YEAR 10 KNOWLEDGE ORGANISER

LENT TERM

Name:

Family Group:

LEARNING - LOVING - LIVING

KNOWLEDGE ORGANISER GUIDANCE

LEARNING - LOVING - LIVING

The knowledge organiser is a book of **EVERYTHING** that you should know (and remember) for the whole term.

EACH NIGHT you should spend *at least* **1 hour** per night on homework.
3 subjects per night x 20 minutes per subject= 1 hour. Use the homework timetable as a guide to what subjects to complete each night.

Complete all work in your exercise book and make sure you bring your knowledge organiser to school EVERYDAY (in your coloured folder).

Every FRIDAY morning the week's worth of KNOWLEDGE ORGANISER homework will be checked in Family Group time and detentions issued for work not complete, or not up to standard.

SUBJECT HOMEWORK

All students will also be assigned **ENGLISH** reading activities on www.CommonLit.org with each assignment taking 20-30 minutes to complete and **MATHS** activities with short explanative videos on the online platform of https://mathswatch.co.uk.

Students in years 9-11 will also be provided with additional subject homework to be completed throughout the week. It is also recommended to take advantage of FREE online revision tools such as www.senecalearning.com or the recently updated BBC BITESIZE.

It is also recommended that students regularly **READ** a variety of **fiction and non fiction books** of their choosing. This extra reading will develop and broaden general understanding and context in all subjects.

HOMEWORK TIMETABLE

Year 10	Subject 1	Subject 2	Subject 3
Monday	Maths	Option A	Option C
Tuesday	English	Option B	Option C
Wednesday	Maths	RE	Option D
Thursday	English	Science	Option A
Friday	Maths	Science	Option B

HOMEWORK CHECKLIST

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Half term					
Week 1	Week 2	Week 3	Week 4	Week 5	Week 6

Here are some activities that you can try at home with your knowledge organiser to help revise. There are even more strategies on page 3.

4 Methods of Retrieval Practice

@ImpactWales

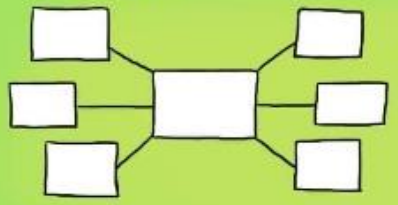
Before you start put away all your books & classroom materials.

Retrieval Practice Examples

- Exit Tickets
- Starter quizzes
- Multiple choice quizzes
- Short answer tests
- Free write
- Think, pair, share
- Ranking & sorting
- Challenge grids

BRAIN DUMP

Write, draw a picture, create a mind-map on everything you know about a topic.



Give yourself a time limit, say 3 minutes, then have a look at your books & add a few things you forgot.

QUIZZING

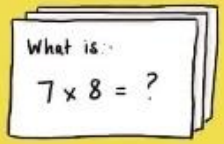
Create practice questions on a topic. Swap your questions with a partner & answer.

Question - What is a metaphor?

- ☐ A comparison using 'like, as, than'.
- ☐ A comparison where one thing is another.
- ☐ A comparison with a human attribute.

FLASHCARDS

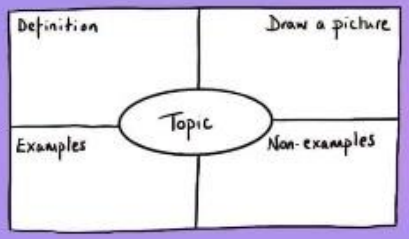
Create your own flashcards, question on one side answer on the other. Can you make links between the cards?



You need to repeat the Q & A process for flashcards you fail on more frequently & less frequently for those you answer correctly

KNOWLEDGE ORGANISERS

Complete a knowledge organiser template for key information about a topic.



You can use knowledge organisers to learn new vocab & make links in between subjects or ideas.

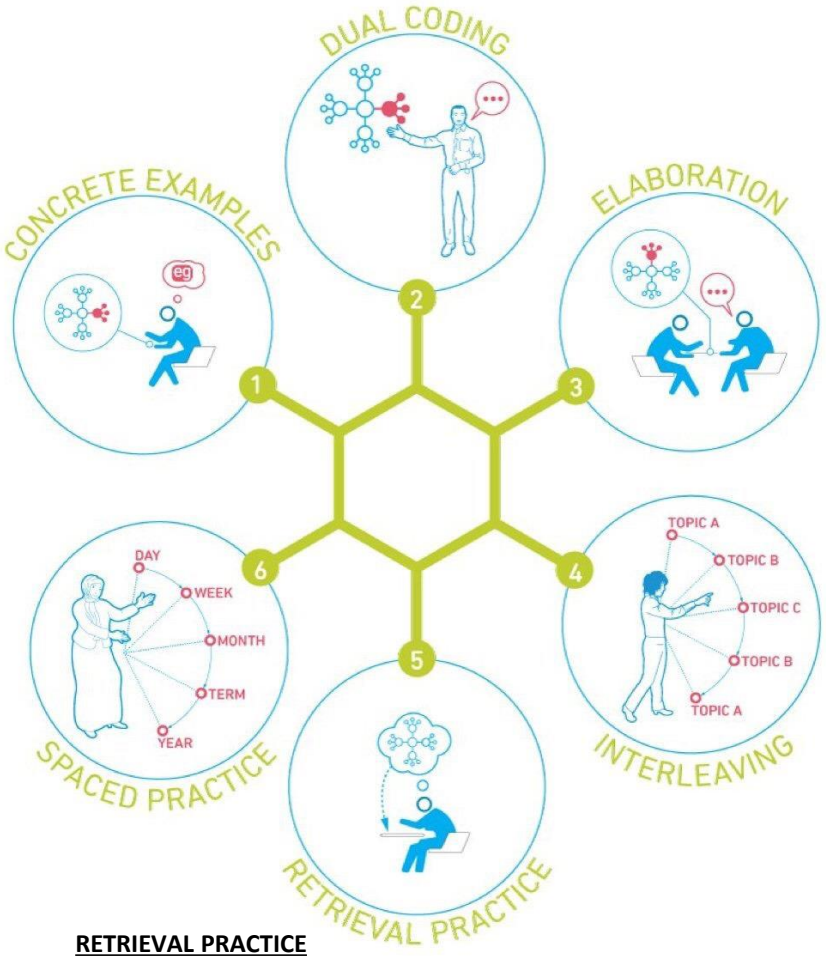
After you have retrieved as much as you can go back to your books & check what you've missed. Next time focus on that missing information

DUAL CODING

Dual coding is the process of combining visual and written materials. You can visually represent materials using methods such as info graphics, timelines, cartoon/comic strips, diagrams and graphic organisers. Combing images with words or explaining an image makes it more likely to 'stick'.

CONCRETE EXAMPLES

When you're studying, try to think about how you can turn ideas you're learning into concrete examples. Making a link between the idea you're studying and a real life example, concrete example, can help students understand abstract ideas and make it 'stick'.



ELABORATION

When talking about studying, elaboration involves explaining and describing ideas with many details. Elaboration also involves making connections among ideas you are trying to learn. Ask yourself questions about a topic to delve deeper. The more information you have about a specific topic the stronger your grasp and ability to recall.

SPACED PRACTISE

Divide up your revision into short manageable chunks of time . When revising aim for 20 - 30 minutes per session. Five hours spread out over two weeks is better than the same five hours all at once. This is **spaced practice** and it is regarded as one of the most effective revision strategies.

INTERVEAVING

Interleaving is a process where you combine multiple subjects and topics while you study in order to improve learning. Switch between ideas and make links between them during a study session. Interleaving has been shown to lead to better long-term retention

RETRIEVAL PRACTICE

Through the act of retrieval, or calling information to mind, our memory for that information is strengthened and forgetting is less likely to occur. Retrieval practice ideas include: Read, cover, write, check, flashcards and brain dumps.

YEAR 10 – LENT TERM- ENGLISH – MACBETH

LEARNING - LOVING - LIVING

Contextual Information	
The Great Chain of Being	1. God is at the top of the Great Chain of Being, a fixed hierarchical society 2. Kings were chosen by 'divine right.' God chose the king. 3. Males were above females. 4. People were expected to respect their position in the chain and, if they did so, would be rewarded in heaven.
Divine Right of Kings	5.The King was chosen by God 6. Disrespecting the King is sacrilegious and an offence to God 7. Regicide was the most heinous crime.
King James 1	8.Previously King of Scotland, King of England 1603-1625. He was unpopular because of his Scots background. His mother was Mary Queen of Scots who had been deposed and imprisoned. 9. King James was fascinated by the supernatural and wrote a book entitled 'Daemonology' in 1597 10.King James's ancestor, Banquo, is made a hero in the play: perhaps to flatter King James 11. King James had survived an assassination attempt (Gunpowder Plot) 12. King James was Shakespeare's patron-Shakespeare wanted to please him. 13. Both Kings in the play (Duncan and Edward) are benevolent-Shakespeare may have wanted to flatter King James.
Witches and the supernatural	14. Christians believed witches to be the agents of Satan; everyone would have been terrified yet excited by witches in play 15.In 1604, it was a capital offence to be a witch. Association with a witch led to hanging, burning or drowning. 16. It was believed witches could see into the future, change the weather and could call up the dead.
The role of women	17. Society was patriarchal. 18.Women were expected to be submissive and compliant 19. Lady Macbeth, an atypical woman, subverts the conventions of femininity.
The Gunpowder plot	20. A failed attempt to blow up England's King James I and the parliament 21. Attempt happened on November 5th, 1605, the year before Macbeth was written 22. Shakespeare's father was friends with one of the conspirator's fathers: maybe Shakespeare wrote Macbeth as a way of avoiding blame. 23. Macbeth can be seen as an admonishment to those who consider regicide.

Key Vocabulary	
Act 1	1. The play begins with an **ominous** atmosphere as the witches use **equivocal language** 2. Macbeth is **lauded** as a **valiant** and 'noble' hero, a **ruthless** warrior who fought **brutally** 3. When Macbeth meets the witches, he is **incredulous** about their prophesies, which are **bewildering.** Macbeth vacillates, saying 'cannot be ill, cannot be good' 4. Duncan admits that 'there's no art to find the mind's construction in the face' and that **duplicity** is difficult to identify. Macbeth is **deceitful** and wants to hide his 'black and deep desires' 5. Lady Macbeth **subverts** the conventions of femininity: she is **malevolent** and manipulative 6. Duncan arrives at Macbeth's castle-he is **oblivious** to their murderous plans. LM is **deferential** and **obsequious** to Duncan. 7. Macbeth's **soliloquy** considering the ramifications of regicide. LM **berates** her husband for being a coward. Macbeth knows he needs to be **duplicitous**, saying 'the false face must hide what the false heart doth know'

Key Vocabulary	
Act 2	1. Macbeth **hallucinates** and sees a 'dagger'. It **lures** him and represents his **burgeoning malevolence.** 2. Macbeth has committed regicide, a **sacrilegious** crime. His **conscience** is **tormented.** Lady Macbeth is **dismissive** and **insouciant**, telling him 'a little water clears us of this deed.' 3. A comical scene with the Porter. Duncan's body is discovered. Macbeth is obsequious, saying 'all is but toys'. Duncan's death causes **turmoil** and **chaos** in nature. 4. Lennox says 'the night has been unruly', a **foreboding** and **apocalyptic** description.
Act 3	1. Macbeth plans to murder Banquo 2. Macbeth is **paranoid**, exclaiming 'o full of scorpions is my mind'. Lady Macbeth seems **nihilistic,** saying 'tis safer to be that which we destroy than by destruction dwell in doubtful joy. 3. Banquo is murdered. Fleance escapes-this echoes James' escape from Gunpowder Plot. Macbeth is a **megalomaniac** 4. The banquet and Banquo's ghost. Macbeth is **barbarous,** saying 'blood will have blood. Lady Macbeth **taunts** him, saying 'are you a man?'. Macbeth's **anagnorisis:** 'I am blood stepped so far that I should wade no more, returning were as tedious as go o'er' 5. Hecate and the witches: scene conveys **malevolence** that has descended on Scotland. 6. Macduff asks 'pious' Edward for help with an **insurrection.** Macbeth is **antithesis** to Edward: Macbeth is an **oppressive despot.** Scotland is 'suffering'
Act 4	**1.** **Apparations** give prophecies to Macbeth. They initially seem **preposterous** making Macbeth think he is invincible and contributing to his **hubris.** Macbeth is **merciless,** ordering the murder of Macduff and his 'babes'. 2. Macduff's wife and 'babes' murdered. Macbeth is **despotic, malevolent** and **ruthless** 3. Scotland 'sinks beneath the yoke'. Macbeth is the **scourge** of Scotland and 'devilish'.
Act 5	1. Lady Macbeth is an **automaton**. She is **deranged, unhinged and nonsensical** she cries 'out damned spot!' 2. Macbeth is **totalitarian**. His subjects 'move only in command'. He is **resolute** and **determined**. He will fight 'until from my bones my flesh be hacked.' He is 'like a giant's robe upon a dwarfish thief'. 3. The prophecies have left Macbeth feeling invincible and he boasts than he cannot be killed. He calls his servant Seyton and insists on putting on his armour. The doctor informs the King that Lady Macbeth's delusions have worsened. 4. Near Birnam Wood Malcolm and the English Lord Siward hatch a plan to disguise their army's number by cutting down branches and using them to hide the soldiers 5. He has become **desensitized** to violence and has 'almost forgot the taste of fears.' Lady Macbeth dies and he seems **mournful** and **dejected** saying life is a 'tale told by an idiot.' 6. Malcolm prepares for battle 7. Macbeth kills young Siward 8. Macduff kills Macbeth. Macbeth is **diabolical** and a 'hell-hound' 9. Malcolm is crowned King. Macbeth is a 'dead butcher'. Lady Macbeth is a 'fiend like queen'

Act 1:1	**The witches meet on a heath**
	Witches: fair is foul and foul is fair
Act 1:2	**Macbeth and Banquo fought bravely and defeated the Irish Invaders. The traitorous Thane of Cawdor has been captured**
	Captain: for brave Macbeth-well he deserves that name-Disdaining Fortune, with his brandished steel, which smoked with bloody execution, Like Valour's minion carved out his passage **Captain:** till he unseamed him from the knave to th'chaps And fixed his head upon our battlements **Duncan:** noble Macbeth
Act 1:3	**The witches meet Macbeth and Banquo. Macbeth becomes Thane of Cawdor**
	Banquo: What are these, so withered and so wild in their attire, That look not like th'inhabitants o'th'earth **Macbeth:** Stay you imperfect speakers **Macbeth:** why do you dress me in borrowed robes? **Banquo:** oftentimes, to win us to our harm, The instruments of darkness tell us truths **Macbeth:** This supernatural soliciting Cannot be ill, cannot be good. **Macbeth:** If good, why do I yield to that suggestion, whose horrid image doth unfix my hair **Macbeth:** my thought, whose murder yet is but fantastical
Act 1:4	**Duncan meets with Macbeth and plans to meet him at the castle.**
	Duncan: There's no art To find the mind's construction in the face **Macbeth:** let not light see my black and deep desires.
Act 1:5	**Lady Macbeth's letter. Lady Macbeth convinces Macbeth to kill King Duncan.**
	LM: It is too full o'th'milk of human kindness **LM:** pour my spirits in thine ear And chastise with the valour of my tongue **LM:** the golden round **LM:** The raven himself is hoarse That croaks the fatal entrance of Duncan **LM:** come you spirits…unsex me here **LM:** look like th'innocent flower, But be the serpent under't
Act 1:6	**Duncan arrives at Macbeth's castle**
	Duncan: This castle hath a pleasant seat **LM:** All our service, In every point twice done and then done double **Duncan:** Fair and noble hostess
Act 1:7	**Macbeth's soliloquy. Macbeth tells Lady Macbeth he will not murder Duncan. She convinces him to go ahead with the murder.**
	Macbeth: If th'assassination could trammel up the consequences **Macbeth:** return to plague th'inventor **Macbeth:** his virtues will plead like angels **Macbeth:** shall blow the horrid deed in every eye **Macbeth:** only vaulting ambition which o'erleaps itself **Macbeth:** I dare do all that becomes a man **LM:** Screw your courage to the sticking-place **Macbeth:** False face must hide what the false heart doth know **LM:** dashed the brains out

