to Australia was seen as a serious punishment and worked as a deterrent
- Reformers like Charles Dickens led campaigns against public executions – he thought they were not an effective deterrent
- The growth of the prison system meant there was an alternative to transportation



Law Enforcement 1700-1900

- In the early 18th century methods of law enforcement were similar to the early modern period
- The Bow Street Runners were established in 1748 which showed a development in policing
- In 1829, the Metropolitan Police was set up by Robert Peel in London
- The 1856 Police Act meant that all areas had to have a professional police force that was controlled by the government
- In 1878 the Criminal Investigations Department (CID) was set up



Case Studies: Pentonville Prison and Robert Peel

Pentonville

- It was a model prison
- The plan was to keep prisoners as separate as possible
- The government made conditions harsh to deter criminals
- In the late 19th century the punishments became harsher at Pentonville
- The 1856 Prison Act focused on strict punishment – not reform



Robert Peel

- Robert Peel became Home Secretary in 1822
- During the 1820s he brought in many changes to law enforcement
- He wanted to use the law more effectively and introduce a new penal code
- In 1829 he introduced the Metropolitan police which was not popular at first



Key Word	Definition
Transportation	The punishment of being sent to another country to serve a period of hard labour
Smuggling	Bring goods into the country illegally
Highway Robbery	Highway men stopping a stagecoach and robbing its passengers, often violently
Decriminalisation	When something stops being a crime
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)
Penal reforms	Improvements/changes to punishments
Profitable	When you are likely to make a profit (more money that you are spending)
Pentonville Prison	One of first modern prison built in 1840
Reformer	Someone who wanted to change things for the better
Repeal	Undo/take back something – usually a law

Crime and definitions of crime 1900-present

- Changing attitudes made some things that were previously legal become a crime
- The 1968 Race Relations Act made it illegal to refuse jobs, housing or public services to anyone based on race
- During the 20th century there were big changes to laws on violence and intimidation between people in a relationship or who have been
- New technology and changing attitudes led to changes on how driving offences were viewed and dealt with
- Digital technology has enabled criminals to carry out old crimes in new ways e.g. fraud/theft



Law enforcement 1900-present

- Technology and science have improved the ability to catch criminals
- A focus on crime prevention has also helped reduce crime
- Co-ordination and co-operation at a local and national level has increased
- In the 20th century there was an increase in specialisation, with special division set up and better training
- There was a focus on crime prevention including Neighbourhood watch schemes



Changes in punishment 1900-present

- At the start of the 20th century, the death penalty was still used, almost always for murder
- In 1965, the death penalty was abolished
- The 1940s Labour government introduced many radical welfare and social reforms including some on youth justice
- During the 20th century there were many new ideas about the purpose of prison, and the way prisoners should be treated
- Changing attitudes meant that courts could use alternative punishments to prison for less serious crimes



Case Studies: Conscientious objectors in WW1 and WW2 and Derek Bentley

Conscientious objectors

- Some men refused to fight as it was against their beliefs
- By 1916, they were viewed as criminals
- The Military Service Act included a section called the 'conscience clause' which allowed men to refuse to fight but was very rarely accepted
- Prison was the most common punishment for COs in WW1
- Government attitudes to COs were less harsh during WW2 but people's opinions did not change



Derek Bentley

- Derek Bentley was arrested for murdering a policeman
- The case was controversial and led to questions about the death penalty
- Many MPs believed it was wrong to hang Bentley



Key Word	Definition
Hate crime	Crime committed against a person because of their race, gender, disability or sexuality.
Extortion	Using threats to make someone pay money
Neighbourhood watch	Local group of people who raise awareness about crime and encourage local community to keep an eye on each others' property
Borstals	Specialist prison for young boys only
Conscientious objectors	People who refuse to take part in war or conflict for moral reasons.
Bentley Case	Young man executed for murder. Prompted mass protest. Was pardon after he died
Cyber crime	Crimes committed using technology (usually computer, mobile phones and the internet)
Abolish	To get rid of something
Reform	A change for the better
Tribunal	Like a court case where someone puts an argument across to be considered
Prevention	Stopping something before it happens

