ORMISTON SWB ACADEMY

Knowledge Organisers
Spring 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 Henry VIII's wives in History.* Read through this section of the knowledge organiser (a couple of times if it helps)	Now **cover up this section** of your knowledge organiser with a post it note or scrap paper.	**Self quiz- what can you remember** and rewrite? Make sure you do this without looking back at your knowledge organiser.	**Remove the post it and check for accuracy**- did you get the key terminology? Was it spelt correctly? Was the order correct? If you drew a diagram, how much of this did you get correct? Most importantly- what did you miss out?	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 where your learning is not secure. 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 Eating meat – causes global warming. Cows produce methane which is a greenhouse gas.*	**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 orgainser. 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.

KS4 – English – A Christmas Carol Plot and Key Quotations

Stave 1: "Marley's Ghost"

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

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

…'solitary (c) as an oyster.'

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

'Hard and sharp as flint.'

Stave 2: "The First of the Three Spirits"

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

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

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

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

Stave 3: "The Second of the Three Spirits"

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

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

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

'As good as gold.'

Stave 4: "The Last of the Spirits"

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

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

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

'…legs trembled beneath him.'

Stave 5: "The End of It"

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

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

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

'A merry Christmas to everybody.'

KS4 – English – A Christmas Carol Context, Theme and Characters

Christmas

Decline of Christmas

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

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

Christian Values

Family

The role of the Family

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

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

Reflection of Dickens' life

Responsibility

1834 Poor Law

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

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

Stereotyping poorer citizens (J)

Redemption (i)

Role of religion

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

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

Performing kind deeds

	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

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

→ **Employs(S.2)** →

Scrooge
A rich Victorian misanthrope (k).

→ **Employs** →

Bob Cratchit
Scrooge's clerk

Emily Cratchit
Bob's wife who hates Scrooge.

Martha Cratchit
The eldest Cratchit child.

Belinda Cratchit
The second eldest Cratchit child.

Peter Cratchit
The third eldest Cratchit child.

Tiny Tim
Bob's disabled son.

The twins
The youngest Cratchit children.

Shows a vision of (S.2):

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

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

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

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

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

Fan
Scrooge's younger sister..

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

KS4 – Macbeth – Plot and Key Quotations

1. The witches meet on the heath.
2. Macbeth and Banquo have fought and won a battle. They are praised for their bravery by the Captain.
3. 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!
4. Macbeth plans for Duncan to stay at his castle.
5. Lady Macbeth convinces Macbeth to kill King Duncan.
6. Duncan arrives at Macbeth's castle.
7. Macbeth tells Lady Macbeth he will not murder Duncan. However, she convinces him to go ahead with the murder.

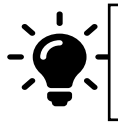
1. Macbeth sees a dagger in front of him on his way to go and kill King Duncan.
2. Macbeth murders King Duncan. Macbeth's guilt is apparent as he appears covered in blood. Lady Macbeth feels no guilt and places the daggers on Duncan's guards.
3. The dead body is discovered by Macduff. Duncan's sons,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

1. Macbeth questions Banquo. He is suspicious of Banquo. As a result, he plans his murder with the help or murderers.
2. Banquo is murdered by the hired murderers but his son, Fleance, manages to escape.
3. 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.
4. Hecate, the witches's leader, is angry that the witches meddled with Macbeth without her permission.
5. Lennox shares his suspicions about Macbeth.

1. The witches share three more prophecies (b):
2. 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.
3. Macbeth has Macduff's wife and children murdered.
4. In England, Malcolm tests Macduff's loyalty and checks they are on the same side, wanting the same things.

1. Lady Macbeth sleepwalks: she is overcome with guilt and loneliness.
2. The rebels discuss the impending battle.
3. Macbeth declares he has nothing to fear from the battle. He appears confident.
4. The doctor reports on Lady Macbeth's condition. Macbeth orders him to cure her.
5. Malcom and Macduff's forces march to Dunsinane castle, disguising themselves with branches from the trees of Birnam Wood.
6. Lady Macbeth dies off stage.
7. Macbeth realises that he is not going to win but decides to at least die fighting.
8. Malcolm prepares for battle.
9. Macbeth kills young Siward.
10. 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.
11. Malcolm is crowned the new king of Scotland.

Act One



"…let not light see my black and deep desires." (1.4)

"…look like the innocent flower but be the serpent under't." (1.5)

"… instruments of darkness." (1.3)

"Too full o' the milk of human kindness." (1.5)

"Stay, you imperfect speakers." (1.3)

"When you durst do it, then you were a man." (1.7)

"… brave…" "Noble…" "Worthy" (1.2)

"… vaulting (c) ambition which o'erleaps itself." (1.7)

Act Two

"… horror, horror, horror!" (2.3)

"… daggers in men's smiles." (2.3)

"Give me the daggers!" (2.2)

"I'm afraid to look on what have done." (2.2)

Act Three

"Fly, good Fleance, fly, fly, fly!" (3.3)

"…fruitless crown." (3.1)

"I fear. Thou played'st most foully for 't." (3.1)

Act Four

"… devilish Macbeth." (4.3)

"All? What, all my pretty chickens and their dam. At one fell swoop?" (4.3)

Act Five

"Turn, hell hound, turn!" (5.8)

"… dead butcher and his fiend-like (d) queen." (5.8)

"Hell is murky." (5.1)

KS4 – Macbeth – Context, Themes and Characters

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

Religion

Ambition

Supernatural

King James I

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

Appearance vs. Reality

Fate vs. Freewill

Gender

Gender stereotypes

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**.

The Role of Women

Masculinity

Ambition

Kingship

King James I

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

Revenge

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.

Influences A1.s3

Macbeth
Originally the Thane of Glamis…

Kills A3.s4

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".

Kills A2.s2

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.

Kills A5.s8

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.

Join forces A4.s3

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.

	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.

KS4 – English - An Inspector Calls

Act 1:

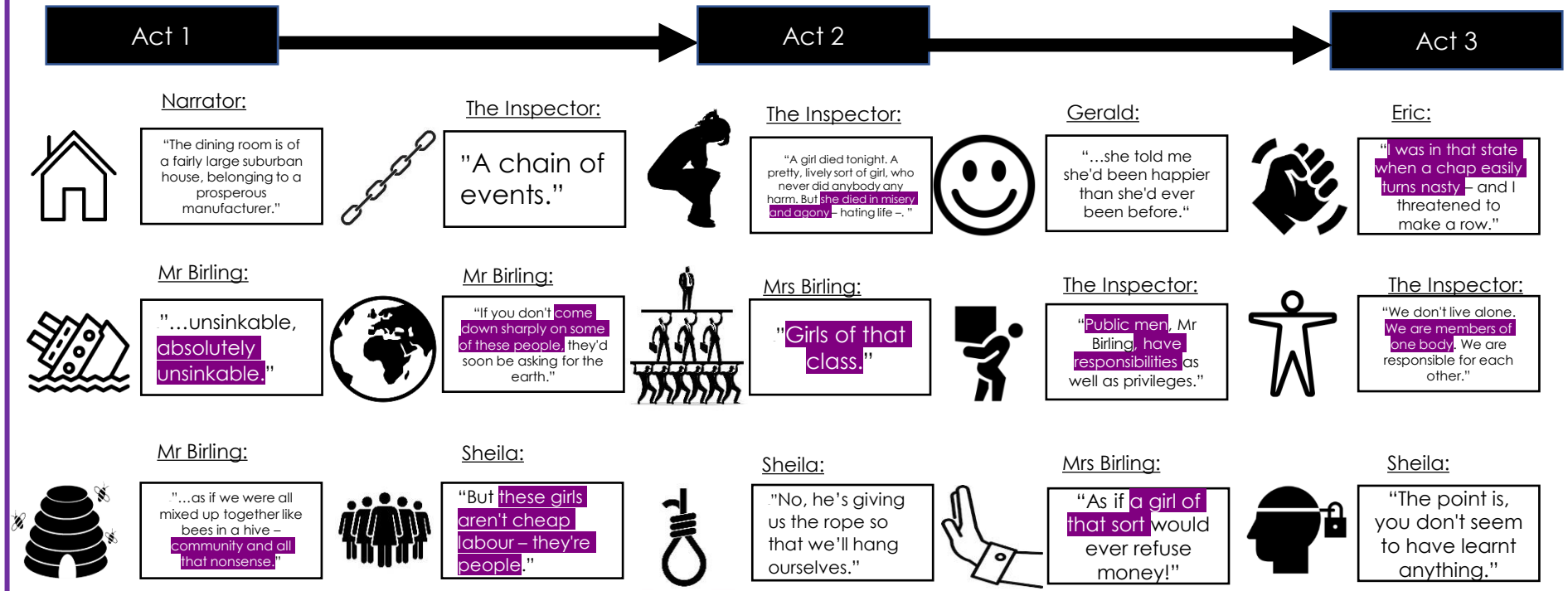
1. The Birling family are celebrating the engagement of Sheila Birling and Gerald Croft.
2. An Inspector arrives and tells them that a woman named Eva Smith has committed suicide.
3. After Inspector Goole questions Mr Birling, it becomes clear that Mr Birling fired Eva from his factory for asking for 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.



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)b) attitudes.
L Mouthpiece	Someone placed there to speak your own views.
K Credited	Given the praise for.

KS4 – English - An Inspector Calls

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.

Characters

Sybil Birling
Arthur's wife of a higher class. An unsympathetic woman who represents the bourgeoise (E) upper class. She is adamant that she is blameless in Eva Smith's suicide.

Arthur Birling
Sybil's husband. He represents the capitalist (B) class that controls the wealth and means of production; he is concerned with material gain and conventional attitudes. He is a wealthy factory owner in his mid 50s.

Eric Birling
Sybil and Arthur's son. He is adolescent in his manner and drinks too much. He forced himself on Eva, got her pregnant, then stole money from his father to support her. He accepts responsibility.

Sheila Birling
Sybil and Arthur's daughter. She's in her early twenties; bright, lively and optimistic. Unlike her parents and fiancé, she expresses deep regret for her role in Eva Smith's suicide.

Edna
The maid of the Birling family; used a symbol of their wealth.

Gerald Croft
Sheila's fiancé. Gerald Croft represents the aristocracy: the highest class of society, comprised of rich land owners and people who inherit their wealth from their parents. He had an affair with Eva.

Eva Smith
She never appears on stage; she has already committed suicide. She represents the proletariat(F) who are exploited (D) by the upper classes, like the Birlings.

Inspector Goole
A mysterious figure. His name evokes the word 'ghoul', meaning spirit or phantom. He appears to have supernatural powers of observation and persuasion. He reflects a socialist (A) point of view.

Winston Churchill

War Hero — Conservative MP

Often voted as one of the top three greatest ever Britons, Winston Churchill was the Conservative (k) Prime Minister who is often credited with being important in winning WWII (1945).

Responsibility

Social Responsibility — Responsibility for our Actions

Priestley believed in social responsibility and taking care of everyone in society; this is explored through each character's reaction to their role in Eva's death.

Age

Younger Generation — Older Generation

This theme is explored through the older and younger generation (Mr and Mrs Birling vs Eric and Sheila); their reactions to their part in the "chain of events" demonstrates how the younger generation have more capacity for change.

Gender

Inequality — Role of Women

Women were treated as though they were inferior and they were often oppressed by the male characters in the patriarchal (G) society in which the play was set.

Social Class

Bourgeoisie — Proletariat (f)

The Birlings and Gerald represent the upper classes who abuse their power and exploit (D) the lower classes who are represented through Eva and the Inspector.

KS4 – English – Unseen Poetry Knowledge Organiser

Step-by-step approach for Q1

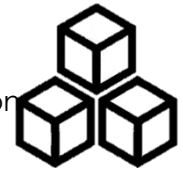
Step 1: Read the question: what is the steer (a)?

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)

Step 1:

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

Give

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

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.

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.

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.

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 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.

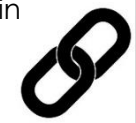
KS4 – English – Unseen Poetry Knowledge Organiser

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"

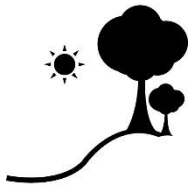
Step 4:  This also emphasises how much people need others as the speaker has to 'beg' for human affection

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.
It 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

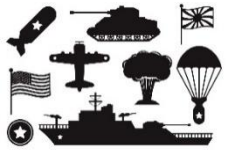
KS4– English – Power and Conflict Poetry Context



Romantic era (g)

Imperialism (d)

Global Conflict



Global Conflict

Global Displacement (e)

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

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

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

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

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

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

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

Poems:
11. Kamikaze

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

Poems:

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

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

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

KS4– English - Power and Conflict Poetry – Language Analysis AO2

War and conflict

7 1957

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

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

9 1985

"A hundred agonies in black and white."

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

5 1854

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

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

6 1917

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

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

Effects of war

14 2008

"…his blood shadow stays on the street."

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

15 2009

"I traced the inscriptions on the war memorial."

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

11 2000s

"A shaven head full of powerful incantations."

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

Power of nature

8 1966

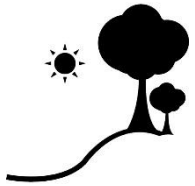
"We are bombarded by the empty air."

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

2 1799

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

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



Power of the individual/ authority

4 1842

"I choose never to stoop."

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

3 1817

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

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

Power of the state

1 1792

"I wander through each chartered street."

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

13 2005

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

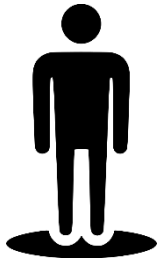
The repetition (p) of 'dem tell me' shows the control the state has to control what the speaker knows.

10 1993

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

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

Power of humans



12 2000s

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

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

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

Number on context page. 12 2000s

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

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

KS4 – English – Language Paper 1 Section A

Start of the exam

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

Top Tips

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

1: The '4 things' Question

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

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

4 marks

2: The 'Language' Question

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

You should: Explain or analyse the effect of language.

8 marks

3 The 'Structure' Question

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

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

8 marks

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

4: The 'Agree' Question

20 marks

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

You should:

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

Active Verbs (similar to" shows")

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

The writer _(active verb)___ the…

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

KS4– English – Language Paper 1 Section B

Section B: Question 5

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.

KS4 – English – Language Paper 2 Section A

Start of the exam

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

Top Tips

- ✓ Use the **What/How/Why** paragraph structure.
- ✓ On questions 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

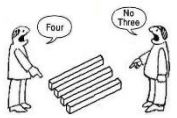
3 The 'Language' Question

-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

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



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…

	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.

Section B: Question 5

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.

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

Start of the exam

- ✓ 5 minute plan with question in mind.
- ✓ 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**?

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.

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.

Year 10 – Maths – Crossover Unit 19 & 20 – Expanding and Simplifying/Factorising

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 $3(a + 4)$

$3(a + 4)$

x	a	+ 4
3	3a	12

$= \mathbf{3a + 12}$

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

$y(3y - 5)$

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

$= \mathbf{3y^2 - 5y}$

Expanding Pairs of Single Brackets

Example: Expand & Simplify $4(a – 2) + 3(2a + 5)$

Expand each bracket separately and then simplify your answer:

$4(a – 2)$

x	a	- 2
4	4a	- 8

$4a – 8$

$3(2a + 5)$

x	6a	+ 5
3	6a	15

$6a + 15$

Then simplify: $4a – 8 + 6a + 15$ $= \mathbf{10a + 7}$

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 $10x - 15$

HCF of 10x and 15 is 5. $10x \div 5 = 2x$
$15 \div 5 = 3$

$= \mathbf{5(2x – 3)}$

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

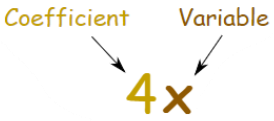
Example: Factorise $x^2 + 5x$

The HCF of $x^2 + 5x$ is x. $x^2 \div x = x$
$5x \div x = 5$

$= \mathbf{x(x + 5)}$

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 remove unnecessary terms and numbers
Expand	To multiply out terms to remove the brackets () (Opposite of **factorise**)
Coefficient	A number used to multiply a variable 
Factor	An integer that divides the number exactly leaving no remainder
Factorise	Write an expression as a product of its factors. (Opposite of **expanding**)
Power/Index	The number of times a number is multiplied by itself. E.g. 10^3 <-This means multiply 10 by itself 3 times -> 10 x 10 x 10
Quadratic	An expression where the highest power is 2 Ex: x^2
Term	A single number or a variable
Highest Common Factor (HCF)	The highest number or variable that divides exactly into two or more numbers or variables

Other Topics/Units this could appear in:

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

Year 10 – Maths – Crossover Unit 19 & 20 – Expanding and Simplifying/Factorising

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)

(a + 4)(a + 5)

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

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

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

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

Ex2: Expand (y + 3)(y – 6)

(a + 4)(a + 5)

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

= $y^2 – 6y + 3y - 18$

= **$y^2 – 3y - 18$**

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

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.

$x^2 + 5x + 6$

__ x __ = 6
__ + __ = 5

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

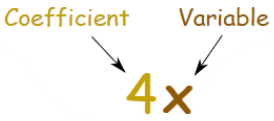
1, 6 2, 3

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

2 x 3 = 6
2 + 3 = 5

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 remove unnecessary terms and numbers
Expand	To multiply out terms to remove the brackets () (Opposite of **factorise**)
Coefficient	A number used to multiply a variable 
Factor	An integer that divides the number exactly leaving no remainder
Factorise	Write an expression as a product of its factors. (Opposite of **expanding**)
Power/Index	The number of times a number is multiplied by itself. E.g. 10^3 <-This means multiply 10 by itself 3 times -> 10 x 10 x 10
Quadratic	An expression where the highest power is 2 Ex: x^2
Term	A single number or a variable
Highest Common Factor (HCF)	The highest number or variable that divides exactly into two or more numbers or variables

Other Topics/Units this could appear in:

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

Year 10 – Maths – Crossover Unit 21 & 22 – Solving Equations & 'Subject of'

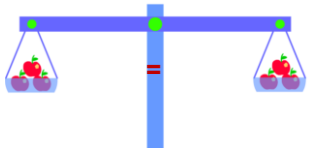
When we are solving equations, you need to figure out the value of the variable in the equation

Variable

$4x - 7 = 5$

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.

One – Step Equations

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

Ex1

y + 14 = 20
-14 -14
y = 6

Ex2

x – 120 = 80
+120 +120
x = 200

Ex3

3n = 12
÷3 ÷3
n = 4

Ex4

$\frac{k}{2}$ = 16
x2 x2
k = 32

Two – Step Equations

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

Ex1

$4x - 3 = 25$
+3 +3
$4x = 28$
÷4 ÷4
$x = 7$

Ex2

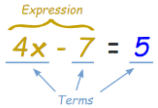
$\frac{y}{5} + 6 = 14$
-6 -6
$\frac{y}{5} = 8$
x5 x5
$y = 40$

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

$3(x + 4) = 27$
Expand the brackets first
$3x + 12 = 27$
-12 -12
$3x = 15$
÷3 ÷3
$x = 5$

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

Year 10 – Maths – Crossover Unit 21 & 22 – Solving Equations & 'Subject of'

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

$$8x + 12 = 5x + 30$$
$$\text{-}5x \qquad \text{-}5x$$

$$3x + 12 = 30$$
$$\text{-}12 \quad \text{-}12$$
$$3x = 18$$
$$\div 3 \quad \div 3$$
$$x = 6$$

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:

$$y + 81 = x + 100$$
$$\text{-}81 \qquad \text{-}81$$

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

$$y = x + 19$$

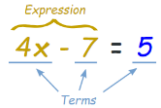
Ex2 Make x the subject of this formula:

$$C = 4x + 5y$$
$$\text{-}5y \qquad \text{-}5y$$

$$C - 5y = 4x$$
$$\div 4 \quad \div 4$$

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

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

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

Year 10 – Maths – Crossover Unit 23 - Averages

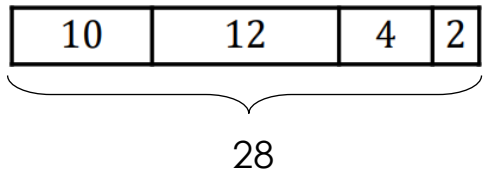
Calculating the Mean

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

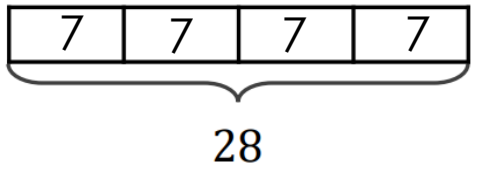
For example take this data set:

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.

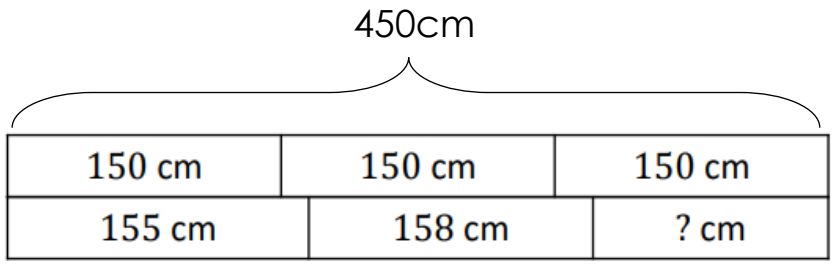


Therefore the mean is 7!

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:
155cm + 158cm = 313cm 450cm – 313cm = **137cm**

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 31÷ 2 = 15

  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 date that can be measured (continuous)
Qualitative	Information that describes something
Average	A calculated 'central value' of a set of numbers
Mean	The mean amount is the total amount split evenly
Median	Place the numbers in value order and then find the middle number. When there are two numbers in the middle we average them.
Mode	The number which appears most often in a set of numbers
Range	The difference between the highest and lowest values
Frequency	How often something happens.
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

Year 10 – Maths – Crossover Unit 24 – Averages From a Table

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 (m) 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
	100

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.

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 105.5^{th} value which is the **median** would be in this category.

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

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

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

The median value would be the **105.5^{th} value** in the table Then use this to help you to work out where this data would lie using 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 date 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.

Year 10 – Maths – Crossover Unit 24 – Averages From a Table

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

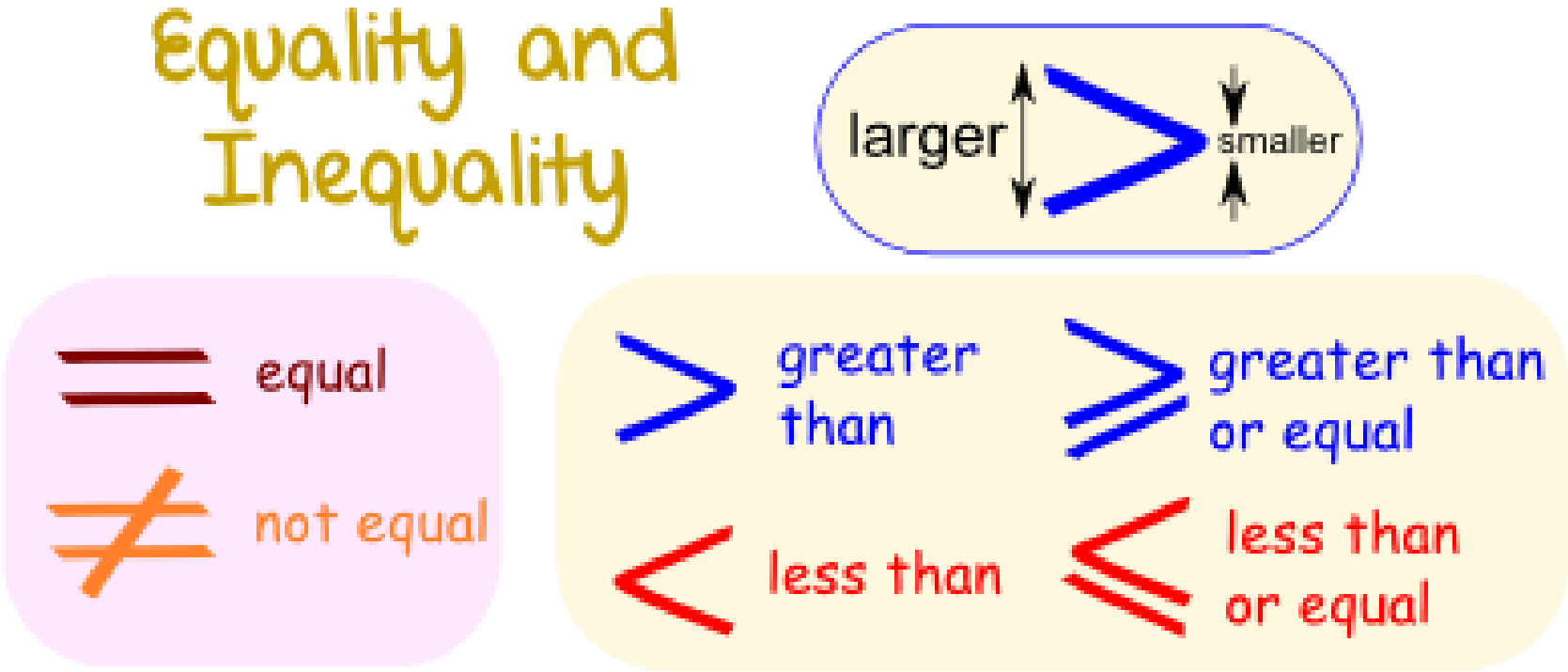
Keyword/Skill	Definition/Tips
Sample	A selection taken from a larger group 'the population' that will let you find out things about a larger group.
Population	The whole group being studied
Stem and Leaf	A plot where each data value is split into a 'leaf' and a 'stem'. 'Stem' values are listed down and '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

Year 10 – Maths – Crossover Unit 25 - Inequalities

Inequality Symbols



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 x y . y is the variable and 6 is the coefficient.
Inverse	Opposite of (i.e. x and ÷, + and -)
Solve	Find all of the values that satisfy the inequality.

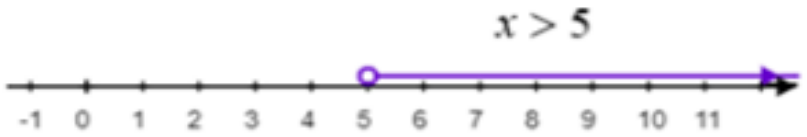
Year 10 – Maths – Crossover Unit 25 - Inequalities

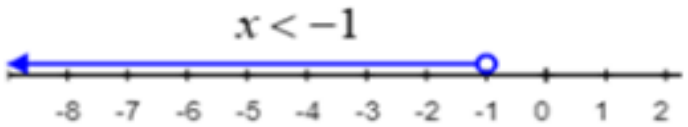
Inequalities Symbols on a Number Line

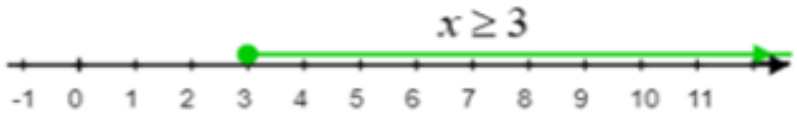
Symbol	Circle	Direction of Arrow
<	Open ○	Left
>	Open ○	Right
≤	Closed ●	Left
≥	Closed ●	Right

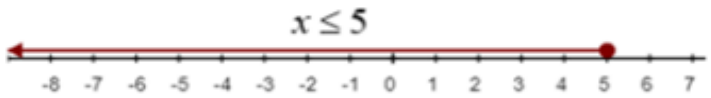
We use open and/or closed circles to represent inequalities on a number line. A closed circle means that the number **is** included in the represented group of values. An open circle means that the number **is not** included in the represented group of values.

Examples:







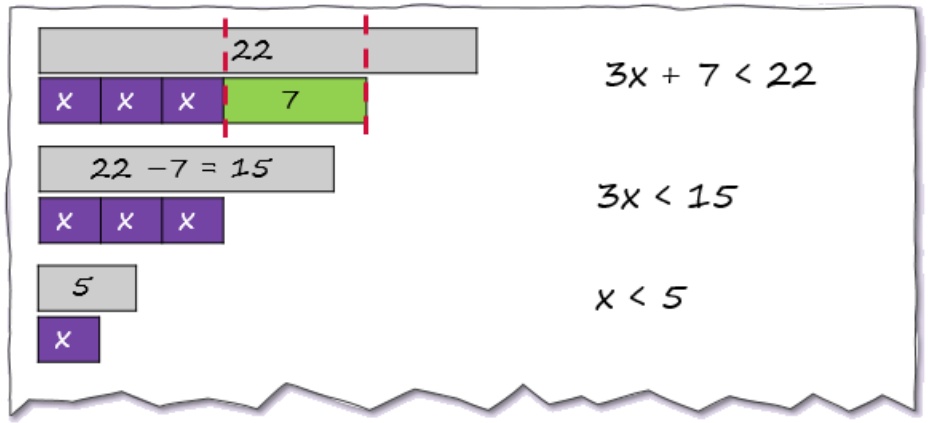


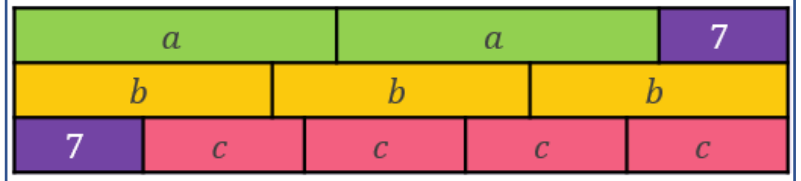
Keyword/Skill	Definition/Tips
Integer	Whole number including 0 and negative numbers. No fractions or decimals.
Inequality	Compares two values showing if one is less than, greater than or not equal to each other.
Greater than	One number is BIGGER than another number.
Less than	One number is SMALLER than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

Year 10 – Maths – Crossover Unit 25 - Inequalities

Solving Inequalities

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

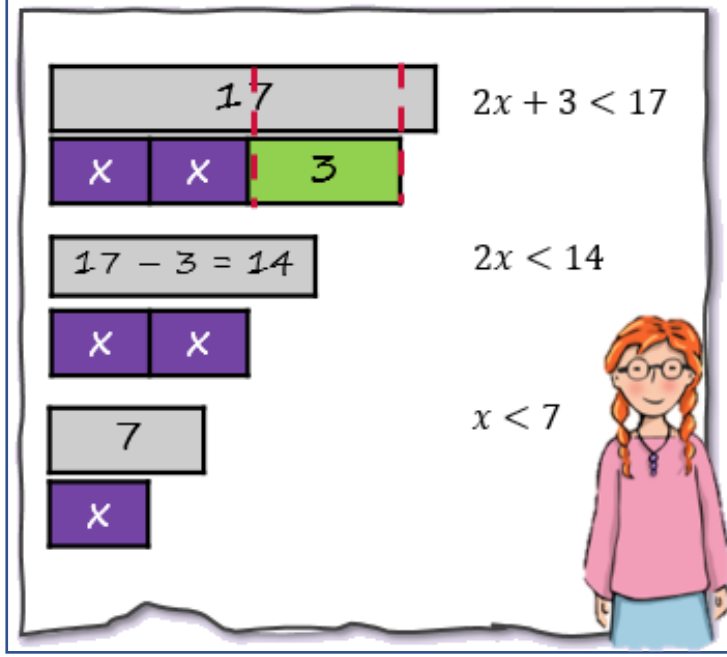


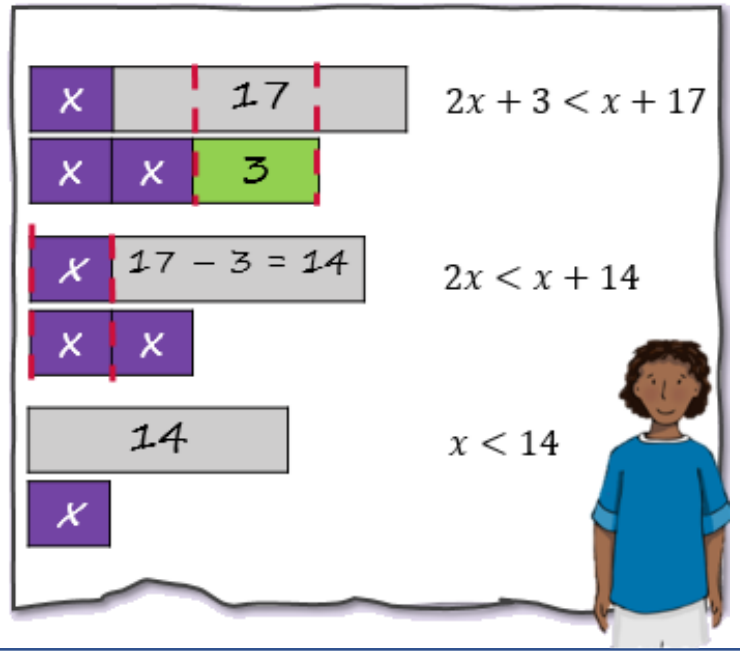


We can also use bar models to form new inequalities.

e.g.

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





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.

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 x y . y is the variable and 6 is the coefficient.
Inverse	Opposite of (i.e. x and ÷, + and -)
Solve	Find all of the values that satisfy the inequality.

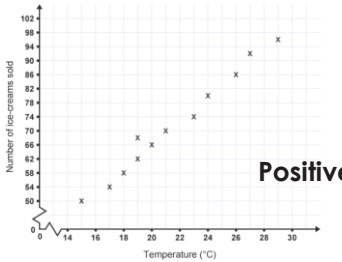
Year 10 – Maths – Crossover Unit 26 – Frequency Diagrams

Frequency Diagram

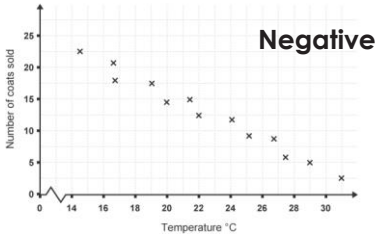
A **frequency diagram**, often called a line chart or a frequency polygon, shows the frequencies for different groups. The frequency chart below shows the results of the table. To plot a frequency polygon of grouped data, plot the frequency at the midpoint of each group.

Scatter Graphs

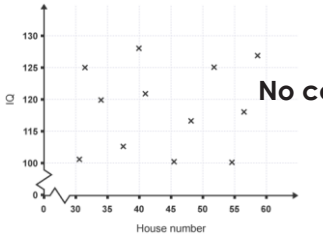
Scatter graphs are a good way of displaying two sets of **data** to see if there is a **correlation**, or connection**.**



Positive correlation.



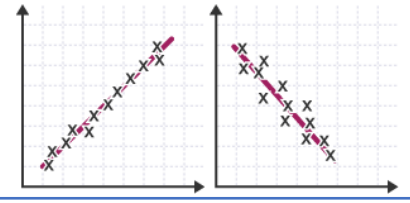
Negative correlation.



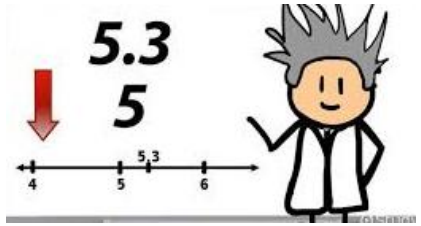
No correlation.

Line of Best Fit

A **line of best fit** is a sensible straight line that goes as centrally as possible through the coordinates plotted. It should also follow the same steepness of the crosses.



Estimation



Stem & Leaf Diagram

15,16,21,23,23,26,26,30,32,41

Stem	Leaf
1	5 6
2	1 3 3 6 6
3	0 2
4	1

Key: 1 | 5 = 15

how to place "32"

Frequency Diagram

Example

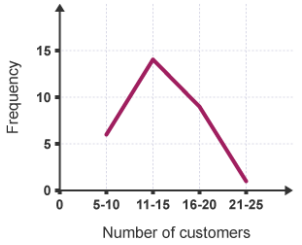
Megan owns a bakery. She counts the number of customers she has each day at lunchtime on 30 consecutive days. The results are shown here.

13	8	16	12	12	16
7	18	11	16	15	7
11	12	13	21	17	19
11	14	10	19	13	12
7	16	6	14	12	18

Using this data in list form could be time consuming and with a large set of data it may lead to mistakes or miscalculations. A grouped frequency table would help to display and give an overview of the data. The smallest number is 6 and the biggest number is 21, so groups that have a width of 5 are reasonable. This will give four groups as shown below. Of course, smaller groups would be more accurate but there may be too many groups to show up any pattern in the data.

Number of customers	Tally	Frequency
5-10	𝍸 |	6
11-15	𝍸 𝍸 ||||	14
16-20	𝍸 ||||	9
21-25	|	1

A **frequency diagram**, often called a line chart or a frequency polygon, shows the frequencies for different groups. The frequency chart below shows the results of the table. To plot a frequency polygon of grouped data, plot the frequency at the midpoint of each group.



Keyword/Skill	Definition/Tips
Average	A number expressing the central or typical value in a set of data.
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.
Scatter Graph	A graphical diagram with points plotted to show a relationship between two variables.
Line of Best Fit	A straight line that best represents the data on a scatter plot.
Correlation	The process of establishing a relationship or connection between two or more things. (Positive or Negative)
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.
Estimate	An approximate or rough calculation, often based on rounding.

Other Topics/Units this could appear in:

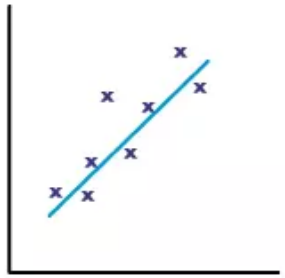
- Probability
- Probability Trees
- Cumulative Frequency & Box Plots
- Histograms
- Representations of Data

Year 10 – Maths – Crossover Units 27 & 28 -Scatter Graphs & Time-Series Graphs

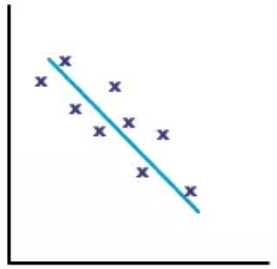
Scatter Graph

You need to be able to draw and interpret scatter graphs.

Positive Correlation

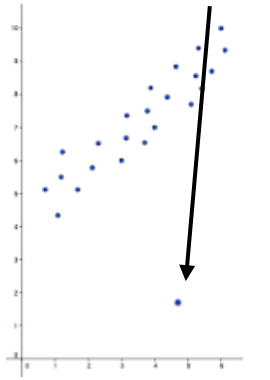


Negative Correlation



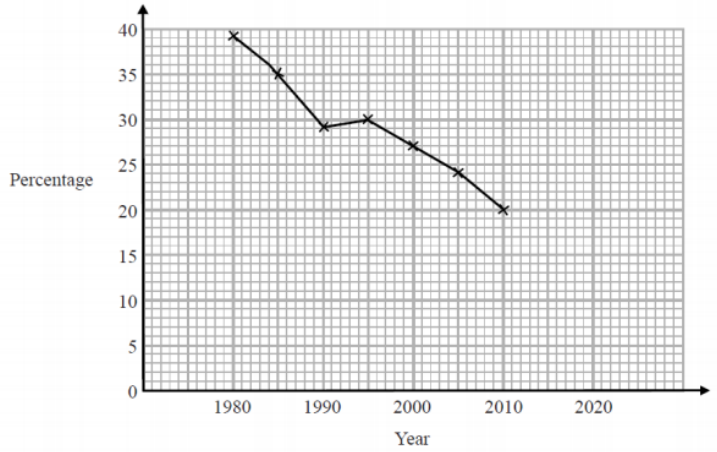
No Correlation

Outlier



Time – series graph

You need to be able to draw and interpret time-series graphs.



Example

The general trend of the above graph is a decrease in the percentages over the years 1980-2010.

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:

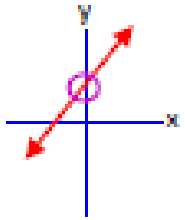
- Coordinate Geometry
- A-Level Statistics - Correlation

Year 10 – Maths – Crossover Unit 29 – Straight Line Graphs

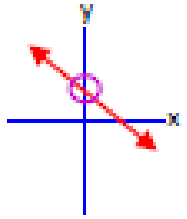
$$y = mx + c$$

Gradient **y-intercept**

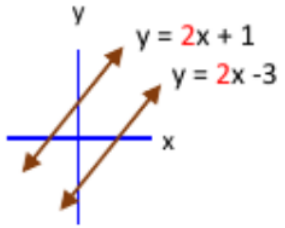
When gradient is positive.



When gradient is negative

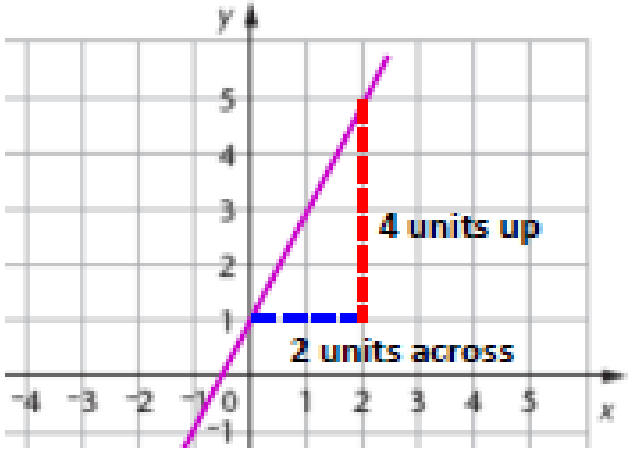


Parallel Lines have the SAME gradient.



How to find the gradient of a line.

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

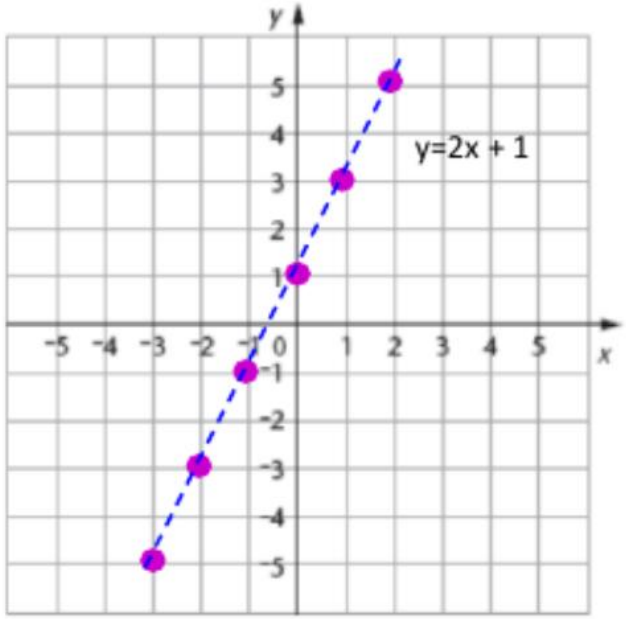


How to complete a table and plot a straight line graph.

1) 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

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

<u>Other Topics/Units this could appear in:</u>

- Coordinate Geometry

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

A Level – Statistics:
- Correlation

Year 10 – Maths – Crossover Unit 30 – Quadratic & Cubic Graphs

$ax^2 + bx + c$

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

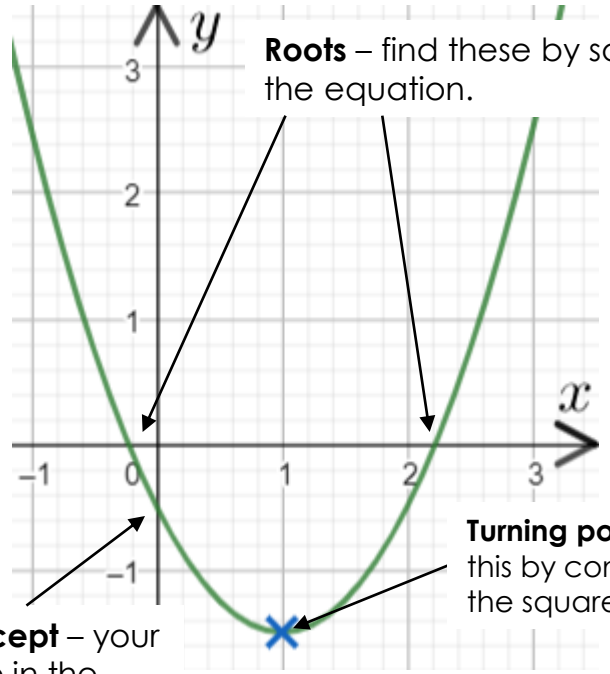
A quadratic graph is called a parabola.

They are symmetrical.

When **a** is positive

When **a** is negative

Features of a Quadratic Graph



Roots – find these by solving the equation.

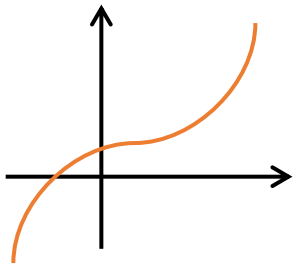
Turning point – find this by completing the square.

y-intercept – your c value in the equation

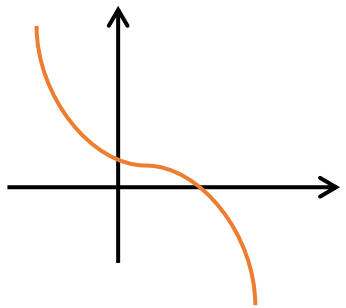
Other Graphs you Need to Know:

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

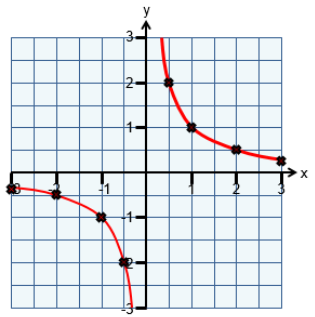
When **a** is positive



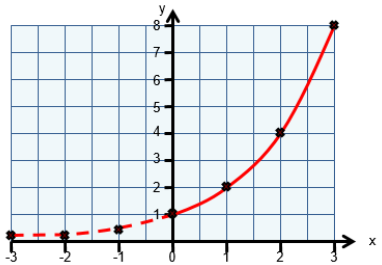
When **a** is negative



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 multiples 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

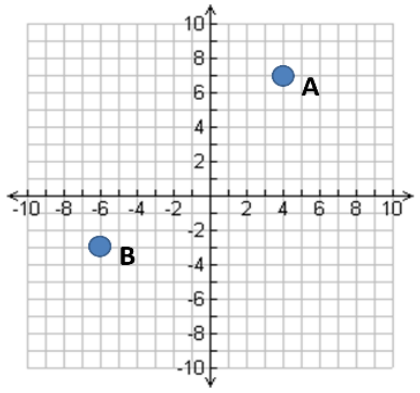
A-Level – Core:

- Algebra & Functions

Year 10 – Maths – Crossover Unit 31 – Coordinate Geometry

The Four Quadrants.

You should be able to plot coordinates in an axes that has 4 quadrants like this one:



How to Find the Midpoint of a Line.

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)

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

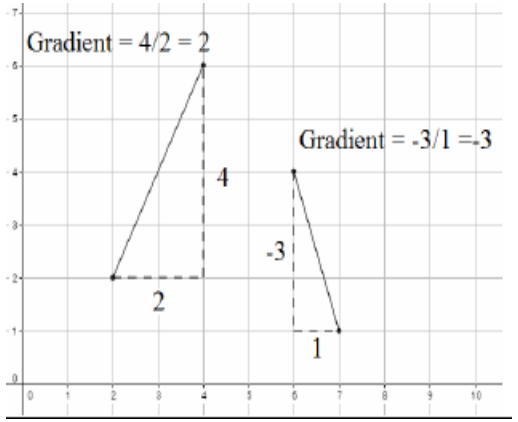
So the midpoint is (4, 5).

Using the Gradient of a Line.

The gradient of a line is how steep it is.

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

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

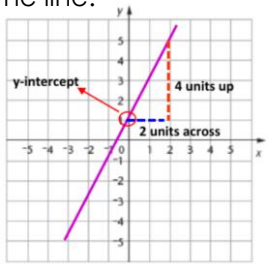
Finding the Equation of a Line

The general equation of a line looks like this:

$y = mx + c$

Gradient y-intercept

You need to be able to find the equation of a line from a graph.
Example:
Find the equation of the line:



Grad = $\frac{change\ in\ y}{change\ in\ x}$

Grad = $\frac{4}{2} = 2$

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.

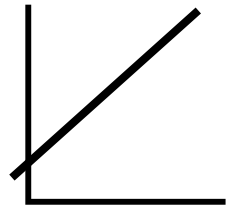
Example:
A line passes through the points (4, 7) and (8, 19). Find the equation of the line.

Grad = $\frac{change\ in\ y}{change\ in\ x}$

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

Then substitute in one of the points to find the value of c
Sub (4, 7): 7 = 3(4) + c
7 = 12 + c
c = -5

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.
Intercept	Where the line crosses
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

Year 10 – Maths – Crossover Unit 32 – Speed, Distance, Time and Compound Measures

Units of Measure

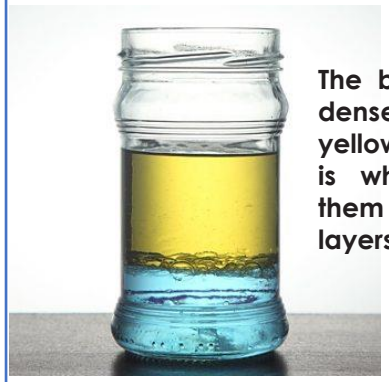
A unit of measurement describes one unit of a quantity. Units of measurement can be imperial or metric. They can be converted using conversion factors.

Density

- The density of an object or substance is its mass divided by its volume:
Density = Mass ÷ Volume.

- The units of density depend on the units used for mass and volume, but are usually: **g/cm³** (if mass is measured in g and volume in cm³).

- The more dense a substance is, the **heavier** it feels for its size.



The blue liquid is denser than the yellow liquid. This is why you see them in separate layers.

The formula for density is:

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

The standard units of density are kg/m^3 and g/cm^3.

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.

The formula for pressure is:

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

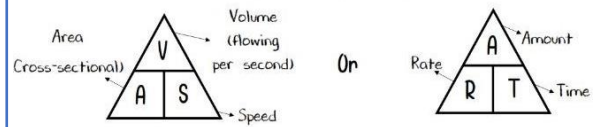
Converting Units of Speed, Density & Pressure

The maximum speed of a racing car is 340 km/h. Convert this speed into m/s (give the answer to one decimal place).
First convert kilometres into metres.
1 km = 1,000 m
Next convert hours into seconds.
1 h = 3,600 s
Finally combine the two unit conversions.

$$340\ \frac{km}{h} = \frac{340 \times 1,000}{3,600}\ \frac{m}{s}$$

$$340 \times 1,000 \div 3,600 = 94.4\ m/s$$

Measuring Flow



Measuring Speed

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

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

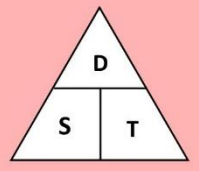
The units of speed are miles per hour so the time must be in hours.
There are 60 minutes in one hour.
30 minutes is half an hour.
Overall time for the journey is 2.5 hours.

$$Average\ speed = \frac{120}{2.5}$$

The average speed is 48 mph.
The formula for speed can be rearranged to calculate the time taken or the distance travelled.

$$Time = \frac{distance}{speed}$$

Distance Speed Time



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

$$Distance = Speed \times Time$$

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

Keyword/Skill	Definition/Tips
Ratio	A ratio shows the relative sizes of two or more values.
Proportion	Proportion says that two ratios (or fractions) are equal.
Best Value	Getting more for your money. What is the best option?
Proportional Change	If we multiply a number over and over again with the same number (except 1) then we 'repeatedly change' it in the same 'proportion'.
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.
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.
Speed	How fast something is moving.
Direct	A relationship between two variables in which one is a constant multiple of the other.
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.
Acceleration	How fast velocity changes.
Velocity	Velocity is speed (how fast something is moving) with a direction.
Inverse	Opposite in effect. The reverse of. The inverse of adding 9 is subtracting 9.
Distance	Length. A measurement of how far through space.
Time	Time is the ongoing sequence of events taking place. The past, present and future.

Other Topics/Units this could appear in:

- Coordinate Geometry
- Real-Life Graphs
- Mechanics

Year 10 – Maths – Crossover Unit 33 – Real Life Graphs

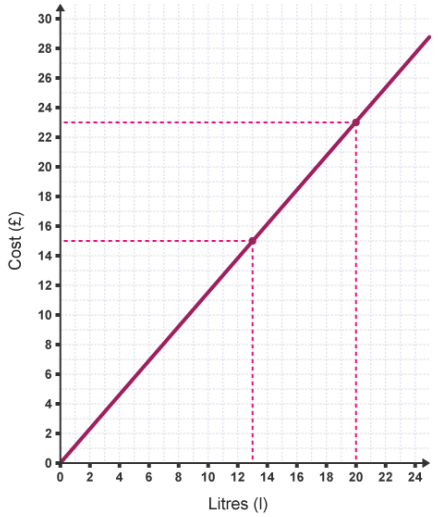
Real Life Graphs

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:

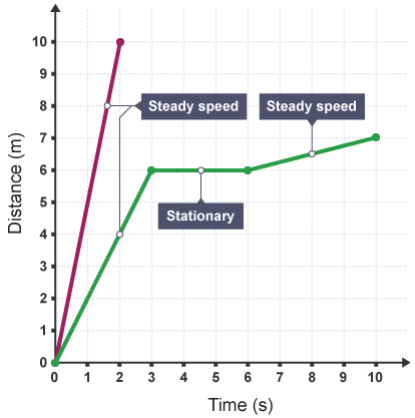
- **the gradient of the line or curve has a particular meaning.**
- **The y-intercept (where the graph crosses the vertical axis) has a particular meaning**
- **The area has a particular meaning**

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

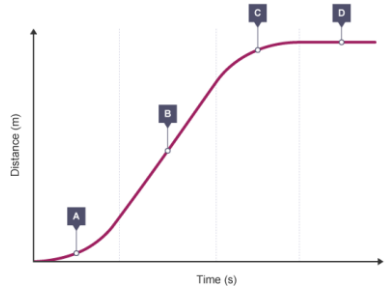


Distance – Time Graphs

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.

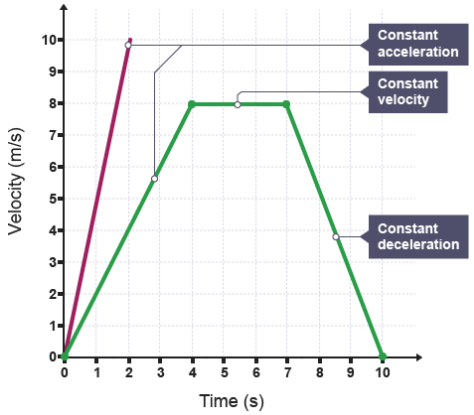


If the speed of an object changes, it will be **accelerating** or decelerating.
This can be shown as a curved line on a distance-time graph.



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.

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

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.

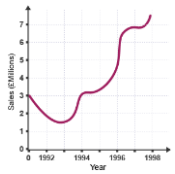
$$Gradient = \frac{6}{2} = 3$$

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.

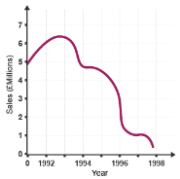
Trends

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

Upward Trend



Downward Trend



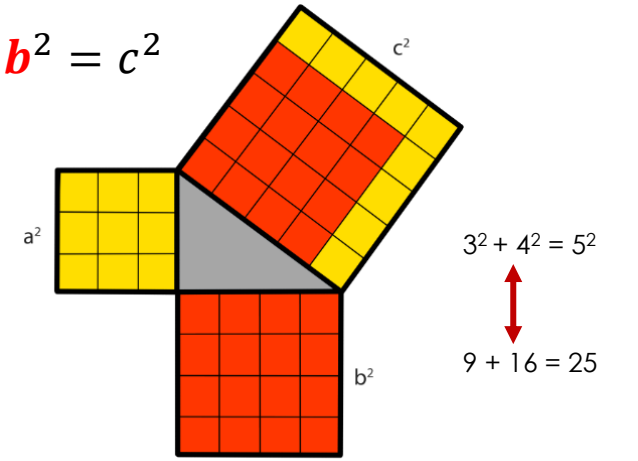
Other Topics/Units this could appear in:

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

Year 10 – Maths – Crossover Unit 34 – Pythagoras & Trigonometry

Pythagoras' Theorem: $a^2 + b^2 = c^2$ Where c is the hypotenuse.
a and b can be either of the two shorter sides.

$$a^2 + b^2 = c^2$$



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

$9 + 16 = 25$

You can use the theorem to calculate the length of the hypotenuse (the longest side)

$$a^2 + b^2 = c^2$$

You can rearrange the theorem to calculate the length of the shorter sides

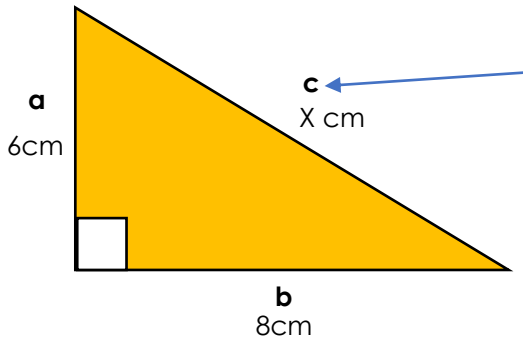
$$a^2 = c^2 - b^2$$

OR

$$b^2 = c^2 - b^2$$

<u>Example of calculating the hypotenuse:</u>

Calculate the value of x:



Label the sides of your triangle with a, b and c.
The hypotenuse must be labelled c.
The other sides can be labelled a and b (it doesn't matter which way round these are).

Substitute the lengths you have into this formula:

$a^2 + b^2 = c^2$

$6^2 + 8^2 = c^2$

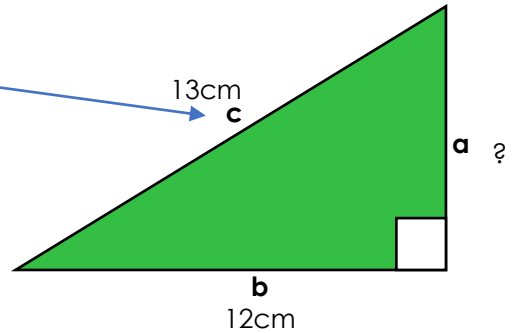
$36 + 64 = 100$

$100 = c^2 \Rightarrow \sqrt{100} = c \Rightarrow 10cm = c$

Don't forget, this is c^2. We want to calculate c so we need to square root!