Act 2:1	**Banquo and Macbeth talk briefly about the witches. Macbeth sees a dagger in front of him.**
	Macbeth: Is this a dagger I see before me, **Macbeth:** a false creation, Proceeding from the heat-oppressed brain? **Macbeth:** thou marshall'st me
Act 2:2	**Macbeth murders King Duncan. Macbeth's guilt is apparent. Lady Macbeth feels no guilt.**
	Macbeth: with these hangman's hands…I could not say 'Amen' **LM:** these deeds must not be thought After these ways; so, it will make us mad **Macbeth:** 'Sleep no more: Macbeth does murder sleep', the innocent sleep….balm of hurt minds **Macbeth:** what hands are here? **LM:** My hands are of your colour, but I shame to wear a heart so white **LM:** A little water clears us of this deed
Act 2:3	**A drunken porter provides comic relief after Duncan's murder. Duncan's dead body is discovered.**
	Lennox: The night has been unruly…the earth was feverous and did shake **Macbeth:** All is but toys…the wine of life is drawn. **Macbeth:** Th'expedition of my violent love…..a breach in nature **Malcolm:** to show an unfelt sorrow is an office that the false man does easy. **Donaldbain:** there's daggers in men's smiles
Act 2:4	**Macbeth becomes king.**
	Ross: darkness does the face of earth entomb **Old Man:** 'Tis said, they eat each other
Act 3:1	**Macbeth questions Banquo. He plans his murder.**
Act 3:2	**Lady Macbeth and Macbeth talk: Macbeth is paranoid**
	LM: 'tis safer to be that which we destroy Than by destruction dwell in doubtful joy **Macbeth:** we have scorched the snake, not killed it **Macbeth:** these terrible dreams… Better be with the dead **Macbeth:** O full of scorpions is my mind
Act 3:3	**Banquo is murdered.**

Act 3:4	**The banquet and Banquo's ghost.**
	LM: Are you a man?...quite unmanned in folly? **Macbeth:** blood will have blood **Macbeth:** I am blood Stepped in so far that I should wade no more, Returning were as tedious as go o'er
Act 3:5	**Hecate, the goddess of witchcraft, meets the witches. Shakespeare may not have written this scene.**
Act 3:6	**Lennox shares his suspicions about Macbeth.**
	Lord: the most pious Edward…the holy King **Lennox:** this our suffering country Under a hand accursed
Act 4:1	**The witches share three prophecies as well as sharing a vision of Banquo.**
	Second Witch: something wicked this way comes **First Apparition:** beware Macduff **2nd Apparation:** none of woman born shall harm Macbeth **3rd Apparition:** Macbeth shall never be vanquished until Great Birnam Wood to Dunsinane hill shall come **Macbeth:** give to th'edge o'th'sword His wife, his babes
Act 4:2	**Macbeth has Macduff's wife and children murdered.**
Act 4:3	Macduff is in England to get help with removing Macbeth. Malcolm puts Macduff's loyalty to the test and asks him questions.
	Macduff: new sorrows strike heaven on the face **Malcolm:** this tyrant, whose sole name blisters our tongues **Malcolm:** our country sinks beneath the yoke, It weeps, it bleeds **Malcolm:** black Macbeth…Devilish Macbeth
Act 5:1	**Lady Macbeth's sleepwalking**
	Gentlewoman: This slumber agitation **Doctor:** she rubs her hands **LM:** Out damned spot!
Act5:2	**Outside the castle some Thanes, horrified by Macbeth's tyrannical behaviour, discuss the military situation. They decide the Scottish army will join forces with the English army at Birnam wood while Macbeth strengthens the castle of Dunsinane..**
	Angus: those he commands, move only in command…his title hang loose about him, like a giant's robe Upon a dwarfish thief **Macbeth:** I'll fight till from my bones my flesh be hacked
Act 5:3	**The prophecies have left Macbeth feeling invincible and he boasts than he cannot be killed. He calls his servant Seyton and insists on putting on his armour. The doctor informs the King that Lady Macbeth's delusions have worsened.**
Act 5:4	**Near Birnam Wood Malcolm and the English Lord Siward hatch a plan to disguise their army's number by cutting down branches and using them to hide the soldiers.**
Act 5:5	**Lady Macbeth is dead**
	Macbeth: I have almost forgot the taste of fears…I have supped full with horrors…my slaughterous thoughts **Macbeth:** Life's but a walking shadow, a poor player that struts and frets his hour upon the stage and then is heard no more. It is a tale told by an idiot, full of sound and fury Signifying nothing.
Act 5:6	**Malcolm prepares for battle**
Act 5:7	**Macbeth kills young Siward**
	Macbeth: They have tied me to a stake; I cannot fly, but bear-like I must fight the course
Act 5:8	**Macduff kills Macbeth**
	Macduff: hell-hound **Macduff:** Macduff was…untimely ripped **Macbeth:** these juggling fiends…palter with us in a double sense
Act 5:9	**Malcolm is crowned King**
	Malcolm: this dead butcher and his fiend-like queen

YEAR 10 – LENT TERM – FOUNDATION - MATHEMATICS - PROBABILITY AND STATISTICS

LEARNING - LOVING - LIVING

Important Ideas

Probability **adds up to 1**

Events are **mutually exclusive** when they cannot happen at the same time

Events are **exhaustive** if they include all possible outcomes

Sample Space Diagram shows all the possible outcomes. It is used to find theoretical probability

Venn Diagrams can be used to calculate probabilities

Tree Diagrams can be used to work out probability

Completing Incomplete Two Tables:

	English	Maths	Sci	Total
Girls	20	13		50
Boys	18		13	46
Total	38		30	96

To complete a two way table you need to use the total cells to help you work out the value of any missing cells.
TIP: look for rows or columns missing only 1 value.
Girls Sci = 50-20-13=17

Putting Information into Two Way Tables:

P(A or B) when A and B are not mutually exclusive:
$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$
P(A or B) when A and B are mutually exclusive:
$P(A \text{ or } B) = P(A) + P(B)$

Vocabulary

Mean	Uses all the data. The most used average.
Median	Only looks at the middle values, so it is a better average to use when the data contains extreme values.
Mode	It is the most common value. Can be used for non-numerical data.
Range	Measures how spread out the data is: a measure of dispersion.

Probability = $\frac{number\ of\ successful\ outcomes}{total\ number\ of\ possible\ outcomes}$

Estimated/Experimental Probability = $\frac{frequency\ of\ event}{total\ frequency}$

Q& A

There are 130 adults at a language school.
Each adult studies one of French or Spanish or German.

96 of the adults are women.
12 of the women study French.
73 of the adults study Spanish.
55 of the women study Spanish.
9 of the men study German.

	French	Spanish	German	TOTAL
Men			9	
Women	12	55		96
TOTAL		73		

How many of the adults study French?

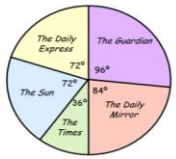
To draw a pie chart we need to know the angle we need to draw for each category. To do this we use the **scaling method.** We need to divide the total frequency by 360°, the number of degrees in a circle. This tells us how many degrees represent one piece of data.

360 ÷ 30 = **12°**

To work out each category's associated angle we then multiply 12 by each frequency, as shown below.

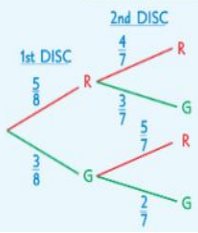
Finally we then draw each angle inside a circle.

Newspaper	No of people	Working	Angle
The Guardian	8	8 × 12°	96°
Daily Mirror	7	7 × 12°	84°
The Times	3	3 × 12°	36°
The Sun	6	6 × 12°	72°
Daily Express	6	6 × 12°	72°
	30		360°



Top Tip: Always draw each angle clockwise, using the previous line drawn to start.

EXAMPLE: A box contains 5 red discs and 3 green discs. Two discs are taken at random without replacement. Find the probability that both discs are the same colour.



The probabilities for the 2nd pick depend on the colour of the 1st disc picked. This is because the 1st disc is not replaced.

P(both discs are red) = P(R and R) = $\frac{5}{8} \times \frac{4}{7} = \frac{20}{56}$

P(both discs are green) = P(G and G) = $\frac{3}{8} \times \frac{2}{7} = \frac{6}{56}$

P(both discs are same colour) = P(R and R or G and G) = $\frac{20}{56} + \frac{6}{56} = \frac{26}{56} = \frac{13}{28}$

MathsWatch References

14	The probability Scale
59	Calculating Probabilities
60	Mutually Exclusive Events
61	Two Way Tables
128a/ 128b	Pie Charts/ Stem and Leaf Diagrams

Key Facts

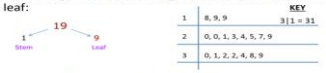
Mean of a set of grouped data

Data	Frequency	Mid interval value	Sub-total Freq x mid- value
$2 < t \leq 6$	3	4	12
$6 < t \leq 10$	2	8	16
$10 < t \leq 12$	5	11	55
$12 < t \leq 20$	2	16	32
Total	12		115

Estimated mean = $\frac{Grand\ total}{Total\ frequency} = \frac{115}{12} \approx 9.58$

Stem and Leaf diagram

Stem and Leaf:
Data is organised by breaking individual pieces up into a stem and a leaf:

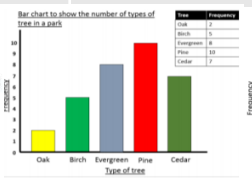


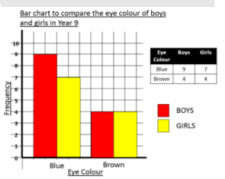
- Stem and leafs must be ordered!
- The smaller the leaf, the closer to the stem it must go.
- Save yourself time by putting your data in numerical order before creating the diagram.
- **ALWAYS INCLUDE A KEY!!!**

Bar Charts	Used to compare discrete data. Ensure you use a clear scale. Bars should be separate and the same width. All parts should be labelled
Dual Bar Charts	The comparing data bars can touch and must be side by side, Eg girls and boys.
Line Graph 	Used to show a trend over time. It is plotted as a series of points, which are then joined with straight lines. The ends of the line graph do not have to join to the axes.
Pie Charts 	Used to represents groups of data. Divide 360 by the total frequency, this shows the degrees per person. Multiply each frequency by this number this gives the size of each sector. Make sure all the angles add to 360.

All bar charts must have:

- Title
- Frequency on the y-axis
- Equal bar widths
- Equal gaps between categories
- Labelled axis





A Sample Space Diagram for a Coin and a Dice showing all possible outcome

Coin	1	2	3	4	5	6
H	H,1	H,2	H,3	H,4	H,5	H,6
T	T,1	T,2	T,3	T,4	T,5	T,6

Important Ideas

When measuring, we always round to a certain degree of accuracy. LB and UB are **the limits of accuracy** and the range between them is the **error interval**.

E.g. The error interval for the 32 cm stick to the nearest cm is: 31.5 cm ≤ length of stick < 32.5 cm (Note that is a strict inequality (<) for the UB)

These two laws are often used to simplify expressions involving surds.

$\sqrt{m} \times \sqrt{n} = \sqrt{mn}$ $\quad \frac{\sqrt{m}}{\sqrt{n}} = \sqrt{\frac{m}{n}}$

For non-zero values of m and n

$\sqrt{m} + \sqrt{n} \neq \sqrt{m+n}$

$\sqrt{m} - \sqrt{n} \neq \sqrt{m-n}$

For example

$\sqrt{75} = \sqrt{25 \times 3} = \sqrt{25} \times \sqrt{3} = 5\sqrt{3}$ and $\sqrt{\frac{32}{49}} = \frac{\sqrt{16 \times 2}}{\sqrt{49}} = \frac{\sqrt{16} \times \sqrt{2}}{\sqrt{49}} = \frac{4\sqrt{2}}{7}$

To simplify surds of the form $\sqrt{n}$ write n as a product including a square number.

Rationalise the denominator of **a** $\frac{1}{\sqrt{3}}$ and **b** $\frac{2\sqrt{3}}{\sqrt{8}}$

a Multiply the top and the bottom by $\sqrt{3}$:

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

b Multiply the top and the bottom by $\sqrt{8}$:

$\frac{2\sqrt{3} \times \sqrt{8}}{\sqrt{8} \times \sqrt{8}} = \frac{2\sqrt{24}}{8} = \frac{4\sqrt{6}}{8} = \frac{\sqrt{6}}{2}$

Vocabulary

Index (Indices plural), exponent, power	The **index** of a number says how many times to use the number in a multiplication
Standard form	Standard form is a way of writing very large and very small numbers using powers of 10. In this form, a number is given a value between 1 and < 10 and multiplied by a power of 10.
LB (lower bound)	The smallest number that rounds up to the given number: half a unit below the number given.
UB (upper bound)	Use half a unit above the number given number.
Surd- A root of a number which does not have an exact value	.For example √2 is a surd but √4 =2 is not, $\sqrt[3]{7}$ is a surd but $\sqrt[3]{1000} = 10$ is not. **Surds** have an infinite number of non-recurring decimals. Therefore, surds are irrational numbers.

Key Facts & Formula

Laws of indices

Rule	Example
$a^m \times a^n = a^{m+n}$	$2^5 \times 2^3 = 2^8$
$a^m \div a^n = a^{m-n}$	$5^7 \div 5^3 = 5^4$
$(a^m)^n = a^{m \times n}$	$(10^3)^7 = 10^{21}$
$a^1 = a$	$17^1 = 17$
$a^0 = 1$	$34^0 = 1$
$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$	$\left(\frac{5}{6}\right)^2 = \frac{25}{36}$
$a^{-m} = \frac{1}{a^m}$	$9^{-2} = \frac{1}{81}$
$a^{\frac{x}{y}} = \sqrt[y]{a^x}$	$49^{\frac{1}{2}} = \sqrt[2]{49} = 7$

Standard form

$73 = 7.3 \times 10 = 7.3 \times 10^1$

$625 = 6.25 \times 100 = 6.25 \times 10^2$

$0.007\,65 = 7.65 \times 10^{-3}$

$0.0098 = 9.8 \times 10^{-3}$

Surds

Calculate the area of a square with a side of 2 + √3 cm. Give your answer in the form a + b√3.