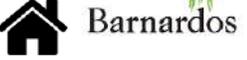
Context: Policing the nation

- Unlike other forces, the Metropolitan police were controlled by the government
- Following a series of scandal and accusations of incompetence, the CID was set up in 1878
- Useful sources for investigating policing include: police station reports, records of court cases, memoirs and local and national newspapers
- There are positive and negative aspects of all these sources – especially police station reports and newspapers



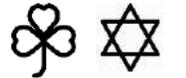
The local context of Whitechapel

- Poor housing, overcrowding and unemployment were common in Whitechapel
- Attempts to improve conditions included building new houses and providing orphanages e.g. Barnados
- These existed alongside the traditional responses to poverty such as workhouses



Tensions in Whitechapel

- By the early 1880s there had been major waves of immigration into Whitechapel – Irish and Eastern European
- In both cases people were scared they had brought dangerous political views with them
- Immigration seemed to be a threat out local people for housing and work
- Immigrant groups were stereotyped as criminals



Police organisation in Whitechapel

- Police were seen as the government in uniform – this made them unpopular
- Prostitution, alcohol and the layout of streets gave the police problems
- There were too few policemen to deal with crime – some areas had no patrols
- Many believed the police focused too little on serious crimes



Investigative policing in Whitechapel

- Failure to catch Jack the Ripper led to criticism of H Division, the Metropolitan police, CID and Scotland Yard
- Police methods were not good enough but often criticism was unfair and did not recognise the problems with solving crimes at this time
- Some of lines of enquiry in 1888 by CID were ahead of their time and effective
- The Metropolitan police were slow to learn from their mistakes in the Ripper case and improvements did not appear until 1900
- There were considerable changes in housing, lighting and health as a result of fear over the serial killer



Key Word	Definition
Anti-Semitic	Hatred and prejudice against Jews.
Beat Constable	The lowest rank of police officer whose main duty was to walk 'the beat' / patrol
CID (Criminal Investigation Department)	Created 1878 to detect crime led by Howard Vincent
Commissioner	Head of MET police, reported to the Home Secretary.
Fenians	Irish Nationalist who wanted an Ireland free from British rule. They protested using force & exploded bombs in London.
H Divison	Policed the area of Whitechapel.
Jack the Ripper	A serial killer who murdered five women in Whitechapel in 1888. Police didn't catch him damaging public confidence in them
Peabody Estate	Peabody Trust built flats in an old slum area, designed to be affordable rents and surrounded by a yard to improve ventilation.
Sensational stories	Press dramatized stories to excite readers & sell more copies of newspapers.
Socialism	Political and economic system in which property and resources are owned or controlled by the state and wealth shared by people
Workhouse	Accommodation that gave food and shelter to poor. Conditions were bad to make it a last resort. Inmates were typically the old, sick, disabled, orphans and unmarried mothers
Protection racket	Taking money from people in exchange for agreeing not to hurt them. Gangs ran protection rackets which threatened the owners of Jewish businesses.

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

- 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 Guru Granth Sahib
- Evaluate:** Consideration of different viewpoints before arriving at a final judgement
- Justified Conclusion:** A final decision which is based upon a range of evidence.

Key Beliefs Continued

The Stages of Liberation: The 5 Khands	
<ul style="list-style-type: none"> - Stages a human being must pass through 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 Mukti	
<ul style="list-style-type: none"> - Sikhs must avoid those things which will stop them from achieving mukti. There are 5 evils (below) but 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
<ul style="list-style-type: none"> - 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:	
<p>The life of Guru Nanak</p> <ul style="list-style-type: none"> - 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' 	<p>The life of Guru Gobind Singh</p> <ul style="list-style-type: none"> - 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
<p>The Guru Granth Sahib</p> <ul style="list-style-type: none"> - 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.' 	<p>Sikhism Today</p> <ul style="list-style-type: none"> - 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	
<ul style="list-style-type: none"> - 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. 	
<p>Tan (Physical Sewa)</p> <p>Using the body to help others e.g. serving in the langar, cleaning shoes or floors</p>	<p>Man (Mental Sewa)</p> <p>Using the mind and mental skills e.g. reading the GGS, teaching others, inspiring others</p>
<p>Dhan (Material Sewa)</p> <p>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</p>	

The Sangat: Sikh Religious Community
<ul style="list-style-type: none"> - 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
<ul style="list-style-type: none"> - 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 whilst they believe in Waheguru and the Gurus, they do not have to follow the strict rules.