<u>Example of calculating the shorter sides:</u>

Calculate the value of the missing side:



Substitute the lengths you have into this formula:

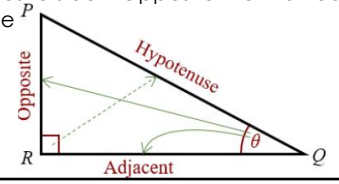
$a^2 = c^2 - b^2$

$a^2 = 13^2 - 12^2$

$a^2 = 169 - 144$

$a^2 = 25 \Rightarrow a = \sqrt{25} \Rightarrow a = 5cm$

Don't forget, this is a^2. We want to calculate a so we need to square root!

Keyword/Skill	Definition/Tips
Pythagoras	A Greek mathematician. He is famous for proving a theorem about the right-angle triangle.
Pythagoras' Theorem	In a right-angled triangle the square of the long side (**hypotenuse**) is equal to the sum of the squares of the other two sides.
Hypotenuse	The longest side of a right-angled triangle. It is always opposite the right angle.
Adjacent & Opposite	Adjacent side – Next to the marked angle Opposite side – Opposite the marked angle 
Trigonometry	Trigonometry is the study of triangles: their angles, lengths and more.
Trigonometric Ratios/Functions	The special measurements of a right-angled triangle: **Sin**/Sine **Cos**/Cosine **Tan**/Tangent
Inverse Trig Functions	You use these when calculating angles: $Sin^{-1}(x)$ $Cos^{-1}(x)$ $Tan^{-1}(x)$
Sin/Sine	The ratio of the length of the **opposite** side to the length of the **hypotenuse**
Cos/Cosine	The ratio of the length of the **adjacent** side to the length of the **hypotenuse**
Tan/Tangent	The ratio of the length of the **opposite** side to the length of the **adjacent** side

<u>Other Topics/Units this could appear in:</u>

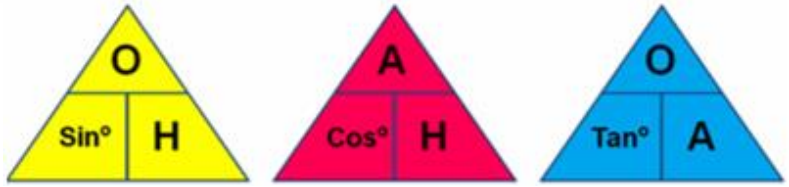
- Graphs of trigonometric functions.
- Further trigonometry.
- Appears throughout A-Level in the Core and Mechanics Units

Year 10 – Maths – Crossover Unit 34 – Pythagoras & Trigonometry

Trig Ratios

Sin **Cos** **Tan**

SOH CAH TOA

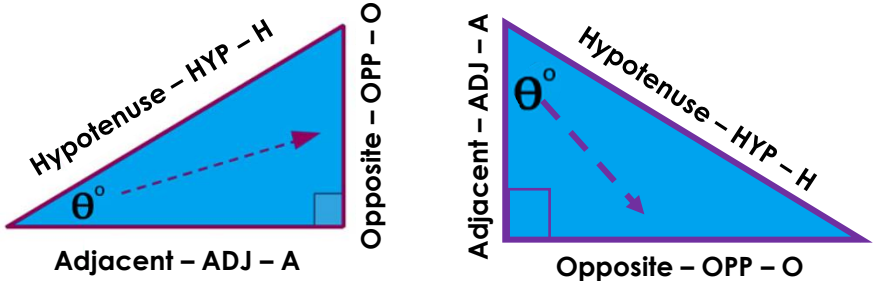


$$\sin(\emptyset) = \frac{opposite}{hypotenuse} \quad \cos(\emptyset) = \frac{adjacent}{hypotenuse} \quad \tan(\emptyset) = \frac{opposite}{adjacent}$$

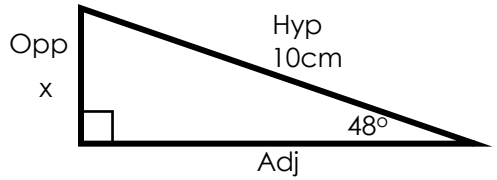
When you are calculating angles it will involve the inverse trig functions:

$Sin^{-1}(x)$ $Cos^{-1}(x)$ $Tan^{-1}(x)$

Your first step in a trigonometry question is to label the triangle's sides.
The three sides are the **hypotenuse, opposite & adjacent** sides.
The **hypotenuse** side is always the longest side.
The **opposite** and the **adjacent** depend on the given angle:



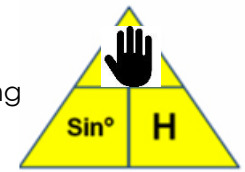
Ex1: Calculate the value of x:



Remember your first step is label the sides!

I am given an angle and a length. I have the hypotenuse and am looking for the opposite.
This means it involves **SOH**

I then cover the O as I am looking for the opposite side.
This means I need to do:

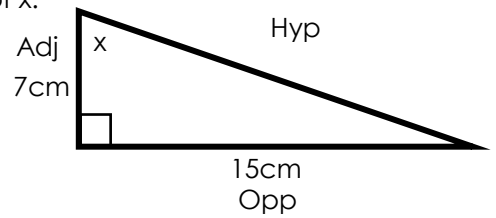


$opposite = Sin(x) \times hypotenuse$

$opposite = Sin(48°) \times 10$ = 7.43cm (rounded to 2 d.p.)

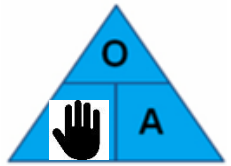
Ex2: Calculate the value of x:

Remember your first step is label the sides!



am given two lengths, the opposite and adjacent sides, and need to find an angle. This means it involves **TOA**

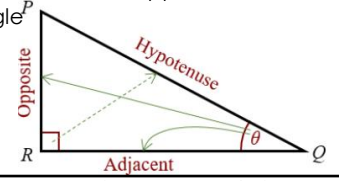
I then cover Tan° as I am looking for the angle.
This means I need to do:



$Tan(x°) = \frac{opposite}{adjacent}$

$Tan(x°) = \frac{15}{7}$ This is what Tan(x°) is equal to. We want just the angle. I need to use Tan^{-1}

$Tan^{-1}\left(\frac{15}{7}\right) = 64.98°$ (rounded to 2 d.p.)

Keyword/Skill	Definition/Tips
Pythagoras	A Greek mathematician. He is famous for proving a theorem about the right-angle triangle.
Pythagoras' Theorem	In a right-angled triangle the square of the long side(**hypotenuse**) is equal to the sum of the squares of the other two sides.
Hypotenuse	The longest side of a right-angled triangle. It is always opposite the right angle.
Adjacent & Opposite	Adjacent side – Next to the marked angle Opposite side – Opposite the marked angle 
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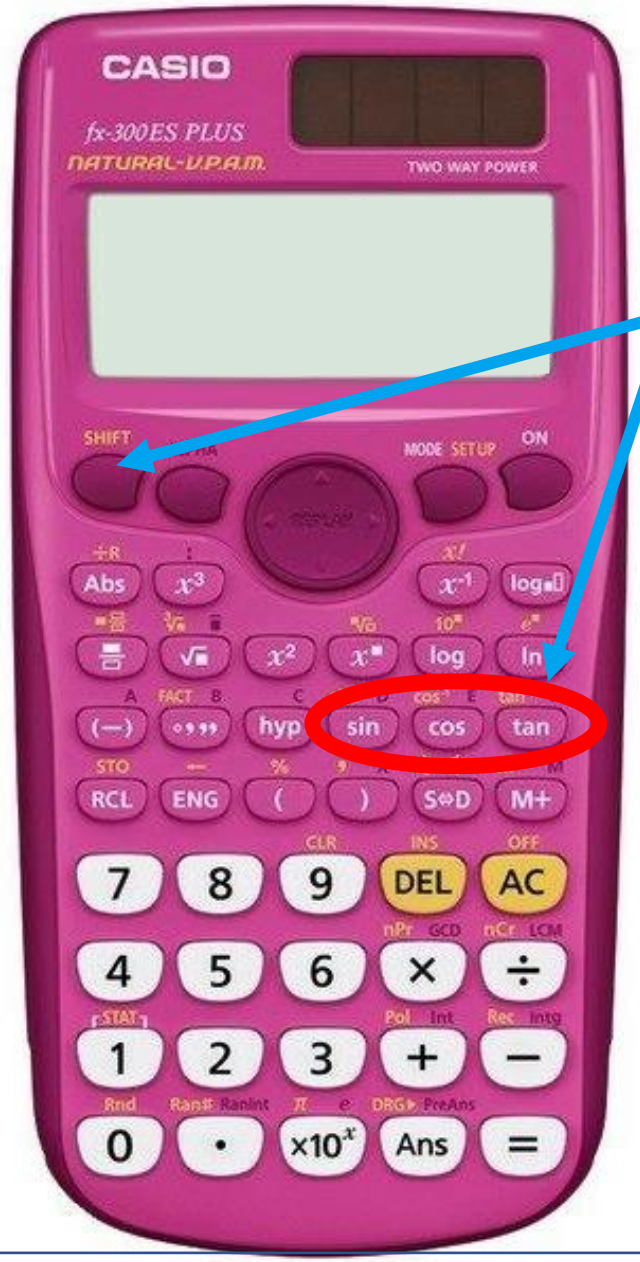
Other Topics/Units this could appear in:

- Graphs of trigonometric functions.
- Further trigonometry.
- Appears throughout A-Level in the Core and Mechanics Units

Year 10 – Maths – Crossover Unit 34 – Pythagoras & Trigonometry

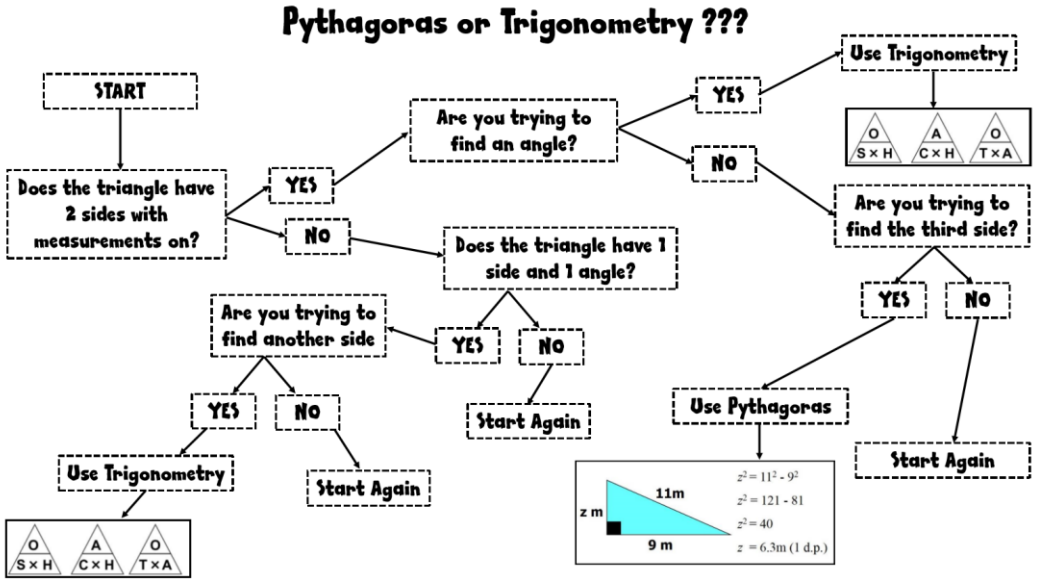


Calculator Help

Here are the **trig functions** on your calculator. You use these ones when you are finding a length.

To get the **inverse trig functions** you need to press the SHIFT button first before you press the function you need. You use these ones when you are finding an angle.

Pythagoras or Trigonometry



Keyword/Skill	Definition/Tips
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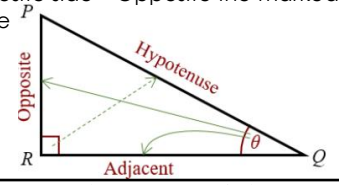
Adjacent & Opposite	Adjacent side – Next to the marked angle Opposite side – Opposite the marked angle 
Trigonometry	Trigonometry is the study of triangles: their angles, lengths and more.
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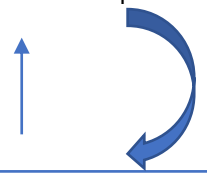
Other Topics/Units this could appear in:

- Graphs of trigonometric functions.
- Further trigonometry.
- Appears throughout A-Level in the Core and Mechanics Units

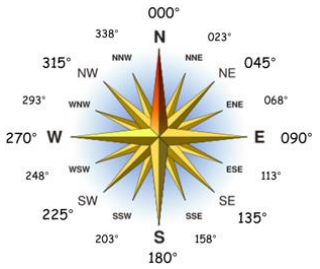
Year 10 – Maths – Crossover Unit 35 – Bearings

Bearings are used to specify direction and are used to navigate ships and aeroplanes.
The key point to remember are:

1. Bearings are measured starting from North.
2. Bearings are always measured in a clockwise direction.
3. Bearings are always written in 3 figures (45° becomes 045°).



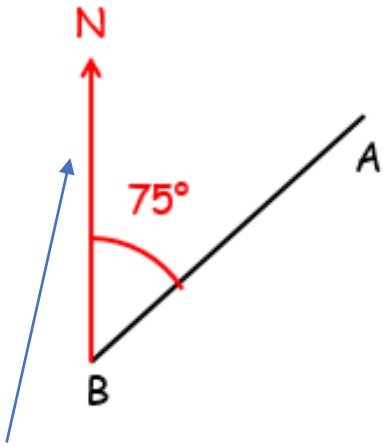
Compass Points



Keyword/Skill	Definition/Tips
Bearing	The angle measured in degrees clockwise from North.
Degree	A measure for angles. There are 360 in a full turn.
Perpendicular	A line that is at a right angle, 90°, from another line
North line 	A line facing North that all bearings are measured from.
Clockwise 	Moving in the direction of the hands of a clock.
Angle 	The amount of turn between two lines about their common point.
Bisect 	To divide something into two equal parts.
Protractor	An instrument used to draw or measure angles.

Measuring Bearings

Find the bearing of A from B.



Mark the North line at B. (You can draw this in if there isn't one).

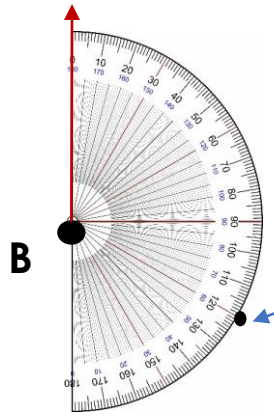
Measure the angle, clockwise from the North line to A.

Give the answer as a three figure bearing.

075°

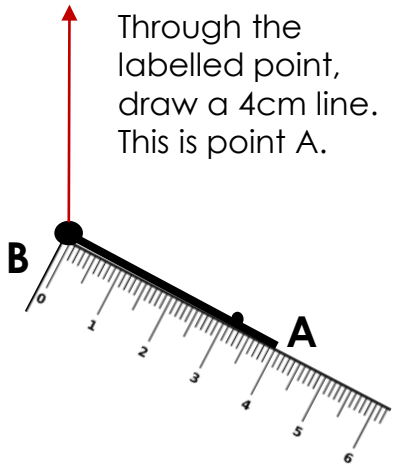
Drawing Bearings

B is on a bearing of 120° from A and a distance of 4cm.



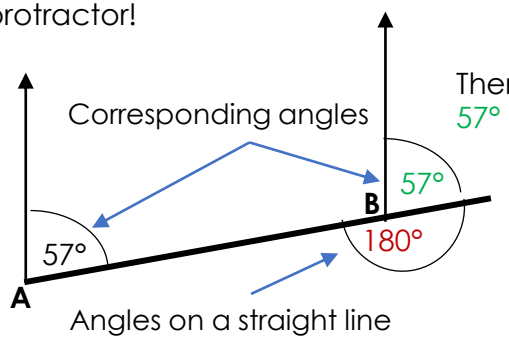
From point B, measure an angle of 120°. Label it so you don't forget where it is.

Through the labelled point, draw a 4cm line. This is point A.



Calculating Bearings

Find the bearing of A from B.
You need to remember some angle facts to calculate these without a protractor!



Therefore, the bearing of A from B is:
57° + 180° = 237°

Look at **Crossover U36 - Alternate and Corresponding Angles/Angle Facts** if you need help with the angle facts used here.

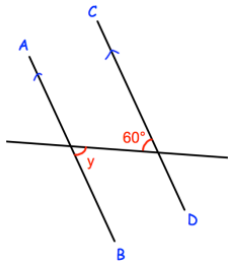
Other Topics/Units this could appear in:

- Properties of Shapes
- Angle Facts
- Mensuration

Year 10 – Maths – Crossover Unit 36 – Alternate and Corresponding Angles/Angle Facts

Alternate Angles

You need to know that alternate angles are equal.



Example

AB is parallel to CD

Q-work out angle y

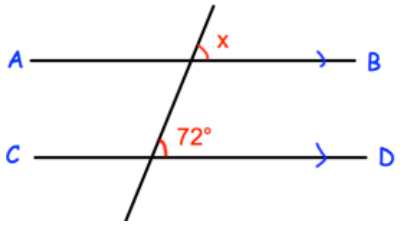
A- 60°

Q-Give a reason for your answer.

A- Alternate angles are equal.

Corresponding Angles

You need to know that corresponding angles are equal.



Example

AB is parallel to CD

Q-work out angle x

A- 72°

Q-Give a reason for your answer.

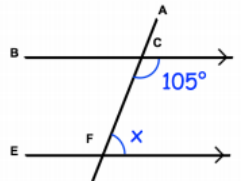
A- Corresponding angles are equal.

Co-Interior Angles

Co-interior angles add up to180°

Q-Work out x

A- 180- 105 = 75°



Applying other known angle facts

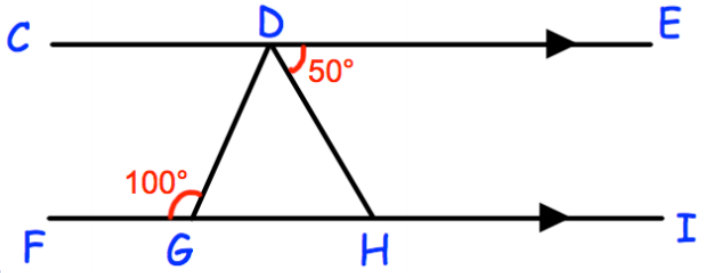
You need to be able to apply a range of angle facts to more complex angle questions

Example

CE and FI are parallel lines.

Angle EDH = 50°

Angle DGF = 100°



Show, giving reasons that triangle DGH is isosceles.

Angle facts to use

DHG = 50° –alternate angles are equal.

DGH = 80° –angles on a straight line = 180°

GDH = 180-80-50 = 50° - angles in a triangle sum to 180°

Triangle DGH is isosceles as it has 2 equal angles of 50°.

Exams!

- Use a highlighter or a different colour to highlight angle facts on any diagram given.
- Always show your method and give reasons.

Keyword/Skill	Definition/tip
Angle	The amount of turning between two lines meeting at a point.
Alternate angles	Two angles that are formed when a line (transversal) crosses a pair of parallel lines. These angles are equal. 
Corresponding angles	Angles that share the same relative position when a transversal crosses a pair of parallel lines. These angles are equal. 
Parallel Lines	Lines that are always the same distance apart. (Like train tracks)
Transversal	A line that crosses two other lines. (Red) 

Other topics/Units this could appear in:

- Trigonometry
- Vectors
- Bearings
- Coordinate geometry

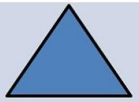
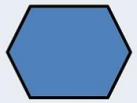
Year 10 – Maths – Crossover Unit 37 - Interior and Exterior Angles

Interior Angles

For the **sum** of interior angles in a polygon we can use this formula:

sum of interior angles= 180(n-2) (n = number of side)

Examples

	3	(3 – 2) × 180° = 180°
	4	(4 –2) × 180° = 2 × 180° = 360°
	5	(5 –2) × 180° = 3 × 180° = 540°
	6	(6 – 2) × 180° = 4 × 180° = 720°

For **one** interior angle in a **regular** polygon

$$\text{angle} = \frac{180(n-2)}{n}$$

Example

Calculate the size of an interior angle of a regular pentagon:

Pentagon = 5 sides $= \frac{180(5-2)}{5} = 108°$

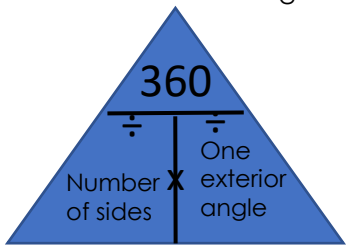
Exterior Angles

To find an exterior angle = $\frac{360}{n}$ n= number of sides

Example

The exterior angle y would be $\frac{360}{6} = 60°$

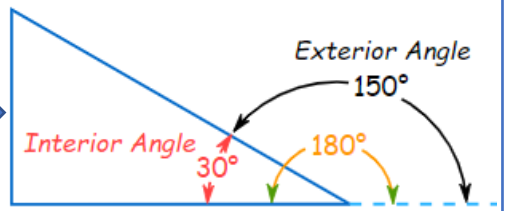
You may be asked to work out how many sides a shape has given the size of it's exterior angles. This formula triangle is really useful!



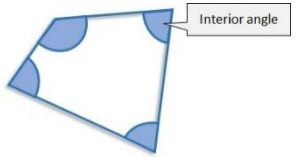
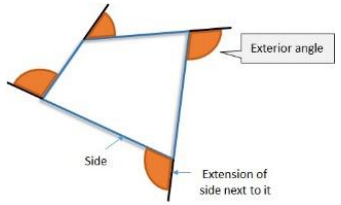
Example
A regular polygon has exterior angles of 24°.
Work out how many sides the shape has.

Using formula triangle = 360 ÷ 24 = 15 sides

Remember
Interior angle + exterior angle in Regular polygons = 180°
(They sit on a straight line.)



Exams!
- You will gain 2 marks for just having to work out an interior or exterior angle of a given polygon.
- A question that requires application of interior/exterior angles knowledge will be worth up to 4/5 marks.

Keyword/ Skill	Definition/tip
Angle	The amount of turning between two lines meeting at a point.
Polygon	A 2D shape with straight sides.
Interior angles	An angle inside a shape, between two joined sides. 
Exterior angles	The angle between any side of a shape and a line extended from the next side. 
Regular polygon	Has all equal length sides and all equal sized angles.
Irregular polygon	Has differing sized lengths and angles.

Other topics/Units this could appear in:
Unit 15 – Circle theorem
Unit 19 – Congruence and geometric proof

Year 10 – Maths – Crossover Unit 38 - Sampling

Sampling is a method of choosing a smaller group of the whole population to use in your investigation. Population means the total number of people who could be included in the survey.

Types of Data

Data can be qualitative or quantitative:

Qualitative Data – Descriptive information (it describes something)
Examples: Colours of cars, Friend's favourite holiday destination…
Quantitative Data – Numerical information
Examples: Height, Weight, Customers in a shop, …

Quantitative data can be discrete or continuous.

Discrete Data – Can only take certain values (whole numbers).
Examples: How many students…, Results of rolling a dice.
Continuous Data – Can take any value (within a range).
Examples: Height (e.g. 24.82cm), Weight, Time in a race, …

Understanding Bias.

Bias is something that is unfair. E.G. if a commentator only talked about one football team because he supported that team.
Avoiding bias - Don't ask leading questions such as isn't it true that or do you agree that?
Think about where the survey is being done.
(E.G. If you want to find out how pupils get to school, don't just ask pupils who are on your bus).

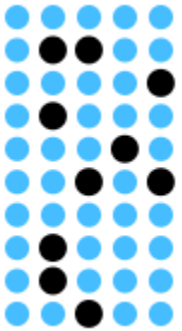
Collecting Data

There are two main points to remember when collecting data:
1. Questions must be specific and have specific answers. (E.G. Do you like going to zoos? Yes/no NOT how do you feel about zoos).
2. Questions must be fair and non-biased (E.G What channel do you prefer to watch, NOT do you agree that BBC is the best T,V. channel).

Types of Sampling

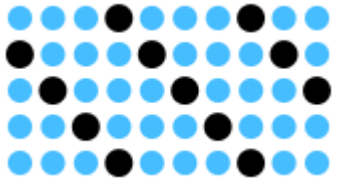
Random Sampling

Random Sampling is when every person in the in the group you are interested in has an equal chance of being chosen. Names might be placed in a hat and then picked out or names could be chosen randomly by a computer.



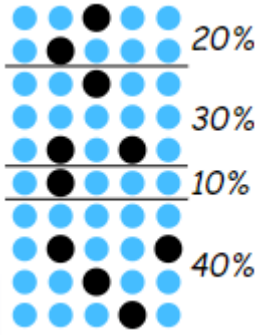
Systematic Sampling

This follows a system. E.G every fourth person is chosen.



Stratified Sampling.

Where the group of people, (population) is divided into smaller groups so that the same PROPORTION can be taken.



E.G. if 50 out of 1000 pupils were asked a favourite pop group,,

Year Group	No. of Pupils	How to work out pupils in each group.	No of Pupils in Sample
7	180	$\frac{180}{1000}$ X 50 =9	9
8	200	$\frac{200}{1000}$ X 50 =10	10
9	240	$\frac{240}{1000}$ X 50 = 12	12
10	220	$\frac{220}{1000}$ X 50 = 11	11
11	160	$\frac{160}{1000}$ X 50 = 8	8

Check your answers add up to 50 (9+10+12+11+8 = 50).

Keyword/Skill	Definition/Tips
Primary Data	Data you collect yourself. E.G. from asking people questions in person or by telephone.
Secondary Data	Data which other people have collected(E.G. from a book, newspaper or from the internet).
Population.	The whole group that you are interested in.
Census.	A collection of data from the whole population.
Sample	A collection of data from part of the population(the whole group).
Discrete Data	Data that only takes in certain values. E.G. number of people in class.
Continuous Data	Data that has a number of possibilities between two fixed points. (E.G. The weight of a newborn baby would have a lowest possible weight to highest possible weight.
Data	Facts that are collected.
Survey.	To gather information by taking individual samples so that we can learn about the whole thing.
Qualitative Data	Data that is given in words, describes something
Quantitative Data	Data that is given in numbers
Discrete Data	Data that only takes certain values
Continuous Data	Data that can take any values

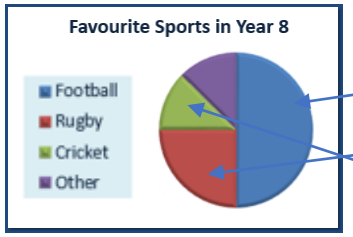
Other Topics/Units this could appear in:

- Interpreting Data
- Sampling (Higher)
- Statistical Sampling

Year 10 – Maths – Crossover Unit 39 – Pie Charts

You may need to look at **Working Toward Unit 5 – Angle Facts & Crossover Unit 14 – Fractions** before starting this knowledge organiser

There are 360° in a circle. You need to know the some key angles:



Football = $\frac{1}{2}$ or 50% = $\frac{360°}{2}$ = 180°

Rugby = $\frac{1}{4}$ or 25% = $\frac{360°}{4}$ = 90°

Cricket= $\frac{1}{8}$ or 12.5% = $\frac{360°}{8}$ = 45°

Example:

8 pupils have cricket as their favourite sport. How many people are in Year 8?

$\frac{1}{8}$ of Year 8 = 8

Therefore, 8 x 8 = 64 64 pupils in Year 8

Constructing a Pie Chart

Example:

Jenny surveyed 90 students in Year 8 about their favourite pets.

Complete a pie chart to show this information.

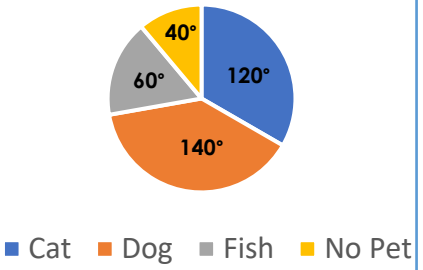
Step 1: A whole circle is 360° so 360° ÷ 90 = 4°
(So one person is worth 4°)

Step 2: Multiply each category by your answer
(In this case, 4°)

Step 3: Measure your angles for your pie chart.
(Your angles should add up to 360°)

Subject	Number of Students	Working Out	Angle
Cat	30	30 x 4°	120°
Dog	35	35 x 4°	140°
Fish	15	15 x 4°	60°
No Pet	10	10 x 4°	40°
Total	90		360°

Year 8 Students Favourite Pet



Always remember to include a key and label your pie chart

Interpreting Pie Charts

Example:

How many games did the Under 13's lose?

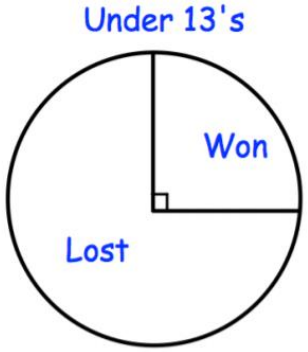
Under 13's lost 75% of games.

75% of 28 = 21

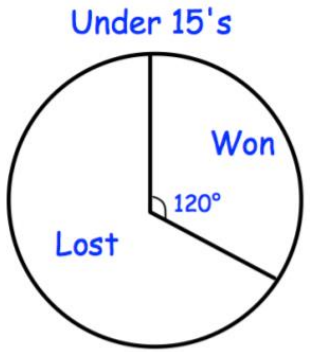
How many games did the Under 15's lose?

Under 15's lost $\frac{2}{3}$ of their games.

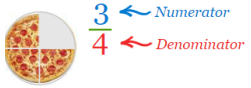
$\frac{2}{3}$ of 18 = 12



The Under 13's played 28 matches



The Under 15's played 18 matches

Keyword/Skill	Definition/Tips
Pie Chart	A type of graph in which a circle is divided into sectors or slices. A way of representing data.
Key	A key is used to identify categories. It tells you what each colour/picture stands for.
Angle	Amount of turn between two lines around a common point. (The vertex).
Sector	A "pie slice", part of a circle. 
Proportion	When two fractions/ parts are equal.
Fraction	How many parts of a whole 
Interpret	Getting information from a graph/ pie chart.
Construct	To draw a shape, line or angle accurately using a ruler and protractor.
Category	Data that can be divided into groups such as favourite colour, sport etc.

Other Topics/Units this could appear in:

- Angles
- Drawing and interpreting tables

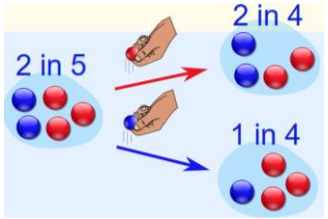
Year 10 – Maths – Crossover Unit 40 and 41– Probability and probability trees

Probability

Probability is always between 0 and 1. When a single dice is thrown, there are six possible outcomes: **1, 2, 3, 4, 5, 6**.

The probability of any one of them is $\frac{1}{6}$

Replacement



The probability of getting a blue in the first bag is $\frac{2}{5}$

But after taking one out the chances change!

If we got a red marble before, then the probability of getting a blue marble from the second bag is $\frac{2}{4}$ or $\frac{1}{2}$

- With replacement the events are independent (the chances do not change)
- Without replacement the events are dependent (the changes change)

Construct sample space diagrams

Sample space diagrams provide a systematic way to display outcomes from events.

The possible outcomes from rolling a dice

The possible outcomes from tossing a coin	1	2	3	4	5	6
H	1,H	2,H	3,H	4,H	5,H	6,H
T	1,T	2,T	3,T	4,T	5,T	6,T

This is the set notation to list the outcomes S =

In between the { } are all the possible outcomes.

S = { 1H, 2H, 3H, 4H, 5H, 6H, 1T, 2T, 3T, 4T, 5T, 6T}

Probability from two-way tables

	Car	Bus	Walk	Total
Boys	15	24	14	53
Girls	6	20	21	47
Total	21	44	35	100

P (Girl walk to school) = $\frac{21}{100}$

The event

The total in the set

The total number of items

Probability from sample space

The possible outcomes from rolling a dice

The possible outcomes from tossing a coin	1	2	3	4	5	6
H	1,H	2,H	3,H	4,H	5,H	6,H
T	1,T	2,T	3,T	4,T	5,T	6,T

What is the probability that an outcome has an even number and a tails?

This is the set notation that represents the question P

P (Even number and Tails) = $\frac{3}{12}$

There are three even numbers with tails

There are twelve possible outcomes

Numerator: the event

Denominator: the total number of outcomes

In between the ( ) is the event asked for

Keyword/Skill	Definition/Tips
Probability	$\frac{\text{number of successful outcomes}}{\text{total number of possible outcomes}}$
Dependent event	One outcome affects another. For example – choosing one red card reduces the chance of choosing another red card.
Independent event	One event does not affect the probability of the other.
Mutually exclusive	Two events that cannot happen at the same time, i.e. if you cannot turn left and right at the same time.
Conditional	The probability of something happening, given something else has occurred.
Sample space	The **set of all possible outcomes** of an experiment.
Theoretical	$\frac{\text{Number of Favourable Outcomes}}{\text{Total Number of Possible Outcomes}}$
Relative Frequency	$\frac{\text{Number of Successful Trials}}{\text{Total Number of Trials}}$
Experimental	An estimated probability based on the results of an experiment. The more trials are performed, the more reliable the results

Other Topics/Units this could appear in:

- Conditional probability

Year 10 – Maths – Crossover Unit 40 and 41– Probability and probability trees

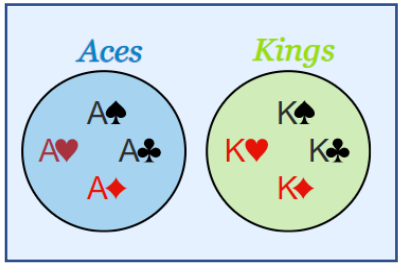
Mutually Exclusive

When two events (call them "A" and "B") are Mutually Exclusive it is **impossible** for them to happen together:

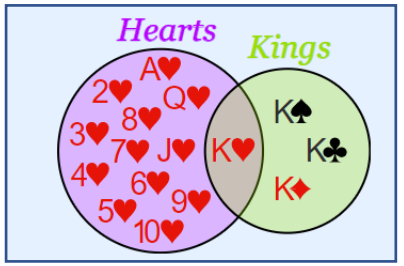
P(A and B) = 0

"The probability of A and B together equals 0 (impossible)"

Aces and Kings are **Mutually Exclusive** (can't be both)

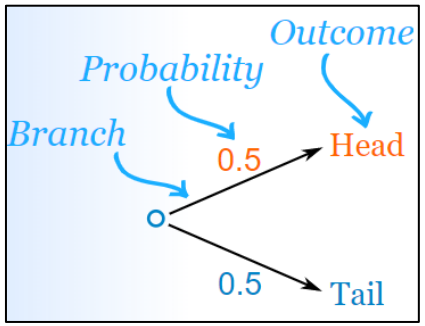


Hearts and Kings are **not** Mutually Exclusive (can be both)



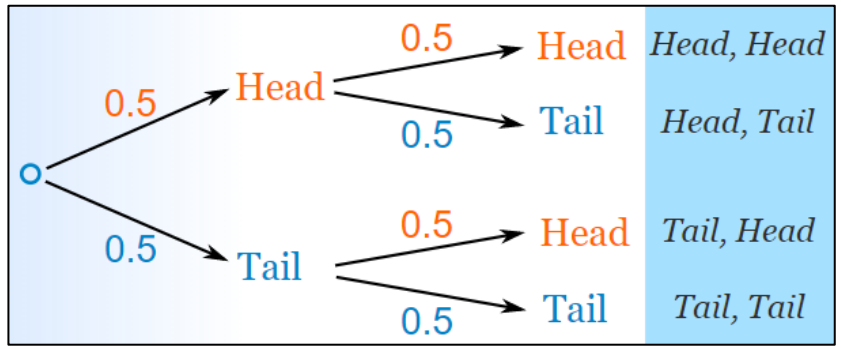
Probability Trees

Here is a tree diagram for the toss of a coin:

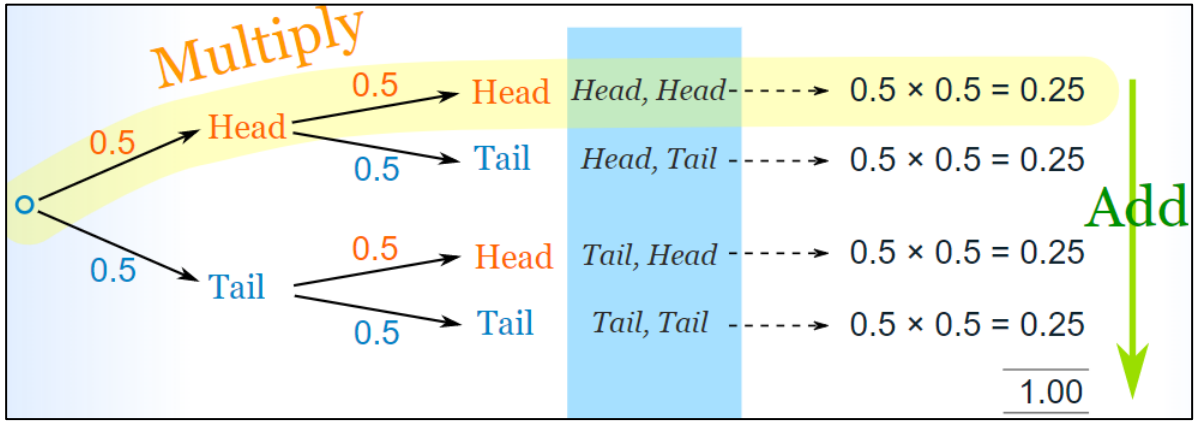


There are two "branches" (Heads and Tails)
- The probability of each outcome is written on the branch
- The outcome is written at the end of the branch

We can extend the tree diagram to two tosses of a coin:



How do we calculate the overall probabilities?
- We **multiply** probabilities **along the branches**
- We **add** probabilities down **columns**



Now we can see such things as:
- The probability of "Head, Head" is 0.5×0.5 = **0.25**
- All probabilities add to **1** (which is always a good check)
- The probability of getting **at least one** Head from two tosses is 0.25+0.25+0.25 = **0.75**

Keyword/Skill	Definition/Tips
Probability	$\frac{\text{number of successful outcomes}}{\text{total number of possible outcomes}}$
Dependent event	One outcome affects another. For example – choosing one red card reduces the chance of choosing another red card.
Independent event	One event does not affect the probability of the other.
Mutually exclusive	Two events that cannot happen at the same time, i.e. if you cannot turn left and right at the same time.
Conditional	The probability of something happening, given something else has occurred.
Sample space	The **set of all possible outcomes** of an experiment.
Theoretical	$\frac{\text{Number of Favourable Outcomes}}{\text{Total Number of Possible Outcomes}}$
Relative Frequency	$\frac{\text{Number of Successful Trials}}{\text{Total Number of Trials}}$
Experimental	An estimated probability based on the results of an experiment. The more trials are performed, the more reliable the results

Other Topics/Units this could appear in:

- Conditional probability

Year 10 – Maths – Crossover Unit 47 – Transformations

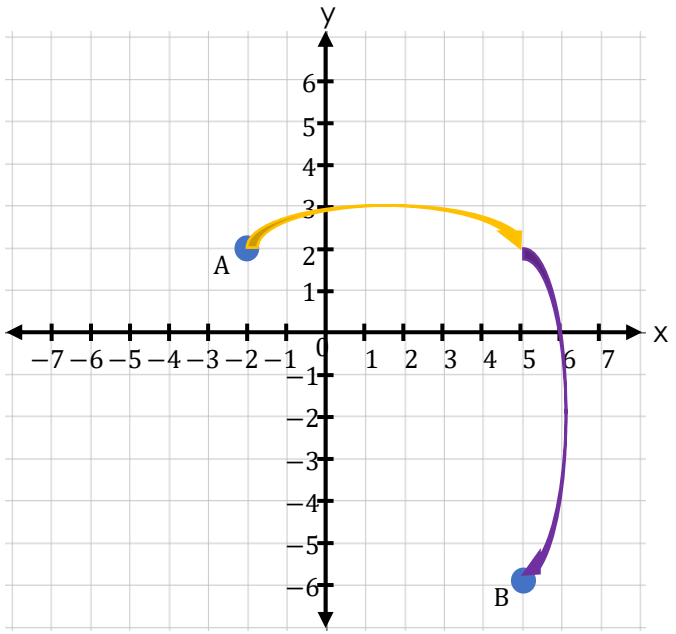
Translations

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

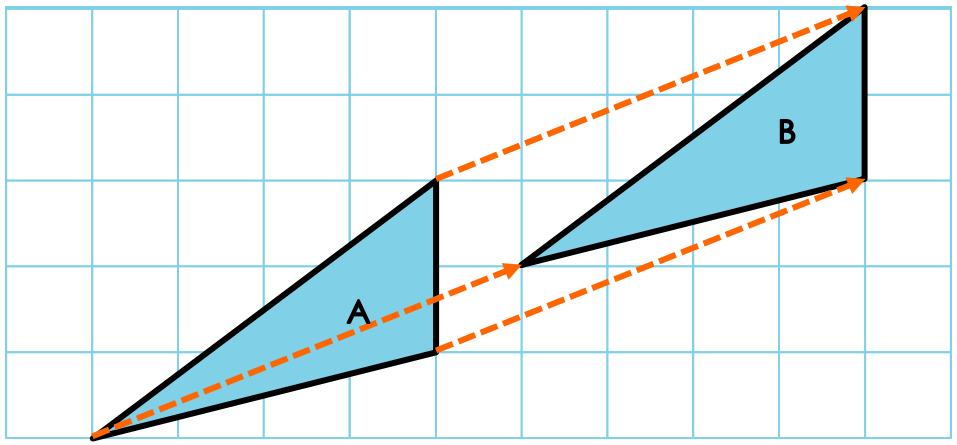
8 units in the negative y-direction



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

Translating a shape

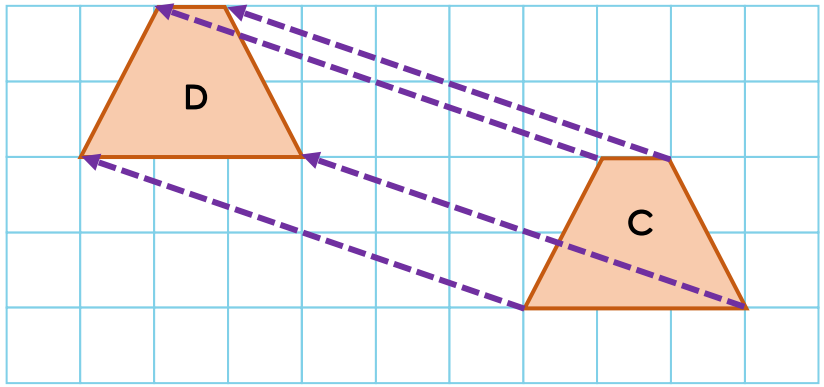
When a whole shape is translated, every vertex (corner) moves by the **same** column vector.



The translation from triangle A to triangle B is $\begin{pmatrix} 5 \\ 2 \end{pmatrix}$

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 $\begin{pmatrix} -6 \\ 2 \end{pmatrix}$

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

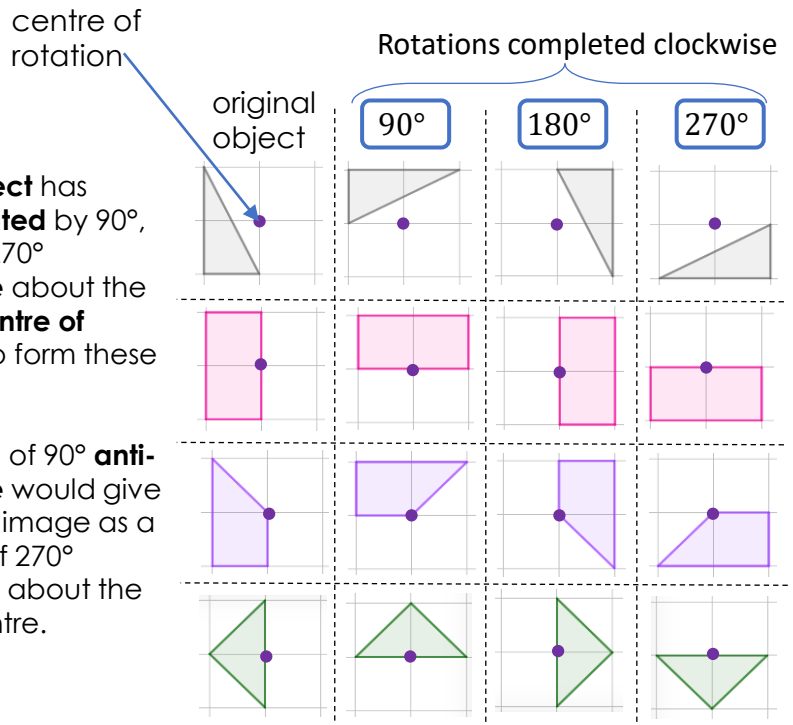
Other Topics/Units this could appear in:
Crossover Unit 46 - Congruence/Similar Shapes
Working Above Unit 5 - Transformations
Working Above Unit 10 - Similarity in 2D & 3D
Working Above Unit 17 - Functions
A level Core - Graph Transformations

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.

Year 10 – Maths – 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**.

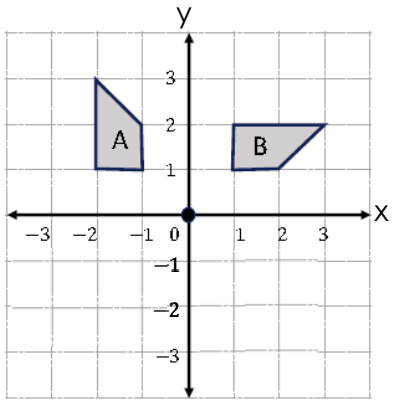
A rotation of 90° **anti-clockwise** would give the same image as a rotation of 270° clockwise about the same centre.

Describing Rotations

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

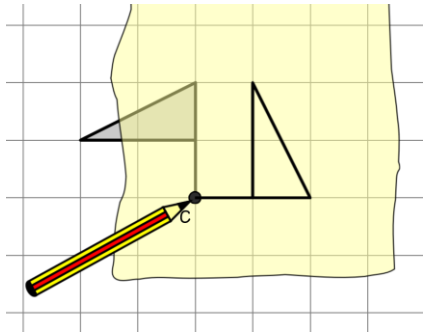
- A rotation
- From centre (0,0)
- By 90° clockwise

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



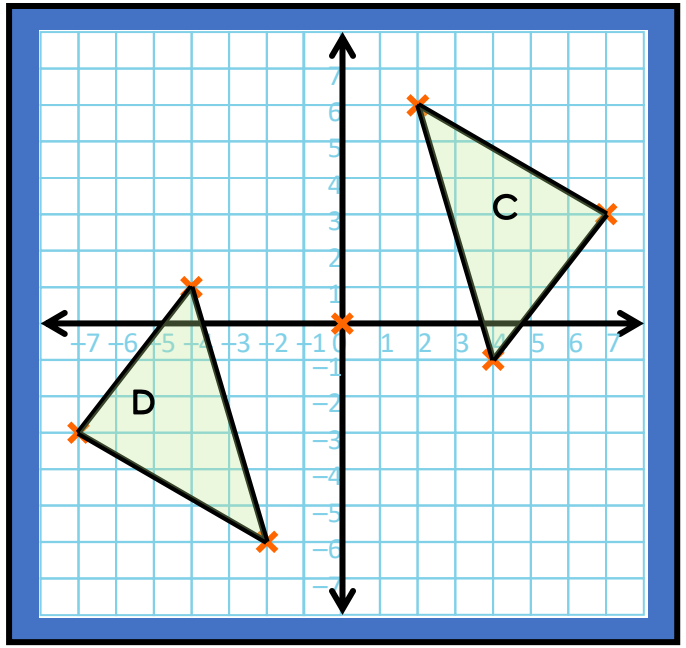
Equipment for Rotations

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.

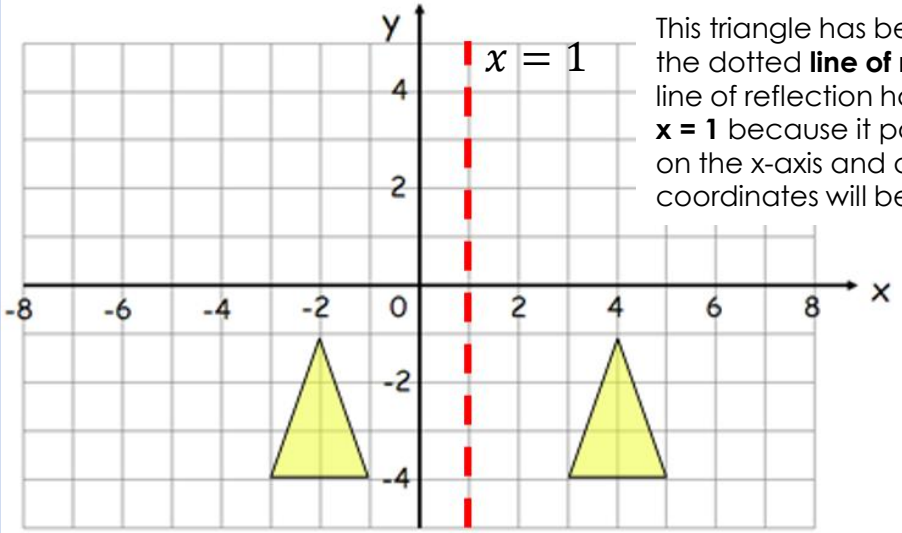


Other Topics/Units this could appear in:
Crossover Unit 46 - Congruence/Similar Shapes
Working Above Unit 5 - Transformations

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 single transformation has been performed on a shape.

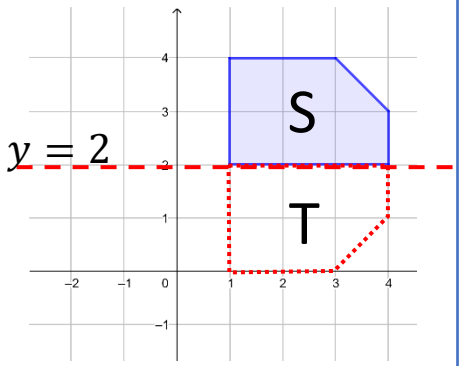
$x = 1$ Year 10 – Maths – Crossover Unit 47 – Transformations

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.

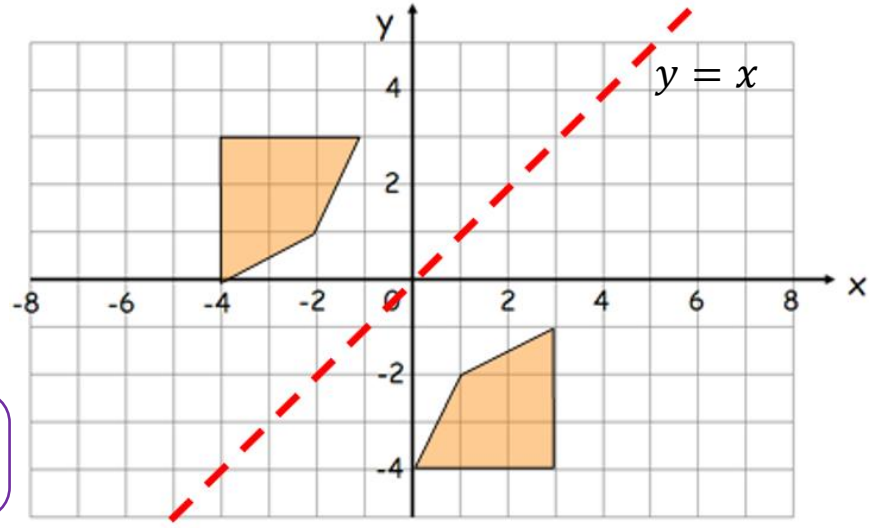
Reflections



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.

Year 10 – Maths – Crossover Unit 47 – Transformations

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

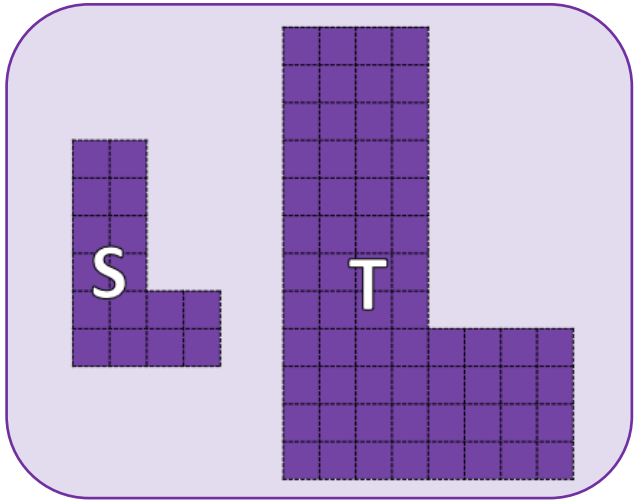
Enlargements

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 $\frac{1}{2}$

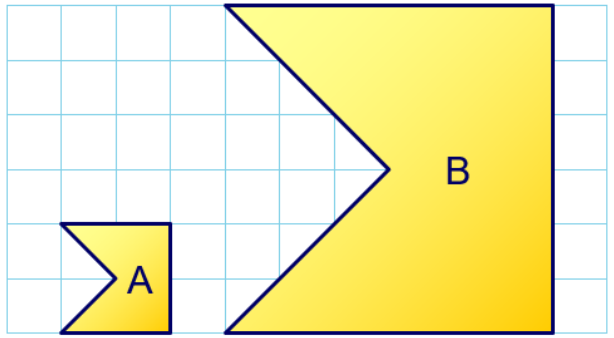
T is an enlargement of S by scale factor 2

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



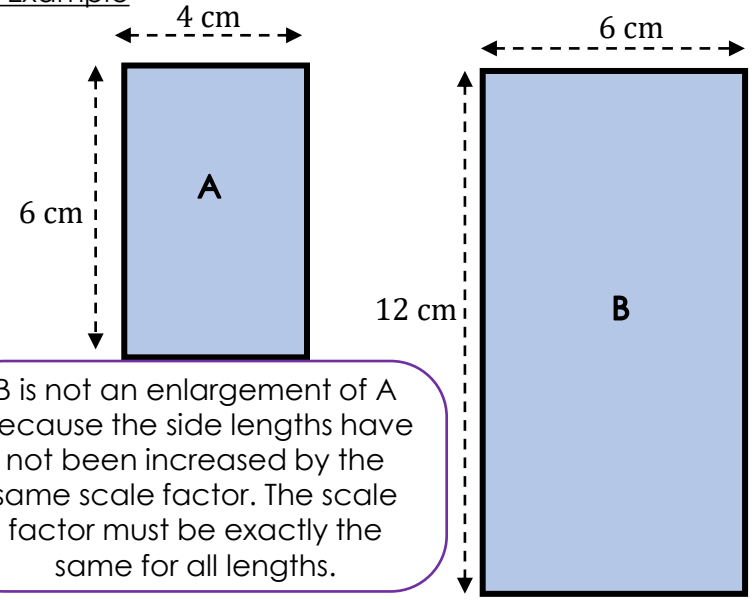
Example

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



B is an enlargement of A by scale factor 3

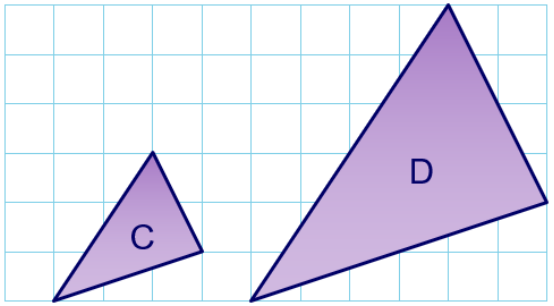
Non-Example



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



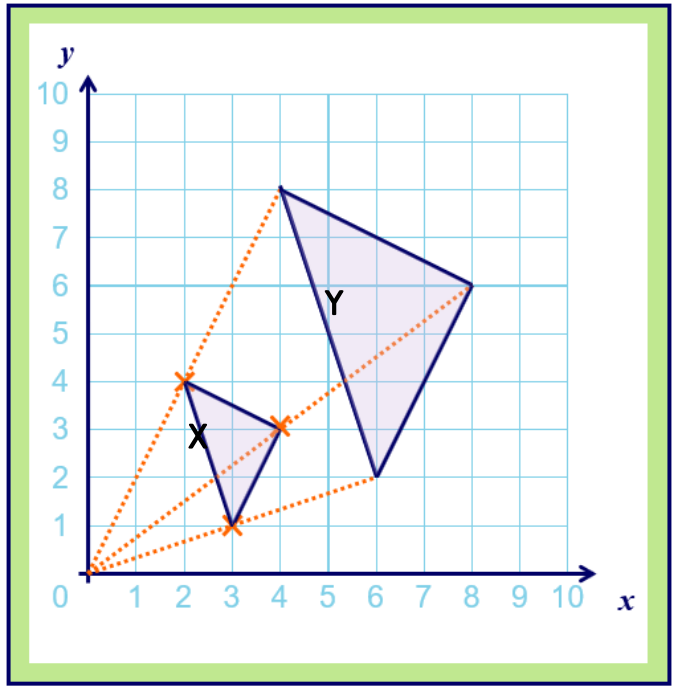
Even when the scale factor makes a shape smaller, the transformation is still called an enlargement.

D is an enlargement of C by scale factor 2

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.

Year 10 – Maths – Crossover Unit 47 – Transformations

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



Enlargements from a centre

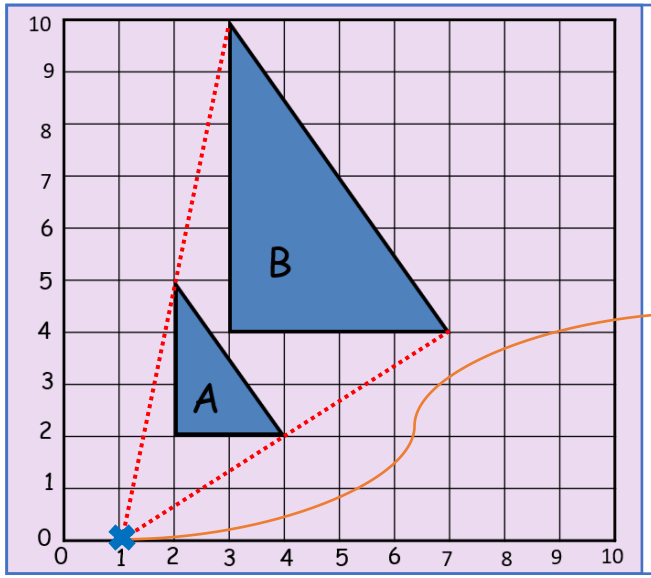
When a centre of enlargement is given, you need to measure the distance from this point to each vertex of your shape.