Solution:

$= (2 + \sqrt{3})(2 + \sqrt{3})\ cm^2$

$= 4 + 2\sqrt{3} + 2\sqrt{3} + 3\ cm^2$

$= 7 + 4\sqrt{3}\ cm^2$

MathsWatch References

Clip 29 Clip 82 Clip 154 Clip 188	Introduction to Powers/Indices Working with Indices Negative Indices Fractional Indices
Clip 83	Standard Form
Clip 31 Clip 32 Clip 90 Clip 91	Rounding to the Nearest 10, 100, 1000 Rounding to Decimal places Rounding to Significant Figures Estimating Answers
Clip 132 Clip 206	Introduction to Bounds Upper and Lower Bounds
Clip 207a Clip 207b Clip 207c	Introduction to Surds Surd Expressions Surds - Rationalising the Denominator

Q&A

Correct to 1 decimal place, $x = 4.8$ and $y = 2.4$

Work out the lower bounds of

a xy **b** $x - y$ **c** $x + y$ **d** $\frac{x}{y}$

Solution 7

a $4.75 \times 2.35 = 11.1625$ — Lower bound × Lower bound

b $4.75 - 2.45 = 2.3$ — Lower bound − Upper bound

c $4.75 + 2.35 = 7.1$ — Lower bound + Lower bound

d $4.75 \div 2.45 = 1.938\,775\,5$ — Lower bound ÷ Upper bound

$H = \frac{v^2}{2g}$ is a formula used to find the height H, of a stone thrown upwards at a speed v.

$v = 10$ correct to the nearest integer, $g = 9.8$ correct to 2 significant figures.

a Write down the upper bound of g.

b Work out the lower bound of H.

Give your answer correct to 3 decimal places.

Solution 8

a Upper bound of $g = 9.85$

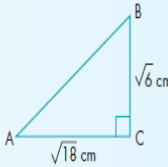
b Lower bound of $H = \frac{9.5^2}{2 \times 9.85}$ — Lower bound of $v^2 \div$ (2 × Upper bound of g)

$= 4.5812...$

$= 4.581$ — An answer correct to 3 decimal places is required.

In the right-angled triangle ABC, the side BC is √6 cm and the side AC is √18 cm.

Calculate the length of AB. Leave your answer in surd form.



Using Pythagoras' theorem

$AC^2 + BC^2 = AB^2$

$(\sqrt{18})^2 + (\sqrt{6})^2 = 18 + 6 = 24$

$\Rightarrow AB = \sqrt{24}$ cm

$= 2\sqrt{6}$ cm

Important Ideas

Surface Area and Volume of Combination of Solids

To find the surface area and volume of such objects,

- Break-up the objects into the basic 3-D shapes
- Find the surface area and volume of these individual basic shapes
- Add or subtract them to get the surface area or volume of required figure

The tanker can be divided into : A cylinder and two hemispheres

TSA of new solid = CSA of hemisphere A + CSA of hemisphere B + CSA of cylinder

where TSA = 'Total Surface Area' and CSA = 'Curved Surface Area'

The figure consists of : a cuboid and a sphere

Volume of space left in the box = Volume of cuboid - Volume of sphere

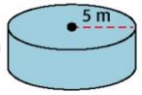
Volume and Liquids

Capacity of liquids is the volume of space they take up.

Vocabulary

Prism	A 3D shape with a constant cross-section
Surface area	The sum of the areas of the faces of a 3D shape
Volume	The space that a 3D shape occupies. Measured in units^3
Capacity	The volume of liquid a container can hold. The standard unit is the litre

Q & A



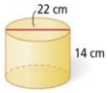
$V = \pi r^2 h$

The radius of the cylinder is 5 m, and the height is 4.2 m

$V = 3.14 \cdot 5^2 \cdot 4.2$ *Substitute the values you know.*

$V = 329.7$

Be sure you know the difference between a radius and a diameter!



SA = (π d x h) + 2 (π r²)

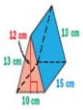
= (3.14 x 22 x 14) + 2 (3.14 x 11²)
= (367.12) + 2 (3.14 x 121)
= (367.12) + 2 (379.94)
= (367.12) + (759.88)
= 1127 cm²

Find the surface area of the triangular prism.

$S = 2B + Ph$

$= 2(\frac{1}{2} \cdot 10 \cdot 12) + (13 + 13 + 10)15$

$= 660$



Find the surface area of the sphere, given that the radius is 9 inches.

$S = 4\pi r^2$

$S = 4\pi(9)^2$

$S = 324\pi$

$S \approx 1017.88 \text{ in.}^2$

The curved surface area of a right circular cylinder of height 14 cm is 88 cm². Find the diameter of the base of the cylinder. Assume $\pi = \frac{22}{7}$

Height (h) of cylinder = 14 cm

& radius of cylinder be r

Given

Curved surface area of cylinder = 88 cm²

$2\pi rh = 88 \text{ cm}^2$

$2 \times \frac{22}{7} \times r \times 14 \text{ cm} = 88$

$r = \frac{88 \times 7}{2 \times 22 \times 14}$

$r = 1 \text{ cm}$

Diameter = 2 × Radius

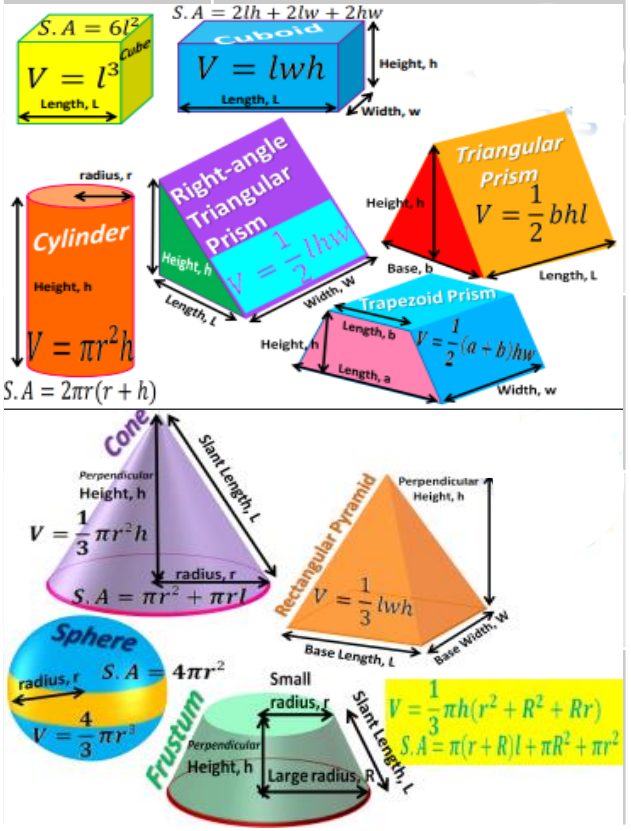
$= 2 \times 1 = 2 \text{ cm}$

Therefore, the diameter of the base of the cylinder is 2 cm.

MathsWatch References

G21b	Surface Area of a cuboid
G21a	Volume of a cuboid
G25b	Surface Area of a prism
G25a	Volume of a prism

Key Facts & Formulae



Important Ideas, Formulas

Solving a quadratic equation by factorisation

Factorise $x^2 + ax + b = 0$	To factorise $x^2 + bx + c$, we are looking for 2 numbers, m and n, where mn=c and m+n = b. Then (x+m)(x+n) = 0 Hence x+m = o, x = -m or x + n = 0, x =-n
Factorise $ax^2 + bx + c = 0$	To factorise $ax^2 + bx + c$, we are looking for 2 numbers whose product is ac and which sum is b. Then we split the middle term using these 2 numbers and group terms to factorise.

Solve $12x^2 - 28x = -15$
Solution: Rearrange : $12x^2 - 28x + 15 = 0$ Factorise: $(2x - 3)(6x - 5) = 0$. So, either $2x - 3 = 0$ or $6x - 5 = 0$
$\Rightarrow 2x = 3$ or $6x = 5 \Rightarrow x = 3/2$ or $x = 5/6$

Solving equations using the quadratic formula

Solve $5x^2 - 11x - 4 = 0$, correct to two decimal places.

Take the quadratic formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

and put $a = 5$, $b = -11$ and $c = -4$, which gives:

$$x = \frac{-(-11) \pm \sqrt{(-11)^2 - 4(5)(-4)}}{2(5)}$$

Note that a, b, *c* have been put in brackets to avoid mistakes. It is a very common mistake to think that $(-11)^2$ is -121.

$$x = \frac{11 \pm \sqrt{121 + 80}}{10} = \frac{11 \pm \sqrt{201}}{10}$$

$$\Rightarrow \quad x = 2.52 \text{ or } -0.32$$

Key Facts

Difference of two squares formula
$a^2 - b^2 = (a-b)(a+b)$
1. Solve $4x^2 - 25 = 0$
Solution: $(2x - 5)(2x + 5) = 0$, $2x - 5 = 0 \Rightarrow x = +5/2$, $2x + 5 = 0 \Rightarrow x = -5/2$

$$x^2 + px + q = \left(x + \frac{p}{2}\right)^2 - \left(\frac{p}{2}\right)^2 + q$$

Solve $x^2 - 6x + 7 = 0$ by completing the square.
Solution:

$$(x-3)^2 - 3^2 + 7 = 0$$
$$(x-3)^2 = 9 - 7$$
$$(x-3)^2 = 2$$
$$x - 3 = \pm\sqrt{2}$$

a $x = 3 \pm \sqrt{2}$

MathsWatch References

Clip 157 Clip 192	Factorising and solving quadratics Factorise harder quadratics
Clip 209b	Completing the square. Solving
Clip 191	Solving quadratics with the Formula
Clip 160	Roots and turning points of quadratics
Clip 179 Clip 180	Iteration-Trial and Improvement Iteration Processes

Q&A

Solving equations by iteration

Solve by iteration method: $x^2 - 5x + 6 = 0$
1)Re-arrange: $x^2 = 5x - 6$, $x = \sqrt{5x - 6}$
2)Make the subject x_{n+1},the other x becomes x_n

$$x_{n+1} = \sqrt{5x_n - 6}$$

3)Substitute in x_1 to produce your first result

$$x_1 = 4$$
$$x_2 = \sqrt{5(4) - 6}$$
$$= 3.741657\ldots$$
$$x_3 = \sqrt{5(3.741657\ldots) - 6}$$
$$= 3.564868\ldots$$
$$x_4 = \sqrt{5(3.564868\ldots) - 6}$$
$$= 3.438654\ldots$$
$$x_5 = \sqrt{5(3.438654\ldots) - 6}$$
$$= 3.345634\ldots$$

...and so on. Carrying this on will eventually converge on one of the roots at $x = 3$

Vocabulary

Factors	Numbers or expressions that go exactly into a given expression
Solve an equation	To find numbers that satisfy the equation, i.e. when we substitute this value into the equation we get identity.
Iteration	Repetition of a calculation, applied to the result again and again, aiming to obtain certain approximation to the solution

Variation

Organisms vary, both organisms of different species (obviously) and organisms of the same species (also obviously!). Variation (differences) are caused by both genetic causes and environmental causes.

- Some differences are only due to **inherited** genes – they are entirely **genetic**;
- Some differences are only due to the conditions in which an organism developed and lives – they are entirely **environmental**;
- Some differences are due to a **combination** of genetic and environmental influences. In this case, we say the genome of an organism and its environment **interact** to affect the phenotype of the organism.

In most populations of most species of organism, there is a lot of genetic variation. The general term for versions of the same organism (i.e. different individuals of a species) is with different genetic information is **variants**. All variants arise from **mutations**. Mutations can be dangerous (remember your work on cancer, for instance), but usually have no effect. Sometimes, they have a beneficial effect. Overall:

- Mutations happen continuously;
- most mutations will not affect the phenotype at all;
- some will influence the phenotype (maybe change it a bit);
- very few mutations cause a total change in phenotype.

The last case is rare, but very important. If a mutation occurs that leads to a new phenotype, and the new phenotype makes the organism better suited to the environment, it will lead to a rather rapid change in the species, by **natural selection**.

Evolution by natural selection

Evolution is the change in inherited (genetic) characteristics of organisms over time. Many theories of evolution have been suggested, but Darwin's theory of natural selection is the one with by far the most evidence. Darwin noticed that all organisms produce more offspring than they need to replace themselves, and yet population sizes stay pretty steady from generation to generation. He also observed that all species show variation, and that life is tough for organisms – only the best adapted survive. So, based on these observations, we can explain evolution by natural selection like this:

1. A population of organisms shows variation – there are **variants** in the population
2. The organisms are in **competition** to survive
3. **Survival of the fittest** – only the variants with the phenotypes best suited to the environment get to survive
4. **Reproduction** – those who survive get to reproduce
5. **Genetic inheritance** – their offspring inherit the genes from their parents, so the successful phenotype becomes more common in the next generation. This continues from generation to generation.

Key Terms	Definitions
variation	Differences in the characteristics of individuals in a population.
genetic variation	Differences in the genome between individuals. This often causes differences in physical characteristics.
variants	Different versions of the same thing. Often this term is used to describe individuals who are different from others in a specific genetic way – for instance the 'long haired cat variant' from earlier.
mutation	A change to DNA. Mutations can cause a change in the sequence of amino acids being produced, affecting the protein being produced from the DNA code.
evolution	Change in the inherited characteristics of organisms over time. Evolution happens through **natural selection**.
natural selection	The process that changes the inherited characteristics of organisms over time. This explains the adaptations of organisms to their environment AND the formation of new species of organism.
common ancestor	An ancestor in common. For instance, if you have a sister, your granddad is a common ancestor to you both.

New species

The theory of evolution by natural selection tells us that all species of living things have evolved from a single, simple type of life form. We know this **common ancestor** was alive on Earth over three billion years ago. How we ended up with millions of different species from this single species is also explained by evolution by natural selection.

Essentially, two populations of one species (e.g. a population of fish is divided into two populations by geographical changes such as the joining of North and South America) can become two different species. This happens when the two populations become so different in their phenotypes that they can no longer **interbreed** to produce **fertile offspring**. This is the point when we define them as different species. For example, tigers and lions are different species (the population of their common ancestor has been separated for a long time) – they can interbreed (producing a liger), but ligers are infertile. So their parents are different species.

Evidence for evolution

There is a vast haul of evidence to support Darwin's theory of evolution by natural selection. This evidence has built up over time: for example, Darwin didn't know about genes so found it hard to explain inheritance from parents in full. Obviously, we've got this knowledge now.

Thanks to all this evidence, Darwin's theory for evolution is now very widely accepted. Two key bodies of evidence for you to know are: the fossil record, and the evolution of resistant bacteria.

Fossils

Fossils are the remains of organisms. They are always old, typically millions of years old, and are found in rocks. They can form by:

1. The organism or parts of the organism don't **decay** because the conditions are not right for decay by microorganisms. For example, mammoths have been preserved in frozen mud.
2. Parts of the organism are replaced by **minerals** from the surrounding rocks as they decay. Most often, this results in soft tissues (e.g. muscle, skin) *decaying* normally, but the form of bones is preserved by the minerals in bones being swapped for minerals from the *rocks/sediments* that the dead organisms were buried under.
3. Preserved **traces** of organisms – so not their actual bodies, but traces like footprints, droppings, burrows and the traces of roots.