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 accompaniment 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 	<ul style="list-style-type: none"> - 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 	<ul style="list-style-type: none"> - 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 	<ul style="list-style-type: none"> - 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
- 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 which 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'.**

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: Diwali

- Name means 'a row of lights' so Diwali 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 Hargobind 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 Diwali.

Celebrations at Diwali

- 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 Gurburbs

- Take place at anniversaries – usually the birth or death of a guru.
- 4 most widely celebrated gurburbs: 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 gurburb
- 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 healing 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 do 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

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 Guru Granth Sahib

Evaluate: Consideration of different viewpoints before arriving at a final judgement

Justified Conclusion: A final decision which is based upon a range of evidence.

GENRE IS...

the word is used to describe a particular style which has certain characteristics or 'Ingredients', which we call genre **CONVENTIONS**



SUB GENRE	HYBRID GENRE
Within most genres we can find sub genres, for example within Comedy we can find RomCom	A hybrid genre is a genre which blends themes and elements from two or more different genres, for example The Office is a documentary/comedy

PURPOSE OF MEDIA PRODUCTS

- Information, entertainment, escapism
- Profit, community, raising awareness
- Inspiration, critical acclaim, experimentation

AUDIENCES can be segmented by
AGE
GENDER
ETHNICITY

KEY WORDS	
CONVENTIONS	Genre conventions are all the parts of the genre such as character similarities and repeated plots that allow us to distinguish between genres. Genres have elements that the audience expects as they have been used many times in previous films.
MISE EN SCENE	A French term meaning “put into the scene”, this includes costumes, hair, make-up, and props and can help us identify the genre.
NARRATIVE	A films ‘story, or plot’ , for example boy meets girl would indicate romance, Heroes or Heroines vs Villains indicates Action
SETTING/ LOCATION	A films setting can help us to tell a films genre, for example ‘western’ films are usually set in the America outback, a Sci-Fi film will usually be set in space
TEHNNICAL CODES	Technical codes are aspects like camerawork, sound and lighting and these can indicate genre. For example low key lighting is used to create mystery and suspense.

PRIMARY AND SECONDARY AUDIENCES

The audience that the media producer targets is called the **PRIMARY audience**. This is the audience they intend to target. For example – Children are the primary audience of Disney films

Audience that engage with the product who are NOT who the producer of the text intends to target is called the **SECONDARY audience** – for example parents are the secondary audience for Disney films **188**

PRE PRODUCTION/ PRODUCTION TERMS

House style

Typography (fonts)