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.



Describing an enlargement

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.

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.

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.

Year 10 – Maths – Crossover Unit 49 - Sequences

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

3, 7, 11, 15
+4 +4 +4

Position to Term Rule (Using the nth Term)

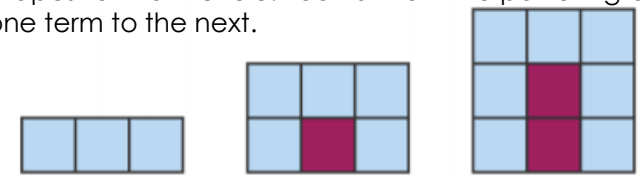
The nth term can be used to find any term in a sequence. To use the nth term you substitute in the value of the position you need.

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

Substitute n = 10 into the nth term
(3 x 10) – 5 = 25
10th 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

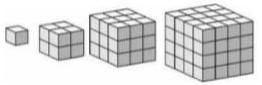
n(position)	1	2	3	4	5
	x5	x5	x5	x5	x5
5n	5	10	15	20	25
	+2	+2	+2	+2	+2
5n + 2	7	12	17	22	27

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

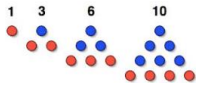
Special Sequences

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

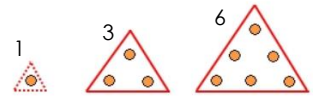
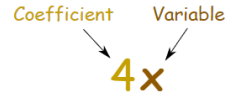
Cube Numbers – 1, 8, 27, 64, 125, 216, …



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. 
Fibonacci Sequences	A sequence where the next number is found by adding up the previous two terms
Function	A special relationship where each input has a single output
Coefficient	A number used to multiply a variable 

Other topics/units this could appear in:

- Rearranging Equations
- Quadratic Sequences
- A Level Topics

Exam!

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

Year 10 – Maths – Crossover Unit 50 – Forming and Solving Equations

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.

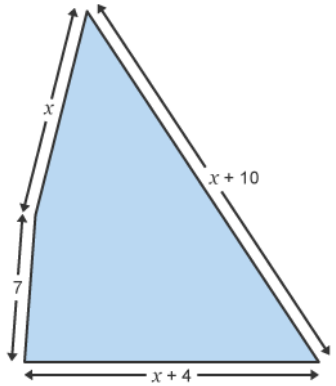
3y = 12
÷3 ÷3
y = 4

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:
3 x + 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

3x + 21 = 33

Subtract 21 from both sides:

-21 -21
3x = 12

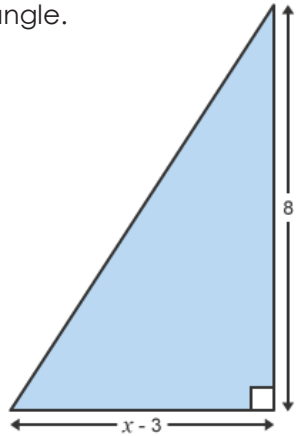
Divide both sides of the equation by 3:

÷3 ÷3
x = 4cm

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.

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

Substituting in our base and height into the equation:

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

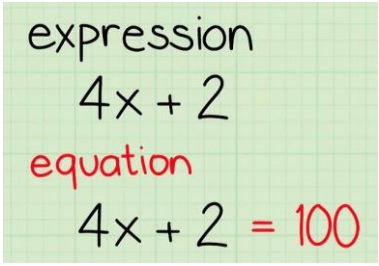
Expanding the brackets:

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

Simplifying:

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.



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

Year 10 – Maths – Crossover Unit 51- Simultaneous Equations.

In order to be able to solve simultaneous equations you will need to be able to **solve linear equations** (see units 2a, 21,22 and 50 for recap)
You also need to be able to use **substitution.** (Unit 2b)

Elimination Method

Example 1

Solve the equation: 6x + y =15 and 4x + y =11
It is useful to label the equations to help with method.

6x + y = 15 (1)
4x + y = 11 (2)

The y-term in both equations has the same coefficient. (No need to balance them)

6x + y = 15 (1)
4x + y = 11 (2) — Equation (1) minus equation (2)

2x = 4 — ÷ 2
x = 2

Substitute x = 2 into one of the original equations. (Usually the one with the smaller numbers)
So substitute x = 2 into: 4x + y = 11
8 + y = 11 — Solve
y = 3

You can then test the solutions by substituting values found back into the original equations

Sometimes you will have to change both equations to get identical terms.

Example 3

Solve these equations:
4x + 3y = 27 (1)
5x – 2y = 5 (2) — Both equations have to be changed to get identical terms in either x or y.

Equation (1) x 2
Equation (2) x 3 — Here it will be best to make the y-coefficients the same so that we can add the equations. (Easier than subtracting)

8x + 6y = 54 (3)
15x – 6y =10 (4) — Label new equations (3) and (4)

Eliminate by adding (3) + (4)

23x = 69 — ÷ 23
x = 3

Substitute into equation (1)=
12 + 3y = 27 — Solve
3y = 15
y = 5

Keyword/ Skill	Definition/tip
Simultaneous Equation	A pair of equations with two unknown variables. Both equations need to be solved at the same time (simultaneously)
Eliminate	To remove a variable in order to help solve the equation.
Substitution	When a letter in an equation, expression or formula is replaced by a number, we have substituted the number for the letter.
Variable	A symbol for a number that we don't know yet. Often this is a letter such as x or y.
Coefficient	The number in front of an unknown quantity (the letter) in an algebraic term.

Example 2

5x + y = 22 (1)
2x – y = 6 (2) — Both equations have the same y-coefficient but with **DIFFERENT SIGNS**

As the signs are different you ADD the two equations to eliminate the y-terms. [Equation (1) + equation (2)]

5x + y = 22 (1)
2x – y = 6 (2) — Add

7x = 28 — ÷ 7
x = 4

Substitute x = 4 into one of the original equations, 5x + y = 22 which gives 20 + y = 22 — Solve
y = 2

Example 4- Apply to solve problems

Three chews and four bubblies cost 72p. Five chews and two bubblies cost 64p. What would three chews and five bubblies cost?

You need to set up two simultaneous equations in c and b and then solve them.

3c + 4b = 72
5c + 2b = 64 — Solve the simultaneous equations as in example 1

c = 8
b = 12
Use these answers to calculate 3 chews = 3 x 8 = **24p**
5 bubblies= 5 x 12 = **60p**

Other topics/Units this could appear in:

- Working above
- Unit 7 – Simultaneous equations
- A-level
- Core – algebra and functions
- Statistics- statistical distributions

Exam Tips

- You will gain 1 mark by correctly starting a process to eliminate a coefficient.

Year 10 – Maths – Crossover Unit 51- Simultaneous Equations.

To be able to solve simultaneous equations graphically, you may be asked to draw the line of given equations. In order to do this you may need to look back at **Crossover Unit 29- Straight Line Graphs knowledge organiser.**

Example

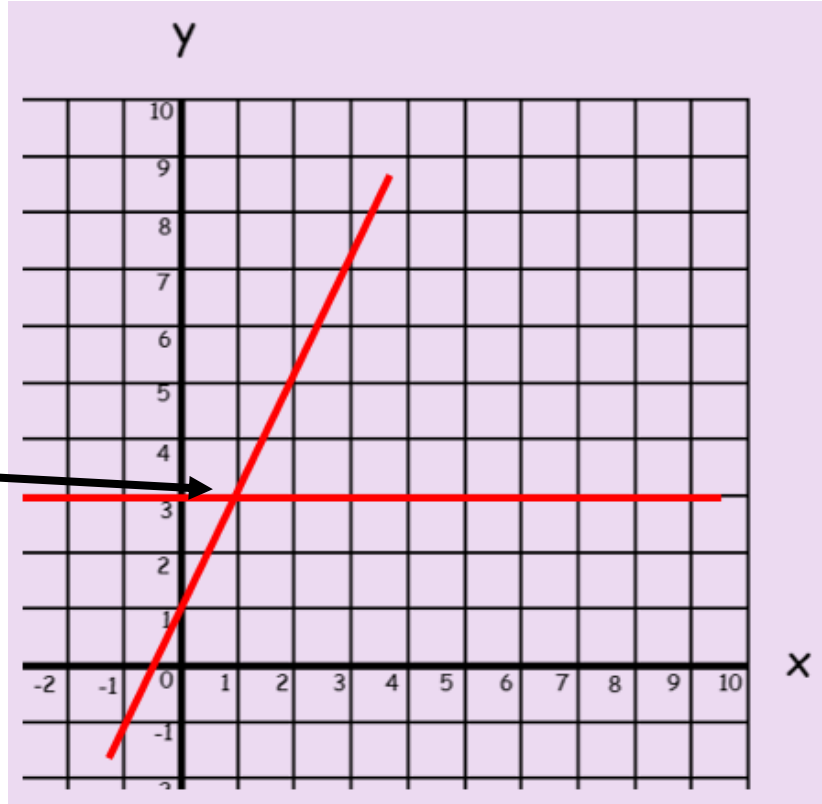
Solve the following simultaneous equations graphically

y = 2x + 1
y = y = 3

Step 1- Draw the line y = 2x + 1

Step 2- Draw the line y = 3

Step 3 - Your solution is the coordinates where the lines cross



Coordinates = (1, 3)

x = 1
y = 3

Keyword/ Skill	Definition/tip
Simultaneous Equation	A pair of equations with two unknown variables. Both equations need to be solved at the same time (simultaneously)
Eliminate	To remove a variable in order to help solve the equation.
Substitution	When a letter in an equation, expression or formula is replaced by a number, we have substituted the number for the letter.
Variable	A symbol for a number that we don't know yet. Often this is a letter such as x or y.
Coefficient	The number in front of an unknown quantity (the letter) in an algebraic term.

<u>Other topics/Units this could appear in</u>:

- Working above
- Unit 7 – Simultaneous equations
- A-level
- Core – algebra and functions
- Statistics- statistical distributions

Further questions relating to this topic may include solving simultaneous equations graphically when **one equation is linear and the other is quadratic**. As with the example above, you would draw the graph of the equations and look for where your straight line crosses two parts of the quadratic curve.

<u>Exam Tips</u>

- If you need to draw your own straight line graph you will gain marks for that
- If the graph has been drawn for you LOOK at where the lines cross.

Year 10 – Maths – Crossover Unit 52 – Direct and Inverse Proportion.

Direct Proportion means as one quantity increases or decreases, so does the other one. Example: The more hours you work, the more you will earn.
A is directly proportional to B is written as:

A ∝ B
A= k x B
A = kB

"k" is the constant of proportionality that links our two numbers. We need to put it into our formula.

Example 1
It takes 3 hours to fill 12 boxes with food. How long does it take to fill 5 boxes?

A = kB

Step 1: Write an equation of proportionality.

12 = k x 3
4 =k

Step 2: Substitute A and B to find k

A = 4B
A = 4 x 5
A = 20

Step 3: Rewrite the equation using k and substitute A and B

Example 2
a is directly proportional to b.
a = 27 when b = 9 Find the value of a when b = 5

a= kb
27 = k x 9
3 = k

Find the value of k first using the steps above.

a = 3 x b
a = 3 x 5
a = 15

Rewrite and substitute the value of k into the equation.

Inverse Proportion means as one quantity increases, the other decreases.
Example: If one quantity doubles the other is halved. If it takes 4 people 5 hours to dig a hole, it would take 8 people 2.5 hours.

Example 1
2 cows eat a tonne of food in 6 days. How long would it take 3 cows to eat a tonne of food?

Step 1: Write an equation → $y = \frac{k}{x}$

Step 2: Substitute x and y to find k → $6 = \frac{k}{2}$ (6 = days, 2 = cows)

k = 12

Step 3: Rewrite the equation using k and substitute x to find y

$y = \frac{12}{x}$

$y = \frac{12}{3}$

y = 4 days

Example 2
y is inversely proportional to x
y = 6 when x = 5. Find the value of y when x = 10

$y = \frac{k}{x}$

$6 = \frac{k}{5}$

$30 = k$

REWRITE & SUBSTITUTE

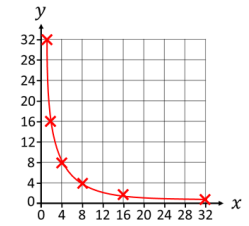
$y = \frac{30}{x}$

$y = \frac{30}{10} = 3$

Use the same steps as above

x	1	2	4	8	16	32
y	32	16	8	4	2	1

1 job takes 32 hours to complete. We can show the inverse relationship on a graph



Keyword/Skill	Definition/Tips
Ratio	Shows the relative sizes of two or more values. E.G. 1 boy and 3 girls would be written as 1:3
Inverse	The opposite or the reverse E.g. the inverse of addition is subtraction.
Proportion	Two ratios or fractions that are equal.
Direct Proportion.	Two quantities change in the same way. When one increases or decrease, so does the other one.
Variable	A symbol for a number we don't know yet, often a letter x or y.
Equation	Says that two things are the equal. (1+1=2).
Linear	A graph that has a straight line.
Substitute	Putting values where the letters are.
Constant of Proportionality	A constant value, written as k, relating to amounts that rise or fall uniformly together.

Other topics/units this may appear in:

- Best Value
- Exchange Rates
- Proportion Recipes
- Straight Line Graphs

Year 10 – Maths – Working Above Unit 1a – Recurring Fractions

A recurring decimal is a decimal number that has repeating digits, or a repeating pattern of digits, after the decimal point. As you can see in the examples below, we put a dot above the digits to show that they are reoccurring.

$0.666666\ldots = 0.\dot{6}$

$8.242424\ldots = 8.\dot{2}\dot{4}$

$5.482182182\ldots = 5.4\dot{8}2\dot{1}$

You only need to put a dot above the first and last digit of the repeating numbers

You need to be able to convert from a recurring decimal into a fraction.

Example 1

Write $0.\dot{1}\dot{7}$ as a fraction.
So if we say,

$x = 0.17171717\ldots$

We then need a multiple of x where the digits after the decimal point are the same.

$10x = 1.7171717\ldots$ (these digits are not the same as above)
$100x = 17.171717\ldots$ (these digits are the same as in x, so this is the one we will need to use)

$$100x = 17.17171717\ldots$$
$$x = 0.171717\ldots$$

Subtracting these gives;

$$99x = 17$$
$$x = \frac{17}{99}$$

Exams!

- These will be questions that ask you to "prove" or state that "you must show your working". The questions are usually worth 3 marks, and all three marks will be for showing the method above.

Example 2

Convert $2.1\dot{4}\dot{5}$ to a fraction in it's simplest form
So if we say,

$$x = 2.145454545\ldots$$

We then need multiples of x where the digits after the decimal point are the same

$$10x = 21.45454545\ldots$$
$$100x = 214.54545\ldots$$
$$1000x = 2145.454545\ldots$$

So the two versions of x that we need to use are $10x$ and $1000x$

$$1000x = 2145.45454545\ldots$$
$$10x = 21.45454545\ldots$$

Subtracting these gives;

$$990x = 2124$$
$$x = \frac{2124}{990}$$
$$x = 2\frac{8}{55}$$

Keyword/Skill	Definition/Tips
Decimal	A number with a decimal point in it. It can be positive or negative. 3746.374
Recurring decimal	A decimal that has repeating digits or a repeating pattern of digits.
Terminating decimal	A decimal that has a set number of digits and does not go on forever. E.g. 0.25
Multiple	A multiple is the result of multiplying a number by an integer (whole number). Multiples of 5 are: 1 x 5 = **5** 2 x 5 = **10** and so on…
Simplify	To reduce something to the smallest possible numbers.
Numerator	The top number in a fraction.
Denominator	The bottom number in a fraction.
Rational	A number that can be written as; an integer, a fraction, where the numerator and denominator are integers, or a recurring/terminating decimal.
Irrational	A number that can be written as a non-recurring decimal that does not terminate. SO there is no pattern in the digits and it goes on forever. For example pi. π = 3.14159265…

Other Topics/Units this could appear in:

- Fractions, decimals and percentages
- Algebraic fractions
- A-level Units

Year 10 – Maths – Working Above Unit 1b – Fractional and Negative Indices

Before starting work with fractional and negative indices, you may find it useful to look back at the **Crossover Unit 18 – Index Laws** knowledge organiser.

1. Fractional Indices

If an index is a fraction, the denominator of the fraction acts as a "root". The numerator of the fraction acts as a normal power.

Example 1
Evaluate

$$64^{\frac{2}{3}}$$

In this fractional index the denominator is 3. So the first thing we need to find is the **cube root** of the base number 64.

$$\sqrt[3]{64} = 4$$

Then then numerator is 2 so we need to **square** 4.

$$4^2 = 16$$

So,

$$64^{\frac{2}{3}} = 16$$

Example 2
Evaluate

$$\left(\frac{4}{9}\right)^{\frac{3}{2}}$$

Here we need to make sure we apply the rules to both the numerator and the denominator of the base number.

The denominator of the index is 2 so we need to **square root** the numerator and denominator of the base number.

$$\frac{\sqrt{4}}{\sqrt{9}} = \frac{2}{3}$$

Then, we need to **cube** the numerator and the denominator of this answer, because the numerator of the index is 3.

$$\frac{2^3}{3^3} = \frac{8}{27}$$

So,

$$\left(\frac{4}{9}\right)^{\frac{3}{2}} = \frac{8}{27}$$

2. Negative Indices

If an index is negative is performs the reciprocal.

Example 1
Evaluate

$$4^{-2}$$

First we need to perform the reciprocal.

$$4^{-2} = \left(\frac{1}{4}\right)^2$$

Now we have the reciprocal, the index becomes positive and we can **square** the numerator and the denominator.

$$\left(\frac{1}{4}\right)^2 = \frac{1}{16}$$

Example 2
Evaluate

$$\left(\frac{2}{3}\right)^{-2}$$

First we need to perform the reciprocal.

$$\left(\frac{2}{3}\right)^{-2} = \left(\frac{3}{2}\right)^2$$

Now we have the reciprocal the index becomes positive and we can **square** the numerator and the denominator.

$$\left(\frac{3}{2}\right)^2 = \frac{9}{4}$$

Exams!

- Read the question carefully!
- Sometimes it will say "Evaluate" or "What is the value of…", this means it wants the final answer as a single value/number without any indices.
- Sometimes it was say "Simplify" or "Leave your answer in index form", this means you just need to use the laws of indices to simplify the answer, and leave index notation in your answer.

Keyword/Skill	Definition/Tips
Index (Plural – Indices)	A small number placed to the upper-right of a number. It shows the number of times the base number is multiplied by itself. 3^2 3 is the base number and 2 is the index.
Fraction	A part of a group or a whole number. Made up of a numerator and a denominator.
Negative number	A number less than zero. We use – to show a negative number.
Square number	A number that is the result of multiplying an integer by itself.
Cube number	A number that is the result of multiplying an integer by itself 3 times.
Square root	A number, when multiplied by itself gives the original number. SYMBOL: $\sqrt{}$
Cube root	A number, when multiplied by itself three times gives the original number. Symbol $\sqrt[3]{}$
Numerator	The top number in a fraction.
Denominator	The bottom number in a fraction.
Reciprocal	The multiplicative inverse of a number. The product of a number and its reciprocal is always 1. $\frac{1}{2} \times 2 = 1$ $\frac{4}{5} \times \frac{5}{4} = 1$

Other Topics/Units this could appear in

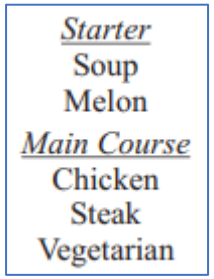
- Laws of Indices
- A 'level Units

Year 10 – Maths – Working Above Unit 1c – Product Rule

The Product Rule for Counting

The product rule allows us to find the total number of outcomes for two or more events happening. In some cases, where there are a small umber of options, it is easy to systematically list the outcomes.

Example:
A restaurant has the simple menu shown.
You can choose a starter and a main course.
List all the possible combinations you could choose.



Soup – Chicken	Melon – Chicken
Soup – Steak	Melon - Steak
Soup – Vegetarian	Melon – Vegetarian

However if there where more options for each course, it would take a long time to list all of the combinations.

Instead you can use the product rule to calculate the total number, by multiplying the number of options for each event happening.

Number of starters x Number of main courses = Total number of combinations

Choosing from Multiple Groups

Example
When buying a new car, you can choose from 6 exterior colours, 5 different interior designs and 3 different types of alloy wheels. How many combinations could be made?

6 x 5 x 3 = 90

Choosing from one group

Example
In a running club there are 12 members, 4 of the members need to be chosen to run in a relay race. How many different groups of runners could be chosen.

When choosing the first runner you would have 12 options. However, when choosing the second runner you would only be left with 11 runners. For the third you would have 10 and the forth you would have 9. So this time the product rule calculation becomes.

12 x 11 x 10 x 9 = 11,880

The Difference Between Permutations and Combinations

For the many circumstances where we need to count the number of outcomes there are two different counting situations – permutations and combinations:

Where the order matters it's a **permutation**
Example:
213 is a permutation of the numbers 123, as is 321 etc.

Where the order doesn't matter, it's a **combination**
Example:
10 students chosen out of a group of 250 students – regardless of the order in which the students were chosen they will represent a combination of 10 of the 250 students in the year group.

How many ways there are of getting two letters from: *a, b, c*?

ab, ac, ba, bc, ca, cb

How many **permutations** are there?
There are 6 because *ab* and *ba* are considered to be different because of the "order" of them.

How many **combinations** are there?
There are now only 3 because *ab* and *ba* are considered to be the same as we no longer care about the "order" of them.

It makes sense to think about the **permutations** and eliminate the "duplicates" to get the **combinations**.

Keyword/Skill	Definition/Tips
Integer	A positive or negative whole number, or zero.
Product	The result when two or more numbers are multiplied
Multiple	A multiple is the result of multiplying a number by an integer (whole number). Multiples of 5 are: 1 x 5 = **5** 2 x 5 = **10** and so on…
Permutation	Any of the ways we can arrange things, where the order is important. Each different order counts as a new permutation.
Combination	A selection of items from a set of items where the order does not matter.
Factorial	The product of a whole number multiplied by every whole number less than itself. 2! = 2 x 1 = 2 3! = 3 x 2 x 1 = 6 4! = 4 x 3 x 2 x 1 = 24

Other Topics/Units this could appear in:

- All probability units
- Multiples in context

Year 10 – Maths – Working Above Unit 1d – Accuracy and Bounds

Error Intervals
An error interval shows the range of values a number could have taken before being rounded or truncated.
An error interval is written using inequalities, with a **lower and upper bound**. Note that the lower bound can be "equal to" but the upper bound is not.
2.5 has been rounded to 1d.p. so the error interval is

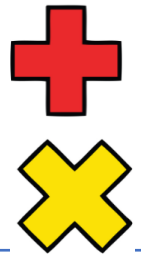
$$2.45 \leq x < 2.55$$

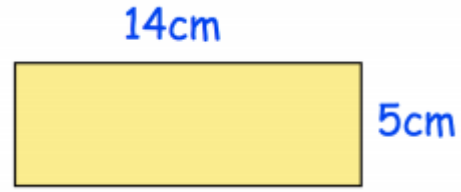
If you need help with this, you may find it useful to look back at the **Crossover Unit 8 – Rounding and Error Intervals** knowledge organiser.

Appropriate Accuracy
This is the level of accuracy when both the upper bound and lower bound are rounded in the same way and give the same value.
For example, if UB = 12.3512 and LB = 12.3475
Rounded to 1dp: UB = 12.4, LB = 12.3
Rounded to 2dp: UB = 12.35, LB = 12.35
Rounded to 3dp: UB = 12.351, LB = 12.348
So the appropriate accuracy is 2dp

Truncation
Approximating a decimal number by dropping all decimal places past a certain point without rounding.
For example, 3.14159265... Can be truncated to 3.1415. If this had been rounded to 4dp it would be 3.1416

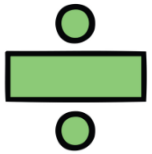
1. Using Bounds with Addition or Multiplication
This may come in the form of a question talking about perimeter (adding lengths) area (multiplying lengths) or working out total weights, costs or number of items. For this you would use the lower bounds (LB's) and upper bounds (UB's) as you would expect.
Example
A rectangle has a length 14cm and width 5cm to the nearest cm.
a) What is the minimum perimeter of the rectangle?
Here we need the LB's for the length and width.
LB of 14cm = 13.5cm. LB of 5cm = 4.5cm
Therefore, the minimum perimeter is 13.5+13.5+4.5+4.5 = 36cm
b) What is the maximum area of the rectangle?
Here we need the UB's for the length and width.
UB of 14cm = 14.5cm. UB of 5cm = 5.5cm
Therefore, the maximum area is 14.5 x 5.5 = 79.75cm²





2. Using Bounds with Subtraction and Division
It is very common to see these questions as substitution questions. It is not as obvious which LB's or UB's you need for these, so you need to think about it carefully.
Example 1 – Subtraction
a = b – c
b = 30 to the nearest 10
LB = 25 UB = 35
c = 8 to 1s.f.
LB = 7.5 UB = 8.5
Minimum value of a
a = 25 – 8.5 = 16.5
Maximum value of a
a = 35 – 7.5 = 26.5

Example 2 – Division
a = b ÷ c
b = 55 to 2 s.f.
LB = 54.5 UB = 55.5
c = 2.5 to 1d.p.
LB = 2.45 UB = 2.55
Minimum value of a
a = 54.5 ÷ 2.55 = 21.373 (3dp)
Maximum value of a
a = 55.5 ÷ 2.45 = 22.653 (3dp)



Keyword/Skill	Definition/Tips
Integer	A positive or negative whole number, or zero.
Rounding	To change a number to a more convenient value, by making it bigger or smaller
Decimal place	The number of decimal places is the number of digits after the decimal point, including zero. 3.205, has three decimal places
Significant figures	All of the digits in a number starting with the first non-zero digit. 3.205, has 4 significant figures 0.205, has 3 significant figures 0.005, has 1 significant figure.
Lower bound	The smallest value that would round up to the estimated value.
Upper bound	The smallest value that would round up to the next estimated value.
Underestimate	An estimate that is less than the actual answer.
Overestimate	An estimate that is more than the actual answer.
Degree of accuracy	A measure of how close an estimate is to the actual answer. The more decimal places or significant figures you include, the higher the degree of accuracy.
Substitute	To replace letters with numbers
Truncate	To cut a number short with no rounding.

Other Topics/Units this could appear in:
- A-level Units

Year 10 – Maths – Working Above Unit 1e - Surds

Surds

A surd is an irrational number that is the square root of a positive whole number. The value of the surd cannot be determined exactly, since they have infinite non-recurring decimals. This means they cannot be written as a fraction. Instead we leave them in surd form so that they are accurate and easier to complete calculations with.

$\sqrt{2} = 1.41421356\ldots$ which never repeats

Rules of Surds

General Rule	Example
$\sqrt{ab} = \sqrt{a} \times \sqrt{b}$	$\sqrt{48} = \sqrt{16} \times \sqrt{3} = 4\sqrt{3}$
$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$	$\sqrt{\frac{25}{36}} = \frac{\sqrt{25}}{\sqrt{36}} = \frac{5}{6}$
$a\sqrt{c} \pm b\sqrt{c} = (a \pm b)\sqrt{c}$	$2\sqrt{5} + 7\sqrt{5} = 9\sqrt{5}$
$\sqrt{a} \times \sqrt{a} = a$	$\sqrt{7} \times \sqrt{7} = 7$

Simplifying Surds

We need to use the rule $\sqrt{ab} = \sqrt{a} \times \sqrt{b}$ to help us with this as it allows us to take out a factor that is a perfect square.

Example - Write $\sqrt{12}$ in the form $a\sqrt{b}$

$\sqrt{12}$ can be written as the product of a rational number and a surd;

$$\sqrt{12} = \sqrt{4 \times 3}$$
$$= \sqrt{4} \times \sqrt{3}$$

Because 4 is a perfect square, this can be simplified to

$$\sqrt{4} \times \sqrt{3} = 2 \times \sqrt{3}$$
$$= 2\sqrt{3}$$

Note that, like in algebra, $2 \times \sqrt{3}$ is written as $2\sqrt{3}$. This is called a mixed surd.

Rationalising the Denominator

This is the process of changing the way a fraction is written so that the denominator contains only rational numbers. But we must not change the value of the fraction.

Example 1

To rationalise the denominator of $\frac{\sqrt{3}}{\sqrt{2}}$ we need to multiply it by a special version of 1, so that we don't change the value of the original fraction.

$$\frac{\sqrt{3}}{\sqrt{2}} = \frac{\sqrt{3}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$$
$$= \frac{\sqrt{3} \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}}$$
$$= \frac{\sqrt{6}}{\sqrt{4}}$$
$$= \frac{\sqrt{6}}{2}$$

This fraction is equal to 1 but the numerator and denominator are the same as the denominator in the original fraction

We now have a fraction where the denominator is rational, but the value is still equal to the original fraction.

Example 2 - Rationalise the denominator; $\frac{5}{3-\sqrt{2}}$

$$\frac{5}{3-\sqrt{2}} = \frac{5}{3-\sqrt{2}} \times \frac{3+\sqrt{2}}{3+\sqrt{2}}$$
$$= \frac{5(3+\sqrt{2})}{(3-\sqrt{2})(3+\sqrt{2})}$$
$$= \frac{15+5\sqrt{2}}{9+3\sqrt{2}-3\sqrt{2}-\sqrt{4}}$$
$$= \frac{15+5\sqrt{2}}{9-2}$$
$$= \frac{(15+5\sqrt{2})}{7}$$

This fraction is equal to 1 but this time the surd in the numerator and denominator are the negative of the surd in the original fraction. This is so that when we expand the brackets in the next step, they cancel each other out.

Here we have expanded brackets, the same way you would in algebra. If you need help with this look back at the **Crossover Unit 19 & 20 – Expanding and Simplifying/Factorising** knowledge organiser.

Calculator Skills

In the case that a surds question appears on a calculator paper, or you just want to double check your work, you input surds by using the square root button on your calculator. A calculator will always put your answer in its simplest form.

Keyword/Skill	Definition/Tips
Irrational number	A number that can be written as a decimal but not a fraction.
Surd	The square root of an integer that is irrational. $\sqrt{4} = 2$ (not a surd) $\sqrt{5} = 2.236067\ldots$ (this number is irrational, so $\sqrt{5}$ is a surd)
Perfect square	A number whose square root is an integer. Perfect squares include; 1,4,9,16,25… 3 x 3 = 9
Simplify	To simplify a surd you reduce the number under the square root to the smallest number it can possibly be, by removing a factor that is a perfect square.
Rationalise the Denominator	The process of rewriting a fraction so that the denominator contains only rational numbers.
Factor	A factor is a whole number that divides exactly into another number, they can be written in pairs of numbers that multiply to make that number. Factors of 12 are: 1 and 12 (1 x 12 = 12) 2 and 6 (2 x 6 = 12) 3 and 4 (3 x 4 =12)

Other Topics/Units this could appear in:

- A-level units

Exams!

- It is much more likely for surds to appear on a non-calculator paper so the examiner can see you manipulating surds, so it is crucial in these questions to show every step of your working out.
- If a question asks you to "leave your answer in surd form", this means you answer needs to contain a surd, and you do not change it to a decimal. E.g. $\sqrt{7}$ and NOT 2.645…

Year 10 – Maths – Working Above Unit 2a – Expanding & Factorising

Before starting work with expanding and factorising, you may find it useful to look back at the **Crossover Unit 19 & 20 – Expanding & Simplifying/Factorising** knowledge organiser.

General quadratic expression: $\mathbf{a}x^2 + \mathbf{b}x + \mathbf{c}$ (where **a**, **b** and **c** are number values) $\mathbf{a \neq 0}$

Expanding Double Brackets

Example 1: Expand and simplify: $(2x + 3y)(3x - y)$

Expanding the brackets you get: $6x^2 - 2xy + 9xy - 3y^2$
Then be careful when simplifying. You must collect like terms.

$6x^2 - 2xy + 9xy - 3y^2 = 6x^2 + 7xy - 3y^2$

Expanding Triple Brackets

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

$(x + 3)(x - 2)$ → Expand → $x^2 + 3x - 2x - 6 = x^2 - x - 6$

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

$(x^2 - x - 6)(x + 1)$ → Expand → $x^3 + x^2 - x^2 - x - 6x - 6$

Finally, simplify your answer: $x^3 + x^2 - x^2 - x - 6x - 6 = x^3 - 7x - 6$

Difference of Two Squares

There are certain quadratic expressions you need to be able to recognise:

$x^2 - 16$

x^2 and 16 are both square numbers/variables so we can apply a certain rule here called the 'difference of two squares'.

$\sqrt{x^2} = x$ $\qquad$ $\sqrt{16} = \pm 4$

We can put this straight into brackets:

$(x + 4)(x - 4)$

Factorising Quadratic Expressions

Example 1 Factorise: $x^2 - 3x - 10$

As the number on the end is a negative, the two numbers that multiply together to make it means one must be negative and the other positive. So write the factors of -10 down:

-1, 10 -10,1 -5, 2 -2, 5

Out of these factor pairs -5 and 2 add together to make – 3 so these are the numbers we use:

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

Factorising with a Coefficient of x^2

Example 1 Factorise: $2x^2 + 11x + 15$
The first step here is to multiply the coefficient of x^2 by the number at the end of the expression: 2 x 15 = 30

Then find two numbers that multiply to make 30 and add to make 11

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

5 and 6 add up to 11 so this is the factor pair we choose.

We then split the middle part of the equation up into the factor pair:

$2x^2 + 11x + 15$

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

Split the equation in the middle and factorise both sides

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

$2x^2 + 5x = x(2x + 5)$ $\qquad$ $6x + 15 = 3(2x + 5)$

$x(2x + 5) + 3(2x + 5)$

Factorise out the common bracket:

$(2x + 5)(x + 3)$

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

Other Topics/Units this could appear in:

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

Year 10 – Maths – Working Above Unit 2b – Rearranging Equations/Formulae

Before starting work with rearranging equations/formulae, you may find it useful to look back at the **Crossover Unit 21 & 22 - Solving Equations & 'Subject of'** knowledge organiser.

A formula usually has a single variable on one side of the equals sign. This is called the subject of the formula. Sometimes you will want to rearrange the formula so that one of the other variables becomes the subject. To do this you **use inverse operations** (in a similar way to solving equations) in order to isolate the new subject.

Example 1 Make r the subject of $C = 2\pi r$

To isolate r, divide by 2π

$$C = 2\pi r$$

$\div 2\pi \quad \div 2\pi$

$$\frac{C}{2\pi} = r$$

We often write formulae with the subject on the left-hand side, so this becomes:

$$r = \frac{C}{2\pi}$$

Example 2 Make x the subject $y = \frac{x}{5} + 3$

To isolate x, you first need to subtract 3

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

$-3 \quad -3$

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

Next, multiply by 5

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

$x5 \quad x5$

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

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

Example 3 Make r the subject of $V = \frac{1}{3}\pi r^2 h$

We first need to isolate r^2 by multiplying by 3 and dividing by πh

$$V = \frac{1}{3}\pi r^2 h$$

$x3 \quad x3$

$$3V = \pi r^2 h$$

$\div \pi h \quad \div \pi h$

$$\frac{3V}{\pi h} = r^2$$

Now we square root both sides

$$\sqrt{\frac{3V}{\pi h}} = r$$

$$r = \sqrt{\frac{3V}{\pi h}}$$

Example 4 Make x the subject $3x + 5 = y - ax$

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

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

$+ ax \quad + ax$

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

$- 5 \quad - 5$

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

Now we factorise out x:

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

$\div (3 + a) \quad \div (3 + a)$

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

Keyword/Skill	Definition/Tips
Expression	One or a group of symbols representing a number or a value. Can contain numbers, variables & operations
Equation	An equation says that two things are equal
Formula	A rule or fact written using mathematical symbols
Identity	An equation that is true no matter what values are chosen
Variable	A symbol for a number we do not know yet
Simplify	To remove unnecessary terms and numbers
Inverse Operations	The **operation** that reverses the effect of another operation. **Addition & subtraction are inverse operations** **Multiplication & division are inverse operations** **Square & Square Root are inverse operations**
Power/Index	The number of times a number is multiplied by itself. E.g. 10^3 <- This means multiply 10 by itself 3 times -> 10 x 10 x 10
Term	A single number or a variable
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
Isolating the Variable	Using inverse operations to get a variable on its own.

Other Topics/Units this could appear in:

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

Year 10 – Maths – Working Above Unit 2c – Sequences

Before starting work with sequences, you may find it useful to look back at the **Crossover Unit 49 – Sequences** knowledge organiser

Proving a Term is part of a Sequence

You will be given a number and asked if it is part of a sequence.
You need to prove that it is either part of it or isn't part of it.

If it is part of a sequence, n will be a whole number

Example:
Is 46 a part of the sequence 3n – 2?

$3n - 2 = 46$
$+2 \quad +2$
$3n = 48$
$\div 3 \quad \div 3$
$n = 16$ so it is a part of the sequence

If n is a whole number it is part of the sequence.
If n is a decimal number it is not part of the sequence.

Generating terms of a Quadratic Sequence

You will be given an nth term and asked to find some values of that sequence. You need to substitute numbers into the nth term to generate the sequence.

Example:

Find the first 5 terms of the sequence $n^2 + 5n + 3$

For the first term	n = 1	$1^2 + (5 \times 1) + 3 = 9$
For the second term	n = 2	$2^2 + (5 \times 2) + 3 = 17$
For the third term	n = 3	$3^2 + (5 \times 3) + 3 = 27$
For the fourth term	n = 4	$4^2 + (5 \times 4) + 3 = 39$
For the fifth term	n = 5	$5^2 + (5 \times 5) + 3 = 53$

So the sequence is: 9, 17, 27, 39, 53

Finding the nth term of a Quadratic Sequence

For a quadratic sequence the difference of the first difference will be the same (we call this the second difference).

When a quadratic sequence has a second difference of 2, it will involve n^2.

When a quadratic sequence has a second difference of 4, it will involve $2n^2$.

When a quadratic sequence has a second difference of 6, it will involve $3n^2$.

The **coefficient** of n^2 is always half the second difference.

Example:
Find the nth term of this sequence:

	4,	11,	20,	31,	44
First difference		+7	+9	+11	+13
Second difference			+2	+2	+2

As the second difference is 2, it is going to involve n^2
I then need to subtract the n^2 sequence from the original sequence.

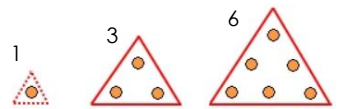
Original sequence	4,	11,	20,	31,	44
n^2 sequence	1,	4,	9,	16,	25

You will then be left with a linear sequence, find the nth term of this now:

3, 7, 11, 15, 19
+4 +4 +4 +4
4n – 1

This combined with n^2 makes the nth term for the original sequence:

nth term = $n^2 + 4n - 1$

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
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.
Quadratic Sequence	A sequence involving a variable with a power of 2 E.g. $n^2 + 5$
nth term	The rule for finding any value in the sequence. Also called the Position to Term rule
Triangular Number	A number that can make a triangle pattern. E.g. 
Fibonacci Sequences	A sequence where the next number is found by adding up the previous two terms
Function	A special relationship where each input has a single output
Coefficient	A number used to multiply a variable 

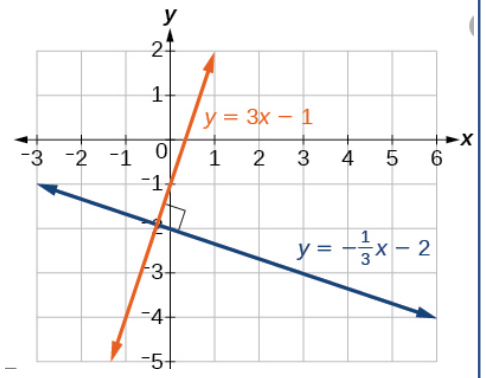
Other topics/units this could appear in:
- Algebraic Proof
- Core – Sequences & Series

Exam!
A linear sequence has a common difference. A quadratic sequence, the first difference will be different and the second difference will be the same. **You will need to know the difference between linear and quadratic sequences .**

Year 10 – Maths – Working Above Unit 3 – Coordinate Geometry

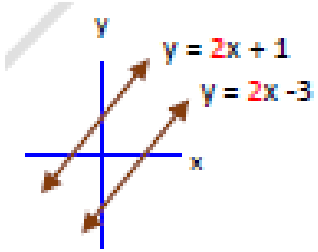
Perpendicular Lines

Lines that meet at 90degrees. Their gradients will be NEGATIVE RECIPROCALS of each other.



Parallel Lines

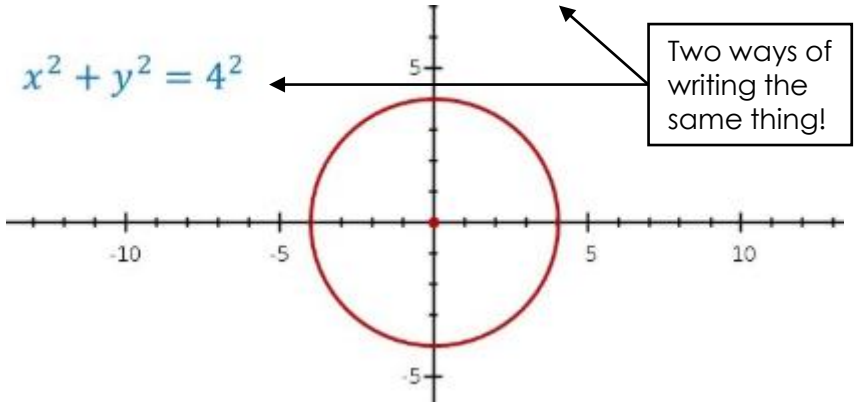
Lines that never meet. They will have the SAME gradient.



Circles

The equation of a circle is in the form $x^2 + y^2 = r^2$, where r is the radius, and the centre of the circle is at (0,0).

So a circle with equation $x^2 + y^2 = 16$ looks like this:



Graphs you need to be familiar with:

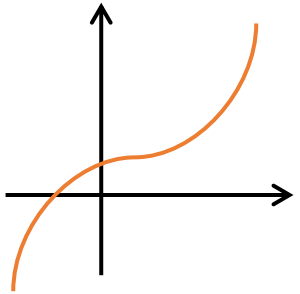
Quadratic:

When **a** is positive

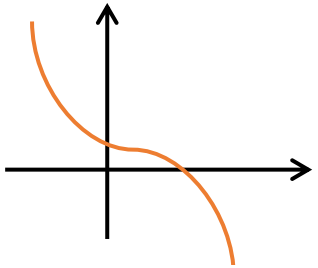
When **a** is negative

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

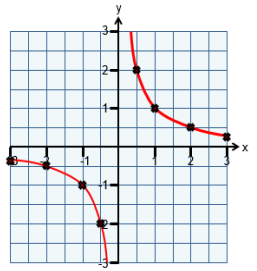
When **a** is positive



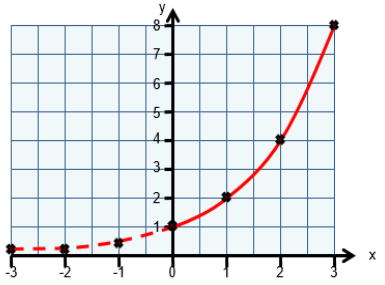
When **a** is negative



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



Exponential: $y = 2^x$



Keyword/Skill	Definition/Tips
Coordinate	Shown as a pair (2,4) to show a position on a set of axes.
Quadratic	An equation that has an x^2 as the highest power.
Cubic	An equation that has an x^3 as the highest power.
Reciprocal	1 divided by the number. E.g. the reciprocal of 2 is ½ The reciprocal of 10 is 1/10 The reciprocal of x is 1/x
Circle	A 2D shape made from drawing a curve that is always the same distance from a center.
Perpendicular	When two lines meet at a right angle.
Parallel	When two lines are always the same distance apart and never meet.

Before starting this unit of work it may help to look back at the **Crossover Unit 31 – Coordinate Geometry** knowledge organiser.

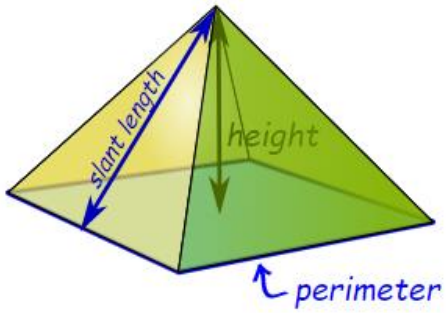
Other Topics/Units this could appear in:

A-Level – Core:
- Graphs & Transformations
- Straight Line Graphs
- Circles
- Functions & Graphs

Year 10 – Maths – Working Above Unit 4 – Surface Area and Volume

Before starting work on this unit, you may find it useful to refer to **Crossover Unit 45 – Surface Area & Volume & Crossover Unit 46 – Similar Shapes**

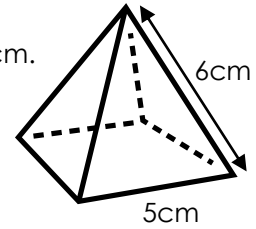
Pyramid



Surface Area = [Base Area] + $\frac{1}{2}$ × Perimeter × [Slant Length]

When side faces are the same:
Example: Slant length = 6cm. The base is a square with side lengths of 5cm.

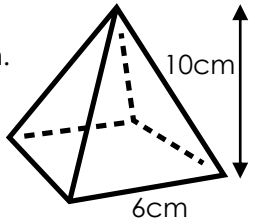
Surface Area = Base Area + ½ x Perimeter of Base x Slant Length
= (5 x 5) + ½ x (5 + 5 + 5 + 5) x 6
= 25 + ½ x 20 x 6
= 25 + 60
= 85cm^2



Note: When the side faces are different, calculate the area of the base AND the area of each triangular face separately and then add them up.

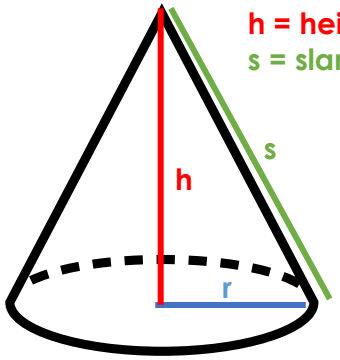
Volume = $\frac{1}{3}$ × [Base Area] × Height

Example: Height = 10cm, The base is a square with side lengths of 6cm.
Volume = ⅓ x Base Area x Height
= ⅓ x (6 x 6) x 10
= 12 x 10
= 120cm^3

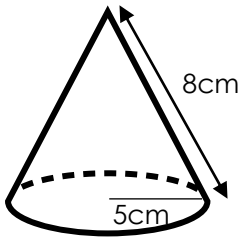


Cone

r = radius
h = height
s = slanted height



Surface Area = Area of the Base + the Curved Area
Example: Radius = 5cm, Slant Height = 8cm
Surface Area = Area of the Base + the Curved Area
= π x r^2 + π x r x s
= π x 5^2 + π x 5 x 8
= 65 π cm^2 or 204 cm^2 (3 sig figs)



Volume = $\frac{1}{3}$ × [Base Area] × Height

= ⅓ x π x r^2 x h
= ⅓ x π x5^2 x √(8^2 - 5^2)
= ⅓ x π x 25 x √(39)
= 163.5cm^3 (1dp)

Keyword/ Skill	Definition/tip
Pyramid	A solid object (3D) where the sides are triangles that meet at the top. (Apex)
Cone	A solid object (3D) that has a circular base joined to a point by a curved side. The point is called a vertex.
Sphere	A solid (3D object) shaped like a ball. Every point on the surface is the same distance from the centre
Frustum	A pyramid or a cone with the top cut off parallel to its base.
Surface Area	Total area of the surface of a 3D shape
Volume	The amount of 3D space that something takes up

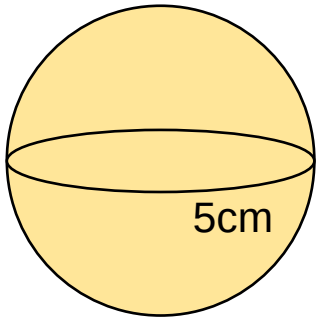
Other topics/Units this could appear in:
A-Level – Pure 1 – Forming and Solving Differential Equations

Exam Tip:
You will sometimes need to use Pythagoras Theorem to find h, r or s

Year 10 – Maths – Working Above Unit 4 – Surface Area and Volume

Before starting work on this unit, you may find it useful to refer to **Crossover Unit 45 – Surface Area & Volume & Crossover Unit 46 – Similar Shapes**

Sphere



The radius of this Sphere is 5cm.

Surface Area = $4 \times \pi \times r^2$

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

$= 100\pi \text{ cm}^2$ or 314 cm^2 (3 sig figs)

Volume = $\frac{4}{3} \times \pi \times r^3$

$= \frac{4}{3} \times \pi \times 5^3$

$= 524\text{cm}^3$ (3 sig figs)

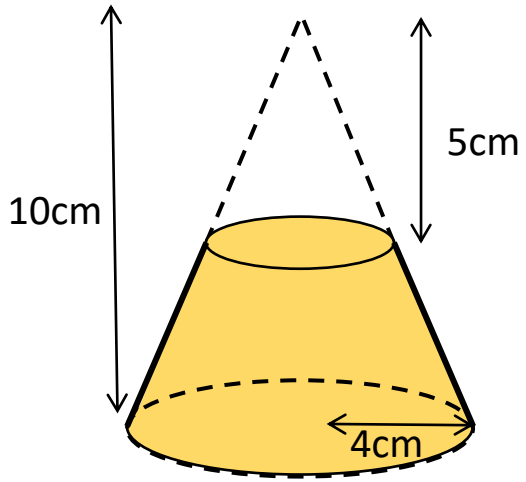
Formula you need to remember for the exam:

Volume of a Pyramid:

$\frac{1}{3} \times \textit{area of base} \times \textit{height}$

The formulas you need for the surface area & volume of a cone and a sphere are given to you in the exam so you do not need to memorise them, just make sure you can use them!

Frustum (Shaded bit)



Remember: The formulae for cones are on the previous page

Scale Factor	$10 \div 5 = 2$
Radius of top circle	$4 \div 2 = 2cm$
Volume of big cone	$\frac{1}{3} \times \pi \times 4^2 \times 10 = 167.6cm^3$
Volume of small cone	$\frac{1}{3} \times \pi \times 2^2 \times 5 = 20.9cm^3$
Volume of Frustum	$167.6 - 20.9 = 147cm^3$ 3 sig figs
Length of big cone	$\sqrt{4^2 + 10^2} = 10.77cm$
Length of small cone	$\sqrt{5^2 + 2^2} = 5.39cm$
Area of curved surface	$(\pi \times 4 \times 10.77) - (\pi \times 2 \times 5.39) = 101.5cm^2$
Surface Area of Frustum	$101.5 + \pi \times 4^2 + \pi \times 2^2 = 164cm^2$

Keyword/ Skill	Definition/tip
Pyramid	A solid object (3D) where the sides are triangles that meet at the top. (Apex)
Cone	A solid object (3D) that has a circular base joined to a point by a curved side. The point is called a vertex.
Sphere	A solid (3D object) shaped like a ball. Every point on the surface is the same distance from the centre
Frustum	Usually a pyramid or cone with the top cut off flat.
Surface Area	Total area of the surface of a 3d shape
Volume	The amount of 3D space that something takes up

Other topics/Units this could appear in:
A-Level – Pure 1 – Forming and Solving Differential Equations

Exam Tip:
You will sometimes need to use the properties of 'Similar Shapes' and/or Pythagoras to calculate some lengths that are required

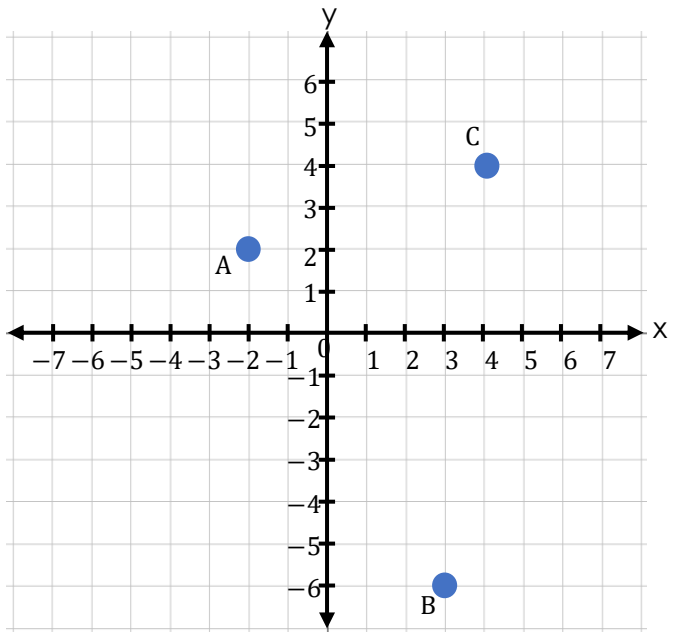
Year 10 – Maths – Working Above Unit 5 – Transformations

Combining Translations

Translations are movements in a direction.
Column vectors can be used to describe translations.
When two or more translations are combined, they can be added together using **vector addition**.

From point A to point B and then to point C the combined translation is:

$$\begin{pmatrix} 5 \\ -8 \end{pmatrix} + \begin{pmatrix} 1 \\ 10 \end{pmatrix} = \begin{pmatrix} 6 \\ 2 \end{pmatrix}$$

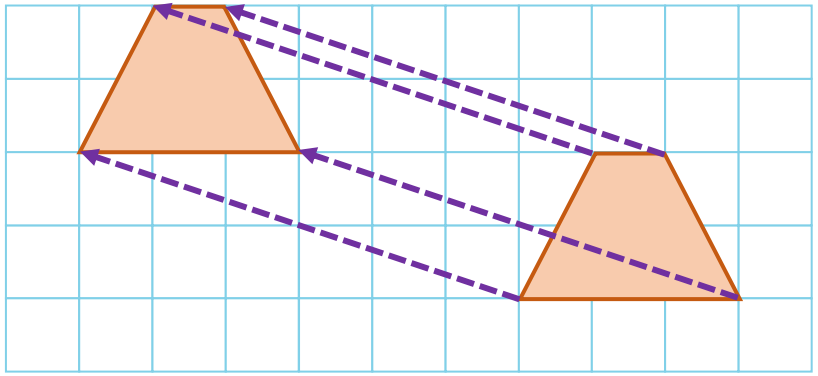


You will need to look at the **Crossover Unit 47 – Transformations** knowledge organiser alongside this one, as those skills are needed on this unit too.

Preserved Properties

When a shape is translated, its **orientation** (which way up it is) and **size** do not change.
Only the shape's **position** changes.
The orientation and size are **preserved**.

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



Preserved properties are the properties about the shape that do not change when the shape is transformed. Which properties are preserved is different for each type of transformation.

Other Topics/Units this could appear in:

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 could replace the combined transformations given in the question.
Combined transformations	Two or more transformations have taken place. Each will have been described fully.

Year 10 – Maths – Working Above Unit 5 – Transformations

Two or more transformations are often combined, and exam questions will ask you to state the **single transformation** which would produce the same effect.

Combining Transformations

Complete each transformation exactly as stated in the question and then compare the starting shape with the end result. Find a single transformation that will achieve the same movement.

Tip: This NEVER involves enlargements, because they change the size of the shape.

Example Exam Question

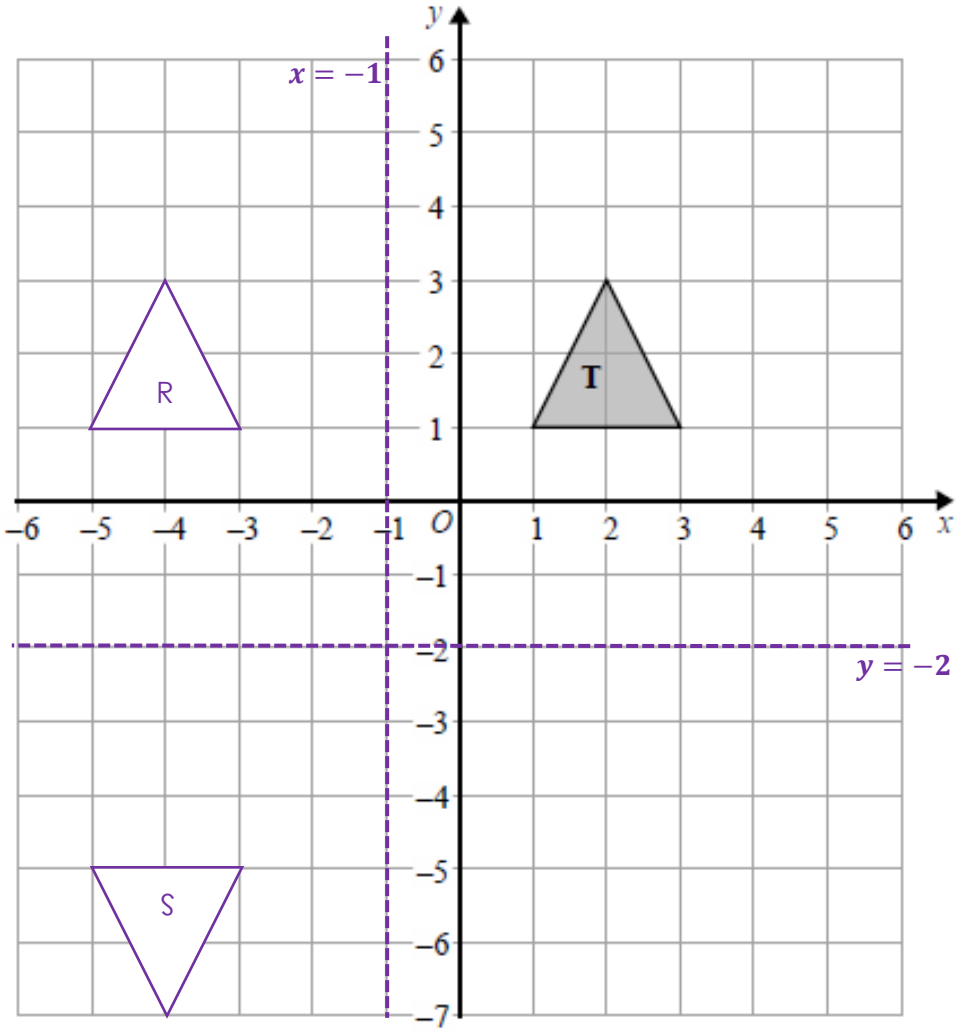
Shape T is reflected in the line x = -1 to give shape R. Shape R is reflected in the line y = -2 to give shape S. Describe the single transformation that will map shape T to shape S.