As most fossils are formed from bones, and many early forms of life had **soft bodies** (no bones), there are few traces of early forms of life. Any traces there were tend to have been destroyed by geological activity (movements of tectonic plates, volcanic activity and so on). This means the fossil record is **incomplete** and scientists cannot be totally sure about the origin of life on Earth.

The fossil record helps scientists fill in timelines and **evolutionary trees** to show how life has changed over time on Earth. Using evolutionary trees shows the closeness of relationships between different species.

Extinction

Extinctions of a species can happen for many reasons, and often extinction is due to more than one factor working together. Some key factors that may contribute to extinction of a species:

- Development of <u>new</u> species, so the old species doesn't exist any more
- <u>New</u> diseases affecting a species, which they aren't adapted to and can't survive
- <u>New</u> predators, to which a species cannot adapt fast enough to survive
- <u>Changes</u> to the environment, to which the species cannot adapt by natural selection, including <u>catastrophic</u> events (like the meteor strike that caused extinction of loads of species, e.g. dinosaurs)
- <u>New</u> competitors that are better adapted to the environment than the species.

Key Terms	Definitions
fossil	The remains of organisms from millions of years ago, found in rocks. They are formed in different ways – see main text.
strain	A variant of microorganism within a species – so they are not a different species to other variants, but have a key difference in their phenotype (e.g. being resistant to an antibiotic). New strains are produced by **mutations**.
resistant strain	Describes a variant form of bacteria with resistance (NOT immunity) to a specific antibiotic.
MRSA	An example of a resistant strain of bacteria. It stands for methicillin resistant *Staphylococcus aureus*.
extinction	When NO individuals of a species remain alive.
evolutionary tree	A timeline that shows how closely related different species are to each other.

Resistant bacteria

The key factor that affects the rate of evolution is how fast an organism reproduces. Bacteria can reproduce as fast as doubling every 20 minutes, so they can evolve rapidly.

Thanks to a **mutation**, strains of bacteria that are **resistant** to an antibiotic can emerge. These are NOT killed by antibiotics used to try to kill them when the bacteria has infected someone. Consequently, they <u>survive</u> and <u>reproduce</u>, so the size of the resistant strain population increases generation to generation, while the non-resistant strain is wiped out. Furthermore, the resistant strain is likely to spread because if it infects other people and:

- They are not immune to it
- And there is no effective treatment.

Society benefits if we <u>reduce</u> the rate of development of antibiotic resistant strains of bacteria. Some methods to help save the day:

- Antibiotics should not be **prescribed** by doctors where they are not needed (especially for viral infections, since antibiotics don't work on viruses).
- Patients need to **finish the full course** of antibiotics they get prescribed, reducing the chance of any surviving and mutating to form resistant strains.
- **Restrict** the use of antibiotics in **agriculture**, as at present many animals receive antibiotics all the time to prevent infections and encourage growth.

We also badly need new antibiotics. However, it is slow and expensive to develop new antibiotic drugs, and at the moment we are not keeping up with the emergence of resistant strains of bacteria.

The structure of the Atom

- An atom is made up of three subatomic particles: **protons, electrons** and **neutrons.**
- Protons and neutrons are found in the nucleus
- Electrons are found orbiting the nucleus in shells (also known as *energy levels*).

- Protons have a charge of +1, electrons have a charge of -1 and neutrons have a charge of 0.
- Atoms have **no overall charge** because they have the same number of positive protons as negative electrons.

Atomic Number and Mass Number

Mass number: This is the total of protons+neutrons

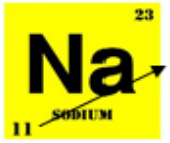
Atomic number: This is the number of protons

Therefore sodium has 11 protons, 11 electrons and 23-11= 12 neutrons

Electron Configuration

There are very strict rules about how electron fill up the electron shells, the inner shell is always filled first. Each shell has a maximum number of electrons it can take.
Shell 1: maximum 2 electrons
Shell 2: maximum 8 electrons
Shell 3: maximum 8 electrons

Example:



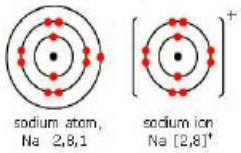
11 electrons

The electronic configuration of Sodium (Na) can also be written like this 2,8,1. This shows there is 2 electrons in the 1st shell, 8 electrons in the second shell and 1 electron in the 3rd shell.

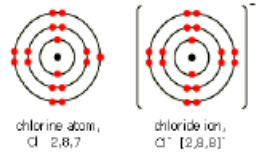
Key Terms	Definitions
Atom	The particles that make up all substances with mass, they contain protons, neutrons and electrons.
Nucleus	The centre of an atom, it contains protons and neutrons.
Proton	A sub atomic particle found in the nucleus, it has a charge of +1 and a relative mass of 1.
Electron	A sub atomic particle found in the shells of an atom, it has a charge of -1 and a negligible mass
Subatomic	These are the smaller particles that make up an atom
Neutron	A sub atomic particle found in the nucleus of an atom, it has a charge of 0 and a mass of 1
Atomic Number	The number of protons in an atom.
Mass Number	The total of protons and neutrons in an atom.

Ions

All atoms want a full outer shell of electrons. To do this they either need to gain or lose electrons. An ion is an atom with a positive or negative charge, these are formed by an atom gaining or losing electrons. Some atoms will lose electrons to get a full outer shell: these are metals. Some atoms will gain electrons to get a full outer shell: these are non metals.
For example, sodium has one electron in it's outer shell, it therefore loses one electron to form a Na^{+1} ion. We represent ions with square brackets around the ion and the charge in the top right corner.



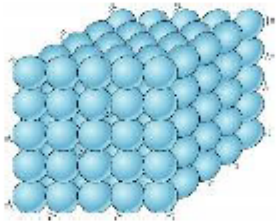
For example, chlorine has seven electrons in it's outer shell, it therefore gains one electron to form a Cl^{-1} ion.



Structure of Matter

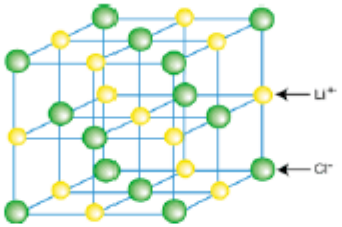
Atoms very rarely exist on their own. They are almost always bonded to another atom of the same type or an atom of a different type in a compound. When atoms are bonded together form structures, this is the way the atoms are arranged in space.

Atoms that are bonded together either form **simple or giant structures.** A giant structure is one which repeats over and over throughout the structure. The diagram below shows only a **very small part of a giant structure.**



Giant Ionic Structures

The particles that make up most giant structures **are ions.** Ions are atoms with a positive or negative charge. When we have 2 atoms that have an opposite charge we have **a giant ionic structure.** Below shows a small part of the 3D structure of Lithium chloride Li^+ and Cl-.



The lithium and chlorine are attracted to each other by a strong force of attraction as one is positive and one is negative. We call the force of attraction between positive and negative charges an **electrostatic force.**

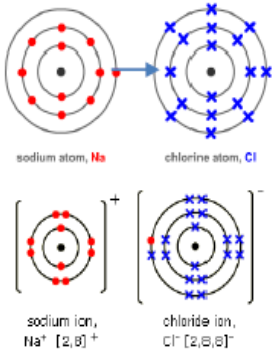
Key Terms	Definitions
Giant Structure	A giant structure is one which repeats over and over throughout the structure.
Ion	An atom (or particle) with a positive or negative charge, due to loss or gain of electrons
Ionic Bond	A bond formed by the electrostatic attraction of oppositely charged ions

Ionic Bonding - How giant ionic structures form

When a metal atom reacts with a non-metal atom electrons in the outer shell of the **metal atom are transferred to the non metal atom.**

This means the metal has a positive charge and the non metal has a negative charge. This means there is an **electrostatic attraction** between the two ions, this is what forms an ionic bond.

Both atoms will have a **full outer shell** (this is the same as the structure of a noble gas) see example below of sodium chloride.



Melting point of giant ionic compounds

To melt a giant ionic structure, a very large amount of energy is required to break the many strong, electrostatic forces that exist between the ions.

Therefore ionic compounds have high melting points. For example the melting point of sodium chloride is 801 °C.

Energy in Reactions

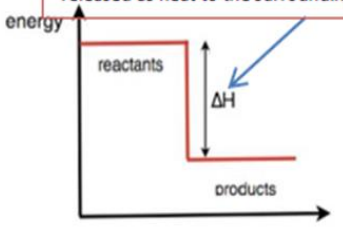
In a chemical reaction, bond breaking and bond making occur. To **break** a chemical bond you need to overcome the force of attraction in the bond, so this process requires energy (therefore it is **endothermic**). The process of bond formation is **exothermic**: energy is released when bonds form. In a chemical reaction the difference between the energy required to break the bonds and the energy gained from making the bonds will decide whether a reaction overall is exothermic or endothermic. Chemical reactions can therefore be divided into exothermic and endothermic chemical reactions.

Type	What happens?	Why?	Example
Exothermic	Heat energy is transferred to the surroundings.	The energy required to break chemical bonds is less than the energy gained from making chemical bonds. Therefore the excess is given off as heat to the surroundings.	Combustion reaction, reactions used in hand warmers
Endothermic	Heat energy is taken in from the surroundings	The energy required to break chemical bonds is more than the energy gained from making chemical bonds. Therefore heat is taken in from the surroundings.	The reaction of citric acid and sodium hydrogencarbonate, the reactions used in ice packs

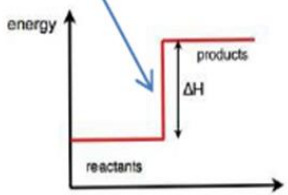
Reaction Profiles

Chemical reactions can occur only when reacting particles collide with each other with sufficient energy. The minimum amount of energy that particles must have to react is called the **activation energy**. **Reaction profiles** can be used to show the relative energies of reactants and products, the activation energy and the overall energy change of a reaction.

This is the reaction profile of an **exothermic reaction**: the energy of the products is lower than that of the reactants. The difference in energy is released as heat to the surroundings.



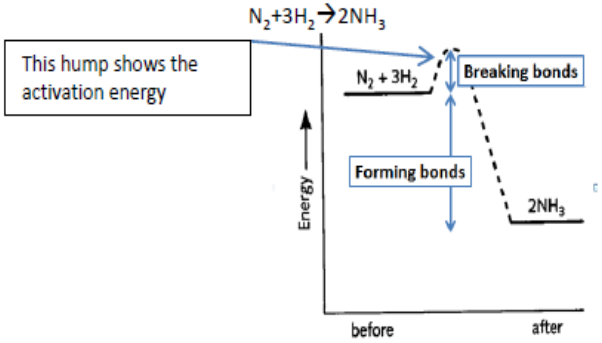
This is the reaction profile of an **endothermic reaction**: the energy of the products is higher than that of the reactants. The difference in energy is taken in from the surroundings, cooling them down.



Key Terms	Definitions
reaction profile	A graph which shows the energies of the products and reactants in a chemical reaction
exothermic	A reaction that gives out heat to the surroundings
endothermic	A reaction that takes heat in from the surroundings

Reaction Profiles- In more detail

The profile below shows the reaction which makes ammonia from nitrogen and hydrogen. The equation is given below:



There are some key features to highlight on this graph: firstly, the humped section represents the **activation energy** for this reaction. This hump shows how much energy is required to break the bonds in the reactants. To overcome the activation energy we often need to heat our reactants. The products are lower in energy than the reactants; this means it is an **exothermic reaction**. The excess energy is given out to the surroundings as **heat energy**.

Higher Tier: Calculating bond energies

The difference between the sum of the energy needed to break bonds in the reactants and the sum of the energy released when bonds in the products are formed is the overall energy change of the reaction. *(bond breaking subtract bond making)*

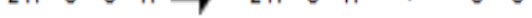
For example consider the reaction:

$N_2 + 3H_2 \rightarrow 2NH_3$

To work out the overall energy change you will need to subtract the energy released while forming the bonds in ammonia from the energy required to break the bonds in nitrogen and hydrogen molecules. This will give you the overall energy change. If the value is negative then the reaction is exothermic. If the value is positive the reaction is endothermic.

Higher Tier: Bond Energies continued

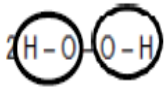
You can calculate the energy change in a reaction from bond energies given to you in a question. For example consider the reaction below:



This shows that hydrogen peroxide breaks down to make water and oxygen. We can use bond energies to work out the energy change in the reaction.

Bond	Bond energy in kJ per mole
H–O	464
O–O	146
O=O	498

The energy required to break the reactant bonds is:



2 x464 (for the O-H bonds) + 146 (for the O-O bond)=1074
However, as there are two moles of hydrogen peroxide molecules in the equation, this number needs to be doubled. **2 x 1074 = 2148 kJ/mol**

The energy gained from making the product bonds is:

2x464 = 928 but there are two moles of water molecules in this equation, so this doubled to 1856. Then we also need to add the 498 for the double bond forming to make O_2

1856 + 498=2354 kJ/mol

To find the overall energy change, we calculate like this:
energy required to break reactant bonds – energy gained from making product bonds:

2148 – 2354 = -206 kJ/mol

If the value is negative then the reaction is **exothermic**
If the value is positive the reaction is **endothermic**.

Key Terms	Definitions
reversible	Describes a chemical reaction that proceeds both ways.
dynamic equilibrium	An equilibrium where the forward and backward reactions are happening at the same rate.

Reversible Reactions and Equilibrium

Some chemical reactions are reversible, this means they can happen in both the **forward and reverse directions.** The symbol we use to represent an equilibrium reaction is shown in the equation below:

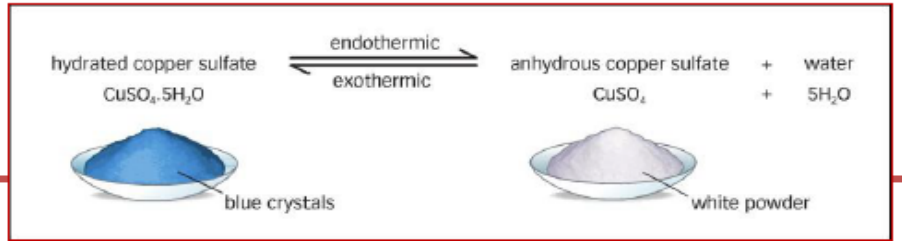
$$N_2 + 3H_2 \rightleftharpoons 2NH_3$$

In a reversible reaction that is left to react in a closed container, **dynamic equilibrium** occurs after some time. During equilibrium, the forward and reverse reactions are happening at the **same rate.** A dynamic equilibrium only occurs in a **closed system,** where no reactants and products are allowed to escape (i.e. a closed container). The overall concentrations of reactants and products all stay the same (but certainly don't have to be equal).