Mood boards

Sketches/ thumbnails

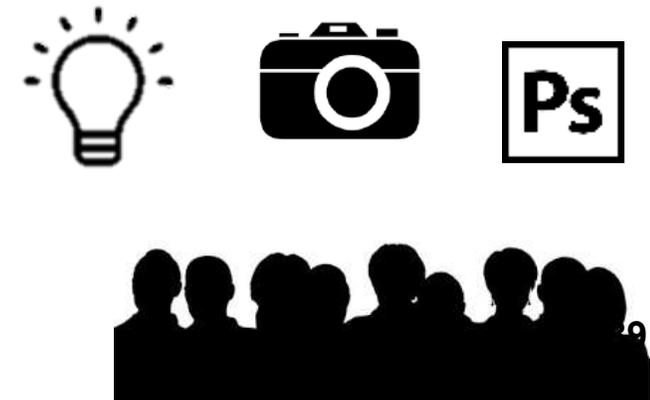
PHOTO SHOT TYPES

PHOTOSHOP TOOLS

- Marquee Tool
- Lasso Tool
- Crop & Slice Tool
- Brush & patch Tool
- Stamp Tool
- Eraser Tool
- Blur, Sharpen & Smudge
- Pen & Point Tool
- Path & Direct Selection
- Hand & rotate Tool
- Foreground Color
- Editing Mode
- Move tool
- Quick Selection Tool
- Eyedropper Tool
- Brush & Pencil Tool
- History Brush Tool
- Gradient & Paint Bucket Tool
- Dodge, Burn & Sponge Tool
- Type/text Tool
- Shape Tool
- Zoom Tool
- Background Color
- Screen Mode

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

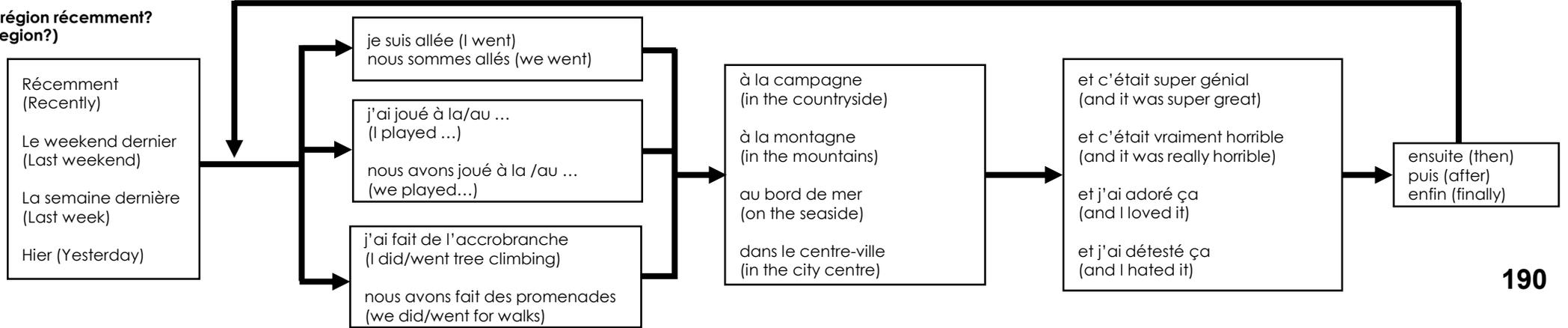
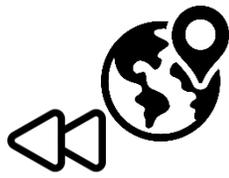


A. Décris ta région. (Describe your region.)		
<p>J'habite dans une région où (I live in a region where)</p> <p>Je vis dans une ville où (I live in a city where)</p> <p>Je vis dans un quartier où (I live in a neighbourhood where)</p> <p>J'habite à ... où (I live in... where)</p>	<p>il y a beaucoup de/d' (there is/are a lot of)</p> <p>il n'y a pas de/d' (there isn't/aren't any)</p>	<p>théâtre(s) (theatre(s))</p> <p>musées(s) (museum(s))</p> <p>stade(s) (stadium(s))</p> <p>café(s)</p> <p>parc(s)</p> <p>restaurant(s)</p> <p>centre(s) de loisirs (community centre(s))</p> <p>marché (market(s))</p> <p>supermarché(s) (supermarket(s))</p> <p>magasin(s) (shop(s))</p> <p>bibliothèque(s) (library/ies)</p> <p>gare(s) (station(s))</p> <p>vélo(s) (bike(s))</p>
	<p>il y avait beaucoup de/d' (there was/were a lot of)</p> <p>il n'y avait pas de/d' (there wasn't/weren't any)</p>	<p>trains</p> <p>métros</p> <p>voitures (car(s))</p> <p>bus</p>
<p>Avant, (Before)</p>		