(2 marks)

How to answer:

1) Reflect shape T in the line x = -1 and label it R.
2) Reflect shape R in the line y = -2 and label it S.
3) Compare shape S with shape T and find a single transformation that move straight from T to S.

Answer: Rotation, 180°, centre (-1,-2)



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).
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 could replace the combined transformations given in the question.

Preserved Properties

The **size** of the shape has been preserved in this situation, but the **orientation** and **position** have changed.

Year 10 – Maths – Working Above Unit 5 – Transformations

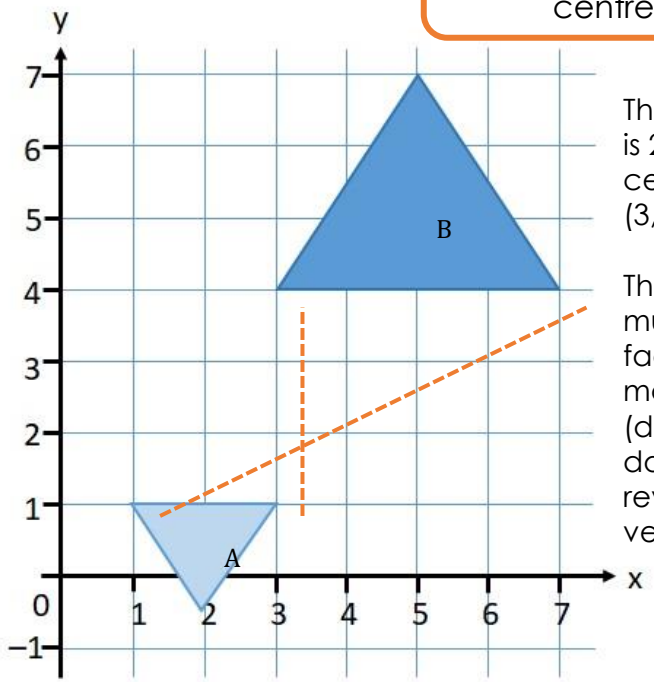
Enlargements - Negative Scale Factors

When a **negative scale factor** is used, the shape is enlarged and also **inverted** (reversed, as if it has been rotated through 180°).

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

This distance then gets multiplied by the scale factor, reversing the directions and therefore inverting the shape.

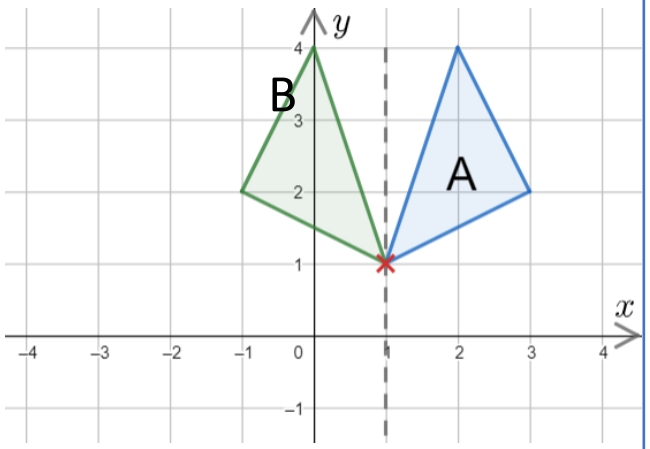
B is an enlargement of A by scale factor −2, from centre (3,2)



The vertex (1,1) on shape A is 2 left, 1 down from the centre of enlargement at (3,2).

This distance has been multiplied by the scale factor -2 to give the movement 4 right 2 up (distance has been doubled, direction has been reversed). This gives the vertex (7,4) on shape B.

Invariant Points



The shape A has been reflected in the line x = 1 to give the shape B. The red cross marks the **invariant point** in this reflection. An invariant point is one which is not altered by the transformation, so does not move or change.

Preserved Properties

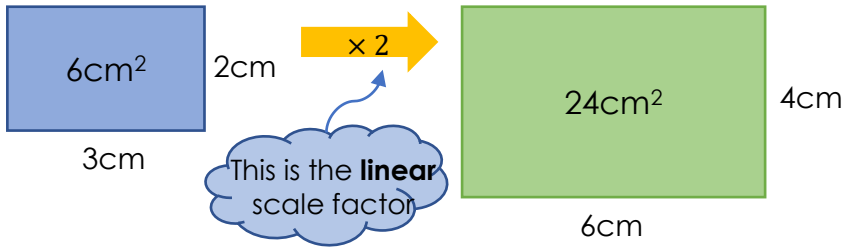
There are no preserved properties when an enlargement with a negative scale factor is performed, unless the **scale factor** is **-1** as the **size** would be preserved in this special case only.

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 could replace the combined transformations given in the question.
Inverted	Reversed in a similar way to being rotated through 180°.

Year 10 – Maths – Working Above Unit 5 – Transformations

Enlarging Area

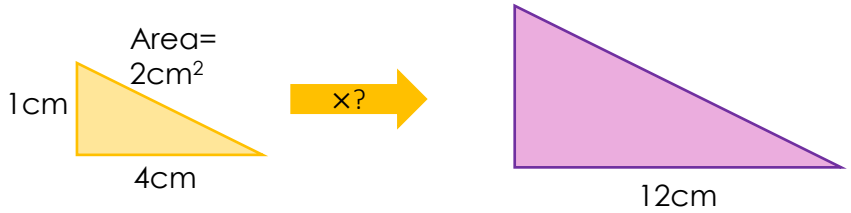
A rectangle with length 3cm and width 2cm has an area of $6cm^2$
It is enlarged by a scale factor of 2.



Because each of the two side lengths has been enlarged by a factor of 2, the **area** has been enlarged by a **factor of 2^2**.

Finding the Scale Factor

A triangle with base 4cm and height 1cm is enlarged to give this new triangle.



To find the scale factor, we compare the matching values for the two shapes. These are the bases in this case because we know both these lengths.

We can see that $\frac{12}{4} = 3$ so the linear scale factor here is 3.

We can now calculate the missing height and the area of the enlarged triangle.

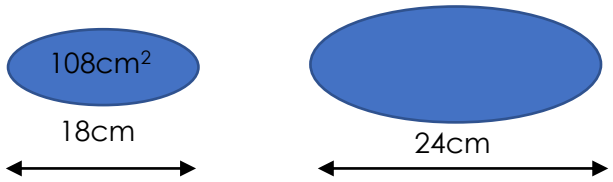
Height: $1 \times 3 = 3cm$

Area: $2 \times 3^2 = 18cm^2$

This is squared because it is a linear scale factor and we are calculating area.

Using the Scale Factor

A shape and its enlargement are shown, with some dimensions.



To find the area of the enlarged shape, we need to find the scale factor first, using the matching values.

$\frac{24}{18} = \frac{4}{3}$ Leave the scale factor in fraction form – it is more accurate and will be easier to work with in further calculations.

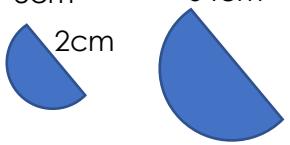
To find the area of the enlarged shape, we multiply the area of the smaller shape by the scale factor squared (it is squared because it is a linear scale factor and we are calculating area):

$108 \times \left(\frac{4}{3}\right)^2 = 108 \times \frac{16}{9} = \frac{108}{9} \times 16 = 12 \times 16 = 192$

The area of the enlarged shape is $192cm^2$.

Linear Scale Factor

Area= $8cm^2$ Area= $64cm^2$



$\sqrt{\frac{64}{8}} = \sqrt{8}$

To find the scale factor we compare the matching values, in this case the areas because we know both areas. We will need to square root because these are areas, and we need the **linear** scale factor.

The diameter of the enlarged shape is then

$2 \times \sqrt{8} = 4\sqrt{2}$ or 5.66cm to 3 s.f.

You will find more information about these concepts in the knowledge organiser for **Crossover Unit 46 – Similarity and Congruence**

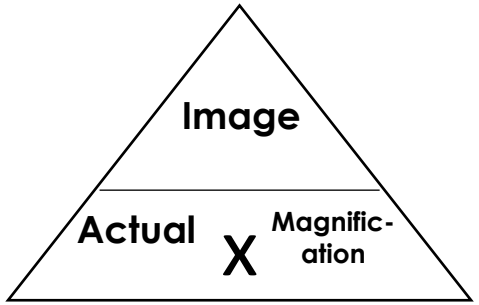
Keyword/Skill	**Definition/Tips**
Scale factor	The multiplier used to change the side lengths of a shape being enlarged. If it is less than 1, the shape will get smaller.
Similar	Shapes that are have the same angles, but the side lengths on one have been enlarged by a scale factor.
Congruent	Shapes that 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.
Linear	Describing a straight length.

See the knowledge organiser for **Working Above Unit 1e – Surds**

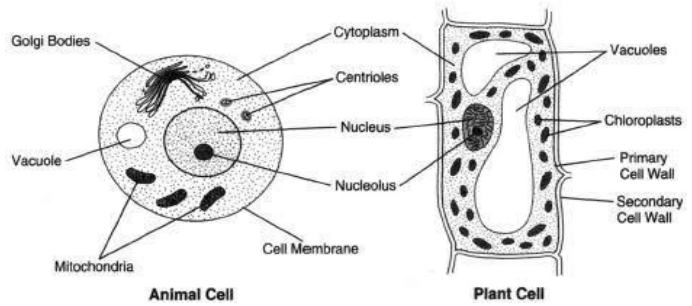
Biology Knowledge Organisers

Year 9 – Science- B3a. Biological Concepts

1. Magnification



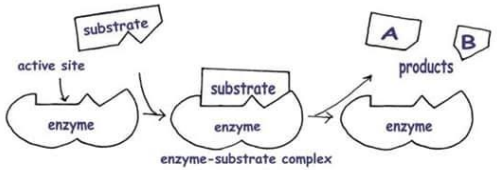
2. Plant and animal cells : compare and contrast



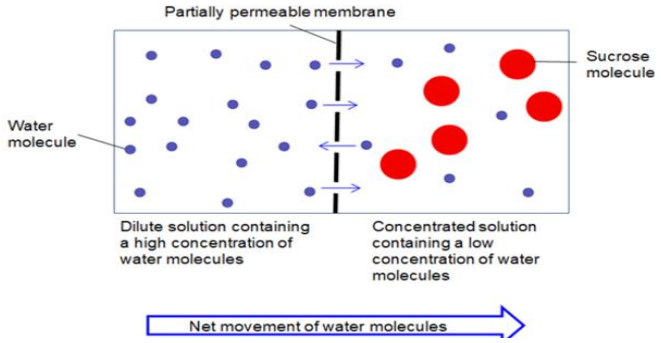
3. Enzymes and food tests

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

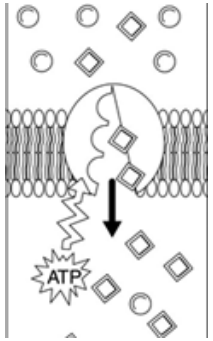
4. Enzyme substrate complex



5. Osmosis

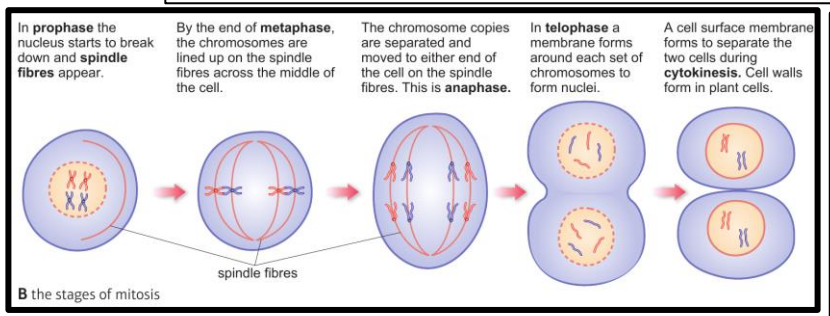


6. Active transport

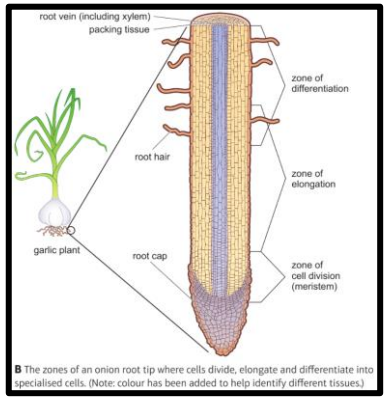


Keyword	Definition
Magnification	The number of times larger an image is than the initial object that produced it
Objective lens	The part of the microscope that is closest to the specimen
Resolution	The smallest change that can be measured by an instrument
Nucleus	The control centre of the "eukaryotic 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)

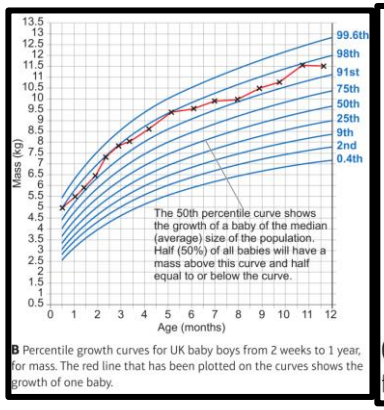
KS4 Biology – Cells and Control



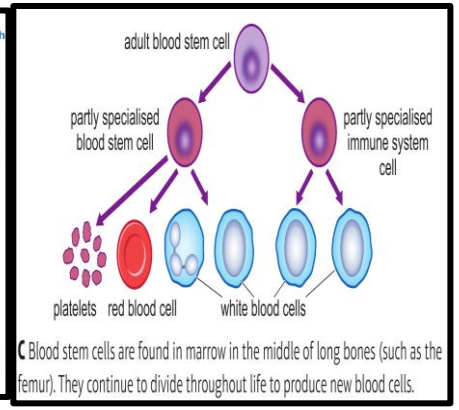
B the stages of mitosis



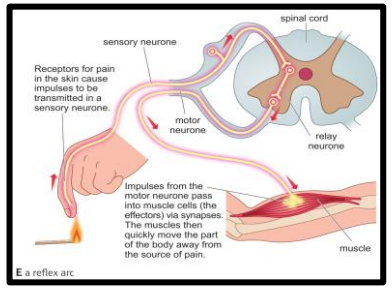
B The zones of an onion root tip where cells divide, elongate and differentiate into specialised cells. (Note: colour has been added to help identify different tissues.)



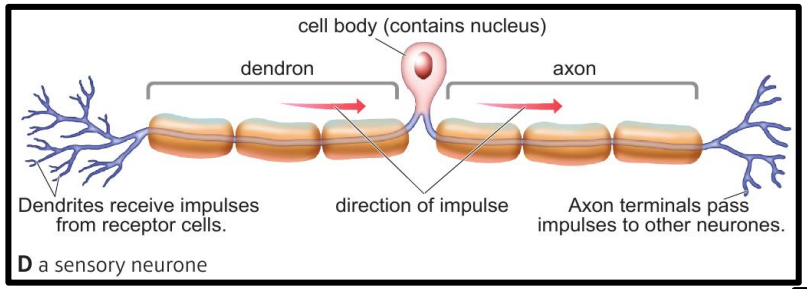
B Percentile growth curves for UK baby boys from 2 weeks to 1 year, for mass. The red line that has been plotted on the curves shows the growth of one baby.



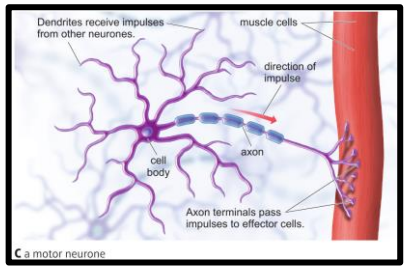
C Blood stem cells are found in marrow in the middle of long bones (such as the femur). They continue to divide throughout life to produce new blood cells.



E a reflex arc



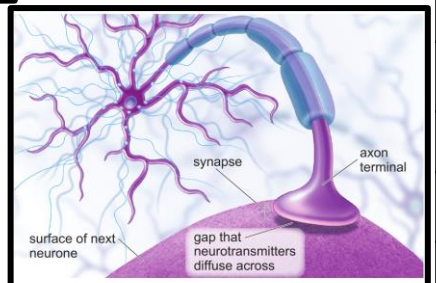
D a sensory neurone



C a motor neurone

Cell differentiation

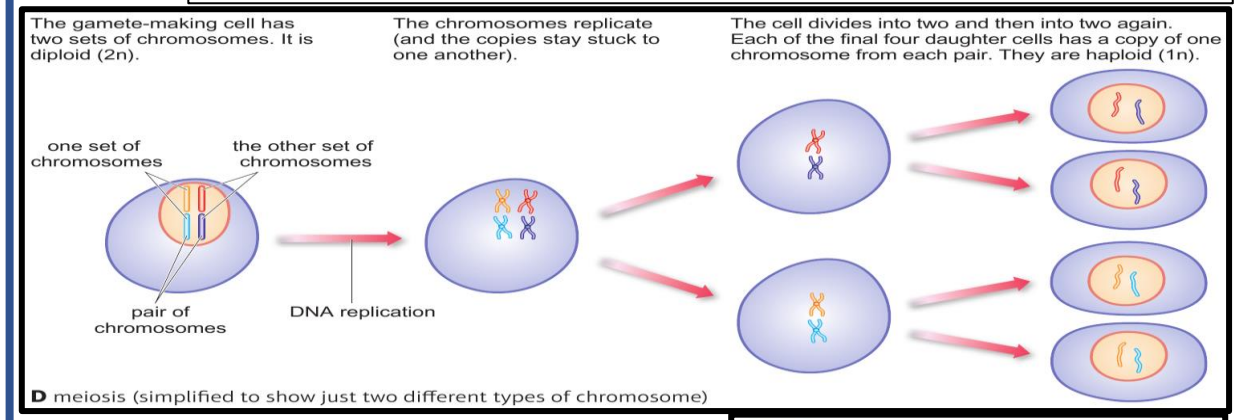
Although all animals develop from a single cell, not all the cells in their bodies are the same. Cells produced by mitosis are the same as the cell from which they were formed. However, the new cells may then change in different ways, so they become specialised for different functions. The process that changes less specialised cells into more specialised ones is called **differentiation**.



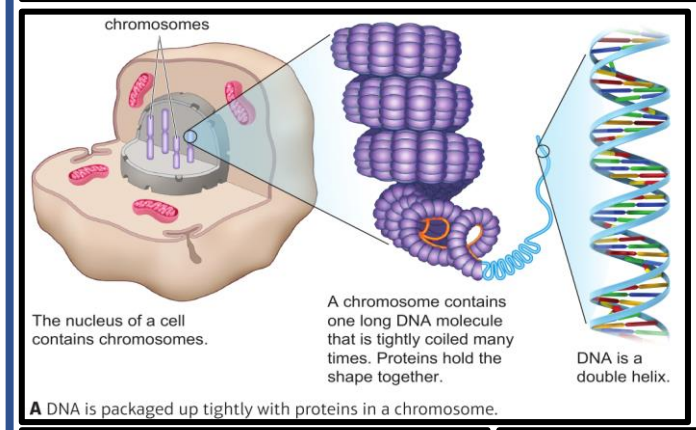
D The gap in a synapse is only about 20 nm (0.00002 mm) wide.

Keyword	Definition
anaphase	The stage of mitosis in which the separated chromosomes move away from each other.
cancer cell	Cell that divides uncontrollably.
cell cycle	A sequence of growth and division that happens in cells. It includes interphase and mitosis, and leads to the production of two daughter cells that are identical to the parent cell.
clone	Offspring from asexual reproduction. All the cells in a clone are genetically identical to each other and to the parent's cells.
cytokinesis	When the cytoplasm of the cell is separated as the cell membrane is pinched to divide the cell into two daughter cells.
daughter cell	New cell produced by cell division.
diploid	A cell with two sets of chromosomes.
DNA replication	The copying of the DNA within a cell.
haploid	A cell with one set of chromosomes.
interphase	The stage when the cell prepares itself for the process of cell division, and DNA replication takes place. The cell also makes more of its sub-cellular structures.
metaphase	The stage of mitosis when the chromosomes line up across the middle of the cell.
mitosis	The process of cells dividing to produce two daughter cells that are genetically identical to the parent.
prophase	The stage of mitosis in which the nucleus starts to break down and spindle fibres appear.
telophase	The stage of mitosis in which the chromosomes arrive at opposite ends of the cell and the nucleus membrane reforms.
differentiation	When a group of similar things, such as cells, become different in form from each other.
percentile	A $\frac{1}{100}$th division of a group. For example, 10 per cent of the data items are below the 10th percentile and 50 per cent are below the 50th percentile.
elongation	When something gets longer (such as a cell in a plant root or shoot before it differentiates into a specialised cell).
adult stem cell	Stem cell found in specialised tissue that can produce more of the specialised cells in that tissue for growth and repair.
cancer	Disease caused by the uncontrolled division of stem cells in a part of the body.
embryonic stem cell	Stem cell from an early embryo that can produce specialised cells of many different types.
rejection	When the immune system attacks and kills cells and tissue that come from another person, such as blood (after transfusion) or stem cells.
axon	The long extension of a neurone that carries an impulse away from the dendron or dendrites towards other neurones.

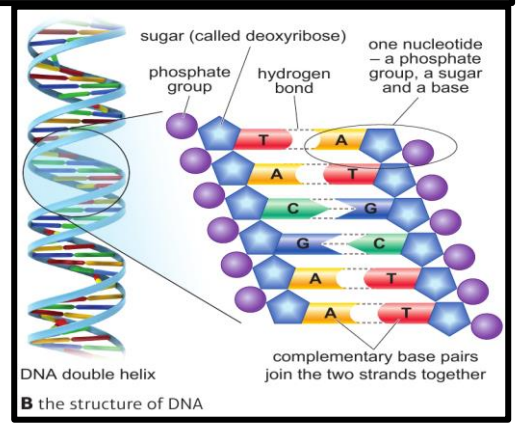
KS4 Biology - Genetics



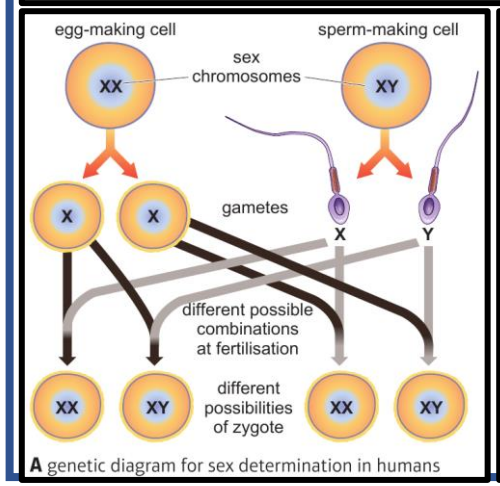
D meiosis (simplified to show just two different types of chromosome)



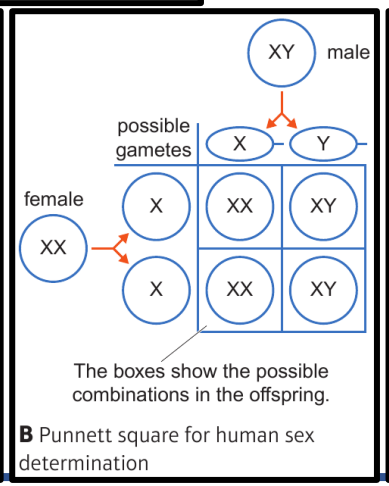
A DNA is packaged up tightly with proteins in a chromosome.



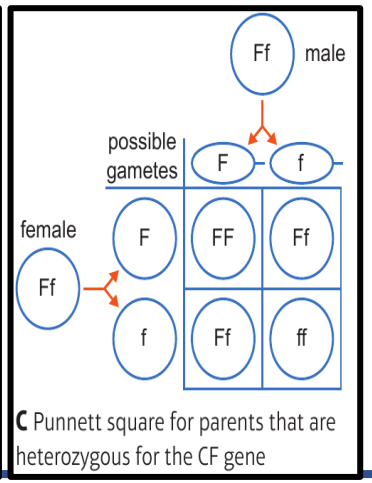
B the structure of DNA



A genetic diagram for sex determination in humans



B Punnett square for human sex determination



C Punnett square for parents that are heterozygous for the CF gene

Keyword	Definition
chromosome	A structure found in the nuclei of cells. Each chromosome contains one enormously long DNA molecule packed up with proteins.
daughter cell	A cell produced by another cell that has divided.
diploid	A cell or nucleus that has two sets of chromosomes. In humans, almost all cells except the sperm and egg cells are diploid.
DNA	Deoxyribonucleic acid. A polymer made of sugar and phosphate groups joined to bases. One molecule of DNA is found in each chromosome.
fertilisation	Fusing of a male gamete with a female gamete.
gamete	A haploid cell used for sexual reproduction.
gene	Section of the long strand of DNA found in a chromosome, which often contains instructions for a protein.
genome	All the DNA in an organism. Each body cell contains a copy of the genome.
haploid	A cell or nucleus that has one set of chromosomes. Gametes are haploid.
meiosis	A form of cell division in which one parent cell produces four haploid daughter cells.
replicate	When DNA replicates it makes a copy of itself.
zygote	Another term for 'fertilised egg cell'.
base (in DNA)	Four substances that help make up DNA, often shown by the letters A, C, G and T. Pairs of bases form 'links' between two 'spines' formed of phosphate groups and a type of sugar.
chromosome	A structure found in the nuclei of cells. Each chromosome contains one enormously long DNA molecule packed up with proteins.
complementary base pair	Two DNA bases that fit into each other and link by hydrogen bonds. There are two types of complementary base pair: A linking with T, and C linking with G.
double helix	Two helices joined together.
allele	Most genes come in different versions called alleles. So a gene for eye colour may have one version (allele) that can cause dark eyes, and another allele that can cause pale eyes.
phenotype	The characteristics that a certain set of alleles display.
genotype	The alleles for a certain characteristic that are found in an organism. Written in a shorthand using letters to represent the alleles (with the dominant allele having a capital and being written first).
dominant	Allele that will always affect the phenotype (as opposed to a recessive allele, whose effect will not be seen if a dominant allele is present).
recessive	Allele that will only affect the phenotype if the other allele is also recessive. It has no effect if the other allele is dominant.
heterozygous	When both the alleles for a gene are different in an organism.
homozygous	When both the alleles for a gene are the same in an organism.

Year 9 – Science – B3b. Natural Selection and Genetic Modification

1. Evidence for human evolution

Ardi (Ardipithecus ramids)	• Human like female fossil • Walked upright • Long arms and short legs • Small skull and brain
Lucy (Australopithecus afarensis)	• 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	• More human like female fossil than Lucy • Walked upright better than Lucy • Arm and legs were human length • Skull and brain larger than Lucy

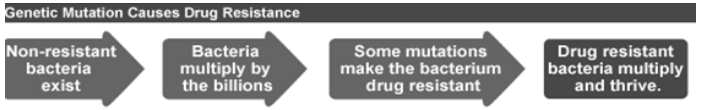
Evidence for human evolution can also be gained from looking at stone tools, which become more sophisticated overtime

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.

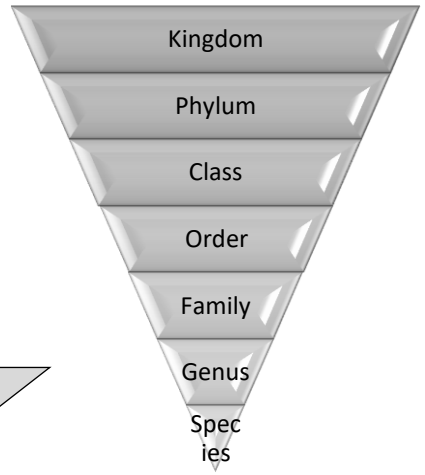
- The differences in a population gives some
- individuals an advantage.
- This individual is more likely to survive for longer and be able to breed to pass on desirable genes.
- Nature is selecting the individual with the phenotypes most suited to survival ('survival of the fittest). This is called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

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

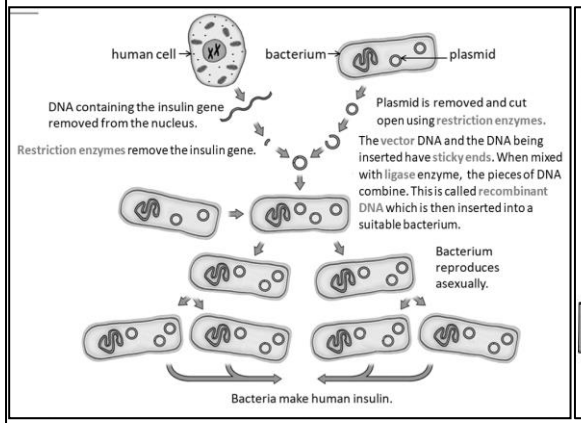


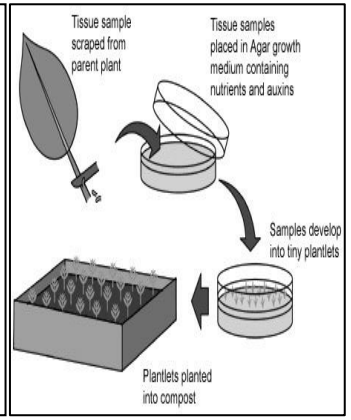
3. Classification

The number of organisms in each group gets smaller, but they have more features in common



4. Genetic Engineering and Tissue Culture





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.

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

KS4 Biology – Health, Disease and the Development of Medicine

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

Communicable diseases:	Non-communicable diseases:
Common cold	Diabetes
Influenza	Cancer
STDs	Cardiovascular disease

Defence Against Disease

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

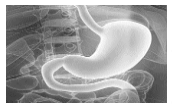
Physical barriers

nose

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

Chemical defence

stomach



Hydrochloric acid (pH1) kills most ingested pathogens.

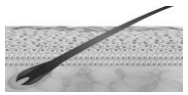
Physical barriers

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

Physical barriers

skin

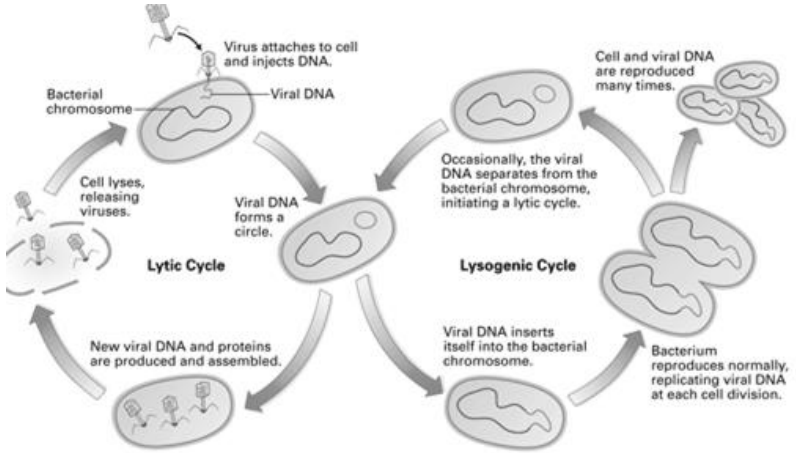
Hard to **penetrate waterproof** barrier. **Glands** secrete **oil** which kill microbes.



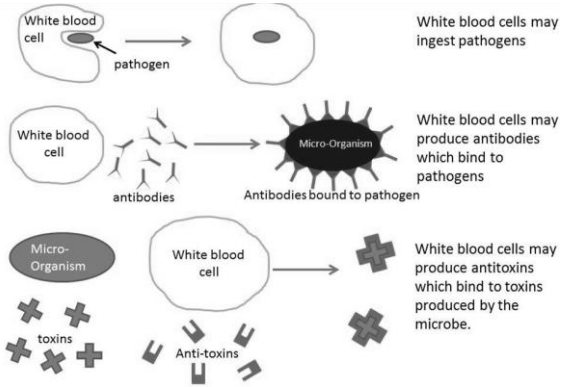
Tears, saliva and mucus contain an enzyme called lysozyme which destroys microorganisms.

Chemical defence

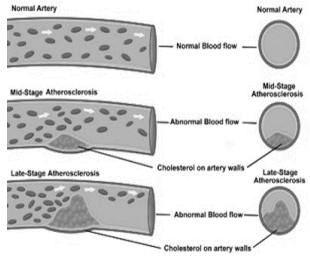
Lysogenic Vs Lytic Virus Lifecycle



The Immune System

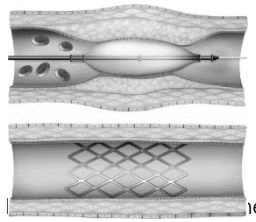


Cardiovascular Disease



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 top 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.

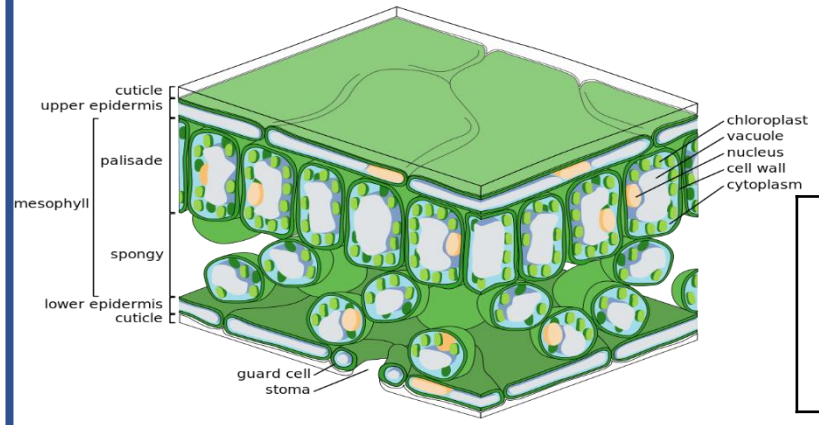
Obesity

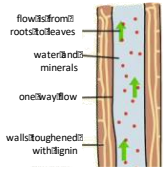
Excess weight (obesity) can make a person at **risk of cardiovascular disease**, a stroke and Type 2 diabetes. A tool called the **Body Mass Indicator** (BMI) can be used to calculate whether a persons weight lies within a healthy range.

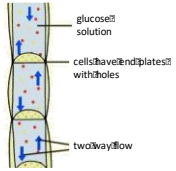
$$BMI = \frac{\text{mass (kg)}}{(\text{height (m)})^2}$$

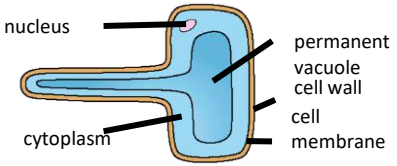
The use of **BMI** has **limitations** because it simply shows if a person is carrying too much weight. It does not calculate if this is excess fat, muscle or bone. The **waist to hip ratio** should be considered alongside the BMI figure.

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 → 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.

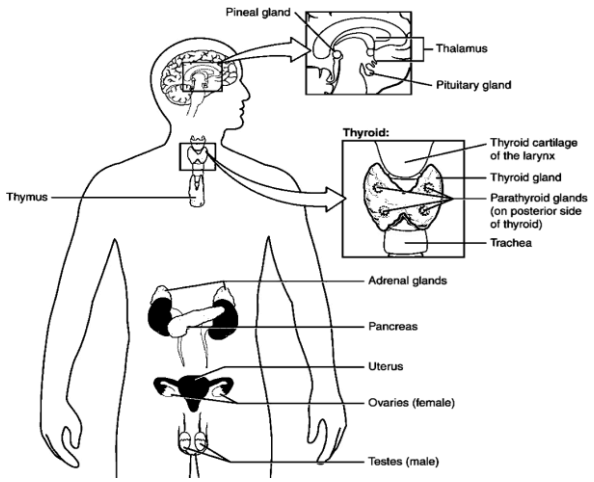
Factors affecting the rate of photosynthesis

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

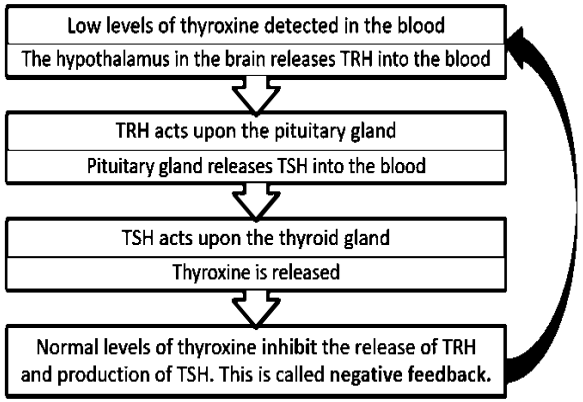
Keyword	Definition
Active Transport	Active transport moves substances from a more dilute solution to a more concentrated solution (against a concentration gradient). The energy is provided by respiration
Xylem	Form hollow tubes made of dead tissue. Long cells with walls toughened by waterproof lignin. 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.

KS4 Biology – Animal Coordination, Control and Homeostasis (part 1)

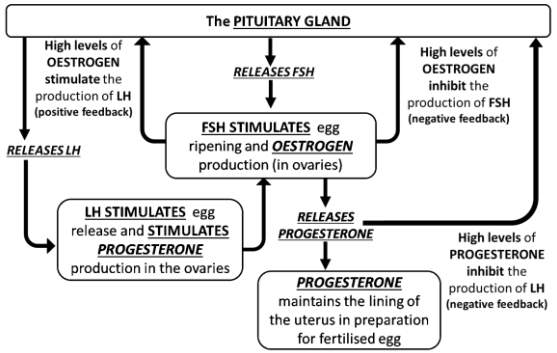
The Human Endocrine System

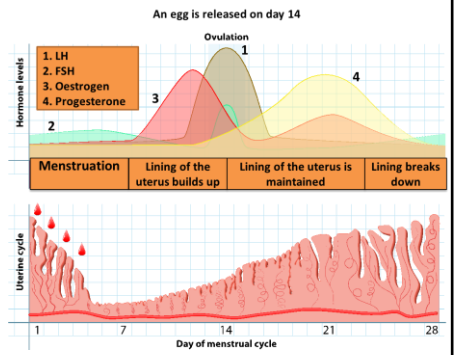


Anti-diuretic hormone (ADH)	Kidney	Controls water levels in the blood
Thyroid-stimulating hormone (TSH)	Thyroid	Stimulates the thyroid gland to secrete thyroxine
Luteinising hormone (LH)	Ovaries	Stimulates egg release and progesterone production in the ovaries
Follicle-stimulating hormone (FSH)	Ovaries	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

KS4 Biology- Animal Coordination, Control and Homeostasis (part 2)

Control of Blood Glucose

Blood glucose concentration TOO HIGH

↓

The PANCREAS releases the hormone insulin

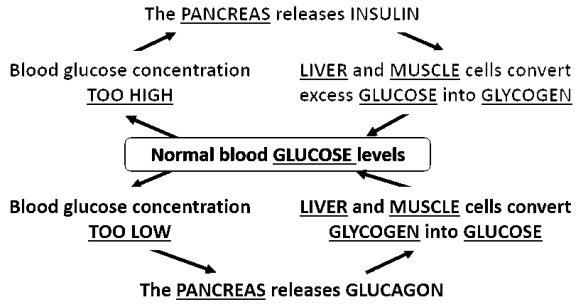
↓

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.

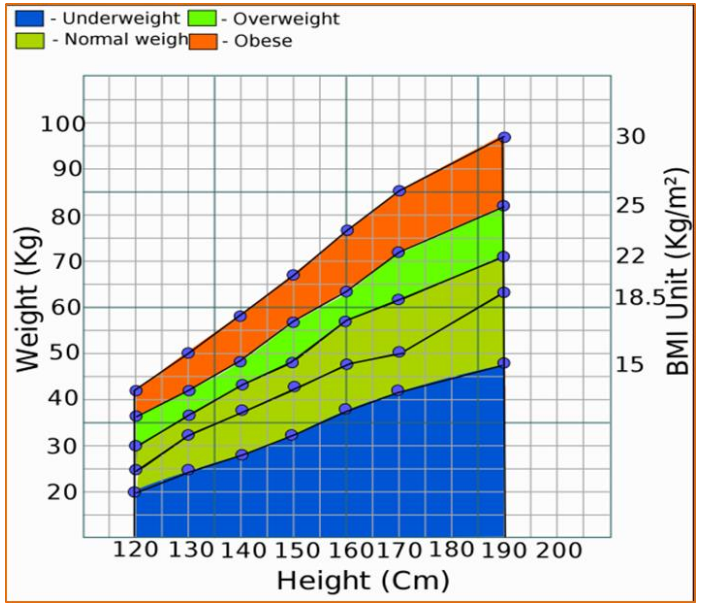
Obesity is a risk factor for Type 2 diabetes.

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 persons weight lies within a healthy range.

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



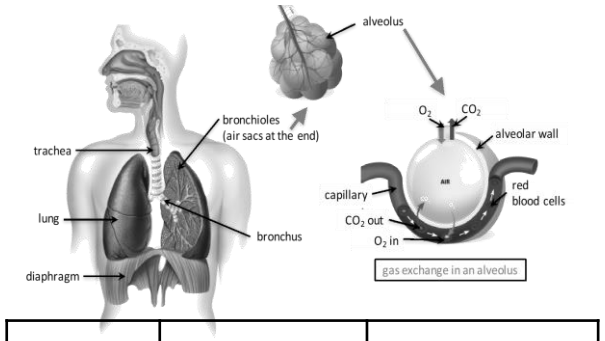
The use of BMI has **limitations** because it simply shows if a person is carrying too much weight. It does not calculate if this is excess fat, muscle or bone.

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

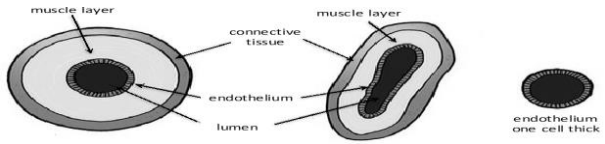
The **waist to hip ratio** should be considered alongside the BMI figure.

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

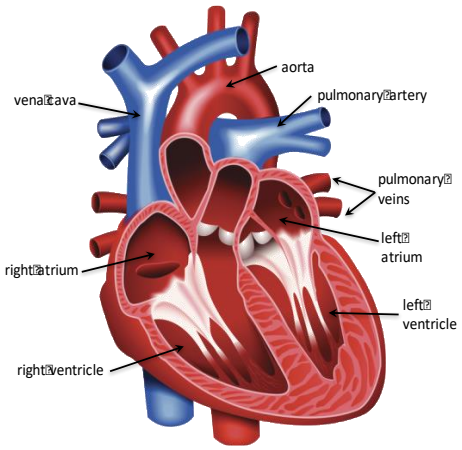
KS4 – Biology Exchange and Transport



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.



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.

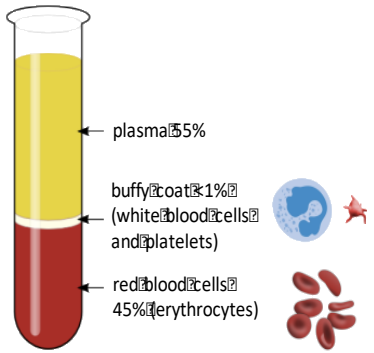


Different structure in the heart have different functions		
	Right ventricle	Pumps blood to the lungs where gas exchange takes place.
	Left ventricle	Pumps blood around the rest of the body. Thicker cardiac muscle in the wall.
	Pacemaker (in the right atrium)	Controls the natural resting heart rate. Artificial electrical pacemakers can be fitted to correct irregularities.
	Coronary arteries	Carry oxygenated blood to the cardiac muscle.
	Heart valves	Prevent blood in the heart from flowing in the wrong direction.

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.
Glucose + oxygen → carbon dioxide + 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.
Glucose → 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 f diffusion.	The smaller the diffusion distance to faster the rate of diffusion,

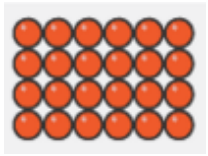
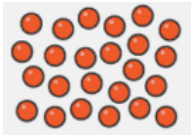


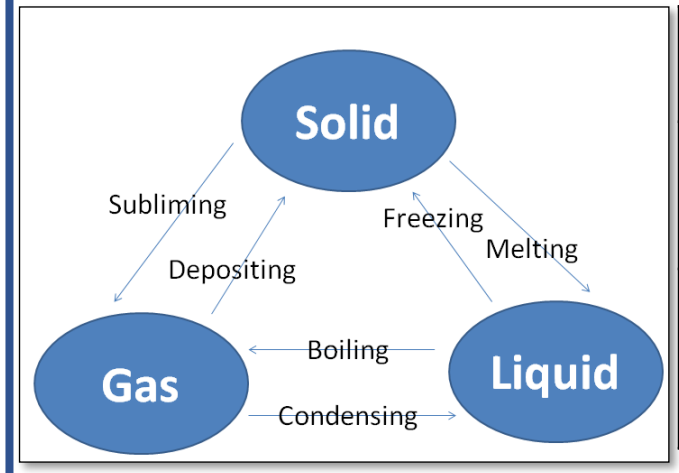
Keyword	**Definition**
Diffusion	The spreading of the particles of a gas or substances in solution, resulting in a net movement of particles from a region where they are of a higher concentration *to an area of* lower concentration
Surface areas to volume ratio	The surface area to volume ratio can be 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 $cm^3\ min^{-1}$
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

Year 9 – Science – C3a. Purifying substances

	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.



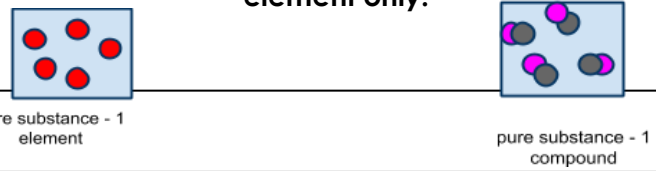
Physical change (Reversible)	Chemical change (Irreversible)
For example – melting chocolate Freezing water into ice	For example – frying an egg - rusting
No new substances or products formed. There has just been a change of state (solid, liquid, gas)	One or more new substances has been formed.

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.

Year 9 – Science – C3a. Purifying substances

A pure substance contains atoms of one single element only.

a.

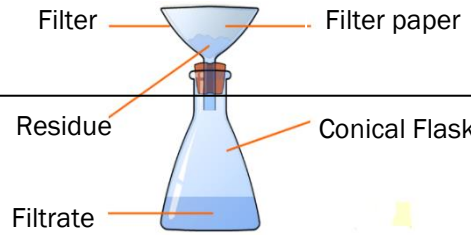


An impure substance is 2 or more different elements and/or compounds together that are not chemically bonded. AKA, a mixture.

b.

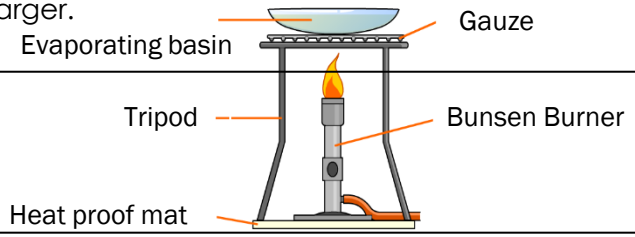
Filtration

- 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.



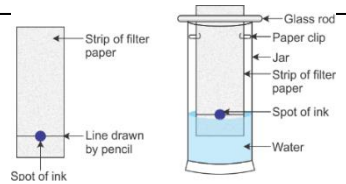
Crystallisation

- 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.



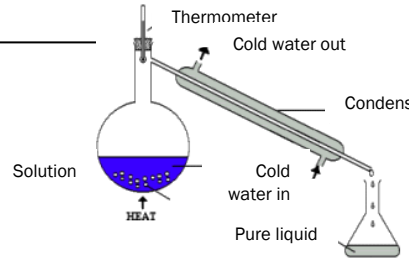
Chromatography

- 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.



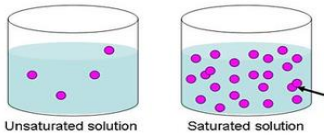
Distillation

- 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

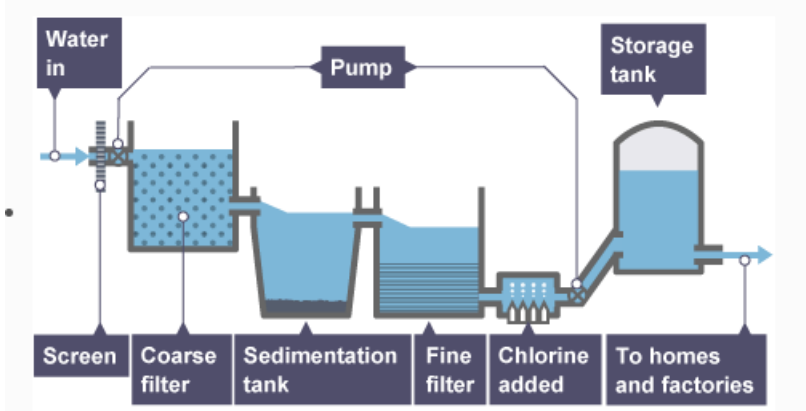
Solvent + Solute → Solution



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



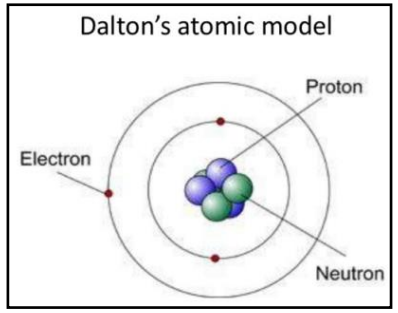
Water is essential for life. Water that is safe for humans to drink is called potable water. Potable water is not pure water because it almost always contains dissolved impurities.

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

Year 9 – Science – C3b. Atomic Structure and the Periodic Table

Atomic Structure



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	Neglible ($\frac{1}{1840}$)	Negative, -1	In shells orbiting nucleus

Isotopes

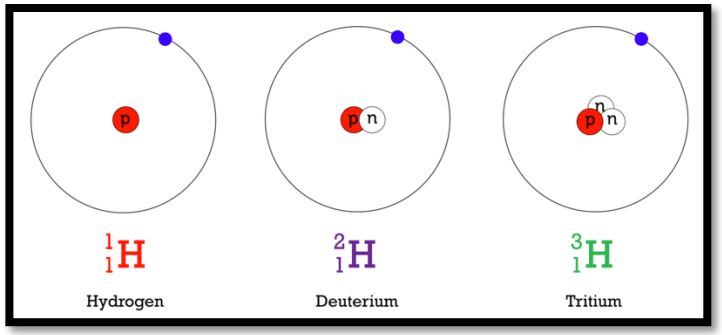
- Versions of an element with same atomic number but different atomic mass.
- Number of protons is the same, but number of neutrons is different.
- Relative Atomic Mass is average of the masses of the isotopes, weighted by their **relative abundance**

- For example, Neon has three isotopes

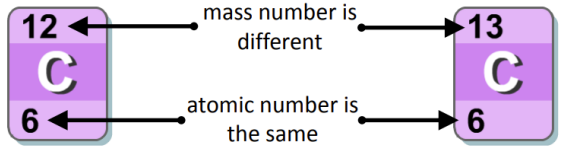
Neon Isotope Mass	Relative Abundance (%)
20	90.5
21	0.3
22	9.2

- Relative atomic mass of Neon = $$\frac{20 \times 90.5 + 21 \times 0.3 + 22 \times 9.2}{90.5 + 0.3 + 9.2} = 20.2$$

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

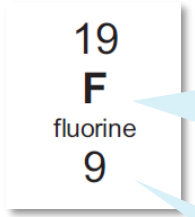


- For example, two isotopes of carbon:



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

Reading the Periodic Table



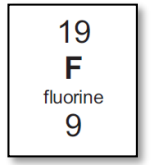
Relative Atomic Mass (aka nucleon number): The total number of protons and neutrons added together.

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.

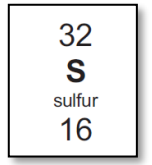
What's in my atom?

Protons = atomic number
Electrons = atomic number
Neutrons = relative atomic mass subtract atomic no.



Atomic number = 9
Relative Atomic mass = 19

Protons = 9
Electrons = 9
Neutrons = 19-9 = 10



Atomic number = 16
Relative Atomic mass = 32

Protons = 16
Electrons = 16
Neutrons = 32-16 = 16

Year 9 – Science – C3b. Atomic Structure and the Periodic Table

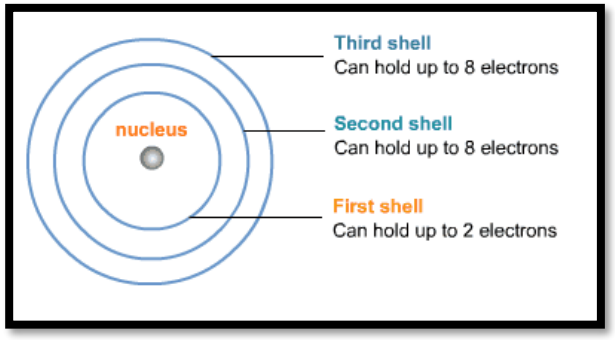
Mendeleev

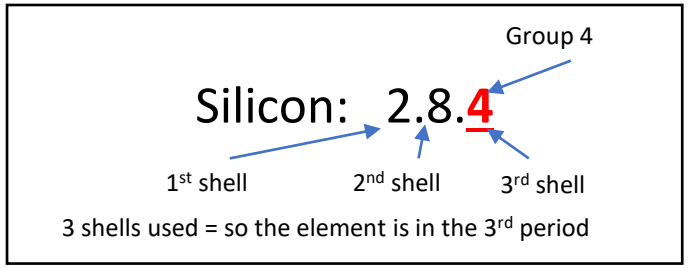
- Arranged elements by increasing atomic mass but….
- He broke this rule and left some gaps if an element's properties weren't similar to the one above it.
- He thought the gaps were for elements that hadn't been discovered yet and predicted their properties.
- When they were discovered, the properties matched the predictions

Electron Configuration

- Electrons orbit the nucleus in **shells.**

- **First** shell holds up to two electrons
- **Second** shell can hold up to 8 electrons
- **Third** shell can also hold up to 8 electrons





PERIODS….increasing atomic mass, differing properties

GROUPS…..similar properties

1	2											3	4	5	6	7	0
																	4 He helium 2
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	63.5 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	[98] Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
133 Cs caesium 55	137 Ba barium 56	139 La* lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	[209] Po polonium 84	[210] At astatine 85	[222] Rn radon 86
[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated						

Key: relative atomic mass, **atomic symbol**, name, atomic (proton) number

1 H hydrogen 1

Element Type: = non-metal = metal

** The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.*

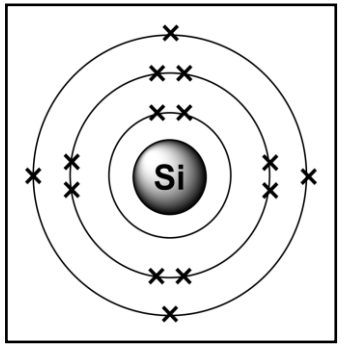
The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.

Example: Silicon
Atomic number is 14, so it has 14 electrons.

You build up electrons from the first shell outwards, so in this case:
- First shell has 2
- Second shell has 8
- Third shell has 4

This can be written as: **2.8.4**; or drawn as:

28
Si
silicon
14



Electron configuration and how it links to the Periodic Table:
Group number: shows the number of electrons in the outer electron shell
Period number: shows the number of electron shells
In the above example, we can see Silicon belongs to group 4, and is in period 3.

KS4 Chemistry – Chemical Bonding and Types of Substances (part 1)

Ionic	Particles are oppositely charged ions	Occurs in compounds formed from metals combined with non metals.
Covalent	Particles are atoms that share pairs of electrons	Occurs in most non metallic elements and in compounds of non metals.
Metallic	Particles are atoms which share delocalised electrons	Occurs in metallic elements and alloys.

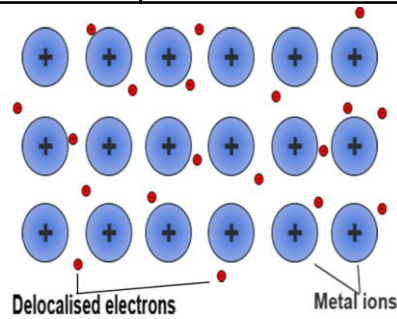
Keyword	Definition
Ionic bond	*A strong electrostatic force of attraction between oppositely charged ions.*
Covalent bond	*The bond formed when a pair of electrons is shared between two atoms.*
Metallic bond	*The type of bonding found in metals. Positively charged ions in a 'sea' of negatively charged electrons.*
Lattice Structure	*An arrangement of many particles that are bonded together in a fixed, regular, grid-like pattern*
Melting point	*The temperature at which a substance changed fro the solid state to the liquid state when heated, or from the liquid state to solid state when cooled.*
Boiling point	*The temperature at which a substance changed from a liquid to a gas.*
Charge	*Also known as electric charge, is a characteristic of a unit of matter that expresses the extent to which it has more or fewer electrons than protons.*
Electrical conductivity	*Allowing electricity to pass through.*
Aqueous solution	*A mixture that is formed when a substance is dissolved in water.*
Molten	*A substance that has been liquefied by heat.*
Electron pair	*Two electrons occupying the same orbital in an atom or molecule, especially forming a nonpolar covalent bond between atoms.*

Keyword	Definition
Ion	*An atom with an electric charge, caused by the loss or gain of electrons.*
Cation	*A positively charged ion.*
Anion	*A negatively charged ion.*
Electrostatic force	*The attractive or repulsive force between two electrically charged objects.*
Attraction	*The electric force that acts between oppositely charged bodies, tending to draw them together.*
Intermolecular force	*Forces of attraction which act between molecules.*
Atom	*The smallest unit into which matter can be divided without the release of electrically charged particles.*
Element	*An element is a substance whose atoms all have the same number of protons.*
Compound	*A substance formed when two or more chemical elements are chemically bonded together.*
Transfer	*Movement of a particle from one place to another.*
Share	*Two bodies having equal portions distributed between the two.*
Delocalised electron	*An electron that is not associated with a particular atom within a shell, or held in a covalent bond.*
Proton	*A particle found in the nucleus of an atom, having a positive charge and the same mass as a neutron.*
Neutron	*A particle found in the nucleus of an atom having zero charge and a mass of 1.*
Electron	*A tiny particle with a negative charge and very little mass.*
Shell	*Area around a nucleus that can be occupied by electrons and usually drawn as circles.*
Nucleus	*The central part of an atom or ion.*

KS4 Chemistry – Chemical Bonding and Types of Substances (part 2)

Metallic bonding

Giant structure of atoms arranged in a regular pattern	Electrons in the outer shell of metal atoms are delocalised and free to move through the whole structure. This sharing of electrons leads to strong metallic bonds.