The relative amounts of reactants vs. products is described in the 'position of equilibrium':

- If the position of equilibrium lies to the **left,** it means that there is a **greater concentration of reactants than products.**
- If the position of equilibrium lies to the **right,** it means there is a **greater concentration of products than reactants.**

All equilibrium reactions are endothermic in one direction and exothermic in another direction. A good example is the hydration and dehydration of copper sulphate. It is exothermic when water is added to the copper sulphate, it is endothermic when water is removed. You must know this example.



Higher Tier: The effect of conditions on the position of equilibrium

The Haber process is a good example to explain Le Chatelier's principle, the equation for the Haber process is shown below. The reaction is carried out in the gaseous state. Remember this is one of many reactions but the principles always stay the same.

Exothermic in this direction

$$N_2 + 3H_2 \rightleftharpoons 2NH_3$$

Endothermic in this direction

Condition Change	Effect on this reaction
Increase the temperature	Shifts the equilibrium to the left as this is the endothermic direction, and endothermic reactions cool the surroundings down. The amount of reactants increases.
Decrease the temperature	Shifts the equilibrium to the right as this is the exothermic direction, which heats the surroundings. The amount of product increases.
Increase the concentration of reactants	Equilibrium shifts to the right to make more product and reach equilibrium again
Increase the concentration of products	Equilibrium shifts to the left to make more reactants and reach equilibrium again
Increase the pressure in the gas	Equilibrium shifts to the right, where there are fewer moles of gas molecules. This will decrease the pressure back again.
Decrease the pressure in the gas	Shifts the equilibrium to the left as there are more moles of gas molecules on that side of the equation.

Key Terms	Definitions
Le Chatelier's principle	A principle which states, "If a system is at equilibrium and a change is made to any of the conditions, then the system responds to **counteract the change**"

Higher Tier: Le Chatelier's Principle

The amounts of all the reactants and products at equilibrium depends on the conditions of the reaction. If we change things like **temperature, concentration of a reactant or product and pressure in gases.**

The French scientist Le Chatelier devised a principle to explain how reversible reactions at dynamic equilibrium respond to a change in conditions. It states that:

"If a system is at equilibrium and a change is made to any of the conditions, then the system responds to counteract the change"

In other words, whatever you do to the system, the reaction will react to try to go back to how it was.

For example, if the temperature is raised the equilibrium will shift to cool the surroundings down.

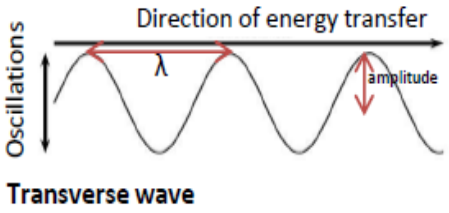
Types Of Wave

You can see waves easily in the sea, or if a tap is dripping into a sink of water. However, waves are far more common than just that. Waves can be **mechanical**, which means they involve particles moving, or **oscillating**, such as waves in the sea or sound waves in the air. Or, they can be **electromagnetic**, which don't involve any particles oscillating – instead, EM waves involve vibrations or oscillations of the electromagnetic field. All waves involve the transfer of energy.

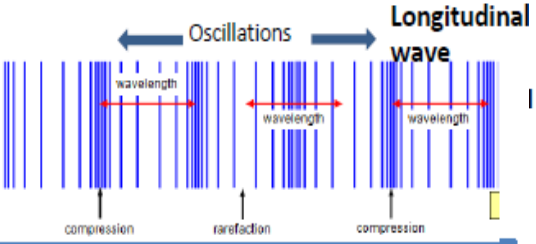
The other way of defining types of wave is whether they are **longitudinal** or **transverse**. Which one they are depends on the direction of the oscillations compared to the direction of energy transfer by the wave.

- In **transverse waves**, the oscillations are **perpendicular** to the direction of energy transfer.
- In **longitudinal waves**, the oscillations are **parallel** to the direction of energy transfer. They show areas of compression and rarefaction – see diagram.

Examples: ALL electromagnetic waves are transverse. Mechanical waves can be either longitudinal or transverse. For instance: sound waves are mechanical and are longitudinal. Ripples in water are mechanical waves, and are transverse.



Transverse wave

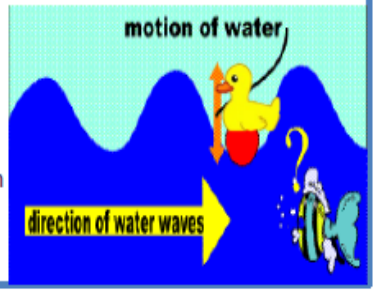


Longitudinal wave

Particles Don't Travel, But The Wave Does. Particles Just Oscillate.

An easy way to see that the particles aren't travelling but the wave is (so energy is being transferred): put a rubber duck in a tank of water where waves are moving across. The duck goes up and down, just like the water particles (oscillations perpendicular to direction of energy transfer, remember), while the waves move across.

With longitudinal waves, you can tell the particles aren't flowing either – just oscillate. When you speak, you don't breathe into someone else's ear! Also, when a tuning fork is vibrating to produce a sound wave, it doesn't create a vacuum around it due to air particles travelling away.



Key Terms	Definitions
wave	A wave transfers **energy** from one place to another, and can also carry information. All waves involve movements or **oscillations**, allowing energy to be transferred **without** particles having to flow or travel from one place to another.
oscillations	Rhythmic back and forth movements from a rest position (e.g. vibrations). These movements are of particles in **mechanical** waves, or of the electromagnetic field when it comes to **electromagnetic** waves.
perpendicular	At right angles to.
amplitude	The amplitude of a wave is the maximum displacement of a point on the wave from the undisturbed position. *Translated*: the distance from a peak or trough to the 'midline' of the wave.
wavelength	The distance from a point on one wave to the equivalent point on the next wave along. This is easiest to measure at the distance from the centre of one area of compression to the next (longitudinal waves) or the distance from peak to peak (transverse waves). Symbol: λ
frequency	The frequency of a wave is the number of complete waves that pass a point per second. Symbol: f
period	The period, or time period, of a wave is the time it takes to complete a full wave. Symbol: T

Equation	Meanings of terms in equation
$T = \frac{1}{f}$	T = *time period (seconds, s)* f = *frequency (hertz, Hz)*
* $v = f\lambda$	v = *wave speed (m/s)* f = *frequency (Hz)* λ = *wavelength (metres, m)*

The Wave Equation

The equation is directly above. You could measure the speed of sound in air, with a long distance between you and a friend. They make a loud noise (you start your clock when you see them do it) and you time how long it takes to get to you. Just use distance/time to calculate the speed.

Electromagnetic Waves (EM Waves)

EM waves are always **transverse waves**. They transfer energy from the source of the waves to an **absorber** – object that absorbs the wave. EM waves occur all over the universe naturally, and we can produce them ourselves for all sorts of uses.

EM waves all travel at the **same velocity** through empty space (a vacuum) – at what we call the speed of light. However, the wavelength of EM waves varies from a few kilometres to wavelengths even smaller than an atom. The EM waves form a **continuous spectrum**, but for convenience we've grouped the infinite types of waves into seven groups of wavelengths, based on their properties. Learn the order of EM waves in the EM spectrum. Notice that a *longer* wavelength equates to a *lower* frequency and vice versa – this is clear from the wave equation.

Long wavelength → Short wavelength

Radio waves	Microwaves	Infrared	Visible light	Ultraviolet	X-rays	Gamma rays

Low frequency → High frequency

Visible light is the only kind of EM wave we can detect with our eyes (hence the name). Thus, we can only detect a limited range of EM waves without special equipment. However, it is easy to understand examples of how EM waves transfer energy. If you are standing in front of a fire, you feel the warmth thanks to infrared. Getting sunburn is due to the transfer of energy by ultraviolet waves from the Sun. Using Wi-Fi means a transfer of energy by microwaves.

Properties Of EM Waves

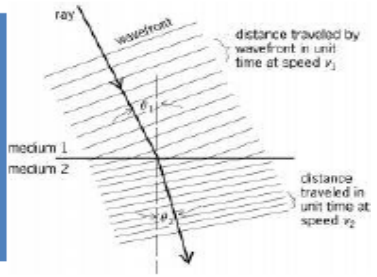
All EM waves can be **reflected**, **refracted**, **absorbed** or **transmitted** *depending* on the wavelength of the EM wave and the **medium** they are travelling through, or surface they are reaching.

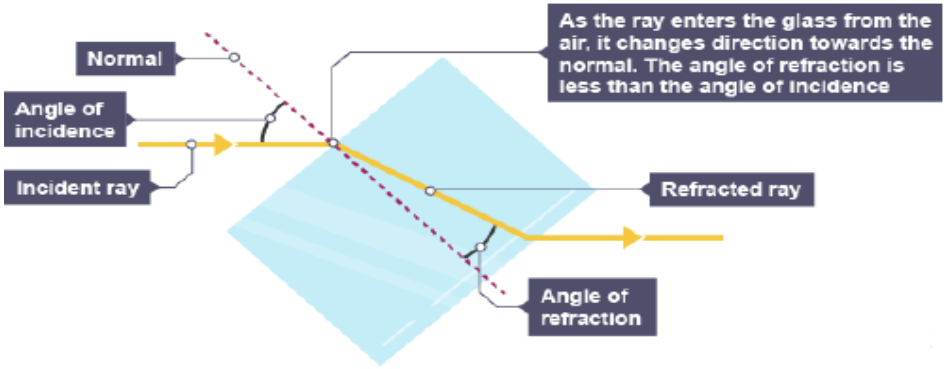
Refraction occurs when a wave changes the medium it is travelling through. Refraction is a change in direction of the wave, and it happens at the boundary, or junction, between the media – for instance, the surface of a sheet of glass would be the boundary between the glass and the air. You need to be able to draw diagrams to show refraction, like the example opposite. Notice that the light ray refracts *towards* the normal as it enters the glass (this is because it slows down), and refracts *away* from the normal as it leaves the glass (it speeds back up), ending up parallel to the original ray in air.

Key Terms	Definitions
reflection	Rebounding of a wave from a surface. The angle between the **incident** (in-going) wave and the **normal** is the same as the angle between the reflected wave and the normal.
refraction	Changing direction of a wave due to a change in the **medium** it is travelling through.
absorption	'Taking in' energy from a wave and transferring it to another form, usually heat. For instance, you warming up if you lie in the sunshine (revising science, of course).
transmission	A wave travelling through a material. Right now, visible light waves are being transmitted through the air to your eyes.
media	*Singular 'medium'*. The medium is the material through which a wave travels.
normal	A 'construction line' (made up line to help with diagram drawing) at right angles to a surface at the point where the wave hits the surface.

HT: More On Refraction

Refraction is due to differences in the velocity of the waves in different media. The diagram shown here represents the **wave fronts**. The wave slows down as it enters medium 2, but the near edge slows first. The other end is faster, as it is still in medium 1. This is what causes the 'bending' of the wave towards the normal.





Electromagnetic Waves (EM Waves): Producing Them

EM waves can be generated by changes in atoms or the nuclei of atoms. For instance, gamma rays are produced due to changes in the nucleus of an atom (nuclear decay – more on this in a later topic).

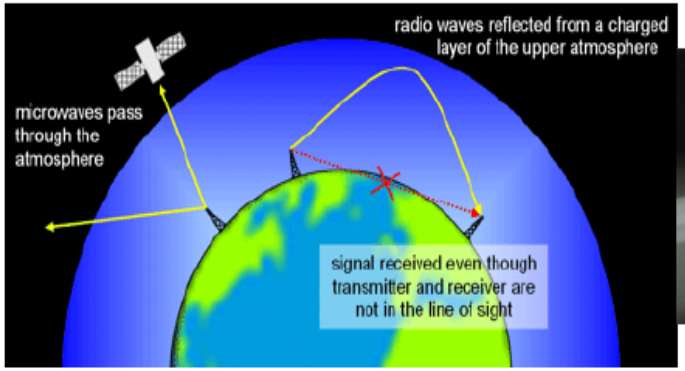
HT: radio waves can be produced by oscillations in electrical circuits. This is how a TV/radio broadcast is produced. It is received (e.g. by your TV aerial) by another electrical circuit; the radio waves create an alternating current with the same frequency as the radio wave itself. More on alternating current in the electricity topic – but it is enough to say for now that it involves oscillations.

Dangers Of EM Waves

Ultraviolet waves, X-rays and gamma rays are potentially dangerous types of EM waves, since they can have hazardous effects on human tissues. How severe the effects are depends on the type of radiation and the size of the **dose** received.

Doses of radiation are measured according to how great the risk of harm to the body is. The radiation dose, or danger due to **exposure** to radiation, is measured in **sieverts** (Sv).

A specific risk due to exposure to ultraviolet waves: they cause skin to prematurely age and increase the risk of skin cancer.
X-rays and gamma rays are **ionising** types of radiation. This means they can damage DNA, causing mutations and therefore increasing the risk of cancer.



Key Terms	Definitions
radiation dose	The risk of harm due to exposure to radiation.
exposure	Receiving and absorbing radiation (by the body).
sievert	The measure of radiation dose. As with the usual prefix: 1000 millisieverts (mSv) = 1 sievert (Sv)
ionising	Describes radiation that forms ions by 'knocking' electrons off atoms to make ions.
cancer	Type of disease caused by specific mutations to DNA, resulting in cells dividing out of control (making a tumour).

Applications Using EM Waves

It is not exaggerating to say that EM waves dominate our technology and our lives. Here are some examples to learn of the practical applications of EM waves:

- **Radio waves:** used for *television*, *radio* and Bluetooth. A signal carried by radio waves can get from a transmitting mast to a receiver by being reflected off a layer in the atmosphere.
- **Microwaves:** obviously, cooking food, but also communication with *satellites* and *mobile phones*; Wi-Fi internet. Unlike radio waves, microwaves can pass through the atmosphere (see diagram bottom left). In microwave ovens, the microwaves cause the water particles in the food to vibrate, heating it up.
- **Infrared:** electrical heaters, cooking food, infrared cameras. All objects emit infrared, but hotter objects emit more. An infrared camera detects infrared instead of visible light, so it can see hotter objects in the dark – night vision.
- **Visible light:** *fibre optic communication* (like the best broadband). Optical fibres reflect pulses of light all the way along their length. The pulses of light transmit the information.
- **Ultraviolet:** *sun tanning* beds… however, look at the dangers of UV in the other box.
- **X-rays:** both medical imaging for *diagnosis* (like broken bones) and medical *treatments*. X-rays can pass through soft tissue (like muscle), but not bone. That's why an X-ray image works to show up bones, and any breaks.
- **Gamma rays:** used in medical treatments such as radiotherapy.

Number	Key term	Definition
1	**Fieldwork**	The process of investigation to find an answer to a question.
2	**Enquiry**	The process of investigation to find an awswer to a question.
3	**Primary Data**	Fieldwork data which you collected yourself (or as part of group) which are first hand information.
4	**Secondary Data**	Data that has been collected by someone else. They are important for giving background information and context to your enquiry.
5	**Census**	The census is a once-in-a-decade survey that gives us the most accurate estimate of all the people and households in England and Wales. It is produced by the Office for National Statistics
6	**ONS**	The office for national statistics
7	**IMD**	Index of multiple deprivation.
8	**Sample size**	This is how many measurements you will take.