B. Qu'est-ce que tu fais dans ta ville normalement ? (What do you do in your region usually if the weather is good/ bad?)		
<p>Lundi (Monday)</p> <p>Samedi (Saturday)</p> <p>Tous les weekends (Every weekend)</p> <p>Souvent (Often)</p> <p>D'habitude (Usually)</p> <p>Le matin (In the morning)</p> <p>L'après-midi (In the afternoon)</p>	<p>je vais (I go)</p> <p>je ne vais pas (I don't go)</p> <p>je ne vais jamais (I never go)</p> <p>nous allons (we go)</p> <p>nous n'allons pas (we don't go)</p>	<p>au parc au cinéma</p> <p>au centre commercial (to the shopping centre)</p> <p>à la bibliothèque (to the library)</p> <p>aux matchs de foot (to football games)</p>
	<p>je visite (I visit)</p> <p>je ne visite pas (I don't visit)</p> <p>je ne visite jamais (I never visit)</p> <p>nous visitons (we visit)</p> <p>nous ne visitons pas (we don't visit)</p>	<p>le musée (the museum)</p> <p>le stade (the stadium)</p> <p>le centre de loisirs (the leisure centre)</p>
	<p>je fais (I do)</p> <p>je ne fais pas (I don't do)</p> <p>je ne fais jamais (I never do)</p> <p>nous faisons (we do)</p> <p>nous ne faisons pas (we don't do)</p>	<p>de l'équitation (horseriding)</p> <p>de la natation (swimming)</p> <p>du karaté (karate)</p> <p>les magasins (shopping)</p> <p>un barbecue</p> <p>un pique-nique</p>

C. Qu'est-ce que tu as fait dans ta région récemment?
(What did you do recently in your region?)





D. Quels sont les avantages et les inconvénients de ta région/ville?
(What are the advantages and inconvénients of your region/city?)

Je pense que (I think that)	l'avantage de ma région c'est que (the advantage of my region is that)			qu' à la campagne (than in the countryside)
Je trouve que (I find that)	l'inconvénient de ma région c'est que (the disadvantage of my region is that)	c'est plus (it is more)	animé (lively) tranquille (calm) sale (dirty)	qu' à la montagne (than in the mountains)
Je crois que (I believe that)	l'aspect positif de ma ma ville c'est que (the positive aspect of my city is that)	c'est moins (it is less)	propre (clean) pollué (polluted) dangereux (dangerous)	qu'au centre-ville (than in the city centre)
Selon moi (According to me)	l'aspect négatif de ma ma ville c'est que (the negaive aspect of my city is that)			qu'au bord de mer (than at the seaside) que dans la banlieue (than in the suburbs)

My extra vocabulary



E. Où veux/aimerais-tu habiter à l'avenir, en ville ou à la campagne ?
(Where do you want to/would you like to live in the future, in the city or in the countryside?)

	je préférerais habiter (I would prefer to live)	à la campagne (in the countryside)		je vouadrerais avoir une grande maison/un grand appartement (I would like to have a big house/a big flat)
Dans le futur, (In the future)	je voudrais habiter (I would like to live)	à la montagne (in the mountains)	parce que (because) car (because)	je veux prendre les transports en commun (I want to take public transport)
A l'avenir, (In the future)	j'aimerais vivre (I would like to live)	à ... en Angleterre (in ... (city) in England)		J'aimerais faire des promenades (I would like to go for walks)
L'année prochaine (Next year)	je veux vivre (I want to live)	au centre-ville (in the city centre) au bord de la mer (at the seaside) dans une ville (in a city) dans un village (in a village)		ça serait vraiment génial (it would be really great) ça serait super pratique (it would be super convenient)



**A. Décris ta famille.
(Describe your family.)**

Dans ma famille, il y a (In my family, there is/are)	mon père (my father) mon beau-père (my step-father) mon grand-père (my grand-father) mon tuteur (my guardian) mon frère (my brother) mon demi-frère (my half-brother)	qui s'appelle ... (who is called) qui a ... ans (who is ... years old)	et moi (and me)
	ma mère (my mother) ma belle-mère (my step-mother) ma grand-mère (my grand-mother) ma sœur (my sister) ma demi-sœur (my half-sister)		
	mes mères (my mothers) mes pères (my fathers) mes ... sœurs (my ... sisters) mes ... frères (my ... brothers) mes parents (my parents) mes grand-parents (my grand-parents)	qui s'appellent ... (who are called...) qui ont ... ans (who are... years old)	



Qu'est-ce qu'il y a sur la photo?