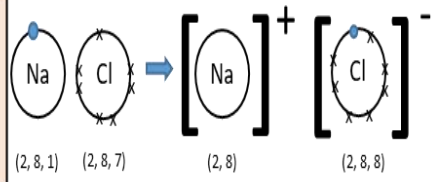
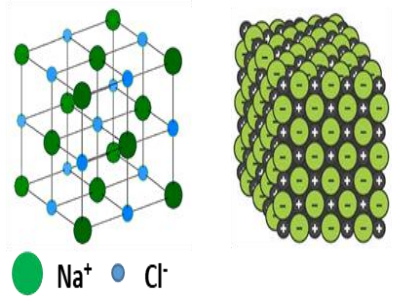
High melting and boiling points	This is due to the strong metallic bonds.
Pure metals can be bent and shaped	Atoms are arranged in layers that can slide over each other.
Good conductors of electricity and heat	Delocalised electrons transfer energy.

Ionic bonding

High melting and boiling points	Large amounts of energy needed to break the bonds.
Do not conduct electricity when solid	Ions are held in a fixed position in the lattice and cannot move.
Do conduct electricity when molten or dissolved	Lattice breaks apart and the ions are free to move.

Electrons are transferred so that all atoms have a noble gas configuration (full outer shells).	*Metal atoms lose electrons and become positively charged ions*	Group 1 metals form +1 ions Group 2 metals form +2 ions
	Non metals atoms gain electrons to become negatively charged ions	Group 6 non metals form -2 ions Group 7 non metals form -1 ions

Structure	• Lattices consist of a regular arrangement of atoms • Held together by strong electrostatic forces of attraction between oppositely charged ions • Forces act in all directions in the lattice

Dot and cross diagram		
Giant structure		

-ide	If a compound name ends in –ide, it usually contains only two elements.	For example: calcium + oxygen → calcium oxide
-ate	If a compound name ends in -ate, it usually contains three or more elements one of which is always oxygen.	For example: Calcium + carbon + oxygen → calcium carbonate

KS4 Chemistry – Chemical Bonding and Types of Substances (part 3)

Covalent bonding

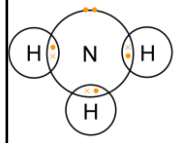
Simple molecular compounds

Low melting and boiling points	Small amounts of energy needed to overcome the intermolecular forces.
Poor conductors of electricity	No free electrons to transfer energy.

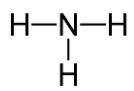
Size of atoms and molecules	Simple molecular structures consist of atoms joined by strong covalent bonds. This means that atoms are smaller than simple molecules.

Atoms share pairs of electrons

Can be small molecules e.g. ammonia



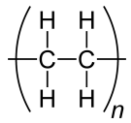
Dot and cross :
+ Show which atom the electrons in the bonds come from
- All electrons are identical



2D with bonds:
+ Show which atoms are bonded together
- It shows the H-C-H bond incorrectly at 90°

3D ball and stick model:
+ Attempts to show the H-C-H bond angle is 109.5°

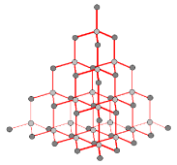
Can be giant covalent structures e.g. polymers



Simple polymers consist of large chains of hydrocarbons.

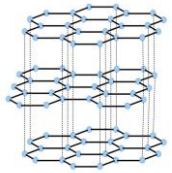
Giant covalent structures

Diamond

Each carbon atom is bonded to four others		Very hard.	Rigid structure.
		Very high melting point.	Strong covalent bonds.
		Does not conduct electricity.	No delocalised electrons.

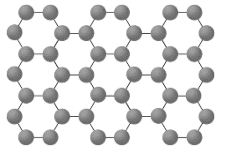
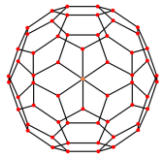
Used for cutting tools due to being very hard.

Graphite

Each carbon atom is bonded to three others forming layers of hexagonal rings with no covalent bonds between the layers		Slippery.	Layers can slide over each other.
		Very high melting point.	Strong covalent bonds.
		Does conduct electricity.	Delocalised electrons between layers.

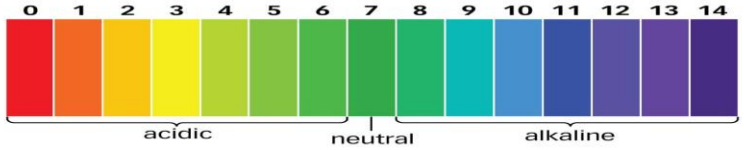
Used for electrodes as is inert.

Graphene and fullerenes

Graphene	 Single layer of graphite one atom thick	Excellent conductor.	Contains delocalised electrons.
		Very strong.	Contains strong covalent bonds.
Fullerenes		Buckminsterfullerene, C_{60} First fullerene to be discovered.	Hexagonal rings of carbon atoms with hollow shapes. Can also have rings of five (pentagonal) or seven (heptagonal) carbon atoms.

Diamond, graphite, silicon dioxide	Very high melting points	Lots of energy needed to break strong, covalent bonds.

KS4 Chemistry – Acids and Alkalis (part 1)



The pH scale and indicators

Acids	Acids produce hydrogen ions (H^+) in aqueous solutions.
Alkalis	Aqueous solutions of alkalis contain hydroxide ions (OH^-).
Base	A base is any substance that reacts with an acid to form a salt and water only
Examples of soluble bases	Alkalis e.g. sodium hydroxide, potassium hydroxide

Universal indicator	*Red in acid, green in neutral and blue in alkali*
Litmus	*Red in acid, purple in neutral and blue in alkali*
Methyl orange	*Red in acid, yellow in neutral and yellow in alkali*
Phenolphthalein	*Colourless in acid and in neutral and pink in alkali*

A neutralisation reaction is between an acid and a base	In neutralisation reactions, hydrogen ions react with hydroxide ions to produce water: $H^+ + OH^- \rightarrow H_2O$

Reactions with acids

Metals	Metal + acid → metal salt + hydrogen	Magnesium + hydrochloric acid → magnesium chloride + hydrogen
Metal oxides	Metal oxide + acid → metal salt + water	Copper oxide + sulfuric acid → copper sulfate + water
Metal hydroxides	Metal hydroxide + acid → metal salt + water	Sodium hydroxide + nitric acid → sodium nitrate + water
Metal carbonates	Metal carbonates + acid → metal salt + carbon dioxide + water	Calcium carbonate + sulfuric acid → calcium sulfate + carbon dioxide + water

Gas	Test	Positive result
Hydrogen	Burning splint	'squeaky pop' sound.
Carbon dioxide	Limewater	Goes cloudy (as a solid calcium carbonate forms).

Keyword	Definition
H^+ ion	A positively charged hydrogen ion
OH^- ion	A negatively charged, diatomic hydroxide ion.
Aqueous solution	*A mixture that is formed when a substance is dissolved in water.*
Acid	*A solution that reacts with alkalis, turns litmus red and has a pH of less that 7.*
Alkali	*A solution which contains an excess of OH^- ions, turns litmus blue and has a pH greater than 7.*
Base	*A substance that will react with an acid to form only a salt and water.*
pH scale	*A scale going up to 14 showing acidity or alkalinity.*
Indicator	*A substance which can change colour depending on the pH of a solution.*
Concentration	*The amount of a solute dissolved in a certain volume of solvent.*
Concentrated	*Containing a large amount of solute dissolved in a small volume of solvent.*
Dilute	*A low concentration of solute in a solution.*
Strong acid	*An acidic solute that dissolves completely into ions when it dissolves.*
Weak acid	*An acidic solute that does not dissociate completely into ions when it dissolves.*
Salt	*A compound formed by neutralisation of an acid by a base.*
Filtration	*Using a filter to separate insoluble substances from a liquid.*
Crystallisation	*Separating the solute from a solution by evaporating the solvent.*
Soluble	*A substance that can be dissolved in a certain liquid.*
Insoluble	*A substance that cannot be dissolved in a certain liquid.*
Solute	*Describes a substance that dissolves in a liquid to make a solution.*
Solvent	*Describes the liquid in which a substance dissolves to make a solution.*
Solution	*Formed when a substance has dissolved in a liquid.*
Burette	*A piece of apparatus used to accurately measure the volume of solution that has been added during a titration.*
Pipette	*A piece of apparatus used in a titration to accurately measure a set volume of a solution.*
End-point	*When just enough solution has been added from the burette to react with all the solution in the flask in a titration experiment.*
Ionic equation	*A balanced equation that only shows the ions that react together. The spectator ions are not included.*
Half equation	*A chemical equation written to describe an oxidation or reduction half-reaction.*
Spectator ion	*These are ions that do not change within a reaction.*

KS4 Chemistry – Acids and Alkalis (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.

Titrations are used to work out the precise volumes of acid and alkali solutions that react with each other to form salt and water.

Step 1	Use the pipette to add 25 cm^3 of alkali to a conical flask and add a few drops of indicator.
Step 2	Fill the burette with acid and note the starting volume. Slowly add the acid from the burette to the alkali in the conical flask, swirling to mix.
Step 3	Stop adding the acid when the end-point is reached (the appropriate colour change in the indicator happens). Note the final volume reading. Repeat steps 1 to 3 until you get consistent readings.

State Symbol	Meaning
s	Solid
l	Liquid
g	Gas
aq	Aqueous solution

Producing salts from soluble reactants

Soluble salts	Soluble salts can be made from reacting acids with solid insoluble substances (e.g. metals, metal oxides, hydroxides and carbonates).
Production of soluble salts	Add the solid to the acid until no more dissolves. Filter off excess solid and then crystallise to produce solid salts.

Solubility

Sodium, potassium and ammonium	All common sodium, potassium and ammonium salts are soluble e.g. sodium chloride and potassium fluoride.
Nitrates	All nitrates are soluble e.g. potassium nitrate.
Sulfates	Common chlorides (e.g. sodium chloride) are soluble, expect those of silver and lead.
Carbonates and hydroxides	Common carbonates and hydroxides are insoluble except those of sodium, potassium and ammonium.

Strong and weak acids (HT ONLY)

Concentrated	High mass of substance in a given volume of solution
Dilute	Low mass of substance in a given volume of solution
Strong acids	Completely ionised in aqueous solutions e.g. hydrochloric, nitric and sulfuric acids.
Weak acids	Only partially ionised in aqueous solutions e.g. ethanoic acid, citric acid.
Hydrogen ion concentration	As the pH decreases by one unit (becoming a stronger acid), the hydrogen ion concentration increases by a factor of 10.

KS4 Chemistry – Calculations involving masses

1. How to find an empirical formula:

Example: 10.0g of calcium reacts with 17.8g of chlorine. Find the empirical formula of the product that is formed.

1. Symbol	Ca	Cl
2. Mass (g)	10.0	17.8
3. A_r	40.0	35.5
4. Divide mass by A_r	10.0 / 40 = 0.25	17.8 / 35.5 = 0.50
5. Divide answers by smallest number	0.25 / 0.25 = 1	0.50 / 0.25 = 2
6. Empirical formula	$CaCl_2$	

2. How to deduce the molecular formula from the empirical formula and relative formula mass:

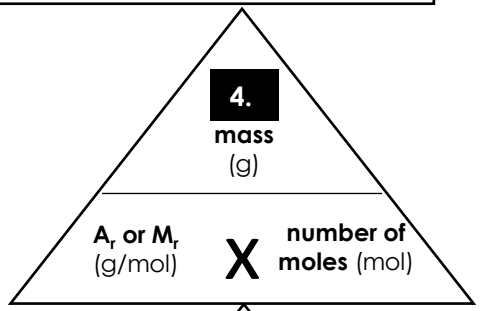
Example: The empirical formula for glucose is CH_2O and its relative formula mass is 180. Deduce the molecular formula for glucose.

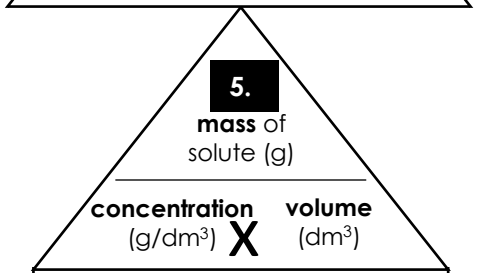
1. Find the empirical formula mass by adding up the relative atomic masses of all of the atoms	C + H + H + O 12 + 1 + 1 + 16 = 30
2. Divide the relative formula mass by the empirical formula mass	180 / 30 = 6
3. Multiply the numbers in the empirical formula to get the molecular formula	• CH_2O x 6 • So $C_6H_{12}O_6$

3. How to calculate the masses of reactants or products:

*Example: Calculate the mass of chlorine needed to make **53.4g** of aluminium chloride.*

1. Write the balanced equation	$2Al + 3Cl_2 \rightarrow 2AlCl_3$
2. Calculate M_r of substances in the question	• $M_r Cl_2 = 2 \times 35.5 = 71$ • $M_r AlCl_3 = 27 + (3 \times 35.5) = 133.5$
3. Calculate the ratio of masses	• $3Cl_2$ makes $2AlCl_3$ • (3×71) Cl_2 makes $(2 \times 133.5)AlCl_3$ • 213g Cl_2 makes **267**g $AlCl_3$
4. Divide to work out the mass for 1g of product	• 213g Cl_2 makes 267g $AlCl_3$ **267** **267** • 0.798g Cl_2 makes 1g $AlCl_3$
5. Multiply to scale up	• (0.798g x **53.4**) Cl_2 makes (1g x **53.4**) $AlCl_3$ • 42.6g Cl_2 makes 53.4g $AlCl_3$





Converting units:
cm^3 to dm^3 divide by 1000
dm^3 to cm^3 multiply by 1000

6. Keyword	7. Definition
atom	The smallest neutral part of an element that can take place in chemical reactions.
Avogadro constant*	The number of particles in one mole of a substance (6.02×10^{23} atoms, molecules, formulae or ions).
closed system	Substances cannot enter or leave such as a precipitation reaction in a stoppered flask.
concentration	The amount of solute dissolved in a stated volume of a solution. Units include g/dm3.
conservation of mass	During a chemical reaction, the overall mass of substances does not change so the total mass of reactants is equal to the total mass of products.
empirical formula	The simplest whole number ratio of atoms or ions of each element in a substance.
excess reactant	There is more of this reactant present than is needed so it is not completely used up in a reaction.
limiting reactant	There is less of this reactant present than is needed so it is completely used up in a reaction. The mass of product formed is controlled by this reactant.
mole*	One mole of particles of a substance is defined as: a) the Avogadro constant number of particles (6.02×10^{23} atoms, molecules, formulae or ions) of that substance b) a mass of 'relative particle mass' g. The SI unit symbol is mol.
molecular formula	This represents the actual number of atoms of each element in one molecule.
molecule	A particle consisting of two or more atoms joined together by bonds.
open system	Substances can enter or leave such as a reaction in an open flask that takes in or gives out a gas.
precipitate	An insoluble substance that is formed when two soluble substances react together in solution.
precipitation	A reaction in which a precipitate is formed.
product	A substance formed in a reaction.
reactant	A substance used up in a reaction.
reaction	A process in which reactants are converted to different substances called products.
relative atomic mass	(A_r) The mean mass of an atom relative to the mass of an atom of C-12 which is assigned a mass of 12. Unit is g/mol.
relative formula mass	(M_r) The sum of the relative atomic masses of all the atoms or ions in its formula. Unit is g/mol.
stoichiometry*	The ratio of moles of each substance in a reaction.
volume	The amount of space hat a liquid takes up. Units include cm^3 and dm^3.

KS4 Chemistry – Electrolytic Processes

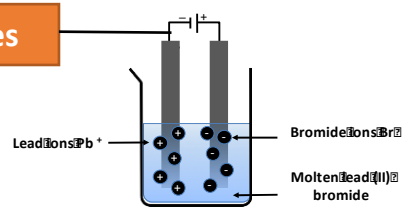
Key Word	Definition
Electrolysis	Decomposition/break down of a compound using electrical energy.
Ions	Charged particle.
Cations	Positively charged ions, formed by losing electrons. Usually metal form cations.
Anions	Negatively charged ions, formed by gaining electrons. Usually non-metal form anions.
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	***Splitting up using electricity***	When an ionic compound is melted or dissolved in water, the ions are free to move. These are then able to conduct electricity and are called electrolytes. Passing an electric current though electrolytes causes the ions to move to the electrodes.
Electrode	***Anode Cathode***	The positive electrode is called the anode. The negative electrode is called the cathode.
Where do the ions go?	***Cations Anions***	Cations are positive ions and they move to the negative cathode. Anions are negative ions and they move to the positive anode.

Electrolytic processes

Electrolysis of aqueous solutions

KS4 EDEXCEL CC10 and SC10



At the negative electrode	Metal will be produced on the electrode if it is less reactive than hydrogen. Hydrogen will be produced if the metal is more reactive than hydrogen.
At the positive electrode	Oxygen is formed at positive electrode. If you have a halide ion (Cl^-, I^-, Br^-) then you will get chlorine, bromine or iodine formed at that electrode.

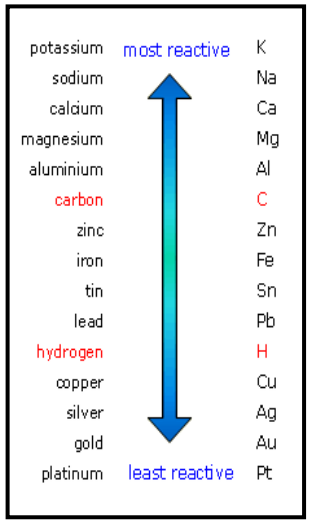
The ions discharged when an aqueous solution is electrolysed using inert electrodes depend on the relative reactivity of the elements involved.

Using copper	***Copper is a very good electrical conductor***	Much of the copper available isn't pure enough for this use so it is purified using electrolysis.
Copper sulfate solution	***The anode is made of impure copper and the cathode is made of pure copper***	Both electrodes are placed in copper sulfate solution. Copper ions (Cu^{2+}) leave the anode and are attracted to the cathode.
Electrodes	***The cathode of pure copper builds up***	The anode decreases in size. The impurities left behind form a sludge.

Oxidation **I**s **L**oss, **R**eduction **I**s **G**ain

Extracting metals using electrolysis	***Metals can be extracted from molten compounds using electrolysis.***
	This process is used when the metal is too reactive to be extracted by reduction with carbon.
	The process is expensive due to large amounts of energy needed to produce the electrical current. Example: aluminium is extracted in this way.

Higher tier: **You can display what is happening at each electrode using half-equations:**
At the cathode: $Pb^{2+} + 2e^- \rightarrow Pb$
At the anode: $2Br^- \rightarrow Br_2 + 2e^-$

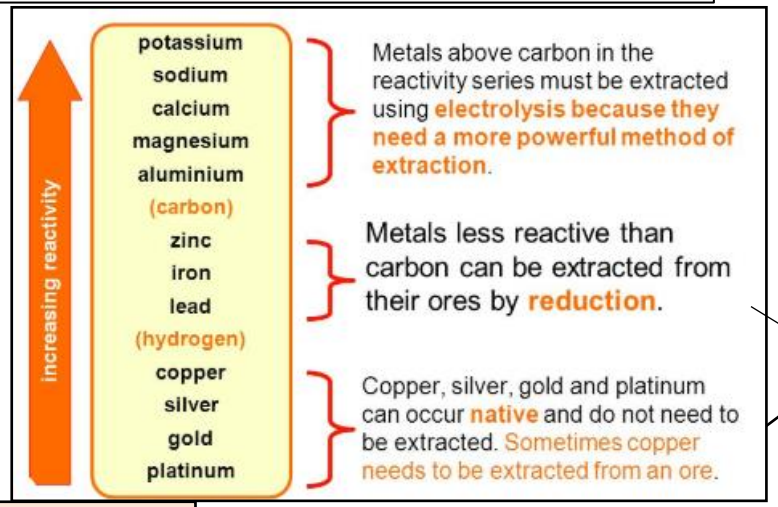


negative ion in solution	element given off at positive electrode
chloride, Cl^-	chlorine, Cl_2
bromide, Br^-	bromine, Br_2
iodide, I^-	iodine, I_2
sulfate, SO_4^{2-}	oxygen, O_2

KS4 Chemistry – Obtaining and Using Metals (part 1)

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 of metals and reduction

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 using carbon	
Metals less reactive than carbon can be extracted from their oxides by reduction.	For example: **zinc oxide + carbon → zinc + carbon dioxide**

Reactions of acids and metals

Acids react with some metals to produce salts and hydrogen.

Reactions with acids	*metal + acid → metal salt + hydrogen*

magnesium + hydrochloric acid → magnesium chloride + hydrogen

zinc + sulfuric acid → zinc sulfate + hydrogen

Obtaining and Using Metals CC11 and SC11

The reactivity series

Metal	Reaction with water	Reaction with dilute acids	Reactivity
Potassium	Violent with cold water	Violent	Most reactive
Sodium			
Calcium	Slow with cold water Rapid with steam	Rapid	
Magnesium			
Aluminium	Usually no reaction		
Zinc		Slow	
Iron	Rusts slowly		
(Hydrogen)			
Copper	No reaction	No reaction	
Silver			
Gold			Least reactive

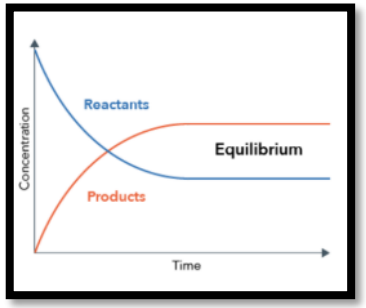
	Reactions with water	Reactions with acid
Group 1 metals	*Reactions get more vigorous as you go down the group*	*Reactions get more vigorous as you go down the group*
Group 2 metals	*Do not react with water*	*Observable reactions include fizzing and temperature increases*
Zinc, iron and copper	*Do not react with water*	*Zinc and iron react slowly with acid. Copper does not react with acid.*

Metals form positive ions when they react	*The reactivity of a metal is related to its tendency to form positive ions*	The reactivity series arranges metals in order of their reactivity (their tendency to form positive ions).
Carbon and hydrogen	*Carbon and hydrogen are non-metals but are included in the reactivity series*	These two non-metals are included in the reactivity series as they can be used to extract some metals from their ores, depending on their reactivity.
Displacement	*A more reactive metal can displace a less reactive metal from a compound.*	Silver nitrate + Sodium chloride → Sodium nitrate + Silver chloride

KS4 Chemistry Dynamic Equilibrium and Fertilisers

Reversible Reactions and Equilibria

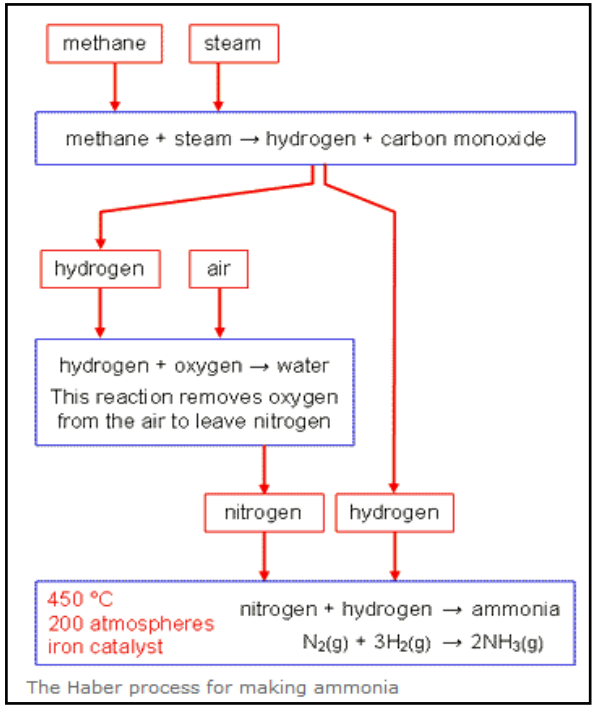
Reversible reactions	In some chemical reactions, the products can react again to re-form the reactants.
Representing reversible reactions	A + B ⇌ C + D
The direction	The direction of reversible reactions can be changed by changing conditions: A + B ⇌ (heat) C + D (cool)



Graph sketch shows in a reversible reaction, the backward reaction gets faster with time, and the forward reaction gets lower with time. When they are occurring at the same rate, dynamic equilibrium has been reached.

Changing concentration	If the concentration of a reactant is increased, more products will be formed . If the concentration of a product is decreased, more reactants will react.
Changing temperature	If the temperature of a system at equilibrium is increased: - Exothermic reaction = products decrease - Endothermic reaction = products increase
Changing pressure (gaseous reactions)	For a gaseous system at equilibrium: - Pressure increase = equilibrium position shifts to side of equation with smaller number of molecules. - Pressure decrease = equilibrium position shifts to side of equation with larger number of molecules.

The Haber process	This process uses nitrogen from the air and hydrogen from natural gas to form ammonia. The reaction is reversible and uses optimum conditions and a catalyst in order to reach dynamic equilibrium.
Optimum temperature	The optimum temperature for the Haber process is 450ºC.
Optimum pressure	The optimum pressure for the Haber process is 200 atmospheres.
Optimum conditions	The optimum temperature for the Haber process is 450ºC and optimum pressure is 200 atmospheres. These are economically viable conditions as they produce the best yield to cost ratio.
The use of a catalyst	The Haber process uses an iron catalyst. This does not alter the position of the equilibrium but it does increase the rate of the reaction.



The Haber process for making ammonia

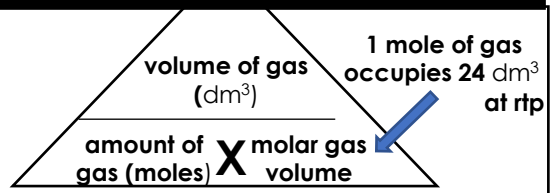
Keyword	Definition
Le Chatelier's Principles	States that when a system experiences a disturbance (change in condition), it will respond to restore a new equilibrium state.
Changing concentration	If the concentration of a reactant is increased, more products will be formed . If the concentration of a product is decreased, more reactants will react.
Changing temperature	If the temperature of a system at equilibrium is increased: - Exothermic reaction = products decrease - Endothermic reaction = products increase
Changing pressure (gaseous reactions)	For a gaseous system at equilibrium: - Pressure increase = equilibrium position shifts to side of equation with smaller number of molecules. - Pressure decrease = equilibrium position shifts to side of equation with larger number of molecules.
Equilibrium in reversible reactions	When a reversible reaction occurs in apparatus which prevents the escape of reactants and products, equilibrium is reached when the forward and reverse reactions occur exactly at the same rate.
Equilibrium in reversible reactions	When a reversible reaction occurs in apparatus which prevents the escape of reactants and products, equilibrium is reached when the forward and reverse reactions occur exactly at the same rate.
The Haber Process	This process uses nitrogen from the air and hydrogen from natural gas to form ammonia. The reaction is reversible and uses optimum conditions and a catalyst in order to reach dynamic equilibrium.
NPK fertilisers	Formulations of various salts containing appropriate percentages of the elements.

KS4 Chemistry Quantitative Analysis

1. Percentage yield

- percentage yield = $\frac{\text{actual yield}}{\text{theoretical yield}}$ x 100
- **Less than 100%** due to:
  - an incomplete reaction
  - side reactions
  - loss of product

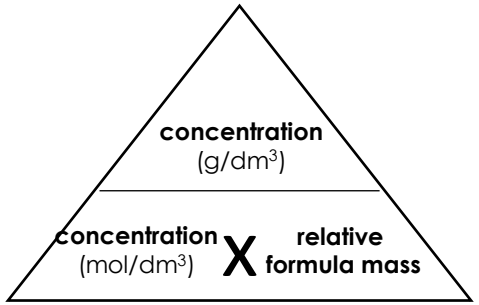
5. Molar volume of gases

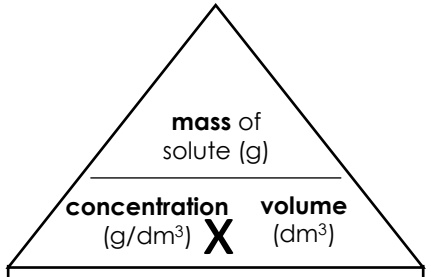


2. Atom economy

- atom economy = $\frac{\text{relative formula masses of the useful product}}{\text{sum of relative formula masses of all reactants}}$ x 100
- We want it to be as high as possible
- It can be increased by finding a different way to make the product

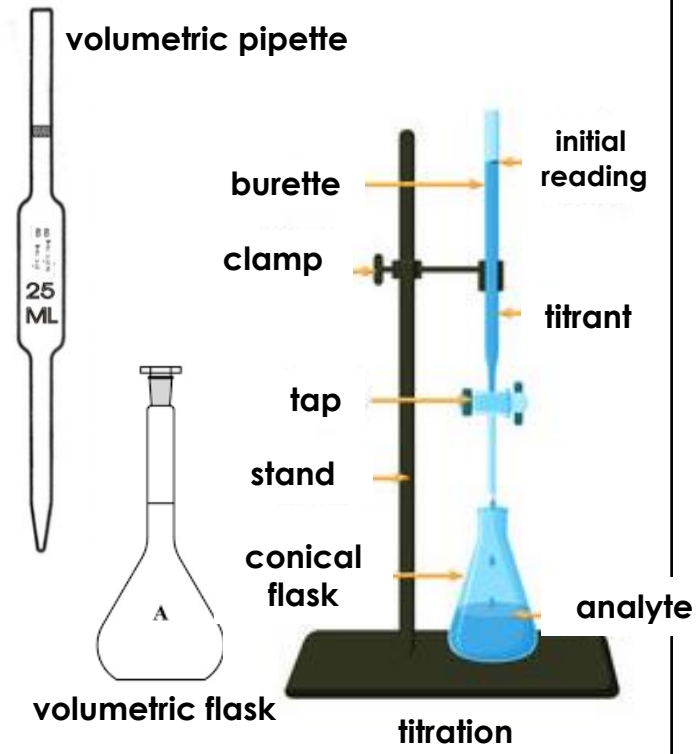
3. Concentration





Converting units:
cm³ to dm³ divide by 1000
dm³ to cm³ multiply by 1000

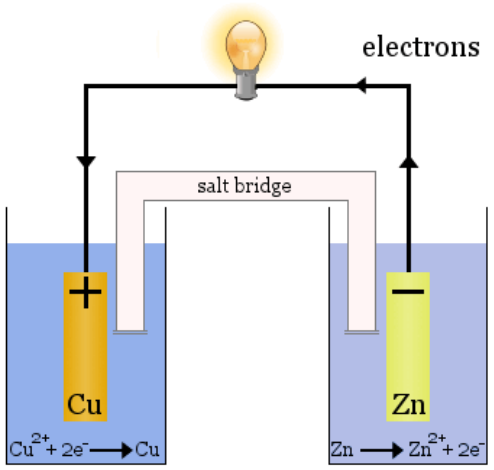
4. Titrations



6. Keyword	7. Definition
actual yield	The actual amount of product obtained from a chemical reaction.
atom economy	The percentage, by mass, of reactants that are converted into useful products.
Avogadro's law	If the temperature and pressure are the same, equal volumes of different gases contain an equal number of molecules.
burette	A piece of apparatus used to accurately measure the volume of solution that has been added during a titration.
by-product	Substance produced in a chemical reaction in addition to the desired product.
calibrated	Marked with a scale for accurate readings.
concentration	The amount of solute dissolved in a certain volume of solvent.
concordant	Readings that have been taken several times and are identical, or close to each other.
end-point	When just enough solution has been added from the burette to react with all the solution in the flask.
indicator	A substance which changes colour depending on the pH.
molar gas volume	The volume occupied by one mole of any gas. It is 24dm³ at rtp.
side reactions	A reaction which takes place at the same time as another main reaction.
theoretical yield	The maximum calculated amount of a product that could be formed from a given amount of reactants.
titration	A technique in volumetric analysis that is used to find the exact volumes of solutions which react with each other.
volumetric flask	A flask which is accurately calibrated to hold a given volume of solution.
volumetric pipette	This piece of equipment is calibrated to allow extremely accurate measurement of the volume of a solution.

KS4 – Chemistry – Chemical and Fuel Cells

Chemical cells



- 2 **different metals.**
- Each metal is in a **solution of its salt.**
- A **salt bridge** to allow ions to move between solutions.
- The further apart the metals are in the **reactivity series**, the bigger the voltage made.
- An e**xothermic reaction** which mainly transfers energy as **electricity**.

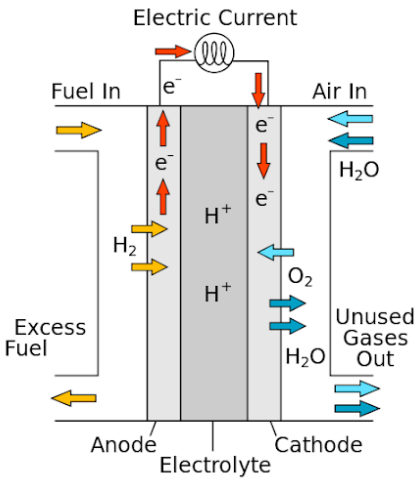
$Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$

Keyword	Definition
by-product	A substance that is made in addition to the desired product.
chemical cell	A device that produces a voltage due to reactions between the reactants stored inside it, until one of the reactants gets used up (cell goes 'flat').
electrode	A rod made of metal or graphite that carries the current into or out of the electrolyte.
fuel	A substance that releases thermal energy when burned.
fuel cell	A device that produces a voltage due to reactions involving a fuel and oxygen.
greenhouse gas	A gas that helps to trap 'heat' in the atmosphere (eg carbon dioxide, methane, water vapour).
oxidation	A reaction in which oxygen reacts with a chemically joins to a substance. Involves the loss of electrons
reduction	A reaction in which oxygen is removed from a substance. Involves the gain of electrons

Fuel Cells – example hydrogen-oxygen cell

- Produces a voltage (electrical energy) by reacting hydrogen with oxygen
- hydrogen + oxygen -> water
- $2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$
- Hydrogen is oxidised
- Oxygen is reduced

- Need non renewable natural gas to make hydrogen
- Making hydrogen produces carbon dioxide as a by-product
- Hydrogen has to be stored safely (explosive, takes up space)



- More efficient than power stations or cells as:

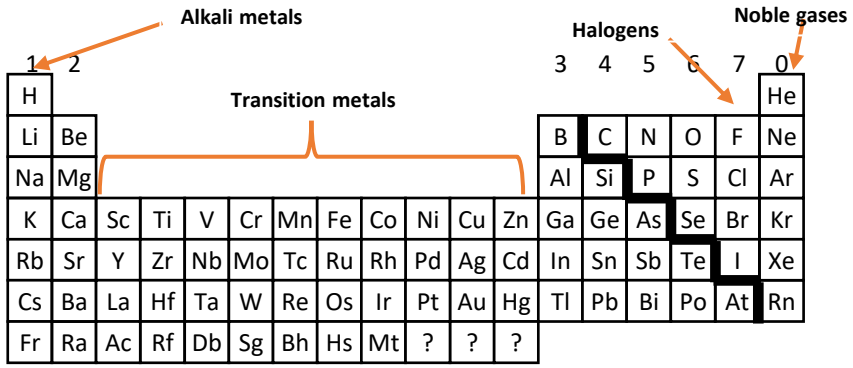
1. less stages so less heat loss.
2. no moving parts so no energy lost as friction.

- No need for turbines, generators etc as electricity is generated directly from the reaction.
- Quieter than a petrol or diesel engine.
- Don't produce CO_2, NO, SO_2, CO.
- Only by-products are water and heat.

$2H_2(g) \rightarrow 4H^+(aq) + 4e^-$

$O_2(g) + 4H^+(aq) + 4e^- \rightarrow 2H_2O(l)$

KS4 Chemistry Groups in the Periodic Table



Elements arranged in order of atomic number	Elements with similar properties are in columns called groups	Elements in the same group have the same number of outer shell electrons and elements in the same period (row) have the same number of electron shells.

Group 0

Noble gases	Unreactive, do not form molecules	This is due to having full outer shells of electrons.
	Boiling points increase down the group	Increasing atomic number.

Helium	Used in balloons	Due to being less dense than air, which means balloons will float.
Neon	Used in signs	Glows when electricity flows through it.
Argon	Used in filament light bulbs	Stops the heated filament reacting with oxygen. Bulbs filled with unreactive argon instead.

Group 1

Metal	Reaction with water	Word equation
Lithium	Fizzing	Lithium + water → lithium hydroxide + hydrogen
Sodium	Fizzing more vigorously than lithium	Sodium + water → sodium hydroxide + hydrogen
Potassium	Fizzes and burns with a lilac flame	Potassium + water → potassium hydroxide + hydrogen

Alkali metals	Soft and easily cut	Low melting and boiling points.
	Very reactive with oxygen, water and chlorine	Only have one electron in their outer shell. Form +1 ions.
	Reactivity increases down the group	Negative outer electron is further away from the positive nucleus so is more easily lost.

Group 7

Halogens	Consist of molecules made of a pair of atoms	Have seven electrons in their outer shell. Form -1 ions.
	Melting and boiling points increase down the group (gas → liquid → solid)	Increasing atomic mass number.
	Reactivity decreases down the group	Increasing proton number means an electron is less easily gained as outer shell is further away from nucleus, therefore the attraction force is weaker.

With metals	Forms a metal halide	Metal + halogen → metal halide e.g. Sodium + chlorine → sodium chloride	e.g. NaCl metal atom loses outer shell electrons and halogen gains an outer shell electron
With hydrogen	Forms a hydrogen halide	Hydrogen + halogen → hydrogen halide e.g. Hydrogen + bromine → hydrogen bromide	Dissolve in water to form acidic solutions.
With aqueous solution of a halide salt	A more reactive halogen will displace the less reactive halogen from the salt	Chlorine + potassium bromide → potassium chloride + bromine	(HT) These are redox reactions. The halogen gains electrons and the halide ion from the compound loses electrons.

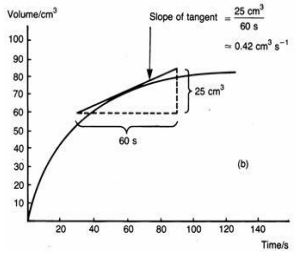
Keyword	Definition
Reactivity of group 1	The atoms get larger as you go down, so the single electron in the outermost shell (highest energy level) is attracted less strongly to the positive nucleus. The electrostatic attraction with the nucleus gets weaker because the distance between the outer electron and the nucleus increases. Also the outer electron experiences a shielding effect from the inner electrons, reducing the attraction between the oppositely charged outer electron and the nucleus.
Reactivity of group 7	When Group 7 elements react, the atoms gain an electron in their outermost shell. Going down the group, the outermost shell's electrons get further away from the attractive force of the nucleus, so it is harder to attract and gain an extra electron. The outer shell will also be shielded by more inner shells of electrons, again reducing the electrostatic attraction of the nucleus for an incoming electron.
Reactivity of group 0	Elements in Group 0 of the periodic table are called the noble gases. They are unreactive because their atoms have stable arrangements of electrons. The atoms have eight electrons in their outermost shell, apart from helium which has just two but still has a complete outer shell. The stable electronic structure explains why they exist as single atoms; they have no tendency to react to form molecules. The boiling points of the noble gases get higher going down the group. For example, helium boils at -269 °C and radon boils at -62°C.

KS4 Chemistry Rates of Reaction and Energy Changes in Reactions

Rates of Reaction

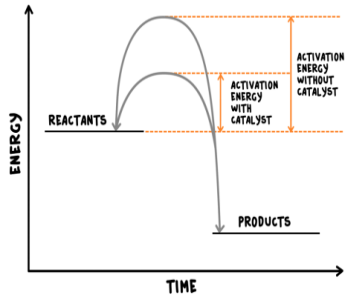
Rate of chemical reaction	This can be calculated by measuring the quantity of reactant used or product formed in a given time.	Rate = $\frac{\text{quantity of reactant used}}{\text{time taken}}$ Rate = $\frac{\text{quantity of product formed}}{\text{time taken}}$

Factors affecting the rate of reaction	
Temperature	The higher the temperature, the quicker the rate of reaction.
Concentration	The higher the concentration, the quicker the rate of reaction.
Surface area	The larger the surface area of a reactant solid, the quicker the rate of reaction.
Pressure (of gases)	When gases react, the higher the pressure upon them, the quicker the rate of reaction.

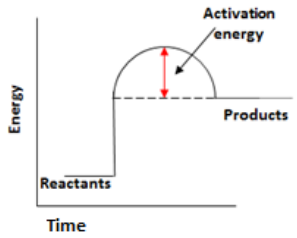
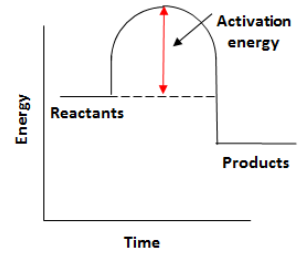


Quantity	Unit
Mass	Grams (g)
Volume	cm^3
Rate of reaction	Grams per cm^3 (g/cm^3) HT: moles per second (mol/s)

Catalyst	A catalyst changes the rate of a chemical reaction but is not used in the reaction.
Enzymes	These are biological catalysts.
How do they work?	Catalysts provide a different reaction pathway where reactants do not require as much energy to react when they collide.



Energy Changes

Endothermic		Products are at a higher energy level than the reactants. As the reactants form products, energy is transferred from the surroundings to the reaction mixture. The temperature of the surroundings decreases because energy is taken in during the reaction.
Exothermic		Products are at a lower energy level than the reactants. When the reactants form products, energy is transferred to the surroundings. The temperature of the surroundings increases because energy is released during the reaction.

Bond energy calculation

Calculate the overall energy change for the forward reaction

$N_2 + 3H_2 \rightleftharpoons 2NH_3$

Bond energies (in kJ/mol): H-H 436, H-N 391, N≡N 945

Bond breaking: 945 + (3 x 436) = 945 + 1308 = 2253 kJ/mol

Bond making: 6 x 391 = 2346 kJ/mol

Overall energy change = 2253 - 2346 = -93kJ/mol

Therefore reaction is exothermic overall.

Keyword	Definition
Collision theory	Chemical reactions can only occur when reacting particles collide with each other with sufficient energy.
Activation energy	This is the minimum amount of energy colliding particles in a reaction need in order to react.
Heat energy changes	Occur in the following: - Salts dissolving in water - Neutralisation reactions - Displacement reactions - Precipitation reactions
Exothermic reactions	Heat energy is given out as bonds are being formed.
Endothermic reactions	Heat energy is taken in as bonds are being broken.

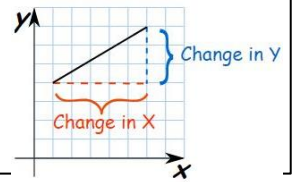
Physics Knowledge Organisers

Motion

Scalar	Vector
Distance	Displacement
Speed	Velocity
Power	Momentum
Mass	Acceleration
Volume	Weight
Temperature	
Force	
Pressure	

Calculating a gradient

Gradient = $\frac{Change\ in\ y}{Change\ in\ x}$



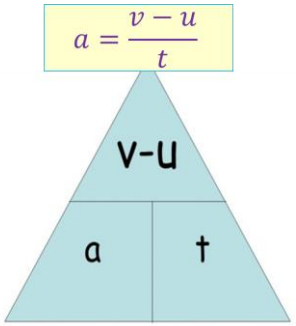
Calculating acceleration

Acceleration is the rate of change of velocity

Acceleration (m/s/s) = $\frac{Change\ in\ velocity}{time\ taken}$ **(m/s) (s)**

$a = \frac{v-u}{t}$

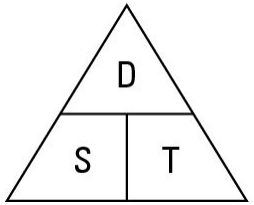
a= acceleration
v= final velocity
u= initial velocity
t= time



Calculating speed/velocity

***Speed** (m/s) = **distance** (m) ÷ **time** (s)*

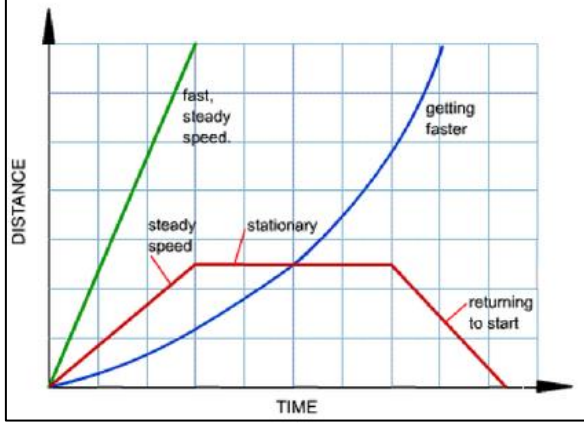
How to remember the equation?
"Don't Step on Turtles"



D = S × T
S = D ÷ T
T = D ÷ S

Distance-time graph

Key features:

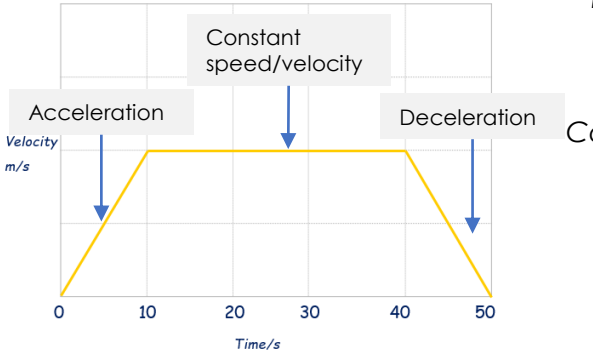


You can calculate speed from this distance-time graph.

Steeper gradient= faster speed.

Velocity-time graph

Key features:



You can calculate acceleration from this velocity-time graph.

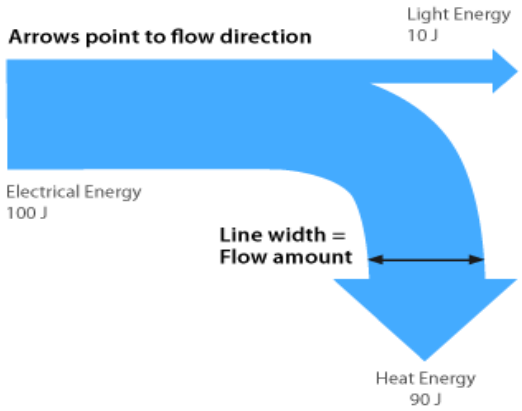
*Calculating the **area beneath the lines**, is the same as the **overall distance travelled***

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 an object ends up.***

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



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

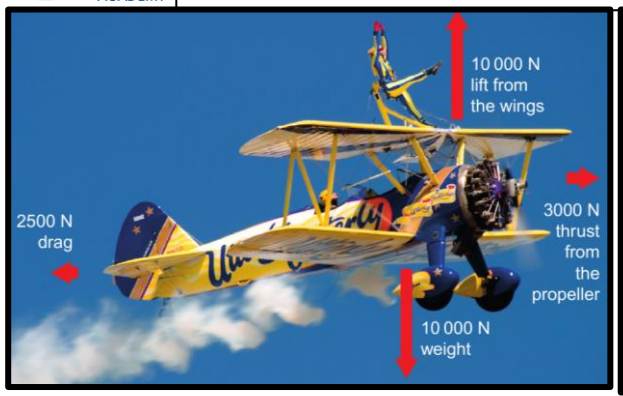
Energy Efficiency = Useful energy/total energy input

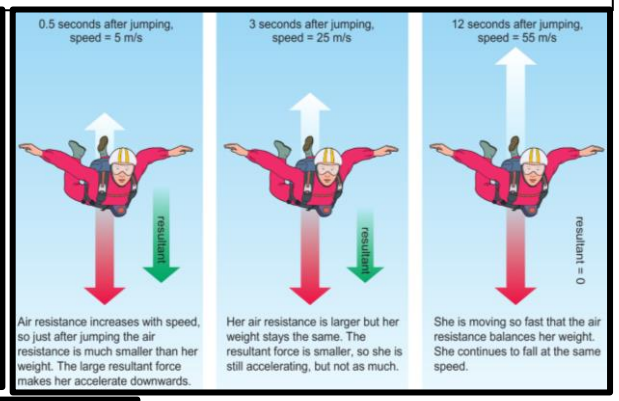
Renewable Energy	Quickly replenishes its energy used. Infinite	Wind power, solar power, hydroelectric power, tidal power, geothermal power, biomass
Non-renewable Energy	Is finite (will run out). Does not quickly replace energy used	Fossil fuels – coal, oil and natural gas Nuclear power

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.

KS4 Physics – Forces and Motion





Newton's First Law of motion can be written as:

- a moving object will continue to move at the same speed and direction unless an external force acts on it
- a stationary object will remain at rest unless an external force acts on it.

The acceleration of an object is a measure of how much its velocity changes in a certain time. Sir Isaac Newton's Second Law of Motion describes the factors that affect the acceleration of an object.

The acceleration in the direction of a resultant force depends on:

- the size of the force (for the same mass, the bigger the force the bigger the acceleration)
- the mass of the object (for the same force, the more massive the object the smaller the acceleration).

Newton's Third Law is about the forces on two different objects when they interact with each other. This interaction can happen:

- when objects touch, such as when you sit on a chair
- at a distance, such as the gravitational attraction between the Earth and the Moon.

On Earth the **gravitational field strength** has a value of about 10 newtons per kilogram (N/kg). This means that each kilogram is pulled down with a force of 10 N. The gravitational field strength is different on other planets and moons.

The weight of an object can be calculated using the following equation:

weight = mass × gravitational field strength
(N) (kg) (N/kg)

This is often written as: $W = m \times g$

Momentum is calculated using this equation:

momentum = mass × velocity
(kg m/s) (kg) (m/s)

This can also be written as $p = m \times v$, where p stands for momentum.

Momentum and acceleration

Table C shows two equations involving acceleration. These can be combined to give:

$$\text{force} = \frac{\text{mass} \times \text{change in velocity}}{\text{time}} \quad \text{or} \quad \frac{m(v-u)}{t}$$

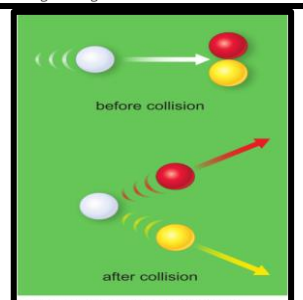
where v is the final velocity and u is the starting velocity.

As mass × velocity is the momentum of an object, this equation can also be written as:

$$\text{force} = \frac{\text{change in momentum}}{\text{time}} \quad \text{or} \quad \frac{mv - mu}{t}$$

H Momentum and collisions

When moving objects collide the total momentum of both objects is the same before the collision as it is after the collision, as long as there are no external forces acting. This is known as **conservation of momentum**. Remember, momentum is a vector so you need to consider direction when you add the quantities together. If two objects are moving in opposite directions, we give the momentum of one object a positive sign and the other a negative sign.



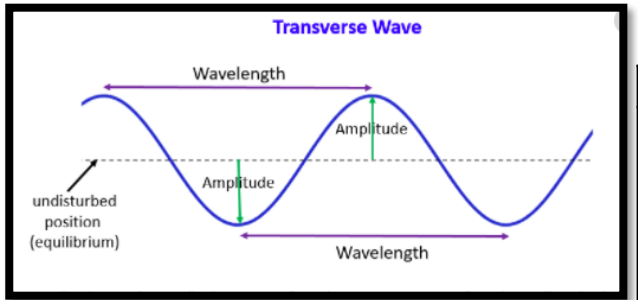
D The total momentum of the two coloured balls will be the same as the momentum of the white ball that hit them.

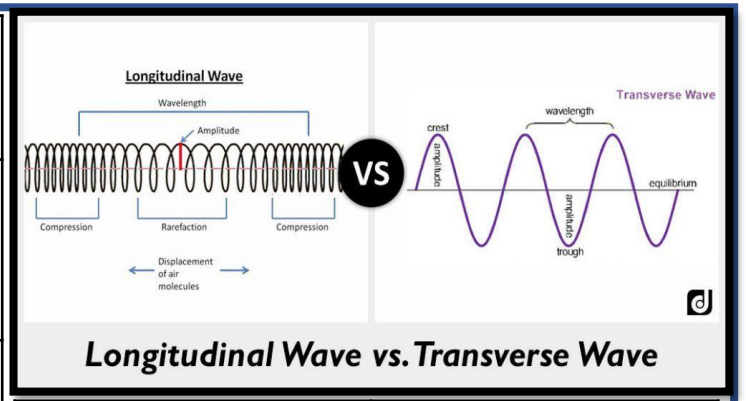
Keyword	Definition
acceleration	A measure of how quickly the velocity of something is changing. It can be positive if the object is speeding up or negative if it is slowing down.
balanced forces	When the forces in opposite directions on an object are the same size so that there is a zero resultant force.
resultant force	The total force that results from two or more forces acting upon a single object. It is found by adding together the forces, taking into account their directions.
scalar quantity	A quantity that has a magnitude (size) but not a direction. Examples include mass, distance, energy and speed.
speed	How fast something is moving. Often measured in metres per second (m/s), miles per hour (mph) or kilometres per hour (km/h).
unbalanced forces	When the forces in opposite directions on an object do not cancel out, to there is a non-zero resultant force.
vector quantity	A quantity that has both a size and a direction. Examples include force, velocity, displacement, momentum and acceleration.
velocity	The speed of an object in a particular direction. Usually measured in metres per second (m/s).
centripetal force	A force that causes objects to follow a circular path. The force acts towards the centre of the circle.
mass	A measure of the amount of material there is in an object. The units are kilograms (kg).
weight	The force pulling an object downwards. It depends upon the mass of the object and the gravitational field strength. The units are newtons (N).
gravitational field strength	A measure of how strong the force of gravity is somewhere. It is the force on a 1 kilogram mass, so the units are newtons per kilogram (N/kg).
inertial mass	The mass of an object found from the ratio of force divided by acceleration. The value is the same as the mass calculated from the weight of an object and gravitational field strength.
action–reaction forces	Pairs of forces on interacting objects. Action–reaction forces are always the same size, in opposite directions, and acting on different objects. They are not the same as balanced forces.
balanced forces	Forces acting on the same object. Balanced forces are always equal, in opposite directions, and always act on the same object. They do not have to be the same type of force An object acted on by balanced forces will not change the way it is moving..
equilibrium	When a situation is not changing because all the things affecting it balance out.
conservation of momentum	The total momentum of moving objects before a collision is the same as the total momentum afterwards, as long as no external forces are acting.
momentum	The mass of an object multiplied by its velocity. Momentum is a vector quantity, with units kilogram metres per second (kg m/s).
kinetic energy	A name used to describe energy when it is stored in moving things. The amount of energy stored depends on the mass of the object and on its speed (or velocity) squared.
work done	The energy transferred when a force acts through a distance to move an object or change its speed. It is calculated using the size of the force and the distance moved in the direction of the force. The unit for work done is the joule (J).
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.

KS4 Physics – Waves

Wave	Vibrations that transfer energy from place to place.
Transverse	A wave where the vibrations are at right angles to the direction in which the wave is travelling.
Longitudinal	A wave where the vibrations are parallel to the direction in which the wave is travelling.
Frequency	The number of vibrations (or the number of waves) per second, measured in hertz.
Period	The time taken for one complete wave to pass a point. It is measured in seconds.
Wavelength	The distance between a point on one wave and the same point on the next wave.
Amplitude	The size of vibrations or the maximum distance a particle moves away from it resting position when a waves passes.
Refraction	The change in direction when a wave goes from one medium to another.
Normal	An imaginary line drawn at right angles to the surface of a mirror or lens where a ray of light hits it.