Number	Key term	Definition
9	**Survey locations/sites**	Where the data will be collected.
10	**Accuracy**	How accurate your data is.
11	**Quantitative data.**	Numerical data
12	**Random sampling**	Where samples are chosen fairly randomly, and every person in the questionnaires, for example, has equal chance of being selected.
13	**Systematic sampling.**	A system is used to work out how to collect data. For example, every 20 meters or paces along a road to record land use.
14	**Stratified.**	Collecting a sample that is made up of different parts; for example, deliberately selecting samples of different people within the town/city so you include the whole range of people found there.
15	**Qualitative**	Data that includes techniques that don't involve numbers or counting.
16	**Continuous Data**	Shows change along a line of study.
17	**Categories**	Show classification of data.

Number	Key term	Definition
18	**Aerial photos**	Photos taken from above
19	**GIS**	Geographic Information System i.e. Google Maps
20	**Cartographic**	Maps
21	**Annotated Photographs**	Photographs with written descriptions on them,
22	**Anomalies**	Unusual data/ doesn't fit the trend.
23	**Mean**	The average value in the data
24	**Median**	To find the median you need to order the data and then find the middle value. This divides the data into two halves
25	**Mode**	The number that appears most frequently in a data set.
26	**Range**	The difference between the highest and lowest values
27	**Quartiles**	Dividing a list of numbers into four equal groups- two above and two below the median.

Number	Key term	Definition
28	**Primary Methods**	The techniques you/ your group used.
29	**Secondary methods**	How did you decide what secondary data to use and how did you decide what not to use.
30	**Data representation**	How you represent your data i.e. different types of graphs, annotated photographs, field sketches etc.
31	**Analysis**	What patterns can you identify from data and why might those patterns exist?
32	**Evaluation**	What went well with your fieldwork and what could have gone better/ you do better if you had more time and resources.
33	**Transect**	A **transect** is a line following a route along which a survey or observations are made
34	**Social Media**	Social media is an excellent source to use to find the opinions of people about your area- Blogs, Instagram, Twitter etc.
35	**New Media**	Newspapers and online news especially local newspapers like the News Shopper can give a good local perspectives on events/issues/peoples' opinions.

YEAR 10 - HISTORY – EARLY ELIZABETHAN ENGLAND- QUEEN, GOVERNMENT AND ENGLAND 1558-1588

Context	
1	There was much religious change under the Tudors and Elizabeth had to find a way of dealing with these issues. Many people objected to Elizabeth's coronation in 1558 and she faced questions over her legitimacy, with many preferring Mary Queen of Scots, and whether a woman could rule effectively.
Key events	
2	**1532** Start of the English Reformation.
3	1556-58 Dutch Revolt against Spanish.
4	**1558** Elizabeth's accession.
5	**1559** Mary Queen of Scots became Queen of France.
6	**1559** Treaty of Cateau-Cambresis – England had to return Calais to France.
7	**1559** Religious Settlement and visitations commenced.
8	**1556** Pope issued an instruction that English Catholics should not attend Church of England services.
9	Elizabeth helped Scottish Protestant lords defeat Mary of Guise. Treaty of Edinburgh.
10	**1562** Religious war in France.
11	**1563** Philip II banned import of English cloth into Netherlands.
12	**1567** Elizabeth allows Dutch Sea Beggars to shelter in English harbours.
13	**1568** Genoese Loan
14	**1568** Mary Queen of Scots fled to Scotland and then arrives in England.
15	**1569** Revolt of the Northern Earls,
Key Concepts	
16	**Society and Government** was very structured and hierarchical. The monarch had much power.
17	**Elizabeth's accession** caused controversy as her gender, legitimacy and religion were questioned.
18	**Religion –** Elizabeth imposed her Religious Settlement but this upset many English and foreign Catholics and some wanted Mary Queen of Scots to replace Elizabeth**.**
19	**Financial problems** – When Elizabeth took the throne the Crown was £300,000 in debt.
20	**Foreign powers** opposed to Protestantism remained an issue for Elizabeth, especially Scotland, France and Spain.

Key Words		
20	**Nobility**	Belonging to the aristocracy.
21	**Gentry**	People of a high social class.
22	**Yeomen**	Men who held a small amount of land or an estate.
23	**Tenant farmers**	Farmed rented land usually owned by yeomen or gentry.
24	**Merchants**	Traders.
25	**Professionals**	Lawyers and doctors.
26	**Craftsmen**	Skilled employees.
27	**Extraordinary taxation**	Occasional, additional taxation to pay for unexpected expenses, especially war.
28	**Militia**	A military force of ordinary people, rather than soldiers, raised in an emergency.
29	**Privy council**	Advisors to Elizabeth.
30	**Justices of the Peace**	Large landowners who kept law and order.
31	**Patronage**	To provide someone with an important job or position.
32	**Secretary of State**	Elizabeth's most important Privy Counsellor.
33	**Crown**	Refers to the monarch and their government.
34	**Divine Right**	Belief that the monarch's right to rule came from God.
35	**Royal Prerogative**	Elizabeth could insist that Parliament did not talk about certain issues.
36	**Succession**	The issue of who was going to succeed the throne after the existing monarch died.
37	**Legitimate**	Being born in wedlock when the existing king and queen were married.
38	**Customs duties**	Taxes from trade.
39	**Auld Alliance**	A Friendship between France and Scotland.
40	**Puritans**	Radical Protestants.

41	**Ecclesiastical**	An adjective used to describe things to do with the Church.
42	**Act of Supremacy**	Made Elizabeth supreme governor of the Church of England.
43	**Act of Uniformity**	Established the appearance of churches and the form of services they held.
44	**Royal Injunctions**	A set of instructions to reinforce the acts of Supremacy and Uniformity.
45	**Recusants**	Catholics who were unwilling to attend church services laid down by the Elizabethan religious settlement.
46	**Visitations**	Inspections of churches and clergy by bishops to ensure that the Act of Supremacy was being followed.
47	**Papacy**	The system of church government ruled by the Pope.
48	**Heretics**	People who refused to follow the religion of the monarch.
49	**Martyr**	Someone who dies for their religious beliefs.
50	**Counter Reformation**	The campaign against Protestantism.
51	**Philip II**	Catholic King of Spain.
52	**Trade embargo**	When governments ban trade with another country.
53	**Excommunicated**	Expulsion from the Catholic Church.
54	**Sea Beggars**	Dutch rebels who fled to the water.
55	**Genoese Loan**	When Elizabeth took gold loaned to Philip II by the bankers of Genoa.

Early Challenges	
56	**Legitimacy-** Her father Henry VIII divorced his first wife without permission of the Pope. This meant his marriage to Elizabeth's mother Anne Boleyn was invalid. This meant Elizabeth was illegitimate.
57	**Marriage-** Elizabeth was expected to marry quickly because they thought women were not strong enough to rule alone, she would need a husband to help control the nobles and she needed to produce an heir to provide stability after she died.
58	**Invasion-** Danger of invasion from powerful foreign countries… •*France*–England was already at war with Catholic France. France had close ties with Mary, Queen of Scots. •*Scotland,* •*Spain* –Wealthy & powerful, strongly Catholic.

Challenges to Elizabeth at Home and Abroad 1569-88	
1	Elizabeth faced many serious threats both within England and from aboard. Many still wanted Mary Queen of Scots on the throne. Philip II of Spain also wanted to remove Elizabeth from the throne. Spain and England were religious and political rivals. There was particular tension when Drake tried to challenge Spanish dominance in the New World.
Key events	
2	**1492** Discovery of the New World
3	**1567** Spanish travel to Netherlands to crush Protestant revolt.
4	**1568** Mary Queen of Scots arrives in England
5	**1569** Revolt of the Northern Earls
6	**1570** Elizabeth excommunicated
7	**1571** The Ridolfi Plot
8	**1572** Elizabeth hired Drake as a privateer
9	**1576** Spanish Fury and Pacification of Ghent
10	**1577-80** Drake circumnavigated the globe.
11	**1583** Throckmorton Plot
12	**1584** Treaty of Joinville
13	**1585** Act of Preservation of the Queen's Safety/Treaty of Nonsuch
14	**1586** Babington Plot
15	**1587** Mary Queen of Scots executed
16	**1587** Attack on Cadiz
17	**1588 Spanish Armada**

Key Words		
21	**New World**	North and South America.
22	**Revolt of the Northern Earls**	When northern earls encouraged Catholics to rebel.
23	**Ann Percy**	Wife of Thomas Percy.
24	**Jane Neville**	Wife of James Neville and Duke of Norfolk's sister.
25	**Mary Queen of Scots**	Supported the plan to marry the Duke of Norfolk.
26	**Thomas Howard, Duke of Norfolk**	One of England's most senior nobles and a Protestant.
27	**Charles Neville, Earl of Westmorland**	Duke of Norfolk's brother in law and from an important Catholic family.
28	**Thomas Percy, Earl of Northumberland**	Had been important under previous monarchs, but as a Catholic he had been side-lined.
29	**James Pilkington**	Appointed Archbishop of Durham.
30	**Civil War**	A war between people in the same country.
31	**Conspiracy**	A secret plan with the aim of doing something illegal.
32	**Papal Bull**	A written order by the Pope.
33	**Council of the North**	Used to implement Elizabeth's laws and authority in the North of England.
34	**Ridolfi Plot**	Plan to murder Elizabeth, launch a Spanish attack and put Mary Queen of Scots on the throne.
35	**Priest holes**	Secret hiding places for Catholic priests.
36	**Hanged, drawn and quartered**	A type of punishment used when the accused was found guilty of high treason. The accused would be hanged until near dead, cut open, have their intestines removed and were finally chopped into four pieces.
37	**Throckmorton Plot**	Plan for the French Duke of Guise to invade England, free Mary , overthrow Elizabeth and restore Catholicism in England.
38	**Sir Francis Walsingham**	Elizabeth's Secretary of State.
39	**Babington Plot**	The Duke of Guise would invade England and put Mary on the throne.
40	**Act of Preservation of the Queen's Safety**	In the event of Elizabeth's assassination, Mary would be banned from the succession.
41	**Agent provocateurs**	Agents who become part of groups suspected of wrongdoing and encourage other members to break the law so that potential threats can be identified and arrested.
42	**Foreign Policy**	The aims or objectives that guide a nation's relations with other states.
43	**Privateer**	Individuals with their own armed ships that capture other ships for their cargo, often with the support and authorisation of the government.
44	**Francis Drake**	Elizabeth hired him as a privateer.
45	**Circumnavigate**	To travel all the way around the world.
46	**Autonomy**	The right to self government, so people of one country can manage its own affairs.
47	**Spanish Fury**	The Spanish rampaged through Dutch provinces as they left.
48	**Pacification of Ghent**	Spanish troops expelled from Netherlands, political autonomy to be returned and end of religious persecution.
49	**Mercenary**	A soldier who fights for money rather than a nation or a cause.
50	**Treaty of Joinville**	The King of France and the King of Spain became allies against Protestantism.
51	**Treaty of Nonsuch**	Effectively put England and Spain at war.
52	**Singeing of the King of Spain's beard**	Drake sailed into Cadiz harbour, Spain's most important Atlantic port, and over 3 days destroyed 30 ships.
53	**Tilbury Speech**	Elizabeth's famous speech to her troops before the Armada.

Elizabethan Society in the Age of Exploration 1558-88	
1	Elizabeth's I's reign was a time of expansion with growth in many different areas of society and life.
Key events	
2	1563 Statute of Artificers
3	**1570** Norwich Survey
4	**1572** Vagabonds Act
5	**1576** Poor Relief Act
6	**1580** Drake returns from circumnavigating the globe with spices, treasure and tales of Nova Albion.
7	**1584** Raleigh begins planning new colonisation attempt by sending a fact finding mission to Virginia.
8	**1585** Colonists set sail for North America and begin the English colonisation of Virginia.
9	**1586** Surviving colonists abandon Virginia and return to England
10	**1587** New group of colonists arrive in Virginia and establish colony at Roanoke
11	**1590** English sailors arrive at Roanoke only to find it abandoned
Key Concepts	
12	**Education –** Expanded during Elizabeth's reign but it was expensive and mostly for boys. The large majority of people were illiterate.
13	**Pastimes –** Theatre thrived. Elizabethan leisure was similar to modern day but sport was much more violent.
14	**Population Growth –** During the reign of Elizabeth, population grew by as much as 35%. Food prices rose, wages fell and enclosure brought problems. The urban poor grew and poverty was a real problem.
15	**Exploration** by Drake led to conflict with Spain over the New World.
16	**Attitudes** – Unemployment was recognised as a genuine issue.
17	**Poverty** was an issue that Elizabeth wanted to address.

Key Words		
18	**Social mobility**	Being able to change your position in society.
19	**Humanists**	Believed that learning was important in its own right and not for just practical reasons.
20	**Grammar schools**	Private schools set up for boys considered bright who largely came from well off families in towns.
22	**Apprentice**	Someone learning a trade or a skill.
23	**Petty schools**	Set up in a teacher's home. For boys.
24	**Dame schools**	Set up in a teacher's home. For girls.
25	**Pastimes**	Activities for leisure.
26	**Mystery plays**	Plays base on the Bible and saints' stories.
27	**Globe**	Shakespeare's theatre.
28	**Alms**	Charity
29	**Poor relief**	Financial help.
30	**Itinerants**	People who had moved from their home parishes looking for work.
31	**Enclosure**	The process of replacing large, open fields that were farmed by villages with individual fields belonging to one person.
32	**Rural depopulation**	When the population of the countryside falls as people move away in search of a better life.
33	**Subsistence farming**	Growing just enough to feed the family but not to sell.
34	**Vagabonds**	Homeless people without jobs who roamed the countryside begging for money or perhaps committing crimes in order to survive.
35	**Economic recession**	When a fall in demand leads to falling prices and businesses losing money.
36	**Deserving poor**	People unable to work because of illness or old age.
37	**Idle poor**	People who were fit to work but didn't.
38	**Triangular trade**	Route from Europe to Africa to the Americas.
39	**Quadrant/ Astrolobe**	Used by sailors to help with navigation at sea.
40	**Cartographer**	Map maker.
41	**Galleons**	Ships that were much larger than traditional trading ships.
42	**Colonies**	Land under the control or influence of another country.
43	**Monopoly**	When one person or company controls the supply of something.
44	**Nova Albion**	Region named by Drake, probably north of modern day San Francisco.
45	**Walter Raleigh**	Explorer who encouraged colonists to Virginia.
46	**Barter**	To exchange goods for other goods.
47	**Manteo and Wanchese**	Two native American Indians who came back to England.
48	**Native Americans**	People who lived in the New World before the colonists.

YEAR 10– LENT TERM- RELIGIOUS EDUCATION – ISLAMIC BELIEFS

LEARNING - LOVING - LIVING

Topics covered:

1. The Oneness of God (Tawhid)	4. Life after death	8. Holy books
2. Nature of Allah	5. Prophethood	9. Sunni and Shi'a
3. Angels	6. Predestination	10. Imamate
	7. Muhammad	

5. Prophethood

- ✓ God has chosen people to bring the message of Islam to the people. These chosen people are called prophets.
- ✓ They are important because they provide communication between God and humans.
- ✓ In order for humans to live how God wants it is necessary for instructions to be delivered through prophets
- ✓ Around 124,000 prophets of which 25 are named in the Qur'an
- ✓ They are important role models as they were good people who lived according to God's will.