Sur la photo, il y a ...
(On the picture, there is/are...)

Sur la photo, je vois...
(On the picture, I see...)

Il est en train de
(He is)

Elle est en train de
(She is)

Ils sont en train de
(They are)

Elles sont en train de
(They are)

... personnes (...persons)
une famille (a family)
un homme (a man)
une femme (a woman)
un garçon (a boy)
une fille (a girl)

un parc (a parc)
un cinéma (a cinema)
une plage (a beach)
une montagne (a mountain)
une ville (a city)
une maison (a house)
des immeubles (buildings)
des arbres (trees)

parler (talking)
rire (laughing)
travailler (working)
jouer (playing)
manger (eating)
regarder la télévision (watching TV)

Il fait beau
(The weather is nice)

Il fait soleil
(It is sunny)

Il fait nuageux
(It is cloudy)

Il pleut
(It is raining)

Il neige
(It is snowing)



**B. Décris ton meilleur ami/ un membre de ta famille. (Describe your best friend/a member of your family.)/
Est-ce que tu t'entends bien avec ta famille? (Do you get along well with your family?)**

Je m'entends bien avec (I get along well with) Je m'entends mal avec (I don't get along well with) Je me dispute avec (I argue with) Je m'intéresse à (I am interested in) Je m'occupe de (I look after)	mon père (my father) mon beau-père (my step-father) mon grand-père (my grand-father) mon frère (my brother) mon meilleur ami (my best friend)	parce qu'il/elle est (because he/she is)	Ø	fort(e)(s) (strong) bavard(e)(s) (chatty) nul(le)(s) (rubbish) gentil(le)(s) (kind) ennuyeux/-se(s) (boring) travailleur/-se(s) (hardworking) timide(s) (shy)
	ma mère (my mother) ma belle-mère (my step-mother) ma grand-mère (my grand-mother) ma sœur (my sister) ma meilleure amie (my best friend)	parce qu'ils/elles sont (because they are)	un peu (a bit)	
		mais il/elle est (but he/she is)	très (very)	
		mais ils/elles sont (but they are)	trop (too)	
		cependant il/elle est (however he/she is)	vraiment (really)	
	cependant ils/elles sont (however they are)	assez (quite)		



**C. Qu'est-ce que tu fais normalement avec ta famille/tes amis?
(What do you normally do with your family/friends?)**

Normalement, (Normally,)	avec ma famille (with my family) avec ma petite-amie (with my girlfriend) avec mon petit-ami (with my boyfriend) avec mes amis (with my friends)	je fais (I do) je ne fais pas (I don't do) nous faisons (we do)	de la natation (swimming) de l'équitation (horseriding) du karaté (karate) les magasins (shopping)
D'habitude (Usually,)		je joue (I play) je ne joue pas (I don't play) nous jouons (we play)	au foot (football) à la pétanque (petanque) de la musique (music)
Lundi, (On Monday,)		je mange (I eat) je ne mange pas (I don't eat) nous mangeons (we eat)	au fast-food au restaurant chinois (at the Chinese restaurant)
Mercredi (On Wednesday,)		je regarde (I watch) je ne regarde pas (I don't watch) nous regardons (we watch)	des films de science-fiction des séries Netflix des jeux télévisés (game shows) des vidéos Youtube (Youtube videos)
Tous les soirs, (Every night,)		je vais (I go) je ne vais pas (I don't go) nous allons (we go)	au cinéma au centre commercial (to the shopping centre) au centre ville (to the town centre) à la patinoire (to the icering)
Tous les weekends, (Every weekend,)		je parle (I talk) je ne parle pas (I don't talk) nous parlons (we talk)	de musique (about music) de cinéma (about cinema) de mes loisirs (about my hobbies) de nos problèmes (about our problems)
Tous les jours, (Everyday,)			