Frequency	The number of waves pass a point in a second.	Higher frequency = more energy transferred	Increasing frequency = higher pitch
Amplitude	Maximum disturbance from its undisturbed position.	Increasing amplitude increases energy transferred	Increasing amplitude = increase in volume
Wavelength	The distance between a point on one wave and the same point on the next wave.	Increasing wavelength = decrease energy transferred	





Longitudinal Wave vs. Transverse Wave

Longitudinal	Transverse
Particles oscillate (vibrate) in the direction of the wave's movement	Particles oscillate (vibrate) at right angles to the direction of the wave movement
Sound waves, ultrasound	Electromagnetic waves (light), water waves

Wave Formula

Wave speed = wavelength x frequency

Wave speed is measured in meters per second (m/s)	Wavelength is measured in meters (m)	Frequency is measured in Hertz (Hz)

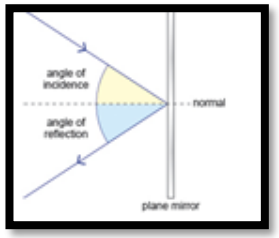
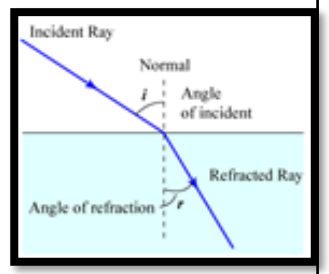
Example

Dylan is standing on the end of a pier. He measures the water waves going past him. The wavelength of each wave is 1.3m. He counts 2 waves every second. Find the wave speed

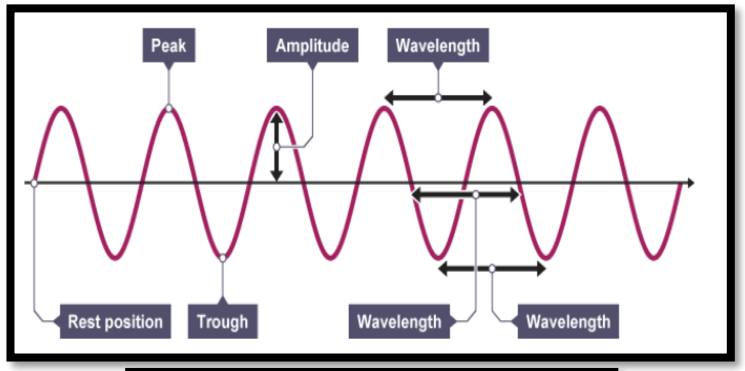
Wave speed = frequency x wavelength

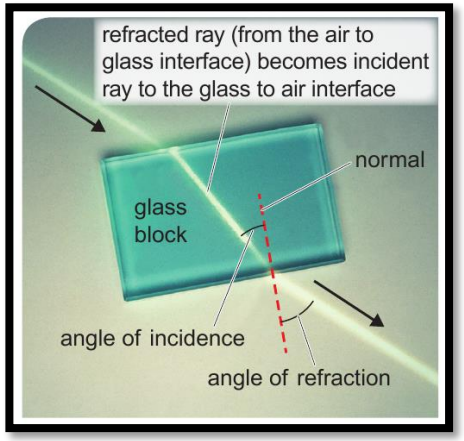
Wave speed = 2 x 1.3

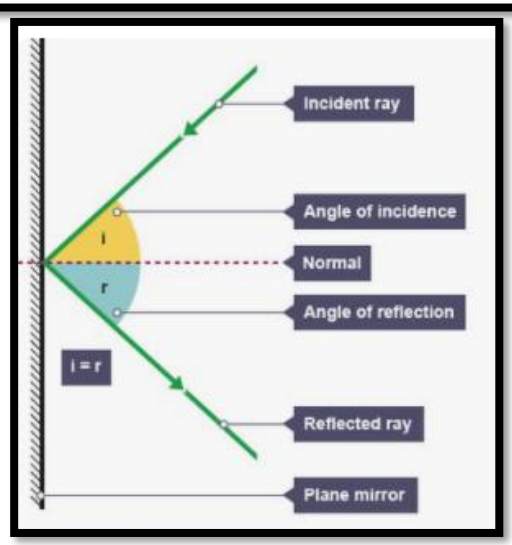
= 2.6 m/s

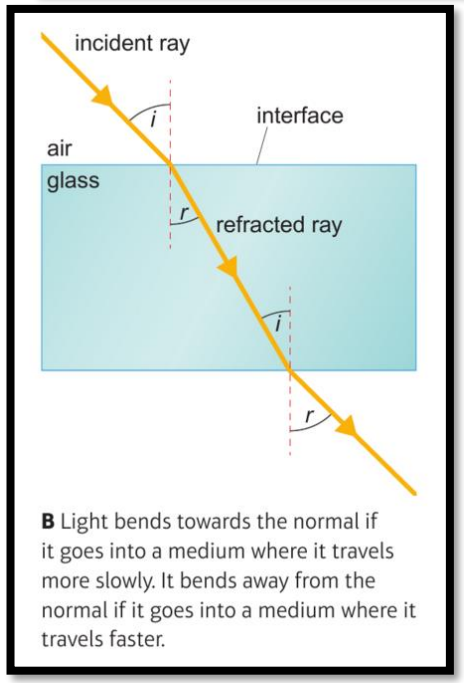
	Description	Diagram
Reflection = light bouncing off a surface	Light waves reflect from surfaces. When waves reflect, they obey the law of reflection: the angle of incidence equals the angle of reflection.	
Refraction = light bends	Waves change speed when they pass across the boundary between two substances with different densities, such as air and glass. This causes them to change direction and this effect is called refraction.	

KS4 Physics (CP5/SP5) – Light and EM Spectrum

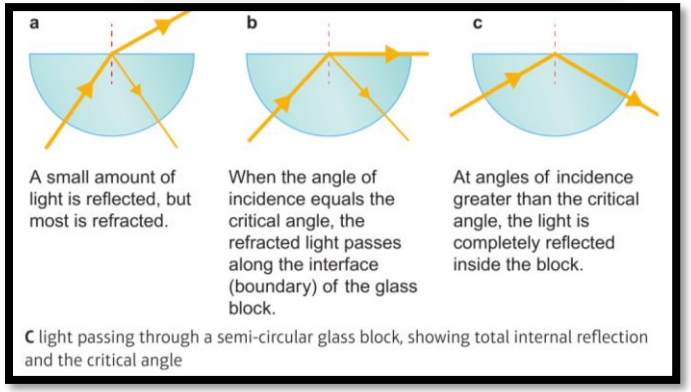








B Light bends towards the normal if it goes into a medium where it travels more slowly. It bends away from the normal if it goes into a medium where it travels faster.



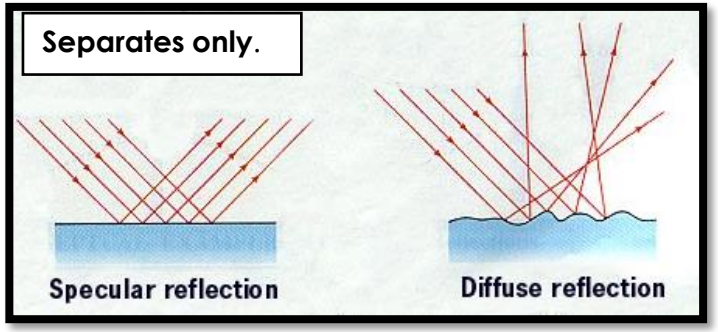
C light passing through a semi-circular glass block, showing total internal reflection and the critical angle

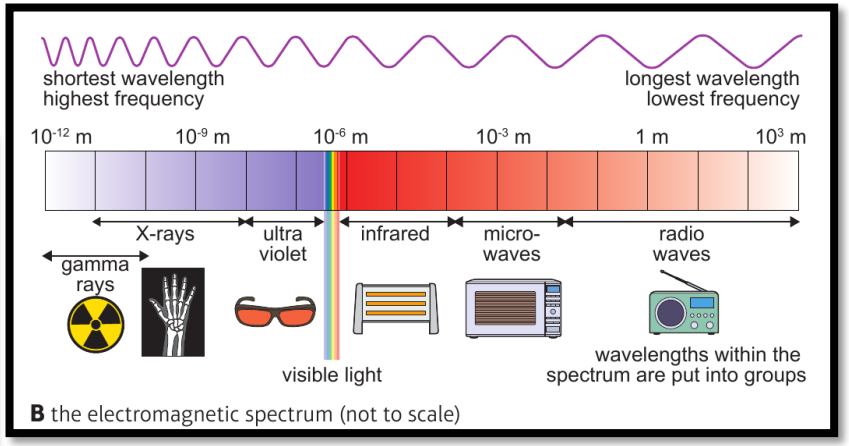
Separates only. Total internal reflection and critical angle.

Angle of incidence (i)	The angle between incidence ray and the normal.
Angle of refraction (r)	The angle between normal and the refracted ray.
Separates only - Critical angle	The angle at which total internal reflection happens. In a glass block this is 42°.
Separates only - Diffuse reflection	Reflected light scattered in all directions
Electromagnetic radiation	Form of energy transfer including radio waves, microwaves, infrared, visible light, ultraviolet, x-rays and gamma rays.
Electromagnetic spectrum	The entire frequency range of electromagnetic waves.
Electromagnetic waves	A group of waves that all travel at the same speed in a vacuum, and all are transverse.
Incident ray	The light ray approaching the interface (mirror edge, or edge of a perspex block)
(H) Oscillations	Movement backward and forward
Radiotherapy	Medical technique to kill cancer cells using gamma rays.
Ray diagram	A diagram that models what happens when light is reflected or refracted.
Refracted ray	The light ray that leaves a material like a glass Perspex block. This ray has changed direction.
Separates only - Specular reflection	Light is evenly reflected from smooth surfaces such as a mirror surface.
Separates only – Total internal refection	When a ray of light is shone into a curved glass block and when the angle (critical angle) has been achieved to allow all the light to be completely reflected inside the glass.
Transverse waves	Vibrations are at right angles to the direction in which the wave is travelling

KS4 Physics (CP5/SP5) – Light and EM Spectrum

Separates only.





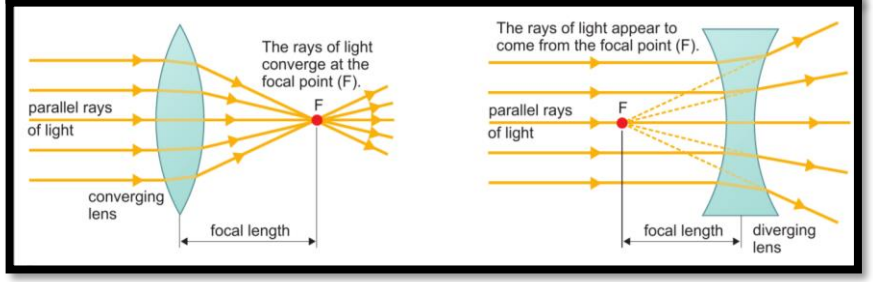
B the electromagnetic spectrum (not to scale)

Long wavelength, low frequency	Uses	Dangers
Visible light	Light bulbs, our eyes detect it	From a laser can damage the retina in the eye
Infrared	Communication – TV remote, grills, toasters	Felt as heat, and can cause skin to burn
Microwaves	Communications, mobile phones, microwave for food	Can cause internal heating of body tissue
Radio waves	Radio broadcast, communications	Very large doses can cause cancer

Short wavelength, high frequency	Uses	Dangers
Ultraviolet	Used to kill microorganisms in water, detecting forge bank notes	Too much exposure can lead to skin cancer
X-rays	Hospitals – to check for broken bones	High frequency, transfer a lot of energy and can penetrate the body. Excessive exposure may cause DNA mutation, possibly leading to cancer.
Gamma rays	Cancer treatment, sterilising hospital equipment	High frequency, transfer a lot of energy and can penetrate the body. Excessive exposure may cause DNA mutation, possibly leading to cancer.

Separates only.

A **converging lens** is fatter in the middle than at the edges. It makes parallel rays of light converge (come together) at the **focal point**. The **focal length** is the distance between the focal point and the centre of the lens. A **diverging lens** is thinner in the middle than at the edges. The focal point is the point from which the rays seem to be coming after passing through the lens.



Separates only.

Heat transfer by radiation - Heat can be transferred by infrared radiation. Unlike conduction and **convection** - which need the vibration or movement of **particles** - **infrared radiation** is a type of electromagnetic radiation. When infrared radiation is absorbed by an object it is heated and its temperature rises.

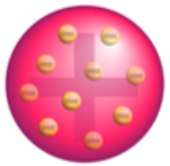
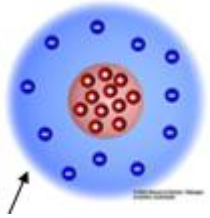
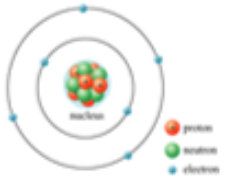
Separates only.

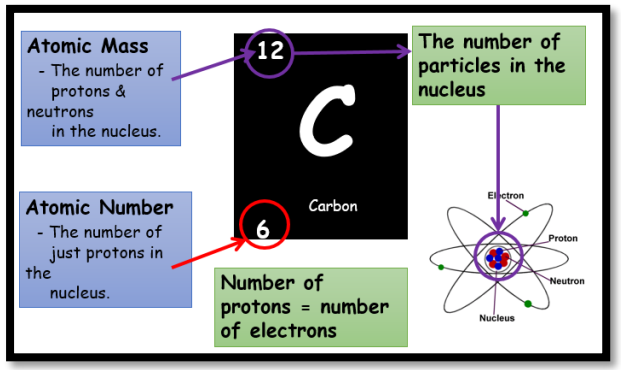
•Dark matt surfaces are better at absorbing heat energy than light shiny surfaces.
•Dark matt surfaces are better at radiating heat energy than light shiny surfaces.

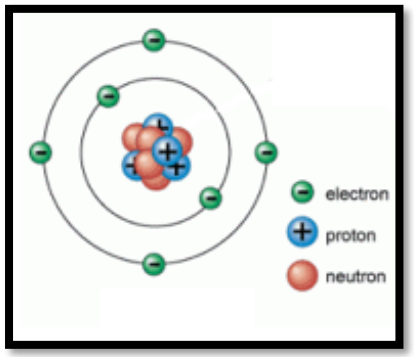
Separates only.

Surface	Absorption	Emission
Dull, matt or rough	Good absorber of heat radiation	Good emitter of heat radiation
Shiny	Poor absorber of heat radiation	Poor emitter of heat radiation

KS4 Physics (CP6/SP6) – Radioactivity

Dalton's model	Plum Pudding - Thomson	Rutherford	Bohr/Chadswick
			
John Dalton thought that all matter was made of tiny particles called atoms, which he imagined as tiny spheres that could not be divided.	Thomson carried out experiments and discovered the electron. This led him to suggest the plum pudding model of the atom. In this model, the atom is a ball of positive charge with negative electrons embedded in it.	Rutherford suggested a new model for the atom, called the nuclear model. In the nuclear model: the mass of an atom is concentrated at its centre, the nucleus the nucleus is positively charged	Bohr did calculations that led him to suggest that electrons orbit the nucleus in shells. The shells are at certain distances from the nucleus. Chadwick found evidence that the nucleus contains no charged particles called the neutron.

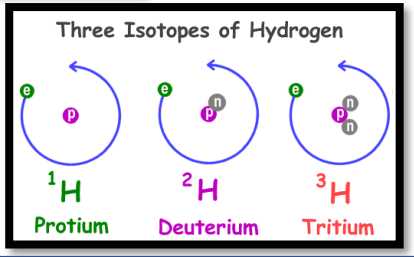




Atomic structure – protons and neutrons found in the nucleus. Electrons orbit the nucleus on electron shells.

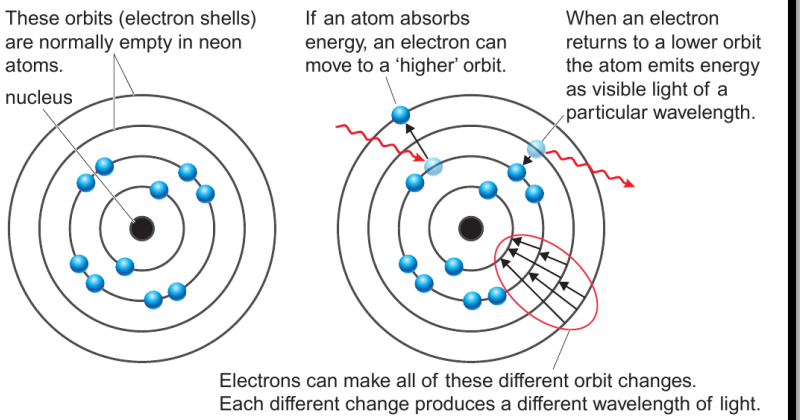
	relative charge	relative mass
proton	+1	1
neutron	0 neutral	1
electron	-1	1 / 1840

Atoms of a single element that have different numbers of neutrons, but same number of protons.

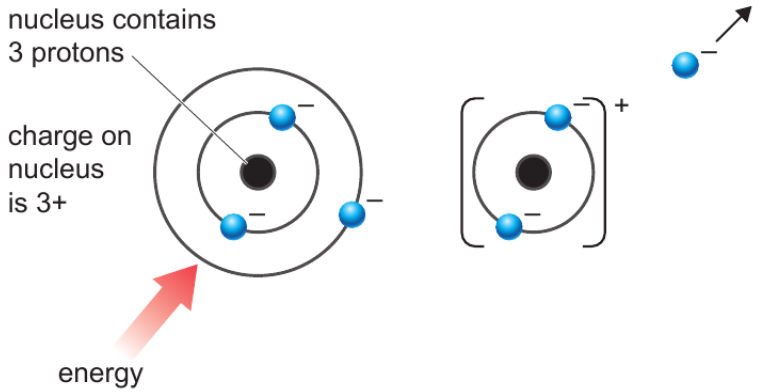


Atomic number (also called proton number)	Number of protons in an atom
Background radiation	Naturally radioactive substances in the environment that produce radiation.
Becquerels (Bq)	Unit to measure radioactivity. One Bq is one nuclear decay each second.
Count rate	Number of clicks on a GM tube when radiation is detected. It is the amount of radiation per second or minute.
Elements	Substances that contain the same type of atoms
Geiger-Muller (GM) tube	An instrument to measure radioactivity.
Half-life	Time taken for half the unstable nuclei in a sample of a radioactive isotope to decay.
Isotopes	Atoms of a single element that have different numbers of neutrons, but same number of protons.
Kinetic theory	Model that helps explains the properties of solids, liquids and gases.
Mass number (also called nucleon number)	Total number of protons and neutrons.
Nucleons	Smaller particles that make up the nucleus.
Neutrons	Sub-atomic particle found in the nucleus, with no charge.
Particle theory	Model that helps explains the properties of solids, liquids and gases.
Protons	Positively charged sub-atomic particle found in the nucleus.
Subatomic particles	Particles smaller than atom, and make up an atom. Protons, neutrons and electrons.

KS4 Physics (CP6/SP6) – Radioactivity



B electronic configuration and energy level changes for neon



D ionisation of a lithium atom

Ionisation

Sometimes an atom gains so much energy that one or more of the electrons can escape from the atom altogether. An atom that has lost or gained electrons is called an **ion**. Radiation that causes electrons to escape is called **ionising radiation**.

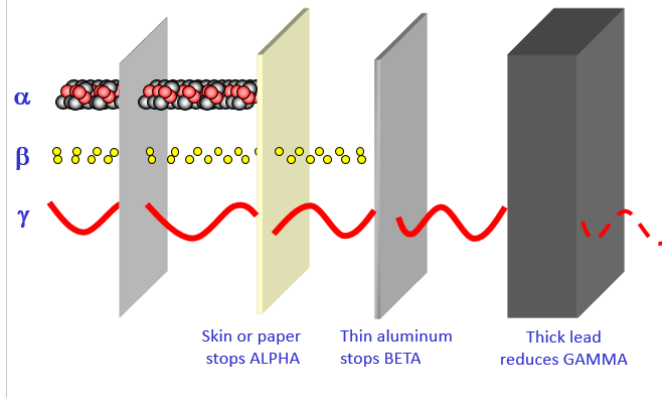
Type of nuclear radiation

Property	Alpha	Beta	Gamma
What is it?	Nucleus of a helium atom	electron	EM waves
Charge	+2	-1	None
Mass	Relative 4	Relative 0 (1/1840)	None
Range in air	3-5cm	15cm	Long range
Penetration ability	Low, stopped by paper	Increased, stopped by aluminium or lead	Great slowed by concrete, lead
Ionising ability	Highly ionisinig	Fairly	Least ionising
Effects of a magnetic field	Deflected	Deflected	Unaffected
Effects of an electric field	Attracted to negative electrode	Attracted to positive electrode	Unaffected

Particle	Symbol	
Alpha	α	$^{4}_{2}He$
Beta	B^-	$^{0}_{-1}e$
Positron	β^+	$^{0}_{+1}e$
neutron		n

Dangers of radioactivity – can damage the DNA inside a cell. This damage is called mutation. Gene mutation that occur in gametes can be passed on to the next generation. Some mutations can cause cancer.

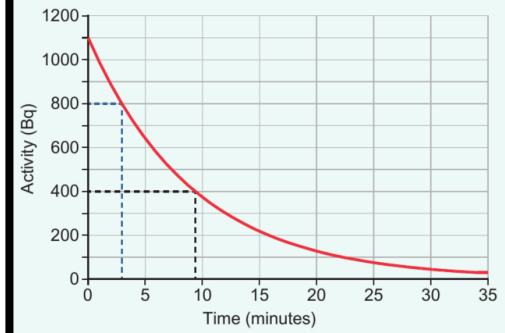
The penetration power of the three types of radiation.



Worked example

In figure D, the activity at 3 minutes is 800 counts per second. After one half-life the count rate will have decreased to 400 counts per second.

This occurs at 9.5 minutes, so the half-life is 9.5 – 3 = 6.5 minutes.



D graph of activity against time for a radioactive substance

[Separates] Using radioactivity
- Killing microorganisms
- Radioactive detecting
- Diagnosing cancer - tracers
- Treating cancer
- Checking thickness of paper
- Smoke alarms – contains a source of alpha particles

[Separates] Radioactivity in medicine
- Radioactive materials are used to diagnose medical conditions without having to cut into a patient's body.
- Tracers that emit positrons – used to detect medical problems.
- - Treating cancer – external radioactivity which uses a beams of gamma rays, x-rays or protons directed at the tumour.

KS4 Physics – Energy – Forces Doing Work

Keyword	Definition	Units of measurement
Work done	The energy transferred by a force	Joules (J)

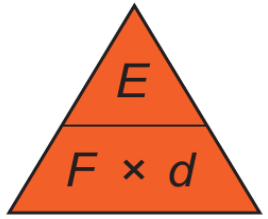
Keyword	Definition	Units of measurement
Power	The rate at which energy is transferred	**Watts (W)** or **Joules per second (J/s)**

work done (J) = force (N) × distance moved in the direction of the force (m)

This can be written as:

$E = F \times d$

where E represents work done
F represents force
d represents distance.



B

$$\text{power (W)} = \frac{\text{work done (J)}}{\text{time taken (s)}}$$

This can be written as:

$P = \frac{E}{t}$

where E represents work done
P represents power
t represents time.

E

Worked Example

Danny is moving a box weighing 200N. He pulls it 12m along a sloping floor using a force of 150N. Calculate the work done by Danny.

The force must be in the direction of movement

E = F x d
= 150N x 12m
= 1800J

Crane A lifts a weight of 1000N a distance of 6m in 10second

Crane B lifts the exact same weight the exact same distance, but in **4 seconds**.

We can say that crane B is more powerful as it has done the same amount of work (lifted a force a certain distance), but has done so in less time.

KS4 Forces and their Effects

Forces can be placed into two groups. There are forces that act on contact and there are forces that act at a distance.

Contact Forces	Non-Contact Forces
Air Resistance	Gravity
Friction	Magnetism
Tension	Electrical Force
Normal Force	Nuclear Force

Force	A vector quantity	. A push or a pull on an object.
Contact forces	Two objects have to touch for the force to act. Interact at zero distance.	Caused by objects interacting. E.G. Friction, man pushing a wall, a book on a table, Upthrust of water on a boat.
Non-contact forces	Two objects do not have to touch for the force to act. Can interact at a distance.	Caused by interacting fields. E.G. Magnetic forces, electrostatic forces, gravitational forces.

When two children are on a see-saw the see-saw may be balanced and the children will not move. In this case the clockwise moment is balanced by the anti-clockwise moment – so the two moments are equal.

As both the clockwise moment and anti-clockwise moment are balanced:

$$F_c \times {}_c = F_a \times {}_a$$

Where the subscript denotes the direction (clockwise or anti-clockwise).

Free body force diagrams	A diagram showing all the forces acting on an isolated object or a system	The size and direction of the pairs of forces acting upon an object or system.
Resultant force	Forces acting along the same line	Add together the forces acting in the same direction. Subtract the forces acting in opposite directions.
Vector diagrams	A diagram where forces do not act in the same line. Use scale diagrams to find the resultant force	Draw all the forces acting upon an object. Make sure they are to scale and in the right directions. Draw a joining line rom the start of the first force and the end of the last force.

Moments: A force or a system of forces may cause an object to rotate.

Everyday examples of force causing a rotation motion include door handles, steering wheels and see-saws.

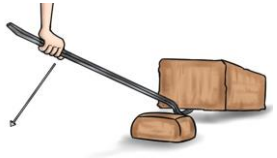
The turning effect of a force is called the moment of the force. The size of the moment is determined by the equation:

moment of a force (Nm) = force (N) × distance (m)

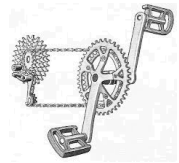
$$M = F \times x$$

The distance, x, is normal to the direction of the force

Levers are used to increase the force applied to an object, usually to lift it up from a surface. Levers must have a pivot to rotate around and will work on the principle of moments.



A gear is a wheel that has teeth on it (also known as a cog), as shown in the diagram opposite. For gears to do work you need at least two gears. Gears are used to transmit rotational forces from one place to another .



When two cogs are in contact with their teeth interlocking, the driven cog will rotate in the opposite direction to the drive cog. If the drive cog in a gear spins clockwise then the driven cog will spin anti-clockwise.

When a large cog is driving a small cog, then the small cog will rotate faster than the large cog. Halving the number of teeth on the small cog will double the speed of the small cog. Going from a large cog to a smaller cog will increase the speed of rotation.

GCSE DEVELOPMENT BOARD
AO1: Developing ideas, artist research.
AO2: Using resources, testing out ideas and media.
AO3: Recording ideas, photos and drawings.

What needs to be included in a GCSE Development Board?

- Drawings /photographs to develop your own ideas tonal and colour. (Linking to your artist's work.)
- X3 small experiments using artist's style/techniques.
- Artist response.
- Developed response..

How do I develop my ideas inspired by my artist's work?

- Decide what objects might link to your artist's work. Take photographs (Primary)find images on the internet of them (Secondary).
- Draw them in pencil, pen, pencil crayon and paint.

How do I create experimental pieces?

Take some of your drawings and try out your artist's materials and techniques on them to develop them further.

What is an artist's response and developed response?

- An **artist's response** is **your own work** developed further using the style/techniques/materials/ideas of your artist.
- A **developed response** makes you look again at what **other** materials and techniques your artist uses to further develop your own ideas.

A Good development Board should include drawings using a range of materials and techniques and show a clear journey towards your final piece.

Wider Thinking:
GCSE Art and Design - BBC Bitesize
www.studentartguide.com

Expert modelling example…

Development Board.

Response/Developed response

Stretch and Challenge:
Use materials and techniques with a high level of skill and control. Record finer surface textures and details.

Keyword	Definition
Tone	Refers to light and dark values.
Texture	Refers to the surface quality in a work of art. (How things look and feel.)
Colour	Colour has the strongest effect on our emotions. It is the element we use to create the mood or atmosphere of an artwork.
Record	To capture visual elements like proportion and form. For recording your ideas. It is important to observe your sources closely.
Artist Response	Your own work developed using your artist's work as inspiration.
Contextual	Connections made to the work of other artists from different and similar times, places and cultures.
Composition	Ways of arranging, organising and laying out elements in a piece of art and design.
Develop	Bring out potential.
Explore	Try out the qualities of materials, techniques or processes through practical investigation.
Imaginative	Develop ideas and concepts in new, engaging and inventive ways.
Refine	Improve initial work taking into account feedback and aims.

Y10 TEXTILES KNOWLEDGE ORGANISER ORGANIC STRUCTURES

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

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**.

Digital Art

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.

Keyword	Definition
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.

LEARNING OUTCOME 4: Attracting and retaining customers

Knowledge Organiser – RO64

- **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: • The income levels of targeted customers • Whether or not the customers can afford the product Example: family car versus sports cars	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	A business neds 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. 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.

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
Competitive pricing: this is when a business sets the price of the product which is similar to their direct competitors	• 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	• 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
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 Example: £299 instead of £300	• 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	• 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.
Price skimming: A business can charge a higher price due to a lack of competitors. Aimed at customers who like to have the lasted product Example: Apple Iphone	• 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.	• 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.
Price penetration: often used when a product launches, where a low price is set first to attract new customers and they gradually increased.	• Achieves high sales for the duration of the offer. • Attracts customers to the product because of the price Increase market share	• Profit margins will be reduced during the offer period. • Not all products will suit this pricing method, such as sort-term fashions.

LEARNING OUTCOME 4: Attracting and retaining customers

Key Term

Knowledge Organiser – RO64

- **Learning Aim 4.3:** Types of advertising methods and the appropriateness of each

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.

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.

Leaflets

Often used by small businesses to target customers in the local area – for example, menus at fast food take-away

Advantages	Disadvantages
• Easy and cheap to produce • Inform customers about their products • Can target specific local areas • Large or small distribution • Attractive and eye catching	• 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 • Poor impact of sales.

Websites

Website inform customers of the products they sell and allow purchasing online

Advantages	Disadvantages
• 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	• 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
• They often compliment the content of the magazine • Readers tend to keep magazines longer than newspapers • Magazines will be given to others	• 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
• 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.	• 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
• Users can access the material often • A cheap method of advertising • Fast communication with customers • Proven to increase sales • Could generate international customers.	• 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
• Specific target groups per paper. • Free or low cost for local papers • Middle ages/ older target market • National papers have wide audience	• Newspaper reading has fallen in the last 10 years. • National papers are more expensive • Younger readers are less likely to read.

LEARNING OUTCOME 4: Attracting and retaining customers

- **Learning Aim 4.4:** Sales promotion techniques

Knowledge Organiser – RO64

Key Term

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

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.

Competitions can general sales, if the prizes are something the customer wants to try and win. Usually appear on the side of packaging.

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.

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.

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

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
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 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

Product Knowledge

Customer service is not just about making sales but **retaining customers**. Businesses do this by linking these three methods together

Having good product knowledge → Engage with customers → Provide after sales services

New Product

- Features of
- Special offers
- Prices of product
- Specification of product

Good Knowledge = customers are likely to return to the business because of positive customer service

Bad Knowledge = repeat sales are not guaranteed

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 used the product.

It is important that they staff are trained to:

- Deal with angry or upset customers
- Resolve an individuals issue

They must remain helpful, friendly, calm and professional at all times

RO64 – Enterprise and Marketing Concepts

Knowledge Organiser – LO5

- **LO5: Understanding factors for consideration when starting up a business**

- **OWNERSHIP FOR BUSINESS START-UPS**

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!**

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.

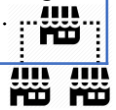
RO64 – Enterprise and Marketing Concepts

Knowledge Organiser – LO5

- **LO5: Understanding factors for consideration when starting up a business**

- **OWNERSHIP FOR BUSINESS START-UPS**

Sole trade	Partnership	Franchise
An individual person owns a business. unlimited liability They can employ other people. Some examples include – hairdressers, plumbers or electricians.	Two or more people own a business. unlimited liability Jointly responsible for the business. Some examples are solicitors, small restaurants, dentists, vets	A franchise is when one business, the franchisor. Gives permission to an entrepreneur, the franchisee, to set up a business using its brand name and its products.



Advantages

- Shared responsibility
- Shared workload
- Partner – brings different skills and attributes
- More capital – investment from different partners

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

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

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

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

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

RO64 – Enterprise and Marketing Concepts

Knowledge Organiser – LO5

- **LO5: Understanding factors for consideration when starting up a business**

- <u>SOURCE OF CAPTIAL FOR BUSINESS START-UPS</u>

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

RO64 – Enterprise and Marketing Concepts

Knowledge Organiser – LO5

- **LO5: Understanding factors for consideration when starting up a business**

- SOURCE OF CAPTIAL FOR BUSINESS START-UPS

Source of Finance	Advantages	Disadvantages
Borrow money from friends / family 	• May charge little or no interest • Do not have to provide security	Could lead to disputes between family members and friends • May not be able to lend large amounts
Own savings 	• Does not have to be paid back	There may be a limit to the amount of money which can be invested
Crowd funding 	• 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 • Someone can steal your idea if it is not protected
Small business grants 	• 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 	• The repayments can be spread out • over a long period of time • Access to larger amounts of • finance	Must be paid back with interest • Lender may require security for the loan
Business angels 	• 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

RO64 – Enterprise and Marketing Concepts

Knowledge Organiser – LO5

- **LO5: Understanding factors for consideration when starting up a business**

- THE IMPORTACE 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.

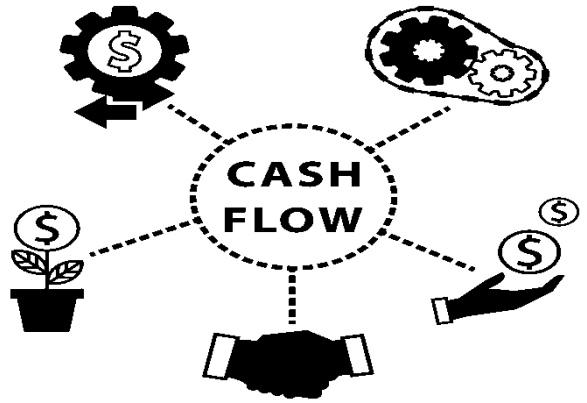
What is a purpose of a business plan?

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.



Knowledge Organiser – RO64

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

Marketing
Identifies the needs and wants of their customers. Develop products that customers would want to purchase

Finance
Manage all the finances for the business and record and report on financial performance.

Human Resources (HR)
Responsible for managing individuals work for the business.

Operations
Organise and cost how the products will be processed, made and delivered to their customers.

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

Finance
Responsible forall things finance related.
- 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

Human Resources (HR)
HR recruit and select employees what 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

Operations
Responsible for managing the production processes (logistics). They plan this process making sure that they have:
- All the necessary raw materials
- Working machinery
- Staff to operate equipment
- Quality control (ensuring the finished products meets the standards that are expected)

Key Terms

Functional activities-
The range of tasks that each functional area will complete within their area of specialism.

Functional areas
The different sections of a business which are divided into different areas of expertise.

4P's-stands for Product, Price
The different sections of a business which are divided into different areas of expertise.

Logistics
How a business manages the production of their product from manufacture to point of sale

Quality control
Ensuring the finished product meets the standards that are expected

In a small business, come 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.

Advantages of having a small business	**Disadvantages** of having a small business
• Staffing costs are small • Communication is often much easier if information needs to be sought	▪ 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.

Year 10 – Computer Science – Programming Techniques

Careers
- Software development
- Programing
- Software Engineering

Constant
Value STORED IN A **MEMORY LOCATION** that **never changes WITHIN A PROGRAM**

Variable
Value STORED IN **MEMORY LOCATION** that **can change WITHIN IN A PROGRAM**

Sequence: Completing steps in the order which they must happen

Selection: Where a choice is made in a program depending on a condition or outcome

Iteration: Act of repeating or lopping specific sections of code

Count controlled Iteration:
Repeats a set number of times

Condition controlled:
Repeats until a condition is met or something in the program changes

Syntax Error
An error in the rules/grammar of the language Eg missing colon / spelling mistake

Logic Error
The program is written to do something other than what the programmer intended
Eg Resetting only the first 9 elements in an array instead of all 10.

Run Time Error:
More difficult to spot as it can run a program without reporting an error. E.g. runs but
Doesn't give an output. Or the program hangs or Becomes inactive

Data Types

Real /Float
Number with decimal Point

Integer
Number without a decimal Point

String
A series of characters/TEXT

Character
A single letter or symbol

Date/Time
Date and Time in any format

Boolean
Yes no, true false value

Other Info

Concatenate
To join different data types together

 # Comments
Use these to add comments in to your code to explain what you have done

Validation: An computer check to ensure that the data entered is sensible and reasonable. It does not check the accuracy of data.

Year 10 – Computer Science – 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

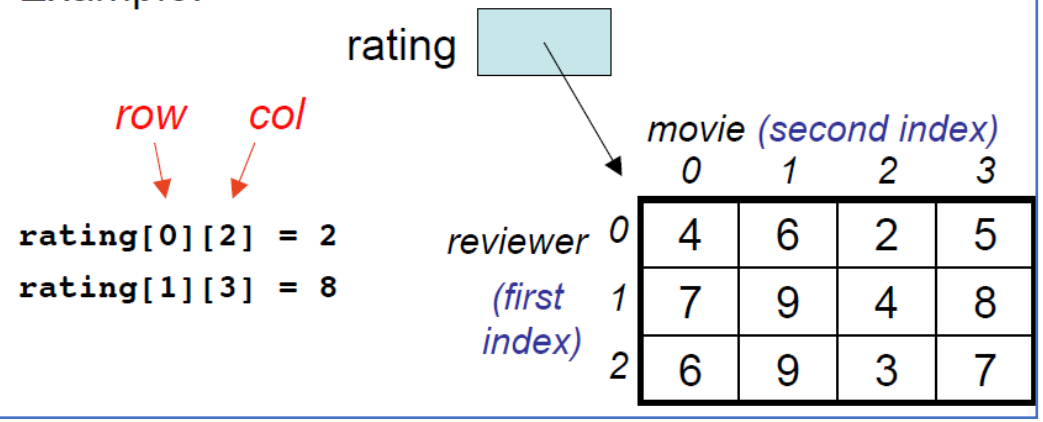
+	Addition eg x=6+5 gives 11
-	Subtraction eg x=6-5 gives 1
*	Multiplication eg x=12*2 gives 24
/	Division eg x=12/2 gives 6
MOD	Modulus eg 12MOD5 gives 2
DIV	Quotient eg 17DIV5 gives 3
^	Exponentiation eg 3^4 gives 81