'Every community is sent a messenger'. Quran 10:47

Adam:

- ✓ First man on earth and first prophet of Islam
- ✓ Father of the human race so treated with great respect
- ✓ God created Hawwa (Eve) to stop Adam being lonely
- ✓ They were told not to eat from the tree in the middle of the garden but they did and so sin entered the world.
- ✓ Adam is important as God gave him understanding which he passed on through his descendants. God revealed to him the foods they can eat, how to repent for wrong doing and how to bury the dead.

'He taught Adam the names [of things]'. Quran 2:31

Ibrahim:

- ✓ Fulfilled all the tests and commands God gave him.
- ✓ Was promised to be the father of all nations.
- ✓ Demanded people to stop idol worship. Was supposed to be burnt alive but survived (miracle) so people began to follow God.
- ✓ Re-built the Ka'aba after it was destroyed.
- ✓ Important as he stopped idol worship, gave the message of one God and rebuilt the Ka'aba

'God took Abraham as a friend'. Qur'an 4:125

8. Holy Book - The Quran:

- The Qur'an is the direct word of God, which was revealed to Muhammad over a period of around 22 years.
- Contains the foundation of every believer's faith.
- Is most sacred of all the holy books.
- Is infallible (without error and non-changing)
- Contains a mixture of historical accounts and advice on how to follow God.
- There are 114 surahs (chapters) in total.
- Those who can recite the Qur'an from memory are given the title 'Hafiz'.

'This is the Scripture in which there is no doubt, containing guidance for those who are mindful of God'. Qur'an 2:2

3. Angels

Muslims believe angels bring the words of God to the prophets. They have no free will and are made from elements of light. Their roles are:

- Messengers
- Guardians of people
- Recording actions of humans
- An angel of death
- Purify hearts
- Bring natural disasters

'Jibril:

- Archangel
- Relayed the Qur'an to Muhammad
- Guided Muhammad through his entire life

- Mika'il:
- Archangel
- Angel of Mercy
- Responsible for sending rain, thunder and lightning

1. The Oneness of God

- One of the most important beliefs for Muslims is Tawhid (the belief that there is only one God).
- This belief is repeated daily in the Shahadah (one of the five pillars).
- A Muslim's most important duty is to declare faith in one God.
- God is unique. No one can picture God which is why there isn't any pictures or statues of Him in Islam.
- God is the only creator and controller of everything.
- Muslims believe they should accept whatever happens as the will of God (supremacy of God's will)

'Say, He is God the One, God the eternal'. Quran 112:1-4

4. Life after death

-Death isn't the end it is a new stage of life called Akhirah.
-After death you lie in the grave waiting for the day of Judgment this is called Barzakh.
-Angels are sent to question them about their life. If they are good and honest they will be rewarded if they are bad an untruthful they will be punished.

The Day of Judgement

- ✓ When God's purpose for the world has been fulfilled He will destroy it
- ✓ The world will be transformed into a new world
- ✓ Everyone who has ever lived will be resurrected and judged by God.
- ✓ If people are given the book of deeds in their right hands they will go to heaven, if it is in their left they will go to hell.

Heaven and Hell

Heaven:

- Described as the gardens of happiness
- It is a reward for faith and good deeds

'A reward for what they used to do'. Quran 56:24

Hell:

- Described as a place of fire and great torment
- Punishment for those who reject God and do evil

'They will dwell amid scorching wind and scalding water in the shadow of black smoke, neither cool nor refreshing'. Quran 56:42-44

2. Nature of Allah

Muslims believe God is:
-Immanent (present in earth and involved with humanity)
-Transcendent (outside life and beyond understanding)
-Omnipotent (all-powerful)
-Beneficent (all-loving and all-good)
-Merciful (compassionate and forgiving)
-Just (fair and judges humans actions)

'There is no God but Him, the Creator of all things'. Qur'an 6:102
'He is with you wherever you are'. Qur'an 57:4

6. Predestination

Sunni:

- Believe God has already determined everything that will happen in the universe.
- Linked to Sunni belief of the supremacy of God's will.
- Doesn't mean that people have no choice about how they behave.

'Only what God has decreed will happen to us'. Qur'an 9:51

Shi'a:

- Believe that God knows everything that is going to happen, but does not decide what is going to happen.
- Shi'a Muslims do not see conflict between supremacy of God's will and human freed to act freely and make choices as God knows what you will choose but does not choose for you.

'God does not change the condition of a people [for the worse0 unless they change what is in themselves'. Qur'an 13:11

7. Muhammad

- Muhammad received the final revelation of Islam from God.
- Known as the last and greatest prophet.
- Religious from an early age and would go into the mountains to a cave to pray and meditate.
- In 610CE on Mount Hira received his first revelation from God through the angel Jibril.
- For more than 20 years received further revelations, which were combined together to make the Qur'an.
- 3 years after the first revelation began preaching the words he received and continued to do it for the rest of his life.
- He challenged the people of Makkah to give up their sinful ways (cheating, drinking, gambling and idol worshipping).
- Was persecuted by the leaders of Makkah and so fled from the city in 622CE. This is known as the **Hijrah (departure)** and marks the beginning of the **Ummah (worldwide community).**
- Before the departure Muhammad was taken on an amazing experience where Jibril took him to Jerusalem. Muhammad was carried on a horse like creature with wings. From Jerusalem he ascended to heaven and saw signs of Gods and spoke to prophets such a Isa. This is where he was told to pray 5 times a day. This journey is known as the **Night Journey.**
- **'Muhammad is not the father of any one of you men; he is God's Messenger and the seal of prophets: God knows everything'. Qur'an 33:40**

10. The Imamate

- When Muhammad died it wasn't clear who should succeed him.
- Muslims split in to two groups **Sunni and Shi'a.**
- **Sunni's** elected Abu Bakr as their first Caliph (leader, teacher).
- **Shi'a** believe that Muhammad named his cousin Ali as his successor so he became the first Imam.
- For Shi'as it was important that Ali took control because they believe that Muhammad appointed him under divine instruction and leadership should follow in the family line.
- When Ali died his son became the Imam. Each Imam that followed was the son of the previous Imam.
- The **Twelver Branch of Shi'a Islam** believe that there have been twelve Imams in total. The last one they believe has been kept alive by God and is hidden somewhere on earth who will return to bring peace, justice and equality.
- The **Twelver's** believe that the Imams not only rule but are able to interpret the Qur'an and Shari'ah Law
- They believe that the receiving of God's law was through Muhammad but guiding people comes through the Imams.
- **The Imamate** is the name given to the appointment of the Imams and is important because people need divine guidance to know how to live correctly.

9. Sunni and Shi'a Islam

Sunni:

- When Muhammad died the majority of Muslims thought that **only** the Qur'an and Sunnah had the authority to guide the beliefs and behaviour of Muslims.
- They elected Caliphs to act on behalf of God and Muhammad. They do not make the laws; they just enforce them.
- These Muslims became known as Sunni (meaning followers of the Sunnah).

Shi'a:

- Another group believed that Muhammad named his cousin Ali as his successor.
- Ali and his supporters thought that the true leader had to be a descendent of Muhammad and chosen by God.
- Ali's claims to be leader were ignored by many Muslims.
- Over time a split developed between those who followed Ali (the Shi'as) and the Sunnis.
- Shi'as have their own interpretations of the Law and only accept sayings of Muhammad which have been passed down through Ali or his followers.

Six Articles of Faith in Sunni Islam:

- There is only one God Allah.
- Angels communicate the message of God to humans.
- The Qur'an is the most important writing and the highest authority in Islam.
- Muhammad is the most important prophet of God.
- The Day of Judgement is when all humanity will be judged by God and sent to paradise or hell.
- The supremacy of God's will means that God already know but also makes happen everything that occurs in the world and in human lives.

The Five Roots of 'Usul ad-Din' in Shi'a Islam:

1. Tawhid means that God is one.
2. Prophethood means accepting that Muhammad is God's last prophet.
3. God is just and wise and cannot do wrong. He holds humans accountable for their actions.
4. The Imamate means accepting that twelve Imams are the leader of Islam and guard the truth of the religion without error.
5. After death you will be resurrected and judged by God.

1. **The Five Pillars** They support the main principles and beliefs of Islam, just as pillars are used to support a building.

2. Shahadah – declaration of faith in God.
3. Salah – prayer.
4. Zakah – charitable giving.
5. Sawm – fasting.
6. Hajj – pilgrimage.

Topics covered:	4. Salah	8. Jihad
1. The five pillars	5. Sawm	9. Id-ul-Fitr
2. Ten Obligatory Acts	6. Zakah	10. Id-ul-Adha
3. Shahadah	7. Hajj	11. Ashura

2. Ten Obligatory Acts For Muslims who follow the Twelver Shi'a Islam, there are ten duties they must follow. They include the five pillars except for Shahadah.

Ten Obligatory Acts:

1. Salah – prayer.
2. Sawm – fasting.
3. Zakah – Charitable giving.
4. Khums – a 20 percent tax on income once all expenses are deducted.
5. Hajj – pilgrimage
6. Jihad – the struggle to maintain the faith and defend Islam.
7. Amr-bil-Maruf – encouraging people to do what is good.
8. Nahi Anil Munkar – discouraging people from doing what is wrong.
9. Tawallah – to be loving to the friends of God, including Muhammad and the Imams.
10. Tabarra – disassociating from the enemies of God.

3. Shahadah

- The basic belief of Islam is expressed: 'There is no God but Allah and Muhammad is the Prophet of Allah'.
- Reciting this in front of Muslim witnesses is the requirement for joining the community.
- It is recited many times during a lifetime. E.g. when a baby is born and in the daily prayers.
- It provides the foundation for the other four pillars. The other four are actions which put a Muslims faith (expressed in the Shahadah) into action.

Shi'a Islam: Many Shi'as add an extra phrase to the Shahadah.

- 'And Ali is the friend of God'.

8. Jihad	Greater Jihad:	Lesser Jihad:
	• A personal inward struggle of all Muslims to live in line with the faith. • They must observe the five pillars to bring them closer to God. • Muslims must devote their lives to God by avoiding temptations like drugs and alcohol. • Some try to improve life for people in the community • By completing these things, Muslims improve themselves spiritually and deepen their relationship with God.	• Less important that greater Jihad. Outward struggle to defend Islam. • There are texts in the Qur'an which appear to allow extreme violence but they cannot be used to defend terrorism. • Muslims must follow the rules set about by Holy War when taking on the task of lesser Jihad. • Neither lesser Jihad nor holy war should be used to defend terrorist attacks. However lesser Jihad in misinterpreted in modern times

4. Salah: Times of prayer:

- Some Muslims are required to pray at 5 set times during the day -just before sunrise, just after midday, afternoon, just after sunset and night.
- Shi'a Muslims combine the midday and afternoon prayers, and the sunset and night prayers, so they pray 3 times a day.

Preparation for prayer:

- It is important to be spiritually clean before prayer. Muslims complete ritual washing or ablution which is called **wudu.**

Direction of prayer:

- It is important Muslims face the holy city of Makkah while praying. It means all Muslims are physically and mentally focusing on one place associated with God.If the prayers take place in a mosque, it is easy to achieve as they have a Mihrab. It is a niche built into the wall which shows the direction of Makkah.If prayer takes place outside of a mosque, Muslims used a compass which shows the direction of Makkah.

Prayer in a mosque:

- ✓ Mosques have carpets which look like rows of prayer mats to give each person suitable room to pray properly.
- ✓ Prayers are led by an imam who is positioned at the front but also facing the Mihrab.
- ✓ Men and women pray at the same time but in separate spaces.
- ✓ It is normal for the imam's voice to be broadcast in to the women's prayer room at the same time so he can lead their prayers.

The rak'ah: The daily prayers are made up of a number of rak'ah. It is a set sequence of actions and recitations.**'So woe to those who pray but are heedless of their prayer'. Qur'an 107:4-5**

Jummah prayer:

- The midday prayer every Friday is considered to be special. All male Muslims are expected to attend a mosque for this prayer, and women may do so if they wish.

Prayer at home:

- Muslims are allowed to pray at home/ they still have to perform Wudu/ many Muslims use a prayer mat, which they position facing Makkah.

Significance of prayer:

- Prayer is important as it is what God commanded them to do.
- It creates a greater awareness of God, which motivates them to do God's will.
- It unites Muslims worldwide, because they all pray in the same way.
- Reciting the Qur'an during prayer reminds them of its importance.

5. Sawm

- Ramadan is the ninth month - when they focus on fasting.
- Muslims fast during daylight hours, so will wake up before sunrise to eat and drink enough to keep them going until sunset.
- For Muslims fasting is not just about food or drink, smoking and sex are also forbidden in daylight hours.
- The whole focus during the month of Ramadan is on God, for which purity of thought is required in order to cleanse the soul and free it form harm.
- Fasting requires self-discipline, but allows Muslims to show they can sacrifice their physical needs as evidence of their submission to God.

Exceptions:

People can be excused for:
- health reasons – for example pregnant women
- those who are too ill to take part
- young children who need to eat
- nursing mothers
- those who are taking long journeys

The Night of Power:

- An important festival which marks the beginning of God's revelation to Muhammad.
- Observing the Night of Power gives Muslims the benefit of worshipping for a thousand months.
- Muslims try to keep awake throughout the night on each of the possible dates, devoting themselves to prayers and studying the Qur'an.

9. Festival of Id-ul-Fitr

It marks the end of the month of Ramadan.

How is it celebrated?

- Celebrated for either one, two or three days.
- Muslims gather together in mosques or outdoor areas to say prayers. There is also a sermon from the Imam reminding them to forgive and forget issues
- Everyone wears their best clothes and homes are decorated.
- Special foods are eaten, and there are processions through the street.
- In areas where Muslims live, they may be given the day off to enjoy the festival.

6. Zakah

- Zakah is giving alms (giving money to the poor).
- For Muslims who have enough savings it is compulsory to give 2.5 percent every year to help the poor.
- Only Muslims who have savings greater than a certain amount are required to give Zakah.
- The Qur'an makes it clear who should receive Zakah.
- In addition to giving Zakah Muslims are encouraged to voluntarily give their money and time to charity at any point of the year. This is called Sadaqh.

'Alms are meant only for the poor, the needy'. Qur'an 9:60

Significance of Zakah:

- Muslims are fulfilling a duty imposed by God.
- Gives Muslims a good attitude towards money. They learn to share wealth and not be greedy.
- Strengthens communities by making the rich support the poor.
- Links well with Salah. Zakah put the prayers of concern for others into action.

Khums:

- An important part of Shi'a practice in addition to Zakah.
- Requirement for Muslims to give 20% of excess earnings as a donation.

7. Hajj

Hajj is a pilgrimage. It should be made at least once in a Muslim's lifetime, provided they are healthy and wealthy enough to do so. Hajj starts and ends in the holy city of Makkah.