Ma vocabulaire

**E. Est-ce que tu voudrais te marier dans le futur? / Quels sont les avantages/inconvénients de se marier ou d'avoir des enfants?
(Would you want to get married in the future? / What are the advantages/disadvantages of getting married or having children?)**

Dans le futur, j'aimerais (In the future, I would like to)	vivre avec quelqu'un (live/living with someone) me marier (get/getting married) avoir des enfants (have/having children) avoir une famille nombreuse (have/having a big family)	mais (but)	c'est une tradition importante (it is an important tradition)
A l'avenir, je voudrais (In the future, I would want to)		cependant (however)	c'est démodé (it is old fashioned)
Quand je serai vieux/vieille, je ne veux pas (In the future, I don't want to)		car (because)	c'est une perte de temps (it is a waste of money)
Je pense que l'avantage de/d' (I think that the advantage of)			c'est que/qu' (is that)
Je trouve que l'inconvénient de/d' (I find that the disadvantage of)			les divorces sont stressants (getting divorce is stressful) on peut organiser une grande fête (you can organise a big party)



Unit 1: Fitness for Sport & Exercise

Unit 1: Learning Aim A – Components of fitness

Components of physical fitness

- Body composition
- Aerobic endurance
- Speed
- Muscular strength
- Flexibility
- Muscular endurance

Components of skill related fitness

- Balance
- Co-ordination
- Reaction time
- Agility
- Power

Unit 1: Learning Aim A - Exercise intensity & Principles of Training.

Exercise Intensity

- Intensity – be able to measure heart rate (HR) and apply HR intensity to fitness training methods
- Know how to calculate maximum heart rate = $220 - \text{age (years)}$
- Training zones: Aerobic = 60% - 85%, Anaerobic = 85%-95% and Speed 95%-100% of Max HR.
- Borg RPE scale 6-20. Know about the relationship between RPE and heart rate where: $\text{RPE} \times 10 = \text{HR (bpm)}$

Principles of training

Basic:

- Frequency, Intensity, Time, Type

Additional:

- Variation, Adaptation, Specificity, Progressive overload, Individual needs, Reversibility, Rest & Recovery.

Unit 1: Learning Aim B – Training Methods

Flexibility Training – PNF, Ballistic, Static: Active, Passive.

- **Circuit Training:** A series of exercise performed in a specific order.

Free Weight training:

- **Muscular endurance** = 50-60% of 1 Rep max for 20 reps
- **Elastic strength** = 75% & 12 reps
- **Max strength** = 90% & 6 reps
- **Plyometric training:** Develops explosive power & Strength

Aerobic Endurance training:

- **Continuous training:** Steady pace, moderate intensity.
- **Interval training:** Period of work followed by a period of rest.
- **Fartlek training:** Varied intensity, running at different speeds over different terrain.

Speed training:

- **Hollow Sprints:** Series of sprints separated by period of jogging or walking.
- **Acceleration Sprints:** Pace is gradually increased from walking to sprinting.
- **Interval training:** Shorter, higher intensity work followed by periods of rest.

Unit 1: Learning Aim C – Fitness Testing

Aerobic endurance: Multi-stage fitness test, forestry step test

Muscular endurance: 60 sec sit up/press up test

Flexibility: Sit & reach test

Speed: 35m Sprint test

Body composition: BMI, BIA, Skin fold/Jackson Pollock test.