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
0	0	1	1

8	4	2	1
1	0	1	0

3 A

Hex to Binary

4B

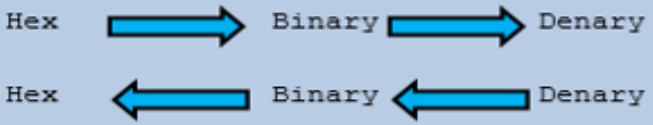
8	4	2	1
0	1	0	0

8	4	2	1
1	0	1	1

128	64	32	16	8	4	2	1
0	1	0	0	1	0	1	1

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
```

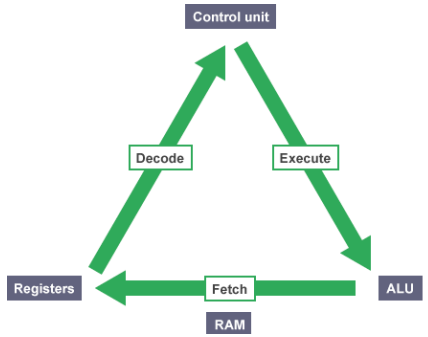
There is not enough bits available to store the answer, so an **overflow error** has occurred

Year 10 – 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.

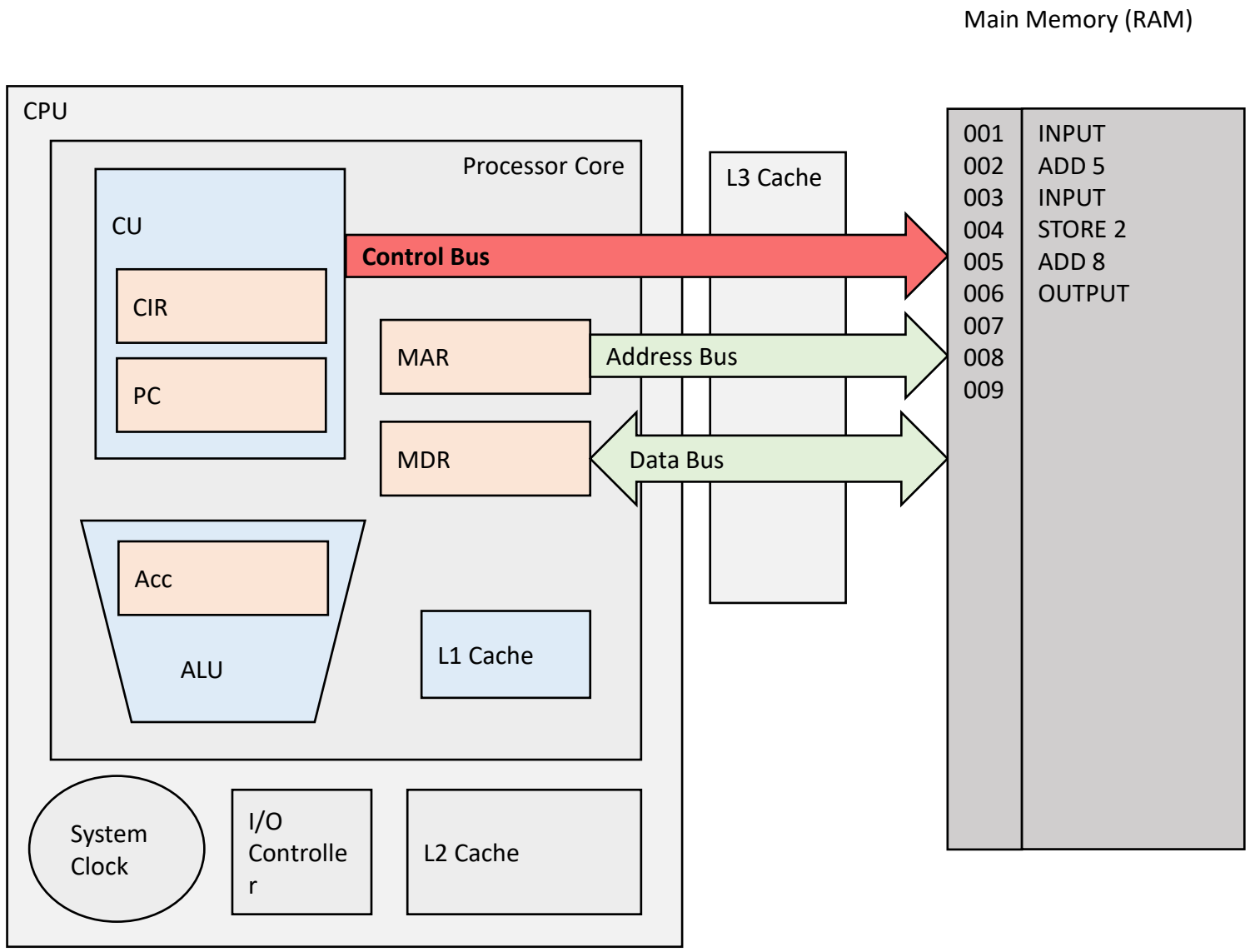
DECODE:

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 – 1.7 System Software

Operating Systems
Manages hardware and software in a computer system

Memory Management
Controls where the programs go in memory when being run.
User Interface
Provides a method of interaction with the user.
MultiTasking
Allows more than one program to run at once by sharing CPU time between programs.
Peripheral Management & driver software
Manages all Input, Output and Storage devices. Allows the OS and the external hardware such as printers, USB's etc to talk to each other
Security
Protects the machine is free from harmful viruses or unwanted access.
File and Disk Management
Helps to store files (images, music, documents etc) and their file extensions, helps you organise and search for files
Disk management such as space on hard drives, and utility software such as disk defragmentation software.
User management
The OS can deal with User accounts – single or multi users – eg. More than one person can us a computer at once. It also allows for use access, e.g. logging in to a system and having access to certain files and permissions etc. OS is also responsible for things like biometric anti-theft measures, fingerprint, and retina scanners.

Possible Careers
- Software Developer
- Data Analyst
- System Analysist
- Teaching

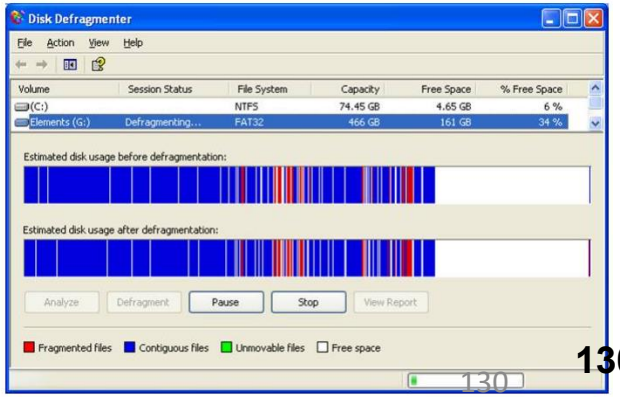
Systems software – Designed to run and maintain a computer system
Examples

UTILITY SOFTWARE
Helps to maintain or configure a computer. Most are installed in the OS but you can add others.

Disk Defragmenter

Moves (parts of) of files around so that all parts of a file are stored together (allowing files to be accessed more quickly)
Free space is collected together (allowing large files to be saved easily)

Disk Defragmenter



System Cleanup (Utility)

(Searches for and) deletes files/programs which are no longer used
… eg deletes temporary files / installation files
… deletes settings / registry values which are no longer used

System Information Utility

displays important data about the current state of the computer
· e.g. temperature, free memory, network speed, % processor used

Year 10 – Computer Science – 1.7 System Software

UTILITY SOFTWARE

Helps to maintain or configure a computer. Most are installed in the OS but you can add others

Back-ups

Back up data – copy of a sysytem files and settings stored somewhere externally

Full back up – copy of EVERY file is taken. Faster to restore from Uses A LOT of storage space, can take a long time to create

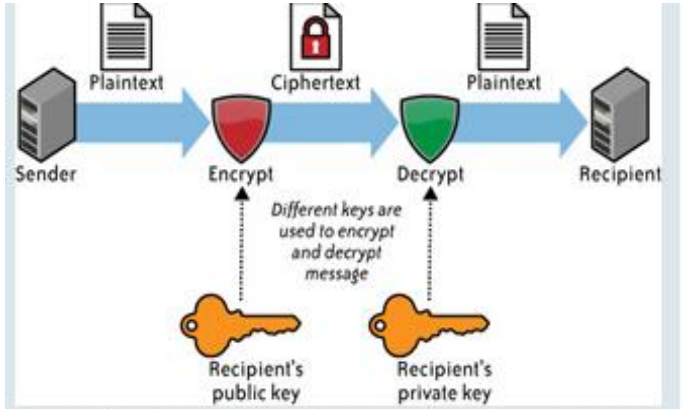
Incremental Back up – only files created and edited since the last back up are copied. Uses LESS storage and much QUICKER to create. BUT full system restore is SLOW

Data Compression

Reduces the size of files so they take up less disk space. Can help upload and download files quicker or send them across email. Standard formats include .zip and .rar to compress the files

Encryption

Scrambles (encrypts) data – this stops people from accessing it. Encryption happens by scrambling the message, you can only decrypt this if you have a special 'key'
Encrypted text is called – Cipher text
Decrypted is called Plain text
Encryption is essential for sending data over a network e.g. internet so it is kept secure



Encryption keys are used to encrypt (lock) and decrypt (unlock) files and data.

Year 10—iMedia Graphics & File Formats

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 files 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	Larger 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	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 Files sizes can be large wit many elements
.PDF (vector)	Widely supported by many devices Free to view PDF files Small file size	Not free to edit PDF files Text 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.

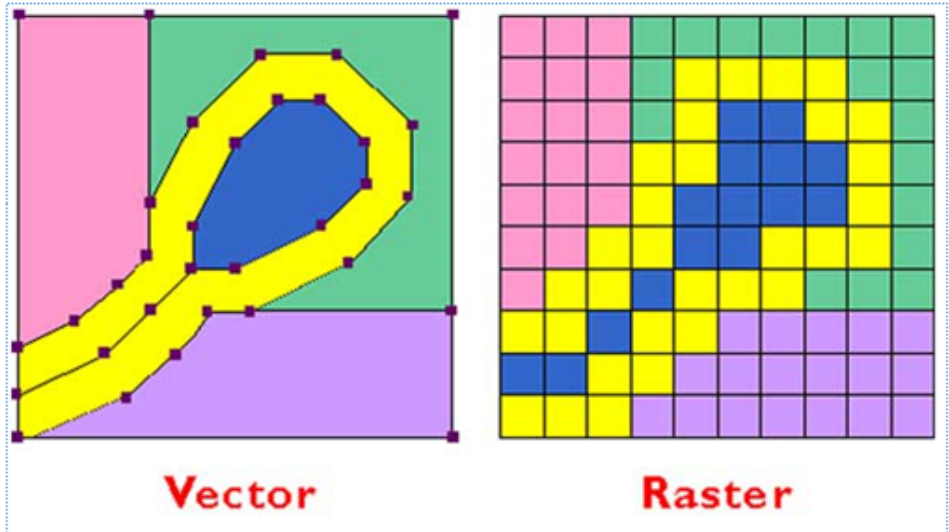
File size compression

Lossy compression

- 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

- 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 Graphics & File Formats

You must know file formats used for audio, video and images and to describe their features

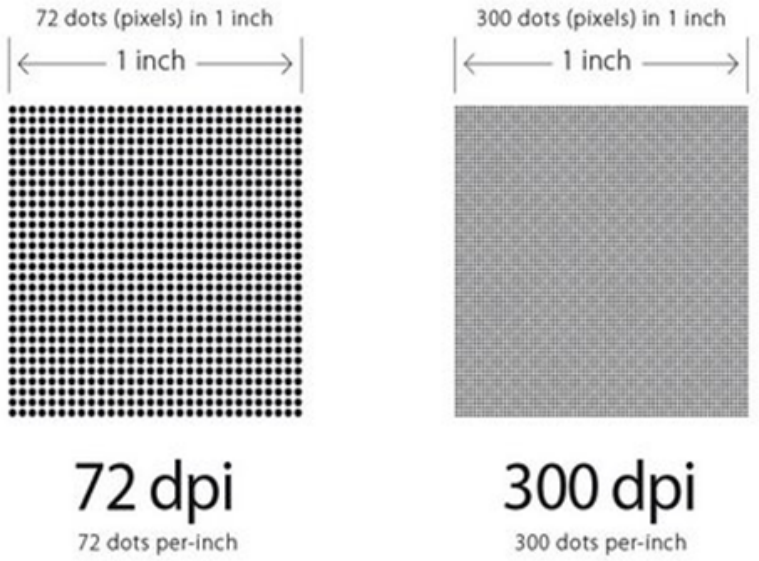


Image Resolution	
Pixel dimensions	The density of pixels in an image. Normally stated as the number pixels on the horizontal and vertical axis of an image, for example HD TV is 1280 pixels wide and 720 high (1280 x 720 = 921,600 pixels = 0.92 megapixels).
DPI resolution	Dots Per Inch. How many pixels occur across one inch (2.54 cm) DPI usually refers to printed media.
PPI resolution	Pixels Per Inch. How many pixels occur across one inch (2.54 cm) DPI usually refers to screen media.
Typical resolutions	Print media typically uses 300 dpi Web media is typically 72 ppi

Question:

A monitor is 20 inches wide and it has a resolution of 1024 x 720. What is the monitors dpi?

Answer:

DPI = dots per inch = dots/inch

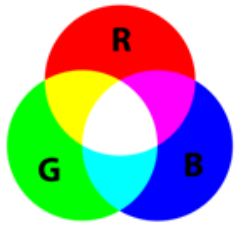
DPI = resolution / width

DPI = 1024/20 = **51.2 dpi**

Each pixel for a computer to TV screen is made from three values for Red, Green and Blue to determine how bright each colour is.

- R = 0 to 255 (255 is the maximum intensity)
- G = 0 to 255 (255 is the maximum intensity)
- B = 0 to 255 (255 is the maximum intensity)

These three **colour channels** are 8-bit values to determine **colour depth**.



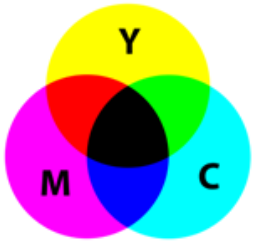
Images are represented **pixels** (**Pi**cture **El**ements).

TVs and monitors produce pixel colours using Red, Green and Blue light (**RGB**)

All screen colours can be produced just from RGB

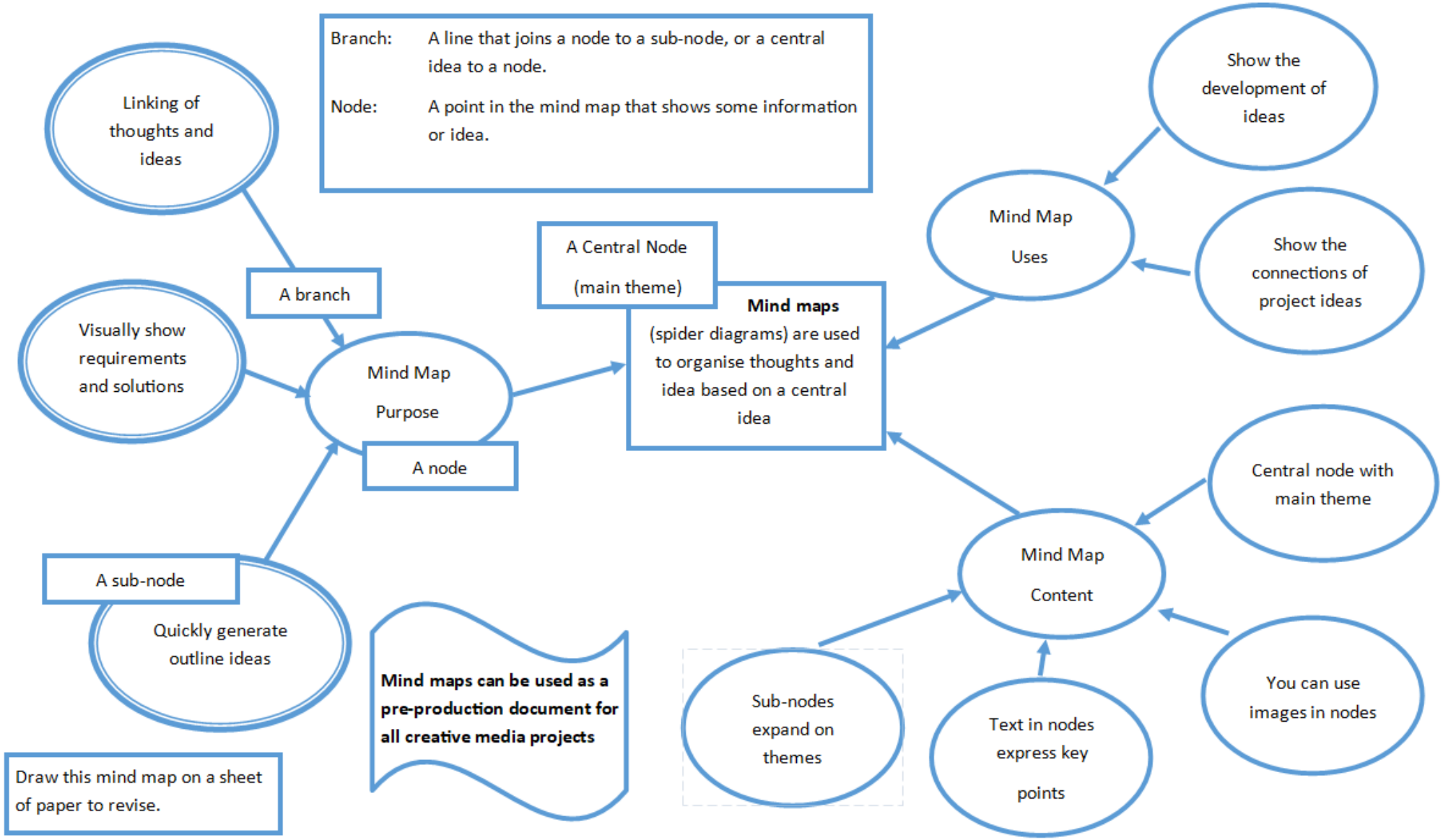
Printed media pixel colours are produced from Cyan, Magenta and Yellow ink (**CMY**).

It is very difficult to colour match between CMY and RGB



Year 10—iMedia—Mind Maps

You must be able to understand the purpose and use the content of different pre-production documents



Year 10—iMedia—Mood boards

You must be able to understand the purpose and use the content of different pre-production documents

Mood Boards

A mood board is a collection of sample materials and products. They can be created using paper/cards on a notice board or with software.

Purpose:

- ⇒ Help with creativity in the design stage to a establish a style
- ⇒ Save time by ensuring the design ideas work well before production begins
- ⇒ Checks there is a clear creative direction for the project (show the client)
- ⇒ The client can be involved at an early stage to give their feedback
- ⇒ Shows concepts that are difficult to describe in words

Remember: Mood boards are ***not*** examples of the finished creative media.

They demonstrate design ideas, concepts , suggestions

Colours

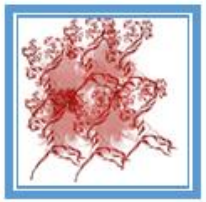
Mood boards can be used to explore several possible colour schemes based on client preferences or your ideas.

Inspiration

Explore ideas to see how assets work well together. What is the mood crated by the design?

Textures

Establish which texture designs work well together to add to the overall theme of the project



Photography (images)

Do client photo's fit with the mood? Do you need other images, if so, what are the limitations of using other peoples images?

Year 10—iMedia– Multimedia Elements

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—Multimedia Products

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	Websites are an interactive multimedia product that can be access 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 thorough 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. 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.
Information Kiosks	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.
Mobile phone applications	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 a different layouts, GUIs and do not always have the same appearance. Touchscreen technology makes accessibility difficult with visual impairments.
E-learning products	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.

Year 10 –iMedia—Scripts

You must be able to understand the purpose and use the content of different pre-production documents

Camera, Lighting and Sound BOP206 / 2011

"This is the Place"

1. TITP GRAPHIC /

TITLES / GRAMS

2. CAM 3 /
M.L. 2-SH
PRES 2 L.O.F.
PRES 1 R.O.F.

PRESENTER 1:
Hello and welcome to "This is the Place".

PRESENTER 2:
This is the show where each week we visit a productive location of interest and today we are here at Ravensbourne – a media college and 'digital destination' just opposite the O2 in North Greenwich, London.

PRES 1:
Ravensbourne sports a Faculty of Fashion and offers studies to MA level but this afternoon we are focusing on Communication Media - more usually called Broadcasting.

3. CAM 2 /
W.S. PRESENTERS R.O.F. AT TOP OF SHOT
PAN LEFT TO INCLUDE CAMERA 1 WITH PRESENTER'S WALK

And we start our walkabout in this the jewel of Broadcasting, the Ravensbourne TV studio. (TURNS) This brand new facility is fully equipped with 5 HD cameras and is State-of-the-Art - in both the specification of its installed kit and the suitability of its building design.

4. CAM 1 /
STUDIO WALL DETAIL AS DIR.

In fact without detailed planning in sound insulation for instance, no studio would be able to co-exist in this an otherwise quiet college of study.

5. CAM 2 /
M.S. PRES

So, let's look at the studio fundamentals. The studio's lighting 'grid' is way up there at over 4 metres high - that's over 13 feet and here you'll find numerous

Page 1 of 11

Scripts

A script is a piece of written work that can be for a movie, audio, audio-visual product or screenplay. It is often that starting point for any of these products and includes information about the media product in a style and format that follows some layout conventions. It is often used by a number of different people involved in the actual production, who will analyse the script and break it down into sections with information that is needed.

Screenplay scripts are created by the writer and presented in a standard format.

They are distributed by agencies or producers to attract talent and finance for production projects. Alternatively, a writer might be employed to adapt an existing novel or event into a screenplay or stage play script.

Year 10 –iMedia—Scripts

You must be able to understand the purpose and use the content of different pre-production documents

Purpose:

⇒ To identify the location where the action takes place

⇒ To identify who will be in the scene, e.g. actors, narrative

⇒ To provide stage direction for actors and production crew

⇒ To provide dialogue (i.e. speech) for the actors and other characters

Uses:

⇒ Any moving product with dialogue (spoken words), actions and a timeline, for example:

- ◊ Video products, e.g. advertisements, films
- ◊ Audio products, e.g. advertisements, jingles, radio plays
- ◊ Animation products, e.g. short films
- ◊ Computer game with short story-telling scene or interactions between game characters

Content:

⇒ Set or locations where the action takes place

⇒ Scene descriptions

⇒ Scene/stage directions, i.e. what happens in the scene

⇒ Camera shot types

⇒ Sounds and sound effects

⇒ Names of actors or characters

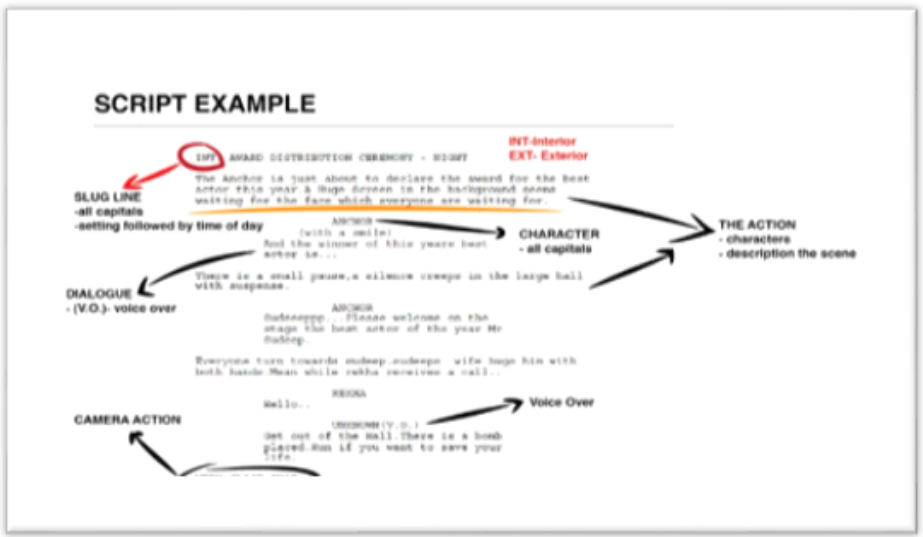
⇒ Dialogue, e.g. speech and how it is spoken

Keywords:

Narrator: A person that tells the story verbally. The narrator voice will be heard over the action, but the narrator does not appear in the scenes or take part in the acting. Typically a narrator is employed in a screenplay or an audio-visual product.

Dialogue: The combination of what is spoken by a character in the scene together with how they say it, that is , identifying any emotion, factual expression, e.t.c.

Voiceover: The words spoken by an unseen person to accompany an audio or audio-visual product. Often used in radio adverts and jingles.



Year 10—iMedia—Storyboards

You must be able to understand the purpose and use the content of different pre-production documents

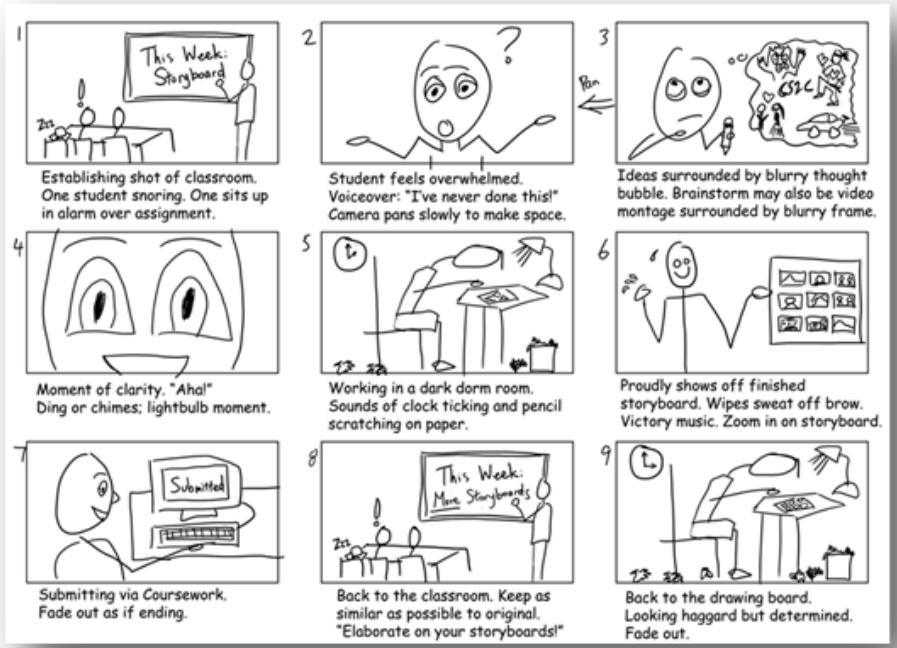
Storyboards

⇒ A storyboard is used by many people to illustrate a sequence of ***moving*** images.

⇒ A storyboard shows the flow of scenes that occur in a timeline, a succession of events.

⇒ This is different to a visualisation diagram which are used for a single of events.

⇒ Each scene of the story is placed in chronological order (in the order



Why use storyboards?

Best way to share your vision for the project

⇒ A visual aid makes it much easier for you to share and explain your vision for your video with others.

⇒ When you have a storyboard, you can show people exactly how your video is going to be mapped out and what it will look like. This makes it much easier for other people to understand your idea.

Makes production much easier

⇒ When you storyboard a video you're setting up a plan for production, including all the shots you'll need, the order that they'll be laid out, and how the visuals will interact with the script.

⇒ The storyboard is a starting point or suggested storyline around which you can plan your story (all the angles you will shoot of a scene). This really comes in handy when you're making your video, as it ensures you won't forget any scenes and helps you piece together the video according to your vision.

Saves you time

⇒ While it may take you a little while to put your storyboard together, in the long run it will save you time in revisions later.

⇒ Not only will it help you explain your vision to your team, it will also make the creation process go more smoothly.

Year 10—iMedia—Storyboards

You must be able to understand the purpose and use the content of different pre-production documents

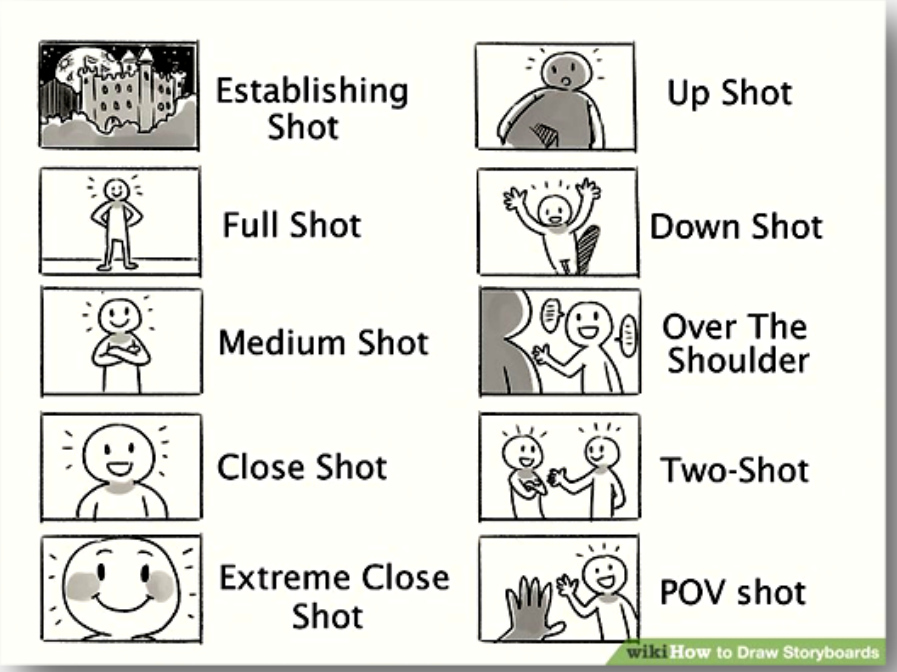
Storyboard and camera angles

⇒ The storyboard could be used by several people who could be involved in the production process.

⇒ Camera shots a angles are important aspects to a storyboard

⇒ The camera operator or animator will use the storyboard to decide how to create each scene.

⇒ Each scene is usually defined by changes to the camera use for each shot.



Purpose of a storyboard

⇒ To provide a visual representation of how a media project will look along a timeline

⇒ To provide a graphical representation of wat a sequence of movements will look like

⇒ To provide guidance on what scenes to film or create

⇒ To provide guidance on how to edit the scenes into a story

Uses of a storyboard

⇒ Any project where movement or a sequence is required, especially along a time-line, for example

- ◊ Video projects
- ◊ Digital animations
- ◊ Comic books to illustrate the story
- ◊ Computer games, to illustrate game flow, narrative or story
- ◊ Multimedia projects, to illustrate the sequence between scenes

Content of a storyboard

⇒ Images, for content of each scene

⇒ Locations

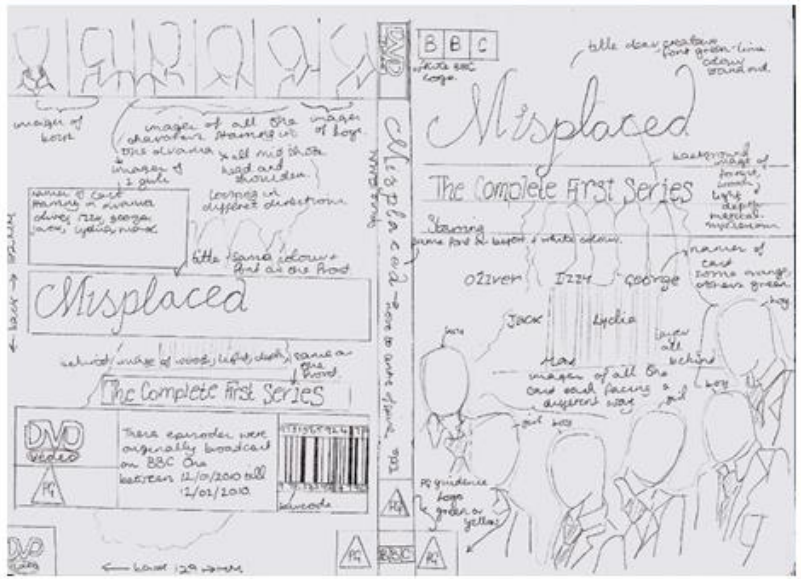
⇒ Camera shot type and angles

⇒ Cameral movement

⇒ Shot length and timings

Year 10 –iMedia—Visualisation Diagrams

You must be able to understand the purpose and use the content of different pre-production documents



Visualisation Diagrams

Visualisation diagrams are a rough drawing or sketch of what the final static image product is intended to look like. They will have annotations to describe the design ideas. Typically, a visualisation diagram is hand drawn, but it does not need any artistic skills to communicate ideas.

It is intended to demonstrate the layout and content of the product that is being illustrated

You might produce several drafts to demonstrate ideas to your client. Your client might choose the draft they like the most. There must be sufficient information in the visualisation diagram for the client to make a decision about their preferred design.

Visualisation diagrams are valid for static designs, that is an image that does not move. It is, therefore, relevant for designs such as a magazine cover, a DVD cover, or an image for a website. It would not be suitable for a video or an animation.

Look closely at the detail in the example visualisation diagram. Compare the concepts in the visualisation diagram and compare them to the final product that was produced. Do you notice the similarities and the differences.

Notice how the visualisation diagram was not modified as ideas developed in the pro-

Purpose:

- ⇒ Plan the layout of a static or still image in a visual manner
- ⇒ To show how a finished item might look like

Uses :

- ⇒ CD/DVD cover design
- ⇒ Poster, such as for a film, event, leaflet or advertisement
- ⇒ A single game scene of display of a single scene
- ⇒ Comic book page layout
- ⇒ Web page layout
- ⇒ Magazine front cover

Content:

- ⇒ Multiple images, layout and positions of items.
- ⇒ Colours and colour schemes
- ⇒ Position and styles of text
- ⇒ Fonts, font colours and size
- ⇒ Notes as annotations which provide

Year 10 - 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

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.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 Files sizes can be large wit many elements
.PDF (vector)	Widely supported by many devices Free to view PDF files Small file size	Not free to edit PDF files Text 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.

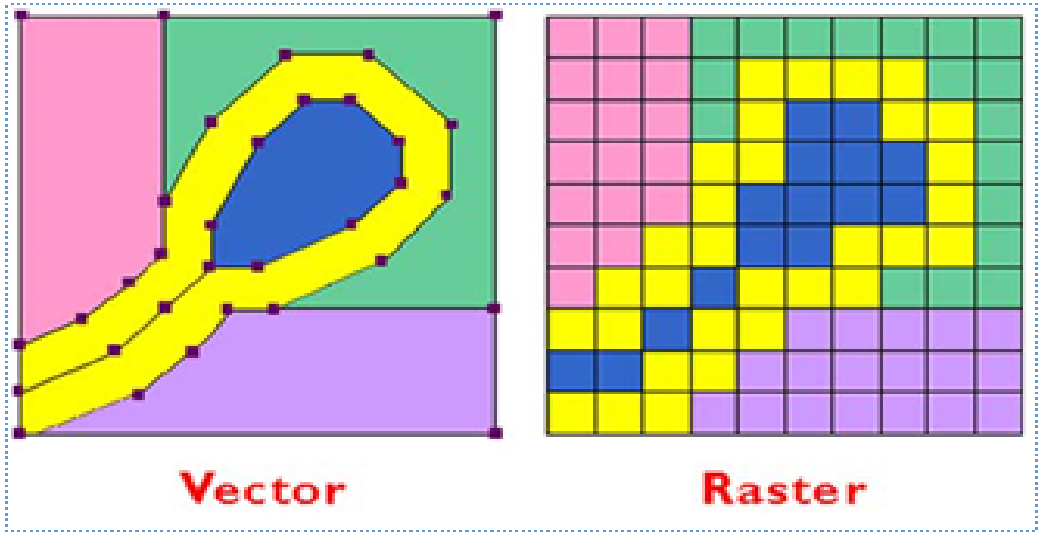
File size compression

Lossy compression

- 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

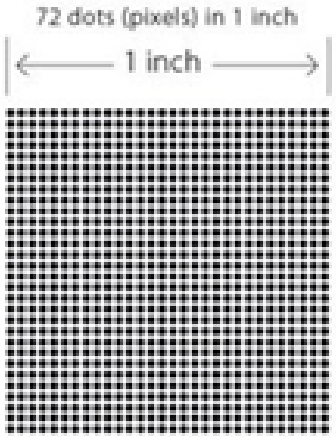
Lossless compression

- 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



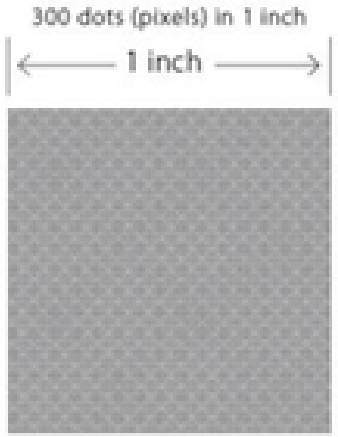
Year 10 - iMedia (ICT) - LO1

You must know file formats used for audio, video and images and to describe their features



72 dpi

72 dots per-inch



300 dpi

300 dots per-inch

Image Resolution	
Pixel dimensions	The density of pixels in an image. Normally stated as the number pixels on the horizontal and vertical axis of an image, for example HD TV is 1280 pixels wide and 720 high (1280 x 720 = 921,600 pixels = 0.92 megapixels).
DPI resolution	Dots Per Inch. How many pixels occur across one inch (2.54 cm) DPI usually refers to printed media.
PPI resolution	Pixels Per Inch. How many pixels occur across one inch (2.54 cm) DPI usually refers to screen media.
Typical resolutions	Print media typically uses 300 dpi Web media is typically 72 ppi

Question:

A monitor is 20 inches wide and it has a resolution of 1024 x 720. What is the monitors dpi?

Answer:

DPI = dots per inch = dots /inch

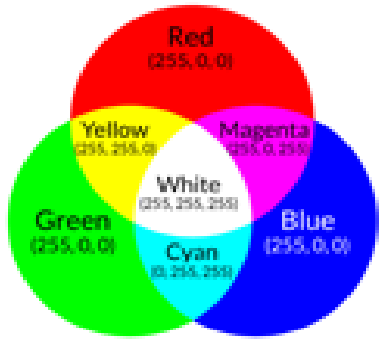
DPI = resolution / width

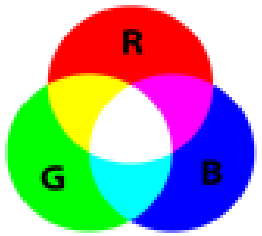
DPI = 1024/20 = **51.2 dpi**

Each pixel for a computer to TV screen is made from three values for Red, Green and Blue to determine how bright each colour is.

- R = 0 to 255 (255 is the maximum intensity)
- G = 0 to 255 (255 is the maximum intensity)
- B = 0 to 255 (255 is the maximum intensity)

These three **colour channels** are 8-bit values to determine **colour depth**.





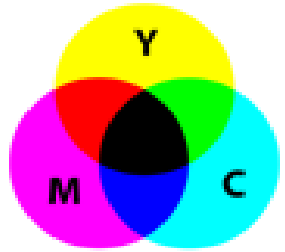
Images are represented **pixels** (**P**icture **El**ements).

TVs and monitors produce pixel colours using Red, Green and Blue light (**RGB**)

All screen colours can be produced just from RGB

Printed media pixel colours are produced from Cyan, Magenta and Yellow ink (**CMY**).

It is very difficult to colour match between CMY and RGB



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 are 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 creates multimedia is typically different to that which is need 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 that 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 hardware, software and peripherals required to create and view multimedia.

Peripheral Devices

A peripheral device is something that can be added to a computer that has a specific purpose. Its purpose will be to add additional **functionality** or to aid a computer system with a specific task.

Peripheral devices are typically hardware systems that are considered to be **auxiliary** (provides help or support) to a system, for examples, a multimedia computer.

Peripheral devices can be input devices, output devices or a combination of output and input devices known as hybrid devices.

Multi function devices are examples of hybrid peripheral devices. They are not just printers because they are also have scanners built into them. A scanner is used to create a digital image of a document or photograph which can be then edited in multimedia software. Many will be able to produce photographic quality prints.

A peripheral device is essentially any device that can be unplugged from a computer system, such as; mice, cameras, speakers, video cameras, microphones or keyboards. These provide a specific purpose, they are generally easy to upgrade as technology improves. For example, external hard drives are becoming faster and are increasing in storage capacity.

Examples of Audio Software

Audacity: Free audio editing software. Ideal for creating podcasts.

Adobe Audition: Professional Audio editing for studio broadcast quality music and voice.

Spotify: Streaming audio playback software.

iTunes: Audio file online purchase and playback software

Examples of Video Software

Blender: A free multiplatform video editing software for 3D animation and modelling.

Adobe Premiere Pro: Industry standard professional video editing used for broadcast quality programmes and movies.

Final Cut Pro: Apple Mac professional video editing software.

iMovie: Apples consumer video editing software that is available iPhone, iPad and Mac

Examples of Image Software

Adobe Photoshop: Leading software for editing and creation of bitmap images.

Adobe Lightroom: Leading software for developing digital photographs.

Capture One: Professional photographer image capture and editing of large digital photographs.

Adobe Illustrator: Leading software for editing and creation of vector images.

Note: There are many other examples of multimedia software used for a variety of purposes, whether animation, editing, creation or viewing.

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	Websites are an interactive multimedia product that can be access 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 thorough 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. 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.
Information Kiosks	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.
Mobile phone applications	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 a different layouts, GUIs and do not always have the same appearance. Touchscreen technology makes accessibility difficult with visual impairments.
E-learning products	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.

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)	Your 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	•Electronic files/evidence •Written report/presentation
Client requirements	•Written report, presentation, audio commentary
Planning Documents	•Work plan, asset table, visualisation diagram and test plan
Finished product	•An interactive multimedia product.
Review	•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

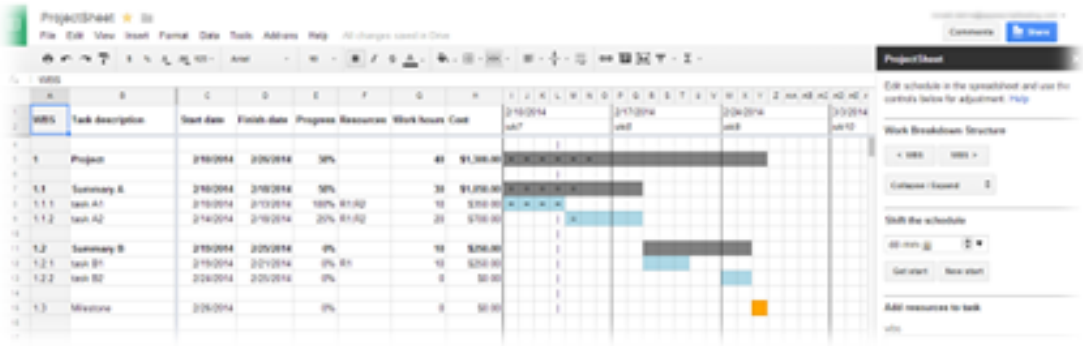
Testing is about identifying areas for improvement and further development with a view to meeting the clients requirements.

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 place 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	flight_info.php	Rendering of arrivals table	Test that table renders as expected for arrivals	Date set: 2nd July 2007 1. Internet Explorer 7.0.6000 2. Mozilla Firefox 2.0.0.6 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

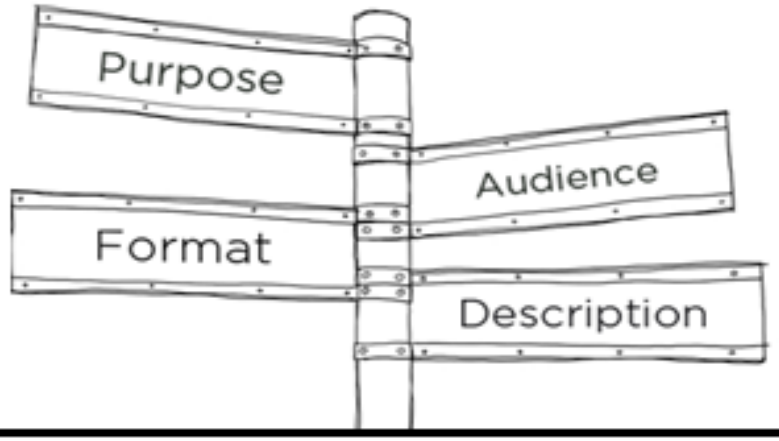
Client Briefs and Work Plans

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 a 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

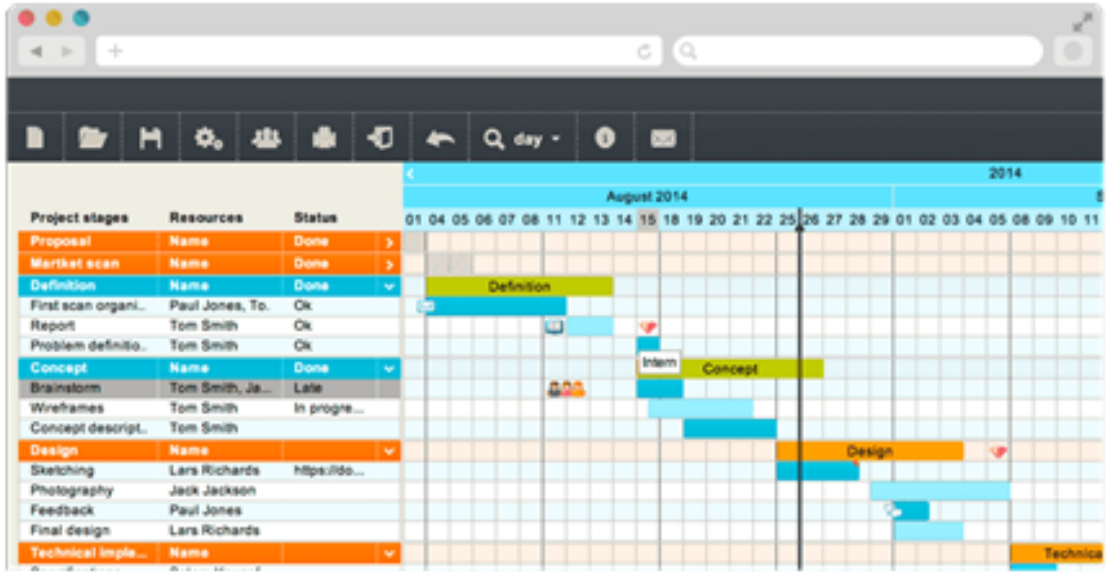
Work Plan

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'?

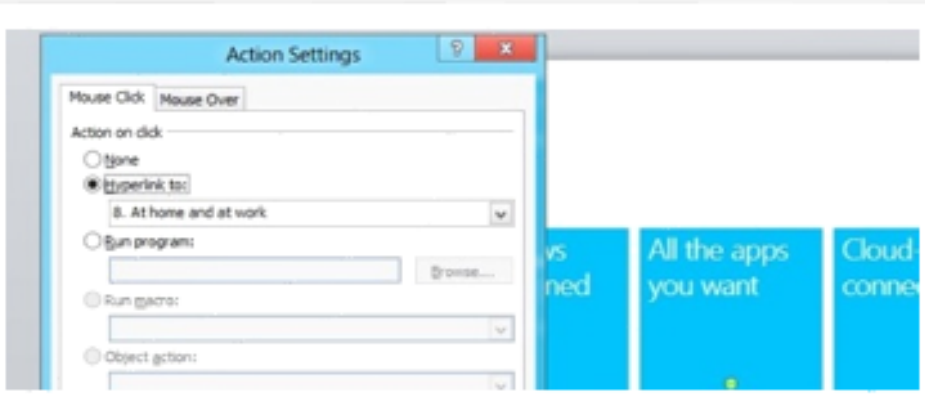
Interactive multimedia is a method of communication in which the program's outputs depend on the user's inputs, and the user's inputs in turn affect the program's outputs. Interactive media engage the user and interact with him or her in a way that non-interactive media do not. Websites, presentations 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.

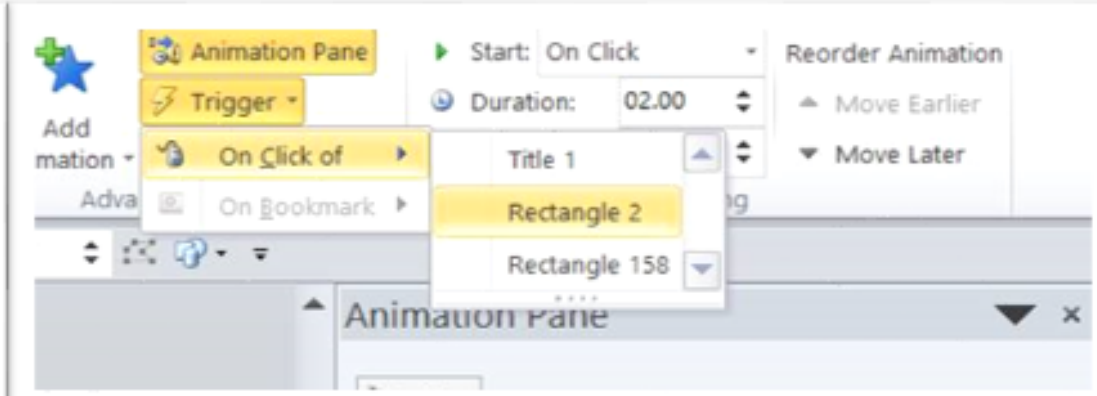
Social networking websites are an example of interactive media. The sites use graphics and text to allow users to share photos and information about themselves, chat and play games. Video games are another type of interactive media. Players use controllers to respond to visual and sound cues on the screen 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;

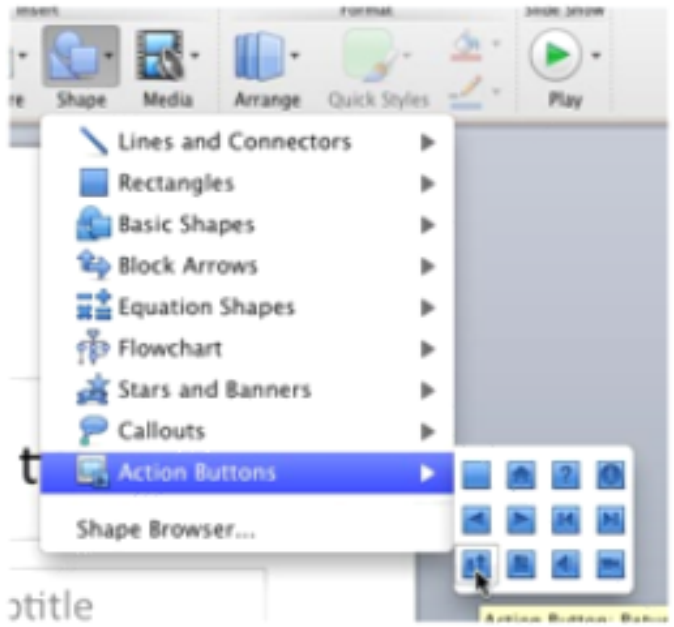
- Using **Master Slides** in presentation software to prepare background and font styles
- Using the **Home Tab** in presentation software to apply fonts to all pages
- Use **Special Effects** icons with added text to create navigation buttons
- Appropriate use of text boxes, images, movie elements and 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:	Constraints:	Requirement:
Evaluating the finished product and assessing the strengths and weaknesses	The limitations or restrictions that have affected the project overall.	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?

Year 10 Child Development KO

Component 1 Learning Aim B: Explore factors that affect growth and development

KEY WORDS for FACTORS	
Physical development	Growth and other physical changes that happen to our body throughout life
Intellectual development	The development of language, memory and thinking skills
Emotional development	The ability to cope with our feelings about ourselves and others
Social development	The ability to form friendships and relationships and to learn to be independent
Cognition/ Cognitive	Acquiring knowledge and understanding though thoughts, experiences and senses.
Communication	Exchanging information through speaking and writing.
Language	The method of human communication
Genes	Inherited characteristics transferred from parents to children
Abnormalities	An abnormal (something unusual or not normal) feature or characteristic
Chromosomes	A threadlike structure inside most living cells that carry genetic information
Foetus	An unborn human.
Spina bifida	A defect in the spine, which causes a gap in the backbone. This causes paralysis of lower limbs and sometimes-learning difficulties.
Substances	An intoxicating and stimulating chemical or drug that causes harm.
Premature	A baby born before the full term of pregnancy.
Mental health	Psychological and emotional well being
Deprivation	A lack or denial of something that is necessary- e.g. food.
Housing need	Considers the households who do not have access to accommodation that meets the normal requirement.
Abuse	Treated cruelly or with violence regularly or repeatedly.
Neglect	Failure to care for someone.
Exploitation	Treating another unfairly to benefit yourself
Mutilation	Inflict serious damage on.
Prescription drugs	Medicine that is only given with a doctor's prescription (recommendation)
Illegal drugs	A drug that is forbidden by the law due to the harm it causes.
Socio economic	Social and economic factors.
Discrimination	Unjust or prejudice treatment of different groups of people based on their age, sex and race.
Social exclusion	Removal from the social system and its rights and privileges due to poverty or belonging to a social group.
Poverty	The state of being extremely poor.

FACTORS AFFECTING GROWTH AND DEVELOPMENT

PHYSICAL FACTORS

BEFORE BIRTH: An effect on the foetus.

Prenatal: based on genetics that are passed on through parents.

Genetic abnormalities can be caused by:

- Maternal nutrition and exercise
- Paternal drug or substance abuse
- Premature/low birth weight
- Mothers mental health

AFTER BIRTH

Health status: chronic or life limiting illness

Diet and dietary deficiency- e.g. not enough calcium

Amount of exercise: not encouraged to eat healthy food, risk of diabetes.

ENVIRONMENTAL FACTORS

Housing:

Living in deprivation or housing needs.

Housing needs- When the local council look at the amount of homeless households, those living in temporary accommodation, and households not big enough for their family.

Home environment:

Living with parental conflict, experiences of abuse and neglect

Exposure to harmful substance:

Drugs, alcohol, smoking, and the effects of this on a child.

SOCIOECONOMIC FACTORS

Discrimination against the child:

Based on their race, social or cultural grounds. For example, what religion they follow, or the groups of individuals they associate with.

Income and poverty:

Unemployed or workless families

Whether they had access to early education services, preschool, nursery.

Poor relationships with significant adults:

Whether they receive warmth and affection from family.

How they respond to significant adults offering support, attention.

Knowledge Organiser | LAB= Learning Aim B: Explore factors that affect growth and development | **Growth and Development** | **Child Development BTEC Technical Award - Component 1**

Key Words

Impact– the effect or influence on something
Development– an acquisition of skills and/or knowledge
Fine motor skills – small precise movements e.g. holding a pencil
Gross motor skills- Using large muscles, balance and coordination
Socioeconomic – the combination of social and economic (money) factors
Environment - a person's immediate surroundings

COMPONENT 1- ASSIGNMENT CRITERIA LAB

P3→ Explain the ways that different factors have affected growth and development in selected case studies
P4→ Explain the impact of physical, environmental and social factors on growth and development in selected case studies
M2→ Compare the impact of physical, environmental and social factors on growth and development in selected case studies
D2→ Assess the impact of physical, environmental and social factors on growth and development in selected case studies

Factors that affect growth and development - PHYSICAL

PRENATAL:
Genetics and genetic abnormalities. E.g. Downs syndrome cause by a chromosomal abnormality
Substance Abuse
Maternal nutrition/Exercise
Premature/low birth weight
Mother's mental health

KEY QUESTIONS FOR ALL FACTORS:
1- What is the factor → Define and Explain
2- How does the factor affect development → Look at positive/negative impact on all areas of development

LAB

ENVIRONMENTAL:

Housing – areas of deprivation or experiencing housing needs
Home environment – parental conflict, abuse and neglect
Effects of exposure to drugs, alcohol and smoking

SOCIOECONOMIC (Social and Economic)

-Experiences of discrimination (social, racial or cultural)
-Income and poverty (unemployed and workless families, access to good early education experiences)
-Poor relationships with significant adults – level of warmth, affection and attention received

Assignment tips:
You need to be able to define and explain each factor.
You also need to be able to explain how the factor can affect each area of development!

Year 10 Health & Social KO - Component 1 Learning Aim B – Life events and types of support

KEY WORDS for LIFE EVENTS	
Life event	A change in an individual's life, which can cause disruption or positive change to their lifestyle and everyday activities
Expected	Something that is **likely** to happen 
Unexpected	Not thought it is likely to happen 
Physical events	Making changes to your physical health, body or mobility.
Relationship changes	A significant change in relationship status such as engagement, marriage, divorce, separation or death.  
Life circumstances	Impacts on day to day life and the choices you make.
Reasoning	The action of thinking about something in a logical and sensible way.
Adapt	To adjust to new conditions or circumstances
Professional	Describes a member of a profession who is trained and skilled in their area of work
Transition	The process of changing from one state or condition to another.
Disposition	An individual's **attitude** or **qualities**
Income	Money received on a regular basis from work.
Long term illness	An illness that cannot be cured by medicine or treatment.
Restriction	A limitation of someone or something.
Responsibility	Being accountable, having control over something or being to blame.
Chronic illness	**Another word for a long term illness.**
Lifestyle	The way in which a person lives
Grief	Intense sorrow, caused by someone's death
Mutual understanding	**A shared feeling or action, in which both people involved have sympathy for.**

Physical life event	Relationship change	Life circumstance
Ill health	Bereavement	Moving house
Accident and Injury	New relationships	Starting or moving school
	Marriage	Exclusion from education
	Divorce	Redundancy
	Parenthood	Retirement

TYPES OF SUPPORT		
Informal support		Informal support is given by anyone who you know **outside of a professional capacity.** This could be **family** and **friends** or those you know well. This will involve the supporter offering security and **practical help,** through **emotional support** and **information and advice.**
Formal support		Formal support is offered by **statutory care services** provided by the government. It could also be from **private care services** and **charitable organizations.**
Emotional support		This involves showing **empathy, compassion** and **genuine care** for others. This can be via informal, formal or voluntary support.
Practical help		This involves helping an individual practically by helping them with finances, childcare or transport issues such as finding alternative transport services.
Information and advice		Involves providing the individual with information to improve their life event or circumstance. This will help them to understand where to go for help? What services are available? How that will benefit them?
Voluntary support		Working for free and offering support, working alongside those providing **informal** and **formal** support. This could involve organisations such as The Princes Trust and Relate.
Occupational therapist		Helping ill and disabled people to continue with daily activities and tasks at ease. This will include shopping, making meals and walking upstairs.
Counsellor		A person trained to give **guidance** on personal or **psychological** problems.
Accident and injury		Something that happens unexpectedly at an abrupt state. This means the individual will have to adjust quickly to their new life circumstance.
Social worker		Assists individuals handle everyday life problems who have experienced **neglect, abuse, mental health** and **domestic violence.**

New relationship:
New relationships develop qualities such as trust, patience and empathy. Having a new relationship will teach individuals about their own qualities, and how equal compromise is important. Having a relationship can take time to adjust to, especially if you have been used to independence. Mutual understanding is highly important when forming new relationships with others.

This can involve intimate relationships and friendships.

Exclusion from education:
Removing a child from education, could eliminate the issues that caused the exclusion, relieving stress and anxiety. However, moving to a new school or educational provision can cause apprehension about new routines and lack of interaction and socialisation. Missing out on valuable learning, can have a negative impact on intellectual development.

Engagement:
Engagement shows commitment to another individual. On acceptance, mutual understanding between both partners is important as they are planning to commit to each other for their remaining life. Engagement will be exciting for both, as planning for a wedding, house and family can be discussed.

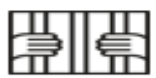
Marriage/Civil partnership:
Marriage/Civil partnership is a joining of two people together. This is a very happy time, as both individuals can forge a new life together, make plans and goals they want to achieve. This could involve starting a family.
Marriage/Civil partnership involves trust, honesty, mutual understanding, respect and empathy.
Couples will need to adapt to living together, changing their lifestyle to suit both partners equally, provides security and safety. It will also involve sexual intimacy.

Divorce/Separation
According to research, divorce is the second life event after death that has the highest emotional impact on an individual. By having strong family ties, support and stability can be offered during the uneasy time of divorce. However, a break down in relationship causes insecurity, which can lead to low self-esteem. With a loss of wider family networks and friendships, social development can be affected.
A positive outcome of divorce, if both people were unhappy, a fresh start could be needed for them to take a new direction in life.

Redundancy
Although this can be devastating, it can be an opportunity for a career change. Losing a job, can have an impact of lifestyle and diet, with a loss of earnings food options and socialising may be limited.

Moving house:
Moving house is an exciting time, it can involve a couple, friends or just the individual. There are opportunities to meet new people and join a new community. However, there can be apprehension moving away from family and friends and starting in a new community of unknown people. There are also pressures from up keeping mortgage fees and household bills.

Imprisonment:
Being imprisoned offers reflection, for the individual to solve issues to change their life. There are options for learning and developing new skills through voluntary roles within the prison. However, a loss of independence and socialisation, will have a negative impact on emotional and social development.



Parenthood:
Parenthood is an exciting time. You are bringing a new life into the world, which involves responsibility, and can cause anxiety especially if there is a single parent. There will be less time for themselves, and more time focused on looking after their child. A change of lifestyle and routine, can cause lack of sleep, adding pressure to the relationship. However, having a child brings positive emotions, excitement and content.

Bereavement:
With an expected death, this can be easier to come to terms with, as emotionally the people around have prepared themselves for death. This doesn't make it easier to get over, as death is a gradual process of coming to terms with. If it is unexpected, this will take longer to come to terms with. It is not about getting over the death, but finding a way to cope with the fact it has happened.

BTEC Performing Arts – Component 1 – Exploring the Performing Arts- Learning Aim A

Practitioner	Style	Key Stylistic Features
Bertolt Brecht	Epic Theatre	**Alienation:** Using sing, placards, pitch and pace to make the audience distance from the action on stage. **Gestus:** To give a character a clear and over exaggerated gesture they must use when they come on stage **Political themes:** Brecht wanted the audience to think about the corruption of the world they live in.
Frantic Assembly	Physical theatre	**Chair Duets**: Using two chairs create a continuous string of movements. Add emotion. Add pace to speed up or slow down sections. **Hymn Hands:** Use hands to mirror what your partner is doing– or grab the hands or shoulders for effect. **Round-by-through:** Moving around the body. Go through another actors' arms to create a spiral effect.
Jerome Robbins	Book Musical	**Allegory for Romeo and Juliet:** based on this story- however focusses on the love of a Jew and a Catholic **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 **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.

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.

Director	To have a vision for the production. To be in charge of telling actors where to go and what to do To tell the other role holder on the production what they need to do to bring your vision to life.
Choreographer	To design the movement for the show. To teach the movement to the actors/ dancers To the liaise with the director about their vision
Costume designer	To design the costumes for the actors. To take accurate measurements or the actors. To liaise with the director and ensure that costumes are in line with the setting and time of the production.
Set designer	To design the set for the show. To build and paint any set required. To liaise with the director about the context and vision of the show.

BTEC Performing Arts – Component 2 – Developing Skills and Techniques in the Performing Arts

Steps to a good monologue or duologue.

Choose your monologue.
Can I play this character?
Can I use **characterisation**?
Is it 3-5 minutes?

↓

Choose a style to perform in.
Naturalism, Epic, Physical Theatre

↓

Take notes in workshop lessons to add specific techniques to your performance.

Use **Line Memory Recall** to learn your lines

↓

Take on feedback from teachers and keep a verbal feedback log to help with this.

Practice performing to peers and family.

Steps to use Line Memory Recall.

Start with the first line. While looking at it, repeat it ten times.

Cover up the line and attempt to say it without looking. If correct, move to next step. If wrong, start again.

Then add the second line. Say it ten times while looking at it.

Cover up the line and attempt to say it without looking. If correct, move to next step. If wrong, start again.

Repeat until all lines are memorised.

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.

BTEC Performing Arts – Component 3 – Responding to brief

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
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.
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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.

DT Knowledge Organiser: Year 10

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

Click to add text

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.

DT Knowledge Organiser: Year 10

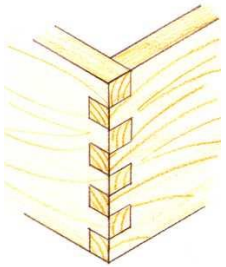
ORMISTON SWB ACADEMY

Timbers

Softwoods:
- Coniferous trees
- Pale in Colour
- Soft/Easy to Cut
- Used for Furniture and Construction Trade
- More sustainable

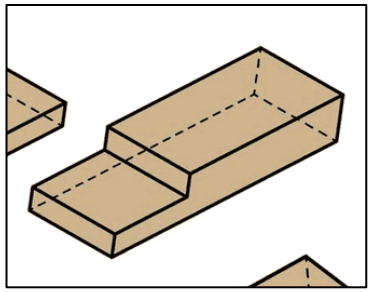
Hardwoods:
- Deciduous trees
- Durable
- Hard to shape and cut
- Long time to Mature
- Furniture
- Some are rare to find

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



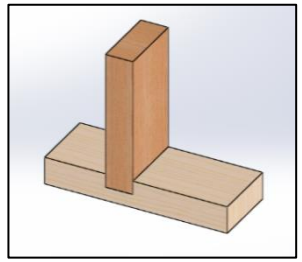
Finger Joint

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.

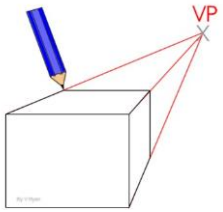
Thermo-Setting Plastics: A plastic that once set it cant be remoulded as it has a very rigid structure once set. If heated it will become flammable.

DT Knowledge Organiser: Year 10

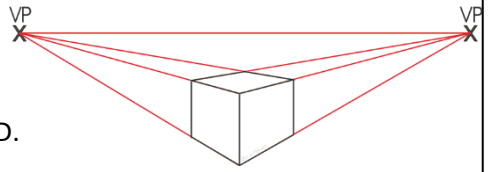
3d Drawing Techniques

3D drawings are used to present ideas so clients are able to understand features more clearly.

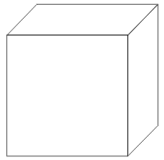
One-Point Perspective:
- Uses one vanishing point
- Used for Room interiors
- Front surface 2D and flat



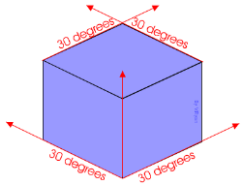
Two-Point Perspective:
- Uses two vanishing points
- Connected by a horizontal line
- Used for developing ideas in 3D.



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 be 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

BTEC Engineering Component 3 Learning Aim A (Year 10 Spring)

Production plan

Stage	Description	Material	Tools and equipment
1.	Check the aluminium is the right size	Aluminum	Ruler and drawing equipment

Try to describe stages in detail

Give information about the materials

List all of the equipment needed at each stage

Following a plan: When you follow a plan you should:

Collect all the tools, materials and equipment listed in the plan

Follow the plan exactly as it is written

Make notes if there are any stages that are difficult to follow

- **Improving a plan**

- Simplifying the task.
- Removing unnecessary stages of the process.
- Reducing the number of tools and/or components that are needed.
- Reducing the number of machines that are to be used

Prototyping

Prototyping is an important part of the development of most products, not just those in engineering.
Some products are only ever produced in prototype form, as only one is needed.
The main reason for prototyping is to prevent expensive mistakes from happening.
The use of prototypes allows an engineer to find any faults and problems with a design before it is made on a large scale.

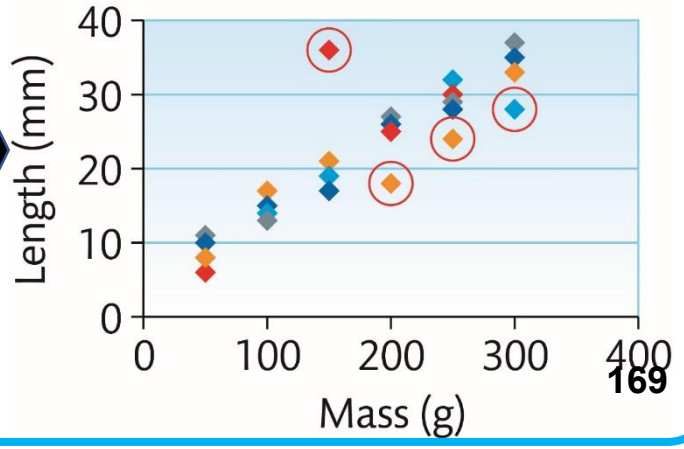
Prototypes can be:
physical models
computer simulations

Using gauges

The go/no-go gauge is used for checking the diameter of holes.
The 'go' gauge, coloured green, must be able to fit through the hole.
If the 'go' gauge does not fit, the hole is too small.

Anomalous results

An anomalous result is one that does not fit in with the expected pattern or trend



BTEC Engineering Component 3 Learning Aim A (Year 10 Spring)

Measuring and recording data

- **Accuracy** – is the data recorded correctly?
- **Precision** – how is the data divided into categories/groups?
- **Units** – what unit is appropriate for measurements?

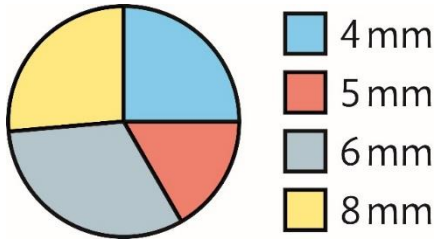
Collecting data

Data can be collected in lots of ways, including tally charts

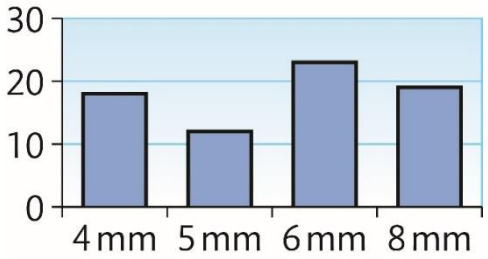
Diameter of screw (mm)	Tally	Total
4	𝍸 𝍸 𝍸 III	18
5	𝍸 𝍸 II	12
6	𝍸 𝍸 𝍸 𝍸 III	23
8	𝍸 𝍸 𝍸 IIII	19

Displaying data using charts and graphs

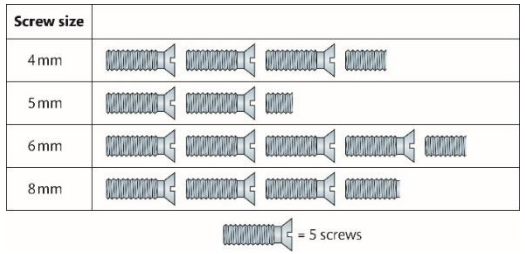
Different types of chart can be used to show the same information.



Pie chart

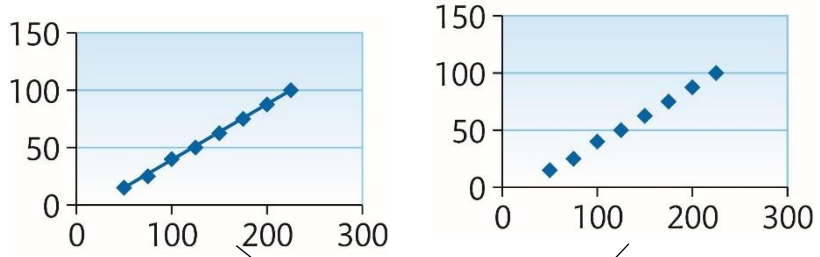


Bar chart



Pictograph

Graphs can also be used to represent data



Each graph represents the same data from an investigation

Displaying data using scatter graphs

Data can often:
be sorted into groups
follow a pattern.
Sometimes when we carry out investigations into how a material or component reacts to different conditions, the results cannot usually be grouped, or presented as perfect straight-line graphs.
In these cases, we will need to produce a scatter graph.
Make sure you record all of the values accurately when you plot them on the graph.

Year 10 Hospitality & Catering KO - LO2 – Understand how hospitality and catering provisions operate

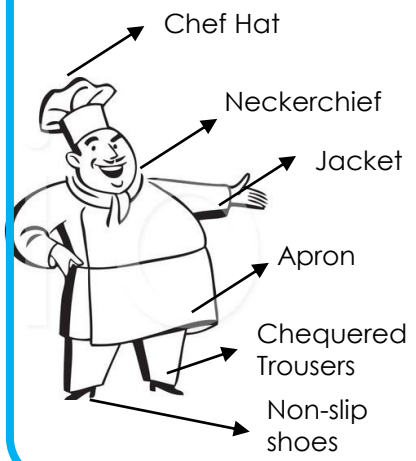
Kitchen Workflow

1. Delivery
2. Storage
3. Food preparation
4. Cooking
5. Holding
6. Food service
7. Wash up
8. Waste disposal

Types of Documentation

- ❑ Temperature charts (fridge, freezer)
- ❑ Time sheets (staff working hours)
- ❑ Accident report form (to log first aid/accidents)
- ❑ Equipment fault reports

Kitchen Dress Code (PPE)



Small Equipment

Large Equipment

All large scale equipment such as a floor standing mixer, walk in fridge/ freezer and a large oven must be:

- Turned off before cleaning
- Use correct cleaning materials
- Any attachments should be stored correctly
- If equipment is not working correctly it must be reported
- Ensure there is no food left on the equipment as it will contaminate future use

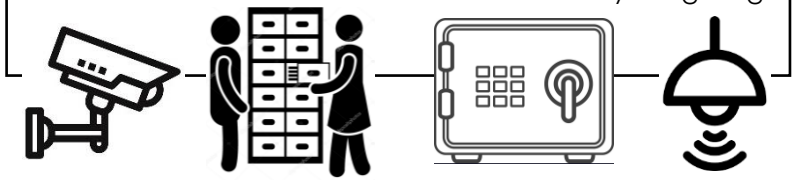
Types of Customer

Leisure	Local Residents	Business/ Corporate
Customers who visit the establishments in their leisure time e.g. a meal with friends, a family day out, tourists.	Customers who live in the local area who visit the establishment often e.g. regular Sunday lunch	E.g. business lunches. Use business facilities in establishment for meetings or presentations, courses and conferences

Safety and Security

All businesses should carry out a regular health and safety risk assessment. This involves looking at your business and identifying potential hazards that may affect staff or members of the public. Your risk assessment should tell you whether you are doing enough to mitigate these risks. Ways to achieve this is through:

CCTV | Staff Lockers | Safes for Money | Lighting



Customer Rights

- ❖ The right to be protected (against hazardous goods)
- ❖ The right to be informed (quality, quantity, allergies)
- ❖ The right to have their complaints be heard
- ❖ The right to seek compensation
- ❖ The right to receive satisfactory goods that match their product description

Good Customer Service

- ✓ Respectful and polite
- ✓ Helpful and attentive
- ✓ Smart and professional
- ✓ Friendly
- ✓ Patient
- ✓ Deals with customer problems effectively
- ✓ Knowledgeable
- ✓ Makes the customer feel welcome, to want to return.

Keyword	Definition
Perishable Foods	Foods with a short shelf life such as meat, fish and dairy
Staple Foods	Foods with a longer shelf life such as canned products
Stock Control	Using the First In First Out (FIFO) rule to rotate food stock
Consumer Rights Act 2015	A legal **right** to reject goods that are of unsatisfactory quality, unfit for purpose or not as described
Food Safety Act 1990	Businesses do not include, remove or treat **food** in any way that would be damaging to the health of people.
Equality Act 2010	All must be treated equally regard to age, gender, race...
Disability Discrimination Act 2010	Unlawful to discriminate against mental and physical disabilities

Year 10 Hospitality & Catering KO - LO3 – Understand how hospitality and catering provision meets health and safety requirements

HASAWA

- ❑ All employers must take care of their own health and safety and not endanger others.
- ❑ The HSE exists to protect peoples health and safety by ensuring risks are properly controlled.
- ❑ HASWA also protects employees from risks to their health and safety arising out of the activities of people at work.
- ❑ The law applies to everyone at work and anyone can be prosecuted if they do not act safely.

RIDDOR

- ❑ The law requires employers and other people in control of work premises (known as the 'responsible person') to report to the Health and Safety Executive (HSE) and keep records of the following:
- ✓ Work related fatalities
- ✓ Work related accidents causing certain serious injuries
- ✓ Certain work related diagnosed occupational diseases such as severe cramp of the hand due to work related issues

COSHH

- ❑ These Regulations require employers to control exposure to hazardous substances to prevent ill health.
- ❑ Substances covered by COSHH:
- ✓ Chemicals including cleaning chemicals
- ✓ Micro-organisms
- ✓ Dusts
- ✓ Medicines, pesticides, gases
- ❑ COSHH Symbols:

Toxic

Oxidising

Gas under pressure

Reproductive Toxic

PPE

- ❑ The Food Safety (General Food Hygiene) Regulations 1995 require every person working in a food handling area to wear suitable, clean, and (where appropriate) protective clothing.

MHR

- ❑ Any transporting or supporting of a load by hand or bodily force
- ❑ Lifting, putting down, pushing, pulling, carrying or moving

Risk Assessment

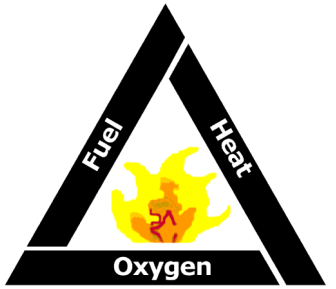
- ❑ Five steps to assessing risks:
1. Identify the hazard.
2. Decide who might be harmed and how.
3. Evaluate the risk.
4. Record the findings and implement them.
5. Review the assessment and update if necessary

Risk/Hazard	Location	Who is at risk? (Employer, Employee, Supplier, Customer).	Level of risk.
Incorrect storage of food.	Kitchen	Customer	High
Faulty Wiring	Bedroom	Employee, Customer.	High

Main Injury Types

Burns	Cuts
Strains	Slips, trips, falls

Fire Safety



Keyword	Definition
HASAWA	Health and Safety at Work Act
HSE	Health and Safety Executive
RIDDOR	Reporting of Injuries, Diseases and Dangerous Occurrences Regulations
COSHH	Control of Substances Hazardous to Health
PPE	Personal Protective Equipment
MHR	Manual Handling Regulations
Provision	An establishment that provides food and drink

Year 10 – Geography – Resource Management

Types of Resources

- Abiotic: found from things that can't reproduce. E.g.: soil, water.
- Biotic: found from things that can reproduce. E.g. animals and plants.
- Non – renewable: resources that either cannot be remade or would take millions of years to make again. E.g.: fossil fuels.
- Renewable: resources than can be used again and again or re-created in a short amount of time. E.g.: wind, solar, hydro electric power.



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 the USA, Iraq, and the 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.
- The USA is eating up the most calories. This leads to undernourishment in other countries.

Exploitation of Natural Resources

- Overfishing – taking too many fish can reduce populations and affect the food chain.
- Mineral Extraction – extracting minerals can lead to the destruction of the natural environment.
- Deforestation – trees are cut for timber, to clear room for cattle farming and to grow palm oil plantations.


Why are we using more resources?

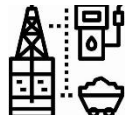
- People are richer and can afford more cars.
- Increasing population requires more space
- People are buying more technology.
- All of this means we need to build/make more which takes up resources.
- We need to manage our energy consumption and become more sustainable as fossil fuels are running out and we're contributing to global warming.


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 their 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.



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 (open cast mining)

Nuclear Power Plants

Advantages

- ✓ Produce electricity all year round.
- ✓ Produces huge amounts of electricity.
- ✓ Produce less carbon dioxide than fossil fuels.

Disadvantages

- Most expensive to build (high technology)
- Radiation spillages can be dangerous

Keyword	Definition
Abiotic resources	Resources obtained from lithosphere, atmosphere, hydrosphere (e.g.: soil/sunlight/fresh water/minerals)
Biotic resources	Resources obtained from the biosphere which are capable of reproduction (e.g.: animals, plants, fungi, timber
Carbon footprint	Measurement of all greenhouse gases an individual produces (expressed in kg)
Consumption	The action of using up a resource; what we use
Energy mix	The proportion of different energy sources used in a country
Emissions	Gases released into the air
Feed-in tariffs	A payment made to individuals who generate their own electricity
Fossil Fuels	Energy sources such as coal, oil and natural gas that were formed from the remnants of plants and animals that lived millions of years ago
Fracking	Drilling into the ground using high-pressured water mixture to release gas trapped within the rock
Geothermal energy	Tapping into the underground heat energy in the Earth's crust
Hydro-electric power	The use of fast-flowing water to turn turbines and generate electricity
Lithosphere	Made up of the Earth's crust and mantle
Non-renewable resources	Sources of energy that cannot be 'remade' because it would take millions years
Open-cast	A type of mining that extracts resources from open quarries

Year 10 – Geography – Resource Management

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.

Wind energy – renewable energy

Advantages
- ✓ Does not pollute greenhouse gases.
- ✓ Creates cheap electricity for customers.

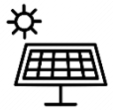
Disadvantages
- Can ruin the look of the landscape.
- Doesn't work when it isn't windy.
- Can be expensive to build.

Hydro-Electric Power (HEP) – renewable energy

Advantages
- ✓ Does not pollute greenhouse gases.
- ✓ Creates cheap electricity for customers.

Disadvantages
- Can be expensive to build.
- Valleys have to be flooded for reservoirs affecting local people and wildlife.

Solar Power– renewable energy



Advantages
- ✓ Does not pollute greenhouse gases.
- ✓ Surplus energy can be stored.
- ✓ Creates cheaper electricity for customers.

Disadvantages
- Expensive to set up
- Can take up a lot of space that could be used for crops

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 Norsee Ost farm. This will increase how much energy is created.

Keyword	Definition
Photovoltaic cells	Used in solar panels to convert light into electricity
Renewable resources	A natural source of energy that will never run out
Shale rock	A type of rock where natural gas (shale gas) can be found
Smart meters	A small computer that tells you how much electricity you are using each hour
Subsistence	Where the resources available provide the basic needs for survival
Surplus	Where there is more supply than demand.
Sustainable	Meeting the needs of today without harming the ability of future generations to meet their needs
Tar sands	A hard form of oil extraction. A mixture of mostly sand, clay, water and oil.
Water scarcity	When water supplies fall below 1000 cubic metres per person in an area.
Water security	The capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water
Water stress	When there is not enough water to meet people's needs (below 1700 cubic metres) but not quite water scarcity.
Water surplus	A situation in which the usable water supply exceeds the demand

Year 10 – History – Early Elizabethan England – Queen, Government and Religion 1558-1569

The situation of Elizabeth's accession

- It was considered unnatural for women to rule
- Elizabeth was highly educated, charismatic but sometimes indecisive
- She was head of the government and made the decisions
- She needed the privy council, parliament, lord lieutenants and JPs to rule effectively
- She faced threats from Scotland, France and Spain
- Catholic wanted Mary Queen of Scots to rule England
- The monarch decided the religion of England

The 'settlement' of religion

- Elizabeth was a Protestant queen but England was a not an entirely Protestant country
- More Protestant areas were London, the South East and East Anglia whereas Catholicism was strong in the North of England
- The religious settlement came in 3 parts – the Act of Supremacy, the Act of Uniformity and the Royal Injunctions
- In some places the changing of the religious settlement was slow
- There was some monitoring of religion but Elizabeth did not want it to be too harsh
- Elizabeth wanted a middle ground for religion

Challenges to the religious settlement

- Challenges came from home and abroad
- The Catholic threat was limited until 1569
- Puritans challenged the use of crucifixes and vestments
- Elizabeth sent troops and money to support Protestants in Scotland (1560) and France (1562) but not the Dutch (1566)
- Relations with Spain became worse after the Dutch Revolt
- The Dutch Revolt caused concern as Spain sent the army to crush the rebellion
- Elizabeth ordered the plundering of Spanish ships to make it hard for them to remain in the Netherlands

The problem of Mary Queen of Scots

- Mary Queen of Scots (second cousin) is **not** Mary I (Elizabeth's sister)
- Mary Queen of Scots was a Catholic
- Mary Queen of Scots arrival in England was a huge problem
- Mary had a strong claim to the throne after Elizabeth
- Mary became the focus at court due to a plot to marry the Duke of Norfolk in 1569
- This plot was developed into a rebellion by English earls
- Elizabeth did not want to take action against Mary
- From 1568 Mary was kept in captivity

Year 10 – History – Early Elizabethan England – Queen, Government and Religion 1558-1569

Key Word	Definition
Catholic	The Pope was in charge of the Catholic Church. It had lots of colour and decoration inside, clergy were not allowed to marry, they had the mass and Bible in Latin
Protestant	Elizabeth I was in charge of the Protestant church. Churches were plainer, priests' clothes (vestments) were plainer, they had services/ Communion and the bible in English
Puritan	Extreme Protestants who wanted to purify the protestant church of anything Catholic that remained and make a simpler church.
Act of Uniformity	Said what Prayer Book had to be used in church each week, that everyone must go to church and punishments and fines for not attending.
Mass	Most important catholic service. The priest performed a miracle and turned bread and wine into the blood and body of Jesus
Protestant Reformation	Changed the church from Catholic with the Pope to Protestant with the Monarch in charge.
Holy Communion	Protestant service /version of Mass where bread and wine are shared with those in church.
Act of Supremacy	Elizabeth is the head of the Church of England as well as the head of State
Nobles	Wealthy and powerful people, with lots of influence and help the monarch run the country.
Gentry	Land owners who were important in running local areas.
Merchants	Normally rich Businessmen in towns.
Yeoman	Farmers who owned land
Crucifix	A cross with a figure of Jesus on it, popular with Catholics
Legitimacy	Being recognised as a royal by being born when the mother and father were married

Year 10 – History – Early Elizabethan England – Challenges to Elizabeth home and abroad 1569-1588

Plots and revolts at home

- The Revolt of the Northern Earls in 1569 was a serious rebellion focused on overthrowing Elizabeth by the Catholics
- Elizabeth was excommunicated in 1570. This caused Catholics to have a divided loyalty between Elizabeth and the Pope
- Plots against Elizabeth were encouraged by the Pope
- There were 3 major plots: Ridolfi (1571), Throckmorton (1583) and Babington (1586) to put Mary Queen of Scots on the throne
- Mary Queen of Scots was executed in 1587
- Plots against Elizabeth failed because of Walsingham's spy network
- Catholic priests were smuggled into England to support Catholics

Relations with Spain

- Relations with Spain worsened between 1569 and 1585
- Elizabeth's foreign policy was defensive – she wanted to avoid war
- The Dutch Revolt led to Spanish armies being sent to the Netherlands. This was seen as a threat to England
- England's support to the Dutch rebels was limited until 1585
- Elizabeth I used her friendship with France and mercenaries to help the Dutch
- Sir Francis Drake angered Spain by making gains in the New World
- Elizabeth frustrated her Privy Council by her hesitation to go war
- In 1584, Elizabeth control meant she could intervene in the Netherlands

The outbreak of war

- Elizabeth promised to help the Dutch and signed the Treaty of Nonsuch in 1585
- England's intervention in the Netherlands was not very successful
- The Earl of Leicester did not have a good relationship with the Dutch nor enough men or resources
- Elizabeth sent Sir Francis Drake to raid the Spanish New World Settlements in 1585
- In 1587, Drake delayed the launching of the Armada (known as the singeing of the King of Spain's beard)

The Armada

- The Armada was the Spanish fleet sent to invade England in 1588
- The English fleet set out from Plymouth and followed to Armada to Calais
- The Armada had problems with supplies and communication
- The English had faster ships that could fire more cannon balls from a greater distance
- The Battle of Gravelines did substantial damage to the Armada
- After Gravelines, the Armada headed North and lost thousands of men in shipwrecks
- The defeat of the Armada boosted Elizabeth and England's profile and Protestantism in Europe

Year 10 – History – Early Elizabethan England – Challenges to Elizabeth home and abroad 1569-1588

Key Word	Definition
Armada	A large fleet of ships from Spain
Excommunicate	Expelling someone from the Roman Catholic Church
Jesuit	A type of priest that came from abroad to convert the English to Catholicism
The Pope	Head of the Catholic Church – lives in Rome
Propaganda	Spreading a one sided message as widely as possible
Recusancy	Deliberate non attendance at Church in Elizabeth's time
Seminary	A type of priest who came from abroad to support English Catholics
Plunder	Attack and steal valuable items from enemy ships
The New World	America and the East – people were beginning to discover these areas
Foreign Policy	Laws that affect relations with other countries
Dutch Revolt	Where the Spanish attack the Netherlands for being Protestant and rebelling against the king
Privy Council	The small group of Elizabeth's most trusted advisors
The Treaty of Nonsuch	A treaty where England promised financial aid to Netherlands to help their rebellion
The Battle of Gravelines	The battle where the English sailed fire ships into the Armada

Year 10 – History – Early Elizabethan England – Elizabethan society in the Age of Exploration 1558-1588

Education and Leisure

- Education expanded during Elizabeth I's reign – however it was mostly boys who received an education
- Most people in the Elizabethan times were illiterate
- There was not much difference in the classroom education of girls and boys but boys were more active outside of the classroom
- Every town had a grammar school by 1577
- Elizabethan past times were similar to modern ones but sport was more violent
- The theatre was very popular and appealed to all classes of people – many new theatres were built
- Protestantism led to many new plays being written

The problem of the poor

- Poverty and vagabondage were seen as a growing problem in Elizabethan England
- The poor were divided into 'idle', 'deserving' and 'impotent'
- Population increase, laws about land (enclosure), disruption to trade and inflation made the issue of poverty worse
- Attitudes changed when unemployment was seen as a genuine issue
- Elizabeth I passed laws to help the poor
- One involved giving people raw materials so they could make goods and sell them
- Vagabonds faced harsh punishment but these were rarely enforced
- There were local initiatives to help the poor too – e.g. Ipswich

Exploration and voyages of discovery

- Trade was the driving force behind exploration
- Another reason was to challenge Spain's position in the New World
- New technology made it possible to undertake longer journeys and increase accuracy of maps and navigation
- The printing press enabled the reproduction of maps, navigation manuals and accounts of exploration
- Drake's circumnavigation of the globe started as a mission to attack Spain and eventually led people to invest in exploration
- Nova Albion encouraged the English to attempt further colonisation of North America

Raleigh and Virginia

- Walter Raleigh attempted to set up a colony in Virginia twice
- These attempts were a failure due to inexperience, the suitability of the colonists and the relationship with the Native Indians
- Conditions in Virginia were harsher than colonists expected
- Many of the 1585 colonists did not co-operate with each other
- The English were very dependant on the Native Indians in Virginia in order to survive
- The local chief – Wingina did not trust the English and became hostile

Year 10 – History – Early Elizabethan England – Elizabethan society in the Age of Exploration 1558-1588

Key Word	Definition
Colony	Area of land owned by another country where people live
Settlement	Living and establishing a community where people haven't typically lived before
Exploration	Finding and discovering new areas
Vagabondage	Vagrancy, homelessness and wandering without purpose
Bear Baiting	Fight between a chained Bear and dogs
Illiterate	Unable to read or write
Protestantism	The religion of the Church of England that Elizabeth was in charge of
Poverty	The state of being extremely poor
Impotent Poor	Helpless, unable to work
Idle Poor	Those seen as able to work but chose not to
Deserving Poor	Those whose poverty was not their fault and wanted to work
Circumnavigation	The process of sailing all around something – usually the world
Colonist	Someone who lives in a colony

Year 10 – History – Whitechapel 1870-1900 – Crime, policing and the inner city

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

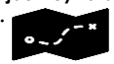
- Failure to catch Jack the Ripper led to criticism of H Division, the Metropolitan police, CID and Scotland Yard
- Police methods were not good enough but often criticism was unfair and did not recognise the problems with solving crimes at this time
- Some of lines of enquiry in 1888 by CID were ahead 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

Year 10 – History – Whitechapel 1870-1900 – Crime, policing and the inner city

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.

PRE Year 10 – Christian Practices: Part 1 – Worship and Festivals

Worship and Festivals

Practice and Key Words	Details/ Contrasting Views		Importance and Quotations
Worship: Act of religious honour or devotion 	**Liturgical** - Takes place in a church and is led by a priest - **Formal**, **set prayers** are read out, and the worship follows a **set pattern and structure** - A more **traditional**, and formal form of worship - E.g. Eucharist in the Catholic Church	**Non-Liturgical** - Also takes place in a church but **less formal** - No set prayers, instead people take turns to preach and read from the **Bible** - Can be modern and appealing to young people - Service is usually focused around a Bible reading - E.g. Methodist or Baptist services	- Shows gratitude, love and respect to God - Could be a way of asking for forgiveness or asking for help - Brings comfort and strength - Gives time for reflection - ***'Sing to the Lord, for he has done glorious things; let this be known to all the world'.***
	Informal - Spontaneous prayers or sharing of thoughts - Community or house churches might meet to eat together and share their faith - Pentecostal Church – 'charismatic' worship. Led by the Holy Spirit and may involve dancing, clapping, calling out, speaking in tongues.	**Private** - Spending time with God alone or with close friends/ family - May involve prayer, meditation, studying the Bible.	
Prayer: Communicating with God 	**Informal** - Prayers that are made up by the individual using **his or her own words**.	**Set Prayers** - Prayers which have been written down and said many times by many people - E.g**. The Lord's Prayer**: The prayer that Jesus taught the disciples to pray, which includes thanks, asking for forgiveness and asking for guidance. ***"Our father who art in heaven…."***.	- Set prayers can bring a sense of unity - Prayer brings comfort and builds relationship with God - ***'Call on me and come and pray to me, and I will listen to you'.***
Sacraments: An outward sign of inward grace. **Eucharist/ Holy Communion** 	**Roman Catholic Church (Mass)** - Readings from the Bible - Offering of bread and wine **brought to the alter** - Priest says the words of Jesus at the Last Supper, says the Lord's Prayer and **gives a sign of peace** - **Congregation come to the alter** to receive the communion	**Orthodox Church (Divine Liturgy)** - Hymns, prayers, readings from Bible. - Priest comes through **Royal Doors** to chant the gospel. - Lord's Prayer said, behind Royal Doors words of Jesus said. - **Bread divided into four** – three consecrated as body and blood and fourth broken into small pieces. **Priest gives bread and wine together on a spoon**.	- Jesus started the tradition at The Last Supper (which took place the day before he died) - Christians now remember Jesus' death – reminds them of Jesus' sacrifice, and reminds them to forgive others. - ***"This is my body which is for you, do this in remembrance of me"***
Sacraments: An outward sign of inward grace **Baptism** 	**Infant Baptism** - Everyone is a descendent of Adam and Eve and therefore carries **Original Sin**. Baptism washes this away. - It also **welcomes them to the church community**. - Infant wears white, Godparents are chosen, font holds the water - E.g. Catholic, Orthodox	**Believer's Baptism (Adult Baptism)** - Some Christians think children are too young to understand the meaning and therefore don't baptise infants. - The person is old enough to understand the meaning behind what they are doing. - This includes a **full immersion** in a pool to wash away sin and start a new life in Jesus. - This is known as being **'born again'** - E.g. Baptist and Pentecostal churches	- Brings a person into the Christian family/ community - Water symbolises the washing away of sins - Jesus was baptised, setting an example for others to follow - Jesus also encouraged baptism in the Great Commission: . ***"Therefore go and make disciples of many nations, baptising them in the name of the father, son and Holy Spirit".***
Pilgrimage: A special religious journey to a holy site. 	**Lourdes (France)** - Dedicated to Mary as Bernadette believed to have seen visions of Mary in the 19th Century. - A spring of water was discovered which had **healing powers**. Now millions of people have been to drink from the spring of water in the hope of being healed.	**Iona (Island off west coast of Scotland)** - Small community set up by St. Columba, an Irish missionary in the 6th Century - Pilgrimages happen there in dedication to the virgin Mary. - The community in Iona hold **daily services in the Church leading a seven mile hike** to holy spots – it is a physical and spiritual challenge	- Pilgrimage shows commitment to God and strengthens faith - People may go on pilgrimage for healing - It brings a sense of community
Festivals: Celebrations for religious reasons  	**Christmas** - Remembers the birth of Jesus – **his incarnation**. - It is celebrated on the 25th December. - Trees and homes are decorated **with nativity scenes**. Lights remember Jesus is the light of the world. **Carol services** happen in Churches with readings from the Bible. Children act out nativity plays and **midnight mass** takes place on Christmas Eve.	**Easter** - Most important festival which celebrates Jesus' resurrection from the dead leading up from holy week. - Jesus was crucified on **Good Friday and rose on Easter Sunday**. - Special services take place and processions led by someone carrying a cross. - On Easter Sunday**, sunrise services** take place with hymns which celebrate the resurrection. **Easter Eggs** are used as a reminder of new life. **Paschal candle** is lit.	- Festivals celebrate the most important events of Jesus' life – his birth, death and resurrection. - They are a time for believers to come together and celebrate their faith. - ***"I bring you glad tidings that today a King is born"*** - ***'Christ is risen from the dead'.***

PRE Year 10 – Christian Practices: Part 2 – The Role of the Church in the Local and Worldwide Community

Key Words

Church: The holy people of God, the body of Christ or a building where Christians worship
Agape: compassionate love
Mission: A calling where an individual or group go out and spread the word of God.
The Great Commission: Jesus instruction to his followers to go and spread his message *"Go and make disciples of many nations"*
Missionary: A person sent on a religious mission to promote Christianity in a different country through preaching or charity work
Evangelism: Spreading the Christian message through preaching the Christian gospels
Alpha course: An example of evangelism –trying to tell others about Christianity
Convert: Someone who has decided to become committed to a religion and change his or her religious belief.
Reconciliation: A sacrament in the Catholic faith, also making up after an argument or disagreement
Persecution: hostility or ill-treatment, because of race or religious or political beliefs.
Poverty: When people live without having basic human rights such as having enough food, water or shelter

The Role of the Church in the Local Community

Food Banks 	- Provide **free food** (usually non-perishable items) to those in need, usually through donations - Some food banks also offer support in seeking employment - Example: The Trussell Trust	The work of food banks and street pastors supports the key Christian message to show love to all. Key words and quotes to support: ***Agape – compassionate love*** ***'Love your neighbour as you love yourself'*** ***'Faith, if not accompanied by action, is dead'*** ***'For I was hungry and you gave me something to eat' (Parable of the Sheep and the Goats)***
Street Pastors 	- Volunteers who patrol streets in urban areas - Do not actively preach but **show their faith through their actions** - Give out flip flops, lollipops and water on nights out, help people to get home safely, offer reassurance and support	

The Role of the Worldwide Church: Reconciliation and Persecution

Working for Reconciliation 	- Jesus came to earth to restore the relationship between humans and God, so Christians believe they have a responsibility **to restore the relationship between themselves and others.** - Lots of examples of arguing between faiths, even within Christianity e.g. **Catholics and Protestants**. Irish Churches Peace Project set up to reconcile these denominations - **Coventry Cathedral** – bombed during WW2. Cathedral has now become a centre for reconciliation as Christians wanted to respond with forgiveness, not revenge.	***'Therefore, if you are offering your gift at the altar and there remember that your brother or sister has something against you, leave your gift there in front of the altar. First go and be reconciled to them; then come and offer your gift'.*** ***'Blessed are the persecuted because of righteousness, for theirs is the Kingdom of Heaven'.*** ***'If one part suffers, every part suffers with it' (St Paul, likening members of the Church to different parts of the body)*** ***'Love your neighbour as you love yourself'*** ***Agape: Compassionate Love***
Responding to Persecution 	- Persecution (ill-treatment) happens all over the world – Christians are tortured or even killed for their faith - Christians have a **responsibility to help those who are persecuted** - They might pray for them, donate to charity or get involved with charities who work abroad. - **The Barnabus Fund**: send financial support, raise awareness for those persecuted, send spiritual and material support.	

Church Growth

Church Growth 	- Estimated to be 2.5 billion Christians in the world - Christians are taught **to help to grow the church** by sharing testimonies (how God has changed their lives), inviting people to meetings, prayer, social events etc.	- ***The Great Commission 'Go and make disciples of all nations, baptising them in the name of the Father, the Son and the Holy Spirit' (Jesus' words before he ascended to heaven).*** - *Example: The Alpha Course. Anyone is welcome to join in with a meal and conversation about the 'Big Questions' of Christianity.*
Mission and Evangelism 	- Evangelism means to **spread the message of Christianity** through preaching the Gospel (which means 'Good News') - Some do this through Mission work, which means evangelism overseas - The aim is to tell people that Jesus is the saviour of the world, in the hope of **converting them** to Christianity.	

The Role of the Worldwide Church: World Poverty

Responding to World Poverty 	- Jesus emphasised helping the poor so Christians follow his example - **Jesus told a rich man to sell everything he had** and give it to the poor. - **Christian Aid**: They aim to stop poverty, encourage sustainable development and provide emergency relief in areas such as Africa and the Middle East. - Their slogan is 'We believe in life before death' - They provide emergency food, shelter, water, sanitation and run a **Christian Aid Week** to fundraise every year.	- ***'If anyone has material possessions and see a brother or sister in need but has no pity on them, how can the love of God be in that person?'*** - ***Parable of the Sheep and the Goats*** - **'Go, sell everything you have and give to the poor, and you will have treasure in heaven. Then come, follow me.'**

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Justified Conclusion: A final decision which is based upon a range of evidence.

Year 10 PRE – Crime and Punishment: Part 1 – Religion, Crime

Reasons for Crime

Cause of Crime	Explanation/ Examples	Christian Responses	Sikh Responses
Poverty and Upbringing 	Some people may commit a crime as they do not have the money for what they need e.g. they may steal to feed their family. Or, they may have been brought up in an environment where crime is normalised or even expected of them.	- Christians may be more sympathetic to those who have committed crimes for these reasons and show compassion: **'Love your neighbour as you love yourself'/ Agape,** **'Blessed are the merciful'** - They would also feel a responsibility to help those in need so that they had no need to steal: **'Faith without actions is dead', 'I was hungry and you gave me something to eat'.** - However, the crime itself is still wrong: **'Do not steal' (10 Commandments)**	- Sikhs would also show some compassion and understanding: **'Show kindness and mercy to all life'** - Sikhs would also feel a responsibility to help, which is why the service of the **langar, an example of sewa**, is so important. There should be no need for people to steal food as the langar is always open.: **'Keep the langar ever open'** - Sikhs emphasise the importance of a strong family network in order to raise children in the right way.
Mental Illness 	Mental illnesses can cause crime; kleptomania is a condition which leads people to steal. Mental illness can lead to anger issues which result in crimes such as assault, and some people feel driven to murder because of their illness.	- Christians would be compassionate towards those with a mental illness as it is not their fault and they are not always consciously committing crimes: **'Love your neighbour as you love yourself'/ Agape** **'Blessed are the merciful'** - However, justice for the victim is still important, so Christians would support an appropriate punishment coupled with medical support.	- Sikhs would also show compassion as the criminal was not in full control of their actions: **'Show kindness and mercy to all life'.** - They would support the criminal getting support and treatment, as well as showing compassion for the victim/ their family.
Addiction 	Addiction means the body cannot cope without a substance e.g. alcohol or drugs. This can lead to crime if the person is not in control e.g. they are drunk. They may behave in ways they wouldn't usually, or they may drive while intoxicated and cause an accident. They may also steal to fund their habit.	- Whilst illegal drugs are unacceptable, most Christians do not forbid drinking alcohol (Quakers do not drink at all). However, drunkenness is not encouraged, and it is a sin in Catholicism. - Addicts would be encouraged to seek support: **'Love your neighbour as you love yourself'/ Agape**	- Sikh teachings forbid the use of alcohol/ illegal drugs as they take the mind away from God, and a person is not able to worship. - Addicts would be encouraged to seek support: **'Show kindness and mercy to all life'**
Greed 	Greed can lead to crime e.g. stealing because you want more money/ possessions	Christians would not at all accept crime for this reason. One of the 10 Commandments says: **'Do not covet'** which means do not be jealous. In the Bible it says: **'you cannot serve both God and money'** and **'The love of money is the root of all evil'**, showing the problems with focusing on material wealth.	Sikhs are encouraged to be **Gurmukh** – God-centered, and to focus their minds on God and not on money/ possessions. **Worldly Attachment** is one of the 5 evils/ barriers to mukti, so crime for this reason is totally unacceptable.
Hate 	Hatred is a negative feeling which can lead to violence/ aggression. It might be based on a prejudice e.g. racism.	This is a totally unacceptable reason for crime as **'Human beings were made in God's image'** so everyone has the right to be treated fairly.	This is a totally unacceptable reason for crime as **'All are made of the same clay'** so all humans should be treated with love and respect.
Opposition to an unjust law 	There are times in history where people have broken the law as they felt the law was unfair, e.g. Rosa Parks refusing to give up her seat in 1950s America. In Britain today, our laws are generally fair but in some countries this is not the case.	- In general, Christians are taught to obey the law: **'Those who refuse to obey the law of the land refuse to obey God'.** - However, if the law was in opposition to Christian beliefs they would perhaps campaign for it to be changed, ideally without breaking the law themselves.	Sikhs have historically protested against laws they felt were unfair or in opposition to their beliefs, e.g. the law on motorcycle helmets. However, they would ideally protest to get the law changed rather than break it.

Types of Crime

Type of Crime	Christian Responses	Sikh Responses
Murder: Deliberately ending someone's life	**'Do not commit murder'** **Sanctity of Life: 'Human beings were made in God's image'**	**Sanctity of Life: 'The Divine Light is within all'**
Theft: Stealing something that does not belong to you	**'Do not steal'**	**Rehat Maryada: (code of conduct) 'No Sikh should gamble or commit theft'**
Hate Crime: Committing a crime based on prejudice e.g. race, age, sexuality	**'Human beings were made in God's image'., 'There is no Jew nor gentile… male nor female, for you are all one in Christ Jesus'**	**'All are made of the same clay', 'We are all sons of the one God, there is no Hindu and no Muslim'.**

Good and Evil Intentions and Action

Christian Views:
- The Bible warns Christians against having evil thoughts which lead to evil actions. Avoiding sin and temptation steers Christians away from crime.
- Christians would be more willing to treat an offender who had good intentions with more mercy than one who acted out of evil intentions.
- Christians do not believe that people are evil but that people can be tempted to do wrong and break the law.
- Many Christians believe that we are born with **'Original Sin'** due to the actions of Adam and Eve, so we are inclined to be tempted and should resist this.

Sikh Views:
- There is no such thing as an evil person but humans do all make mistakes.
- Having good intentions and obeying the law etc helps Sikhs to build bad karma; those who commit evil actions with evil intentions should face justice in this life but will also face punishment in the next life.

Year 10 PRE – Crime and Punishment: Part 2 – Religion and Punishment

Aims of Punishment

Aim	Explanation/ Examples	Christian and Sikh responses
Reformation 	Supports the criminal in **changing their behaviour** for the better. May involve therapy, education, training.	Preferred aim of punishment for Christians and Sikhs: Christian: **'Love your neighbour as you love yourself'/ Agape.** **'Do not take revenge but leave room for God's punishment… do not be overcome by evil but overcome evil with good'.** Sikh: **'Show kindness and mercy to all life',**
Retribution 	Seeking **justice or revenge.** The idea that 'you committed a crime, so you deserve to be punished'.	The Old Testament teaches **'An eye for an eye',** but this really meant that a punishment should be proportionate to the crime. Christians do NOT agree with revenge. Jesus taught to **'Turn the other cheek'** meaning do not retaliate. Sikhs do NOT agree with revenge either: **'If someone hits you, do not hit him back. Go home after kissing his feet'.**
Deterrence 	**Putting people off from committing a crime** – either putting the criminal off from re-offending, or putting society off crime as they see the harsh punishments they could get.	Christians and Sikhs would want criminals to be deterred (put off) from committing crime but NOT in a way that violates their sanctity of life e.g. corporal or capital punishment. Christian: **'Human beings were made in God's image'** Sikh: **'All are made of the same clay'.**

Treatment of Criminals

Type of Punishment	Explanation/ Examples	Strengths and Weaknesses	Christian and Sikh responses
Prison 	A secure building where offenders are kept for a period of time set by a judge	+ Protects society, usually gives opportunity for reformation e.g. counselling, good deterrent - Can lead to poor mental health, many people re-offend as they learn poor behaviour or become comfortable in prison.	Christian: Focus should be on reformation: **'Love your neighbour as you love yourself'/ Agape** Sikh: Focus should be on reformation: **'Show kindness and mercy to all life'.**
Community Service 	An offender contributes to society as a punishment e.g. doing unpaid work in the community	+ Benefits the community, encourages reformation - Some see it as a soft punishment	Christian: Good punishment for minor offences as reformation is encouraged. Encourages **stewardship.** Sikh: Good punishment for minor offences; will build good **karma** and could lead to future acts of **sewa**.
Corporal Punishment 	Punishment of an offender by causing them physical pain e.g. whipping, cutting hands off. Illegal in the UK.	+ Good deterrent, brings justice for the victim/ their family (retribution) - Violates human rights, does not encourage reformation, promotes an attitude of revenge rather than compassion and forgiveness.	Christian: Disagree – violates sanctity of life and is a revenge-seeking punishment: **'Human beings were made in God's image', 'Do not take revenge but leave room for God's punishment'** Sikh: Disagree for same reasons: **'All are made of the same clay', 'If someone hits you, do not hit him back. Go home after kissing his feet'.**
Capital Punishment/ The Death Penalty 	Punishment where an offender is put to death for their crimes e.g. electric chair, hanging, firing squad. Illegal in the UK since the 1960s.	+ Good deterrent, brings justice e.g. if you kill, you deserve to lose your life. Supports **principle of utility**; if it benefits society for one person to lose their life, perhaps it is acceptable. - No going back if you get the wrong person, hypocritical, no chance for reformation, violates human rights.	Christian: Disagree – violates sanctity of life. Does not allow for reformation: **'Human beings were made in God's image', Agape etc.** Sikh: Disagree for same reasons: **'All are made of the same clay', 'Show kindness and mercy to all life', 'If someone hits you…' etc.**

Forgiveness: To show grace and mercy, and pardoning someone for what they have done wrong.

Christian Views

- Forgiveness is at the heart of Jesus' teaching.
- Christians would still agree with justly punishing the criminal, but forgiveness is a key teaching within Christianity.
- On the cross, Jesus said **'Father forgive them, for they know not what they do'.**
- In his life Jesus was also asked how many times people should forgive. He replied: **'Not seven times, but seventy-seven times',** meaning always forgive.
- **'Love your neighbour as you love yourself'/ Agape**
- Gee Walker gives Christians a modern role model on the importance of forgiveness.

Sikh Views

- Forgiveness is a key teaching of Sikhism, closely linked with equality.
- Guru Granth Sahib: **'Where there is forgiveness, there is God'.**
- Forgiveness is not a replacement for punishment; fair punishment is still important but forgiveness can also be given.
- The focus of punishment should always be reformation, which is closely linked with forgiveness.

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Year 10 PRE – Sikh Beliefs: Part 1 – Key Beliefs

The Nature of God: The Mool Mantra

- Opening words of the Guru Granth Sahib (GGS 1a)
- 'Mool Mantra' means 'Main Chant'.
- Sikhs believe the words were the first teachings of Guru Nanak after he became enlightened
- Most important part of the Guru Granth Sahib (GGS) and most important statement for Sikhs
- Said daily in Sikh prayers and recited in worship.

One Universal Creator God (Ik Onkar)
The Name is Truth
Creative Being Personified
No Fear, No Hatred
Image of the Undying
Beyond Birth
Self Existent
By Guru's Grace

God as Creator

- God (Waheguru) created everything.
- There are no creation stories in Sikhism, and Sikhs accept scientific views about how the universe came to be here, but nothing would have happened without it being God's will (hukam).
- Sikhs believe God is both separate from and part of His creation: ***'He possesses all qualities; He transcends all qualities'***

<u>God as separate from the Universe</u>

- 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'***

<u>God shown in and through the Universe</u>

- 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'***

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Year 10 PRE – Sikh Beliefs: Part 2 – Key Beliefs/ Beliefs about the Nature of Life

Key Beliefs Continued

The Stages of Liberation: The 5 Khands

- Stages a human being must pass thorough on the way to mukti.
- Usually will not all happen in one lifetime

1) Piety	- The opportunity for devotion to God, awareness of God.
2) Knowledge	- Knowing about God; learning about and experiencing God
3) Effort	- Devoting oneself to tuning in with God e.g. through prayer, worship, meditation
4) Grace	- Spiritual blessing given by God (as we can only go so far in developing ourselves)
5) Truth	- Finding God, the realisation of God. Can only be experienced, not described.

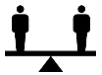
The Barriers to Mukti

- - Sikhs must avoid those things which will stop them from achieving mukti. There are 5 evils (below) bt Sikhs should also guard against:
- **Haumai** (pride and ego)
- Illusion (inability to see the truth; focus on material things)
- Self-centredness (ego, selfishness)

Anger 	- An emotion causing someone to act without balance
Lust 	- Sexual desire – sex outside of marriage leads people away from God: ***'Sexual desire and anger are broken, like a jar of poison'***
Greed 	- A desire to possess more than you need
Worldly Attachment 	- Placing too much emphasis on material possessions and worldly relationships
Pride 	- False pride – being proud of things that were given rather than achieved: ***'Why do you take pride in trivial matters?'***

The Oneness of Humanity

- Guru Nanak, the founder of Sikhism, had an experience where he disappeared into a river for 3 days. During that time, he said he met with God.
- Following this experience, he taught that there was not only one way to God; there is no need to convert others to Sikhism because we can all follow our own path to God.
- Everyone has a divine spark within them which unites us all, and this is known as the **oneness of humanity**.
- ***God is neither Hindu nor Muslim and the path I follow is God's'***
- ***'We are all sons of the one God; there is no Hindu and no Muslim'***
- ***'The Divine Light is within all'***
- This also means that everyone is equal – this was one of Guru Nanak's most important teachings.



The Equality of All
Equality is shown in Sikhism in the following ways:

<u>The life of Guru Nanak</u>

- Had both Hindu and Muslim friends. His best friend was a Muslim man called Mardana
- Emphasised equality between men and women: ***'From her, kings are born… without woman, there would be no one at all'***
- Taught: ***'There is no Hindu and no Muslim'***
- Introduced the practice of the langar: ***'No discrimination… must be made while making people sit in rows for eating'***

<u>The life of Guru Gobind Singh</u>

- Started the Khalsa – both men and women can join.
- When the first 5 members joined, they wore identical coloured robes to show equality.
- One key role of the Khalsa is to stand up against inequality
- Introduced surnames Singh (Lion) and Kaur (princess) to remove inequality shown by the caste system

<u>The Guru Granth Sahib</u>

- The GGS is a collection of hymns and writings from many teachers and saints e.g. the Gurus.
- Writers also included Hindus and Muslims, showing the inclusivity of Sikhism.
- Guru Gobind Singh declared the GGS 'The Living Guru' and is the 11th and final teacher for Sikhs. It contains many teachings about equality: ***'All beings and creatures are His; He belongs to all'. 'All are made of the same clay'.***

<u>Sikhism Today</u>

- The Langer: free kitchen where everyone is welcome. All sit on the floor together to show all are equal. Food is vegetarian so everyone can eat it.
- Both men and women take part in worship, reading GGS in the Gurdwara, cooking or serving food etc.

Sewa: Selfless Service

- Sewa is a duty Sikhs have to help others without expecting anything in return
- It will build good karma and help a Sikh on the path to achieving mukti
- ***'Through selfless service, eternal peace is obtained'***
- It helps Sikhs to show many of the virtues whilst avoiding the 5 evils.

<u>Tan (Physical Sewa)</u>
Using the body to help others e.g. serving in the langar, cleaning shoes or floors

<u>Man (Mental Sewa)</u>
Using the mind and mental skills e.g. reading the GGS, teaching others, inspiring others

<u>Dhan (Material Sewa)</u>
Using material wealth to help others e.g. giving a tenth of their income to the sangat or to charities. This 10% is known as Dasvandh

The Sangat: Sikh Religious Community

- The company of Sikhs meeting in the presence of the Guru Granth Sahib
- 'Sat Sangat' means 'True Congregation'
- ***'Join the Sat Sangat, the True Congregation, and find the Lord'***
- Sikhs may gather together to learn, pray, hold a ceremony, read the GGS etc
- Importance: provides opportunities for sewa, gives the chance to learn from other Sikhs, builds a supportive community to strengthen faith, helps to develop religious understanding.

Amritdhari and Sahajdhari Sikhs

- Amritdhari Sikhs are those who have been initiated into the Khalsa.
- They are expected to offer daily prayers, wear the 5Ks, take the name Singh and Kaur, practise the virtues, be vegetarian and obey the code of conduct (which includes rules such as no smoking, drinking or adultery)
- 5 Ks: **Kara** (steel bracelet), **Kirpan** (ceremonial sword), **Kachera** (cotton underwear), **Kanga** (wooden comb), **Kesh** (uncut hair). Amritdhari Sikhs must wear all of the 5 Ks. Sahajdhari Sikhs may choose to wear some.
- Sahajdhari Sikhs have not been initiated into the Khalsa so, whilst they believe in Waheguru and the Gurus, they do not have to follow the strict rules.

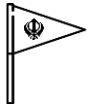
Year 10 PRE – Sikh Practices: Part 1 – Worship and Service

The Gurdwara: Religious Features

- The gurdwara is the Sikh place of worship. Translates to 'Door of the Guru'
- Technically a gurdwara is any place in which the Guru Granth Sahib is installed and treated with proper respect
- The gurdwara is open to all, no matter their age, race, religion etc.

Outside the Gurdwara:

- Many have a dome and decorations on the outside
- All will have a flag outside – the Nishan Sahib. This is usually yellow with the Khanda symbol in blue.



Prayer Hall: Darbar Sahib	Large space with a throne at one end Men and women sit separately so they are not distracted by one another, and all sit on the floor so they are lower than the GGS
Takht 	Throne: represents the GGS being treated like royalty/ a human guru. Seat covered in fine cloth, often surrounded by flowers, space for money and food offerings, and a bowl containing karah parshad (a sweet food which is seen as a blessing)
Palki	Domed structure used to cover the raised area where the GGS is placed. Canopy at the top may be engraved with the word 'Waheguru' or with scripture.
Manji	A small bed on which the GGS is placed during the day.
Chanani	Large canopy made of decorated cloth which is placed over the palki.
Langar Hall	The area of the gurdwara where free food is served. All are welcome, everyone sits together on the floor to represent equality.

Worship in the Gurdwara

- Worship can include meditating, listening, singing, reciting, working and serving people – is it true worship as long as God is kept in mind.
- ***'Worship and adore Him, and you shall be at peace forever'.***
- Worship in the gurdwara may last up to 5 hours but people may come and go.
- Shoes are removed, heads are covered, hands/ feet washed, before bowing and touching the floor in front of the GGS.
- Worship services start and end with the Ardas Prayer
- Kirtan – singing of hymns which nourishes the soul
- Ragis – musicians who sing or play accomoniment for kirtan
- Karah Parshad – given out at the beginning and end of the service, from the same bowl to show equality. Sweet like God's blessings.

The Role of Prayer in the Home

- Sikhs are expected to remember God at all times which includes reciting daily prayers at home.
- Some Sikhs have a copy of the GGS at home but many have a gutka instead, a prayer book, which is treated with as much respect as the GGS (ideally has its own room, or section of a room, and is kept in a clean cloth).
- GGS 305, written by Guru Ram Das, outline how Sikhs should pray:
- ***'One who calls himself a Sikh of the Guru, the True Guru, shall rise in the early morning and meditate on the Lord's Name'.***
- Prayer routine includes waking early, bathing, repeating the japji (a prayer given by Guru Nanak), and repeating other prayers at different points of the day.

Nam Japna: Meditating on the Name of God

- One key responsibility of Sikhs is to meditate on the name of God, known as Nam Japna.
- This keeps God in mind at all times and helps them to act well in their life.
- It may involve quietly reciting God's name to oneself, or by saying it out loud in a community recitation.
- It is the community recitation that is usually known as Nam Japna.
- ***'Those who have the treasure of the Lord's Name deep within their hearts – the Lord resolves their affairs'***

The Role of the Gurdwara in the Sikh Community

Management and Role

- There are very few paid roles as most Sikhs volunteer as part of sewa.
- A granthi (or management team) manage and maintain the gurdwara.
- Many gurdwaras are open 24/7 and all are welcome
- Besides prayer and worship, other roles for the gurdwara include langar, meeting/ education rooms to teach Punjabi and Gurmukhi, committee meetings, youth clubs etc.

Granthi:

- A male or female Sikh, who has been initiated into the Khalsa, who reads the Guru Granth Sahib.
- They are expected to be of good character and live life according to the Sikh code of conduct
- They do not have a higher status than other Sikhs but they are highly respected.
- Granthis arrange and conduct religious services, maintain the gurdwara, leads kirtan (singing hymns), lead an akhand path etc.
- Most importantly, granthis take care of the Guru Granth Sahib, organizing the ceremony to bring it to and from the rest room each day.

The Role and Importance of the Akhand Path

What 	- A continuous reading of the Guru Granth Sahib from start to finish – all 1430 pages. - Takes approx. 48 hours – male and female Sikhs take shifts to complete it. - Karah Parshad is given out at the beginning and the end as a blessing
When/ why 	- Usually takes place at the start of a festival - Times of joy and sorrow e.g. wedding, funeral, birth of a baby, death of a family member - GGS may be taken to a new home or new business as a blessing
Importance 	- Seen as a great blessing to have the Living Guru recited at an important event – it should not be taken lightly. - If it is to bless a new home or business, the family are expected to listen and take part at some point during the 48 hours to show respect

Showing Respect to the Guru Granth Sahib

- GGS is known as the Living Guru (as declared by the 10th and final human guru, Guru Gobind Singh) and is treated with as much respect as a human guru would be.
- Sikhs show respect to the GGS in a number of ways, e.g.:
- All printed copies have 1430 pages to show they are identical and the words do not change
- Sikhs sit on the floor to worship so they are lower than the GGS
- They do not point their feet towards it
- They bow before it
- They cover it with a rumalla, a decorated cloth (often made of silk)
- They wave a chauri over it – a fan made from yak's hair whch would have been waved over honoured teachers to keep them cool and keep flies away
- At the end of each day it is wrapped in clean cloth and carried in a procession to its rest room, where it is effectively put to bed overnight. The room is called Sach Chand.

Langar as an expression of Sewa

- Started by Guru Nanak to promote equality in a time of the Caste System
- Shows equality: all are welcome, all sit on the floor so they are on the same level, food is vegetarian so everyone can eat it.
- Excellent way for Sikhs to carry out Tan – physical sewa – by cooking, serving, cleaning. Can also show Dhan – material sewa – by donating produce.
- Both men and women take equal roles in helping in the langar.
- Many langars run in times of crisis, and to help those in poverty.
- ***Guru Gobind Singh: 'Keep the langar ever open'.***

Year 10 PRE – Sikh Practices: Part 2 – Festivals and Lifestyle

Festivals: Vaisakhi

- Originally a harvest festival where farmers would show thanks to God for a good harvest
- Usually celebrated on 13th or 14th April

Vaisakhi in 1699

- Guru Gobind Singh started the Khalsa – he asked who would be willing to die for their faith and 5 men stepped forward. They became the Panj Piare, the first 5 members of the Khalsa. The practice of the surnames Singh and Kaur began here.

Vaisakhi in 1919

- During celebrations at Jallianwala Bagh, Amritsar, many Sikhs were shot and killed by a British general who was acting on the orders of the Lieutenant Governor of the Punjab. Sikhs remember sad occasions such as this at Vaisakhi and it's a reminder to stand up for people's human rights to practise religion freely.

Celebrations at Vaisakhi

- Akhand Path
- Act of worship including Ardas Prayer and kirtan
- Community meals – langar
- Many Sikhs choose to join the Khalsa at Vaisakhi
- New clothes, especially for children
- Sending Vaisakhi cards
- Processions through the streets – floats, singing, dancing etc
- Nishan Sahib – a new flag replaces the old flag. Flagpole washed in yogurt and milk then rinsed with water as a symbol of purity.

Festivals: Divali

- Name means 'a row of lights' so Divali is often known as the festival of lights.
- Held in October/ early November
- Celebration of freedom, and the victory of good over evil.
- It's a time for Sikhs to remember those who have stood strong in their faith and who have been brave in times of persecution.
- Sikhs are encouraged to follow the example of Sikhs who have promoted and protected people's freedom

Guru Hargobind and the 52 princes

- Guru Hargobind (6th Guru) and 52 princes were arrested and imprisoned for political reasons.
- The emperor believed the charges were false and demanded Guru Hagobind be released, but he refused to leave unless the princes were released as well.
- The emperor said as many princes as could hold on to the Guru's clothes as he walked out of the gate could be released.
- The Guru's cloak had 52 long tassels – all could hold on and all were freed.
- Became known as 'prisoner release day' and is celebrated at Divali.

Celebrations at Divali

- Akhand Path
- Street Processions, firework displays and langars
- Homes are spring-cleaned and decorated with oil lamps and lights
- New clothes and presents given to children
- Huge celebrations at the Golden Temple – pool and buildings decorated with thousands of lights.

Festivals: The Gurpurbs

- Take place at anniversaries – usually the birth or death of a guru.
- 4 most widely celebrated gurpurbs: Guru Nanak's birthday, Guru Gobind Singh's birthday, martyrdom of Guru Arjan and Guru Tegh Bahadur.
- **Importance**: remind Sikhs of their religion's history, strengthen their faith as they join together to celebrate, enable Sikh children to learn about the gurus, gives Sikhs chance to share their faith and perform acts of sewa.

General Celebrations

- Akhand Path
- Guru Granth Sahib carried in processions
- Kirtan
- Langars

Guru Nanak's Birthday

- October/ November
- Most important gurpurb
- Processions, candles lit, firework displays, new clothes for children, holiday from school (in India)

Different Celebrations in Great Britain and India

Great Britain

Celebrated on nearest Sunday
Takes place at weekend so no schools closed
Quieter and more local celebrations, focused around gurdwara.

India

Celebrated on actual day
School often closed
Much bigger celebrations – colourful processions, firework displays, fairs.

Pilgrimage: Visiting the Golden Temple

Pilgrimage: a religious journey

- Many Sikhs travel to the Golden Temple (Harimandir Sahib) in Amritsar in the Punjab.

Features:

- Surrounded by a pool of fresh, clear water
- 4 entrances to represent that everyone around the world is welcome
- The upper storey is covered with gold leaf
- The original Adi Granth, the first version of the holy book, is installed on a takht inside the temple

Akal Takht

- Political building
- Houses the rest room for the GGS – it is carried in procession every morning and evening.

Visiting/ Importance

- Pilgrims may bathe in the sacred water, thought to have heling properties
- They visit the gurdwara, listen to kirtan, hear readings from GGS, meditate etc
- Langar feeds thousands of pilgrims
- Pilgrimage is not compulsory but Sikhs may choose to as it can strengthen and deepen their faith
- It teaches pilgrims more about the history of their faith and is a time for Sikhs, and non-Sikhs, to gather together
- Rituals such as pilgrimage, or bathing in the sacred pools, are less important than a person's inner faith – bathing would do nothing if they are not clean inside.

Naming Ceremony

What happens? 	- Takes place around 2 weeks after a baby is born - Baby is given a spoonful of amrit (sugar and water) and the amrit is stirred with a khanda by the granthi. - Granthi dips the sword into amrit and lightly touches the baby's head and tongue with the tip of the sword. - Mother drinks the rest of the amrit - Karah Parshad is given out.
Naming the baby 	- First name: Granthi opens the GGS at a random page. First letter of the first word of the first hymn on left hand page decides the first letter of baby's name. - Surname: Many Sikhs use Guru Gobind Singh's tradition of Singh (lion) or Kaur (princess)
Importance 	- A human is the greatest thing to be reincarnated into as it offers the best chance of achieving mukti, so the birth of a baby is a time to celebrate and give thanks to God.

Amrit Sanskar: Initiation Ceremony

What is it?	A ceremony where those who are prepared to be a fully committed Sikh are initiated into the Khalsa
What happens? 	Person being initiated must wash their hair, cover their head and wear clean clothes and the 5Ks. 6 other amritdhari Sikhs present – 5 to represent the Panj Piare, plus the granthi. They drink amrit from the bowl 5 times. Amrit is sprinkled on their eyes and hair 5 times. The remaining amrit is then shared between those being initiated, drinking from the same bowl. Karah Parshad is shared out.
What changes? 	Initiated Sikhs are known as amritdhari Sikhs. They will follow the Sikh code of conduct (Rehat Maryada) and keep rules such as: no smoking, alcohol or drugs, no eating meat, wearing the 5Ks, no stealing or gambling. They will also take the surname Singh or Kaur, if they didn't have this already.

Exam Terminology

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 and HYBRID genres

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

GENRE: Repetition & Difference

Genres are instances of repetition and difference (Steve Neal). Mere repetition alone would not attract the audience
Products must conform to (repeat) enough of the genre's conventions to be considered a part of that genre
Products must also subvert these conventions (difference) to be considered a unique product
This leads to genres changing over time – genres are therefore not static.

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.**
Actors	Certain types of characters stereotypically only act in the same genre of film for example Jenifer Aniston is usually only found in Romcoms, Jason Statham as a star would usually indicate an action film
Narrative	A films 'story, or plot' , for example boy meets girl would indicate romance, Heroes or Heroines vs Villains indicates Action
Setting or Location	A films setting can help us to tell a films genre, for example 'western' films are usually set in the America outback, a Scifi film will usually be set in space
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.
Iconography	Icons that help us to identify the genre, for example icons of the Western genre includes ten gallon hats, spurs and horses, the action genre would include guns.
Technical Codes	Technical codes are aspects like camerawork, sound and lighting and these can indicate genre. For example the technical code of lighting is used in all genres but in horror, side and back lighting is used to create mystery and suspense.

NARRATIVE: Todorov's Theory

1. A state of equilibrium (all is as it should be)
2. A disruption of that order by an event
3. A recognition that the disorder has occurred
4. An attempt to repair the damage of the disruption
5. A return or restoration of a NEW equilibrium

Audience RESPONSE

Preferred Reading – the audience respond to the product the way media producers want/expect them to without questioning – these are **passive audiences**

Negotiated Reading – the audience knows what the producer wants us to think, knows why that might be an untruthful representation, but forms an opinion which is a combination of both – these are **active audiences**

Oppositional Reading – the audience completely reject the product's message

Everything we see in the media is constructed – the people, places, issues and events we see are a *re-presentation* of reality. When analysing a media text you should consider:

- What is being represented? To whom?
- Is the representation positive or negative?
- How might different audiences 'read' this representation?

Types of NARRATIVE Structure

linear, where the story is told in order and a new equilibrium arrived on at the end

non-linear, where events are told out of sequence

circular, where the story ends where it began – ie there has been no change to the equilibrium

interactive, where the audience can influence the narrative

open narratives, where there is no resolution by the end

closed narratives, where the story is resolved

single-strand, where the narrative follows just one storyline

multi-strand, where there are different interwoven stories

Propp's CHARACTER Types

Hero – undertakes a journey or a quest

Villain – attempts to thwart or kill the hero

Donor – gives the hero advice or a useful object

Helper – a friend who helps the hero in their quest

Princess – motivation and reward for the quest

Dispatcher –sends the hero on their quest

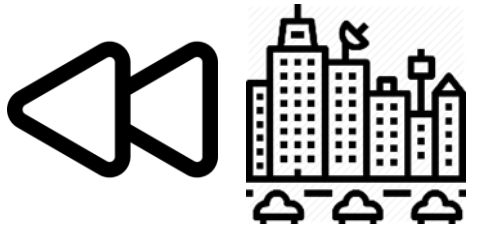
False Hero – one who turns on the hero and is punished

A. Décris ta région. Describe your region.

Starter phrase	*There is + article*	*Noun*	*Connective*	*Time phrase*	*There was + article*	*Noun*
J'habite dans une région où I live in a region where **J'habite dans une ville où** I live in a town where **Je vis dans un village où** I live in a village where **Je vis dans un quartier où** I live in a neighbourhood where	**il y a un** there is a **il n'y a pas de** there isn't a	**centre commercial** shopping centre **centre sportif** sports centre **château** castle **cinéma** cinema **gymnase** gym	**cependant** however **néanmoins** nevertheless **pourtant** however **toutefois** however	**avant** before **dans le passé** in the past	**il y avait un** there was a **il n'y avait pas de** there wasn't a	**marché** market **musée** museum **stade** stadium **supermarché** supermarket **théâtre** theatre
	il y a une there is a **il n'y a pas de** there isn't a	**bibliothèque** library **église** church **gare** train station **mosquée** mosque			**il y avait une** there was a **il n'y avait pas de** there wasn't a	**pharmacie** pharmacy **piscine** swimming pool **poste** post office
	il y a des there are **il n'y a pas de** there isn't any	**cafés** cafes **hôtels** hotels **magasins** shops			**il y avait des** there were **il n'y avait pas de** there weren't any	**parcs** parks **restaurants** restaurants

B. Qu'est-ce que tu fais normalement dans ta ville ? What do you normally do in your town?

Time phrase	*Preposition + place*	*Opinion verb*	*Infinitive phrase*
Lundi on Mondays **Samedi** on Saturdays **Tous les weekends** every weekend **D'habitude** usually **Souvent** often **Le matin** in the morning **L'après-midi** in the afternoon **Le soir** in the evening	**dans ma ville** in my town **dans ma région** in my region **dans mon quartier** in my neighbourhood **dans mon village** in my village	**j'adore** I love **j'aime bien** I like **je n'aime pas** I don't like **je déteste** I hate **ce que j'aime le plus, c'est de** what I like the most is **ce que j'aime le moins, c'est de** what I like the least is	**acheter des souvenirs** to buy souvenirs **aller à la plage** to go to the beach **aller au parc** to go to the park **aller prendre un verre** to go for a drink **aller aux matchs de foot** to go to football matches **apprécier les belles vues** to appreciate the beautiful views **apprendre de l'histoire** to learn about history **découvrir de la nature** to discover natyre **faire des excursions** to do trips **faire des promenade** to go for walks **faire des randonnées** to go hiking **faire les magasins** to go shopping **faire un pique-nique** to do a picnic **goûter à la cuisine locale** to try local food **manger aux restaurants** to eat at restaurants **prendre des photos** to take photos **sortir avec des amis** to go out with friends **visiter des monuments** to visit monuments



C. Qu'est-ce que tu as fait dans ta région récemment ? What have you done recently in your region?

Time phrase	*Perfect tense verb*		*Opinion phrase*	*Verb*	*Quantifier*	*Adjective*
Récemment Recently **Le weekend dernier** Last weekend **La semaine dernière** Last week **Hier** Yesterday	**je suis allé[e]** I went **nous sommes allés** we went	**à la campagne** to the countrysiede **à la montagne** to the mountain **à la plage** to the beach **au bord de la mer** to the seaside **au centre-ville** to the city centre **au parc** to the park **au parc d'attractions** to the theme park **prendre un verre** for a drink **à un match de foot** to a football match	**je dois avouer que** I must admit that **j'estime que** I feel that	**c'était** it was	**absolument** absolutely **énormément** enormously **extrêmement** extemely **tellement** so	**affreux** awful **décevant** disappointing **insupportable** unbearable **agréable** pleasant **divertissant** entertaining **incroyable** incredible **passionnant** exciting **relaxant** relaxing
	j'ai I **nous avons** we	**acheté des souvenirs** bought souvenirs **apprécié les belles vues** appreciated the beautiful views **appris de l'histoire** learnt about history **découvert la nature** discovered nature **fait des excursions** did trips **fait des promenades** went for walks **fait des randonnées** went hiking **fait les magasins** went shopping **gouté à la cuisine locale** tried local food **mangé aux restaurants** ate at restaurants **pris des photos** took photos **visité des monuments** visited monuments				

D. Quels sont les avantages et les inconvénients de ta région ? What are the advantages and disadvantages of your region?

Opinion phrase	*Noun*	*Place*	*Verb*	*Comparative + adjective*		*Comparative + noun*
Je crois que I believe that **Je pense que** I think that **Je trouve que** I find that **Selon moi** As I see it **Je considère que** I consider that **J'estime que** I feel that **Je dois avouer que** I must admit that **En ce qui me concerne** As far as I'm concerned	**l'avantage** the advantage **l'inconvénient** the disadvantage **l'aspect positif** the positive aspect **l'aspect négatif** the negative aspect	**de ma région** of my region **de ma ville** of my city **de là où j'habite** of where I live	**c'est que c'est** is that it is	**aussi** as **plus** more **moins** less	**animé** lively **fascinant** fascinating **moderne** modern **populaire** popular **tranquille** calm **touristique** touristic **cher** expensive **dangereux** dangerous **ennuyeux** boring **industriel** industrial **surpeuplé** overpopulated **vieux** old	**qu'à la campagne** as/than the countryside **qu'à la montagne** as/than the mountain **qu'au bord de la mer** as/than the seaside **qu'au centre-ville** as/than the city centre **que dans la banlieue** as/than theoutskirts

E. Où aimerais-tu habiter à l'avenir, en ville ou à la campagne ?
Where would you like to live in the future, in the city or in the countryside?

Time phrase	*Verb + infinitive*	*Place*	*Connective*	*Reason*
Dans le futur In the future **À l'avenir** In the future **L'année prochaine** Next year	**j'aimerais habiter** I would like to live **je n'aimerais pas habiter** I wouldn't like to live **je préférerais habiter** I would prefer to live **je voudrais vivre** I would like to live **je ne voudrais pas vivre** I wouldn't like to live	**à la campagne** in the countryside **à la montagne** in the mountain **à … en France** in … in France **à … en Angleterre** in … in England **au bord de la mer** by the seaside **au centre-ville** in the city centre **dans un village** in a village	**parce que/qu'** because **étant donné que/qu'** given that **vu que/qu'** seeing that	**j'aurais un grand appartement** I would have a big flat **j'aurais une grande maison** I would have a big house **il y a beaucoup de magasins** there are lots of shops **il y a plus d'air frais** there is more fresh air **il y a plus d'espaces vertes** there are more green spaces **il y a plus de possibilités d'emploi** there are more opportunities for work **il y a trop de bruit** there is too much noise **il y a trop de pollution** there is too much pollution **ça serait génial** it would be great **ça serait pratique** it would be practical

Year 10 BTEC Sport –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 – 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: RPE x 10 = 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 o 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	Strength x Speed = Power
Maximum Heart rate	The maximum amount of times your heart can beat in 1 minute.
Borg RPE	Rate of Perceived exertion

Year 10 BTEC Sport – Unit 2: Practical Performance in Sport




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.

Keyword	Definition
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.