Muscular strength: Hand grip dynamometer

Agility: Illinois agility test

Power: Vertical jump test

Keyword	Definition
Body Composition	The relative ratio of fat mass to fat-free mass (vital organs, muscle, bone) in the body.
Aerobic Endurance	The ability of the cardiorespiratory system to work efficiently, supplying nutrients and oxygen to working muscles during sustained physical activity
Speed	Distance divided by the time taken. Speed is measured in metres per second (m/s).
Muscular Strength	The maximum force (in kg or N) that can be generated by a muscle or muscle group.
Flexibility	Having an adequate range of motion in all joints of the body; the ability to move a joint fluidly through its complete range of movement.
Muscular endurance	The ability of the muscular system to work efficiently, where a muscle can continue contracting over a period of time against a light to moderate fixed resistance load.
Balance	The ability to maintain centre of mass over a base of support or there are two types of balance: static balance and dynamic balance.
Co-ordination	The smooth flow of movement needed to perform a motor task efficiently and accurately.
Reaction time	The time taken for a sports performer to respond to a stimulus and the initiation of their response.
Agility	The ability of a sports performer to quickly and precisely move or change direction without losing balance or time.
Power	$\text{Strength} \times \text{Speed} = \text{Power}$
Maximum Heart rate	The maximum amount of times your heart can beat in 1 minute.
Borg RPE	Rate of Perceived exertion



Unit 2: Learning Aim A – Rules, regulations, scoring systems & Officials

- **Minimum of 10 rules** of the chosen sport. Regulated by the sports governing body.
- A **Rule** is something that is put in place to make the game safe, fair and competitive.
- **Minimum of 6 regulations.** Regulated by the governing body and officials
- A **regulation** is something that is put in place in order for the game to be played. E.G equipment, court/pitch, clothing, facilities, officials.
- **Scoring Systems:** The method of scoring goals or points in order to determine a winner.
- **Application of the rules:** How are the rules applied? E.G when a goal is disallowed in football because the scoring player was offside.
- **Roles of Officials:** What are the officials of the sport? E.G referee, umpire, judge, assistant referee.
- **Responsibilities of the Officials:** What are they responsible for? E.G Qualifications, applying the rules and regulations, Health & safety, fair play, use of technology, communication.

Unit 2: Learning Aim B – Skills, techniques & Tactics in Sport

Components of fitness required for Sport:

- Aerobic Endurance
- Flexibility
- Speed
- Muscular strength
- Muscular endurance
- Body Composition

And why these are important for your chosen sport.

Skills:

- All skills required for your sport (Badminton shots, Rounders skills – batting, bowling, fielding)
- Technique of skills (how are these performed)
- Key points of the techniques for each skill

Tactics:

- Decision making and strategies to beat an opponent, including using personal strengths to your advantage.
- Use of attacking & defending tactics
- Use of different skills during the game to outwit the opponent. (E.G performing a net shot in Badminton when your opponent is at the back of the court)

Unit 2: Learning Aim B – Skills, techniques & Tactics in Sport

Demonstration & Application of the skills & tactics in Sport:

- Demonstrate appropriate levels of fitness throughout sporting performance
- Demonstrate & apply the relevant skills required to be successful in sport
- Demonstrate & apply the tactics used in order to outwit the opponent

Demonstrate all skills and tactics required for your sport in:

- Isolated practises
- Conditioned practises
- Competitive situations.

Unit 2: Learning Aim C – Review Sport performance

Observation checklist:

- Review your own performance using video analysis and a checklist. Ranking your performance from 0-10 for each skill & tactic performed.

Review Performance:

- Explain your strengths and areas for improvement for each skill, tactic and effectiveness of decision making.
- Evaluate and analyse performances in competitive situations.
- Create activities/drills to improve areas for improvement and overall performance.
- Explain the activities and how they are going to improve performance.

<u>Keyword</u>	<u>Definition</u>
Rule	A rule is created and put in place by the governing body for the sport. This is to ensure the game is played fairly and safely.
Regulation	A regulation is developed by the governing body for the sport and applied by the officials and participants. This is to ensure the game can be played safely and with the correct equipment.
Official	An official is in charge of applying the rules of the game.
Skill	An athlete's ability to choose and perform the right techniques at the right time, successfully and regularly.
Technique	The way in which a skill is broken down and performed.
Tactic	Tactics are the skills required in any game that allows a player or team to effectively use their talent and skill to the best possible advantage.
Isolated practise	A Practise or drill that is completed without pressure/competition.
Conditioned practise	A practise or drill that is completed with specific requirements/rules.
Competitive Situation	A game related activity or full competitive game where there is clear competition for success