How Hajj is performed

1. State of Ihram
2. Circling the Ka'aba
3. Travelling to Arafat
4. Standing at Arafat
5. Throwing pebbles at Mina
6. Returning to Makkah

The significance of Hajj:

- Many Muslims go a number of times even though it is a requirement to only go once.
- It can bring about a deep spiritual transformation that makes them a better person.
- It teaches sincerity and humility in a person's relationship with God.
- It produces inner peace, which is shown in the values of justice, honesty, respect, kindness, mercy and forgiveness.
- It shows self-discipline. The physical and mental demands it imposes are great.
- It emphasises unity and equality.
- It reminds Muslims of the faith and examples set by Ibrahim, Hajira and Ishmael.

10. Festival of Id-ul-Adha

It is the festival of sacrifice or **Greater Eid.** It remembers and honours the Prophet Ibrahim, who was willing to sacrifice his son **How is it celebrated?**

- Begins with prayers in the mosque and a sermon from the imam about sacrifice.
- Animals are slaughtered to remember Ibrahim's sacrifice.
- Cards and presents are given and community celebrations organised.
- People living on their own receive invitations to go their neighbours to share meals. Those in hospital will receive visitors to make sure that everyone is included in the celebrations.

11. Ashura

Sunni Muslims refer to Ashura as the Day of Atonement. They remember it as the day when the Israelites were freed from slavery in Egypt.

How is it commemorated?

- In many Muslim countries, a public holiday takes place. During the day Shi'a Muslims take part in a public expression of grief and mourning. Some even hurt themselves to connect with Husayn's suffering and death. However, religious authorities have condemned these acts saying they are wrong for Muslims to do.
- Muslims in the UK, will go for a procession and to listen to speeches. They are encouraged to donate blood to remember the sacrifice instead of hurting themselves.
- For Sunni Muslims, Ashura is a day when many will voluntarily fast. Many give to charity, show kindness to their family and to the poor, recite prayers and learn from Islamic scholars.

YEAR 10– LENT TERM- COMPUTER SCIENCE- DATABASES

Alphanumeric A data type that can consist of either letters or numbers or both, e.g. 4 Willow Drive.

Boolean A data type that can only have two possible values, e.g. on/off, true/false, yes/no.

Calculated This can be used to add totals or averages to fields field displayed in a report.

Currency A data type where numbers are formatted as money, usually with symbol and two decimal places, e.g. $499.99, €10.00, ¥250.00.

Data Types Different kinds of data, e.g. alphanumeric, numeric, currency, date/time & Boolean.

Database A collection of related information organised in a logical way for rapid search and retrieval.

Date/time A data type used for storing dates. We always use British formatting: DD/MM/YY.

Field Fields provide the categories for the details in each record. Name, address, and phone number are fields.

Flat-file A database that contains only one table.

Foreign key A foreign key is a primary key from another table that has been used to create a relationship.

Form A form is a data entry tool, used to enter data into a table in a simple, clear way.

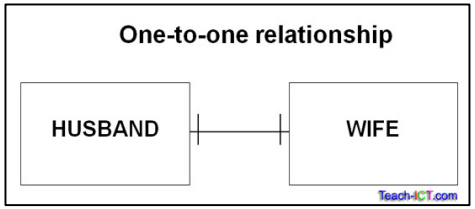
Number field Numeric data stored as an integer or decimal which calculations can be performed on, e.g. 200, 49.53.

Parameter A query where the term being searched for is entered value query in a dialog window, so the search term can change each time the query is run.

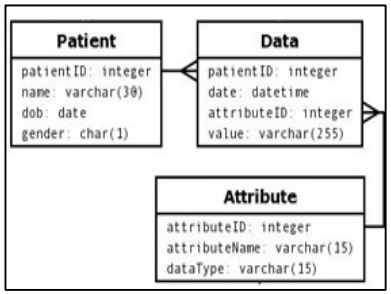
Primary key A field that uniquely identifies each record in a table.

Query A query is a search, or request for information from a database against set criteria.

Record A set of related fields about a person or thing. **Validation rules** Ensure input data is sensible.



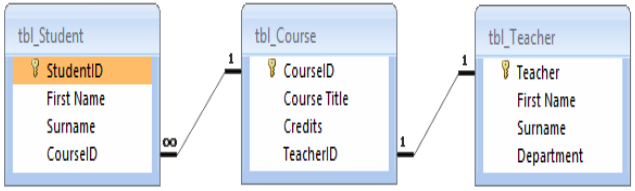
These relationships take the form of:
one-to-one
one-to-many
many-to-many



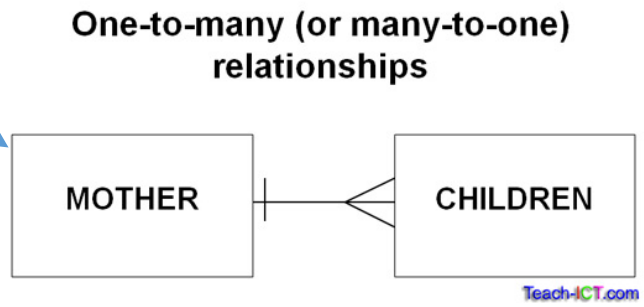
Relationships

Referential integrity	A rule that relationships between tables must be kept consistent. There are three forms of **referential integrity:**
One-to-One	Each record in table A matches a record in table B, e.g. 1 driver has 1 driver's license.
One-to-Many	Each record in table A can match many records in table B, e.g. 1 borrower can borrow many books from a library.
Many-to-Many	Each record in table A can match many records in table B, and vice-versa. This is a very inefficient form of relationship and is not recommended.

In the database to the right, one teacher teaches one course which can be studied by many students.



Example of a one-to-many relationship
Think about a mother and her children.
A mother can have many children
A child can have only one mother
this would be known as a 'one-to-many relationship'



Memory: Find out the purpose

Effect on Performance of

Random Access Memory (RAM) (Volatile)

Faster **RAM** can improve communication speed with the processor and decrease load times.

Read Only Memory (ROM)(Non-volatile)

Increasing the amount of **ROM** in a system could reduce the amount of a program that is installed on a slower disk or other external memory device. It could also be used to store lookup tables that might otherwise be created in RAM which can slow down a program's execution.

Virtual memory: The operating system makes part of the storage drive available to use as **RAM**. ... It copies the data back into **RAM** when the process is needed again. Using **virtual memory** slows the **computer** down because copying to a hard disk takes much longer than reading and writing **RAM**.

Flash memory: Flash memory, also known as flash storage, is a type of nonvolatile memory that erases data in units called *blocks* and rewrites data at the byte level. Flash memory is widely used for storage and data transfer in consumer devices, enterprise systems and industrial applications. Flash memory retains data for an extended period of time, regardless of whether a flash-equipped device is powered on or off.

Read/Write operations: **Write** caching lets your **computer** store data in a cache before it is written to the hard drive. Because a **computer** can **write** data to a cache much more quickly than to a hard drive, the overall **read/write performance** of the hard drive is improved. Remember, however, that data in a cache is only temporary.

Features affecting performance:: Clock speed (MHz, GHz)

A PC **clock speed** is normally in the gigahertz region. That is a billion cycles per second. Typical **speeds** are two to four gigahertz. The faster the **clock speed**, the faster the instructions can be processed by the **processor**.

Cache Memory

Cache plays the greatest part in improving the **performance** of the processors. The larger the **cache** size, the faster the data transfer and the better the CPU **performance**.

Multiple cores

This means that a **processor** can be up to **two** or four times faster than a normal **processor** . However the actual speed of the **processor** is dependent on the software that's being run. Not **all** software will take **advantage of the quad and dual cores.**

Binary logic

- Why binary? (transistors) Computers use **binary** - the digits 0 and 1 - to store data. ... The circuits in a computer's processor are made up of billions of **transistors** . A **transistor** is a tiny switch that is activated by the electronic signals it receives. The digits 1 and 0 used in **binary** reflect the on and off states of a **transistor**.

Name	Graphic Symbol	Algebraic Function	Truth Table
AND		F = A · B or F = AB	A B | F 0 0 | 0 0 1 | 0 1 0 | 0 1 1 | 1
OR		F = A + B	A B | F 0 0 | 0 0 1 | 1 1 0 | 1 1 1 | 1
NOT		$F = \overline{A}$ or F = A′	A | F 0 | 1 1 | 0

Central processing unit (CPU) – what are the following?

Arithmetic & logic unit: An arithmetic-logic unit (ALU) is the part of a computer processor (CPU) that carries out arithmetic and logic operations on the operands in computer instruction words. In some processors, the ALU is divided into two units, an arithmetic unit (AU) and a logic unit (LU).

Control Unit (CU): A control unit (CU) handles all processor control signals. It directs all input and output flow, fetches code for instructions from micro-programs and directs other units and models by providing control and timing signals. A CU component is considered the processor brain because it issues orders to just about everything and ensures correct instruction execution.

Registers (Memory Unit): A register may hold an instruction, a storage address, or any kind of data (such as a bit sequence or individual characters). Some instructions specify registers as part of the instruction. For example, an instruction may specify that the contents of two defined registers be added together and then placed in a specified register.

Fetch-Decode-Execute: The fetch execute cycle is the basic operation (instruction) cycle of a computer (also known as the fetch decode execute cycle).

During the fetch execute cycle, the computer retrieves a program instruction from its memory. It then establishes and carries out the actions that are required for that instruction.

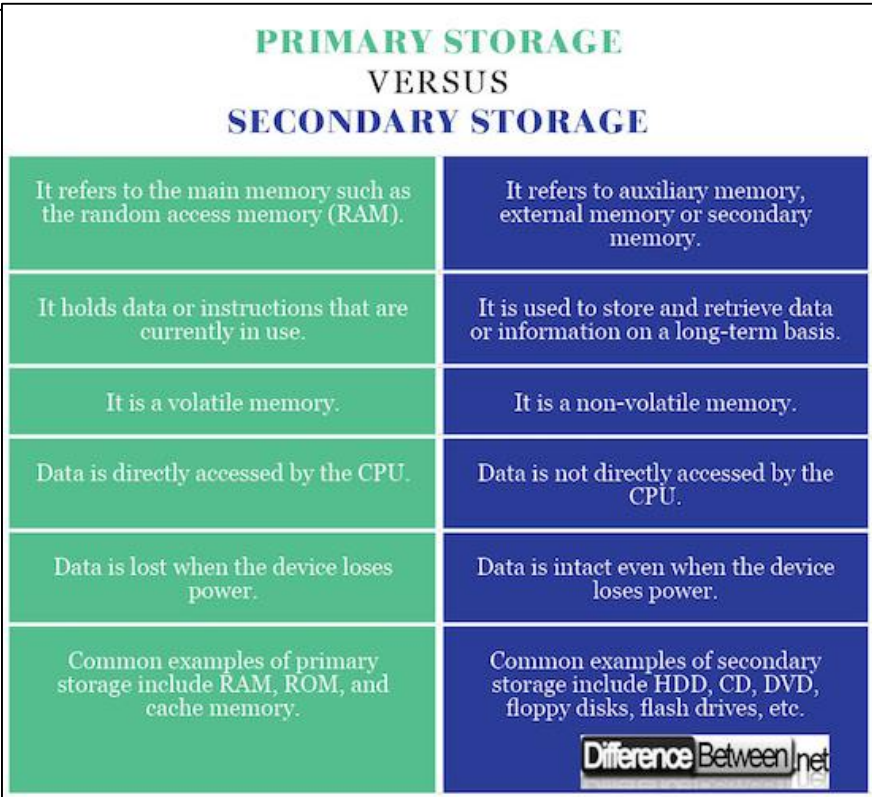
The cycle of fetching, decoding, and executing an instruction is continually repeated by the CPU whilst the computer is turned on.

Buses and their Purposes: The **CPU** sits on the motherboard (also called the logic board). **Buses** are circuits on the motherboard that connect the **CPU** to other components. There are many **buses** on the motherboard. A **bus** moves instructions and data around the system.

The Boot Sequence: **Boot sequence** is the **order** in which a computer searches for nonvolatile data storage devices containing program code to load the operating system (OS).

Hardware: research and list examples of the following;
Input devices (moves data in) Keyboard, Mouse, Touch screen Microphone, Camera, Sensor Bar code scanner, Foot mouse, Accelerometer, GPS, Braille keyboard
Process devices
Storage devices List them for primary and secondary storage devices:

Output devices (moves data out) Monitor, Printer, Plotter, Speakers, Actuators, LEDs



Programming Software

Editors / IDEs
Text **editors** and integrated development environments (**IDEs**) are applications for writing code.
Translators
Computers only understand machine code (binary), this is an issue because programmers prefer to use a variety of high and low-level programming languages instead. To get around the issue, the high-level and low-level program code (source code) needs to pass through a translator. A translator will convert the source code into machine code (object code). There are several types of translator programs, each able to perform different tasks.
Compiler
Compilers are used to translate a program written in a high-level language into machine code (object code). Once compiled (all in one go), the translated program file can then be directly used by the computer and is independently executable.
Interpreter
Interpreters read, translate and execute one statement at a time from high-level language source code.
An interpreter stops when a line of code is reached that contains an error.
Assembler
An assembler is a type of computer program that interprets software programs written in assembly language into machine language, code and instructions that can be executed by a computer.
Pros and Cons of different Translators
Here are some **advantages** of the Compiler: The whole **program** is validated so there are no system errors. The executable file is enhanced by the compiler, so it runs faster. User do not have to run the **program** on the same machine it was created.

Security
Malware (mailious software (viruses) **alicious Software** refers to any **malicious** program that causes harm to a computer system or network. **Malicious** Malware **Software** attacks a computer or network in the form of viruses, worms, Trojans, spyware, adware or rootkits.
Patching: **Patch** (**computing**) ... A **patch** is a set of changes to a **computer** program or its supporting data designed to update, fix, or improve it. This includes fixing security vulnerabilities and other bugs, with such **patches** usually being called bug fixes or bug fixes, and improving the functionality, usability or performance.
Authentication: **Authentication**. In **computing**, **authentication** is the process of verifying the identity of a person or device. A common example is entering a username and password when you log in to a website.
Access Levels: In **computer** science and **computer** programming, **access level** denotes the set of permissions or restrictions provided to a data type. ... The two most common **access levels** are public and private, which denote, respectively; **permission** across the entire program scope, or **permission** only within the corresponding class.
Encryption: Encryption is used to scramble information so that it can be sent safely without anyone else being able to read it. The information is encrypted with a password or key that is needed to read the information again. If you visit a website on the internet that starts with 'https://' then this means that all of the information you are looking at or sending is being securely encrypted. Sign of encryption is Secure socket layer. It is important when transmitting data over a network that it is kept secure. Encryption encodes data so that only those who have the encryption key or **password** can decrypt it.
Caesar cipher: The Caesar **cipher** is one of the earliest known and simplest ciphers. It is a type of **substitution** cipher in which each letter in the text is 'shifted' a certain number of places down the alphabet. For example, with a shift of 1, A would be replaced by B, B would become C, and so on. The method is named after Julius Caesar, who apparently used it to communicate with his generals.

Characterisation

The act of changing voice, body language, movement, gesture etc. when in role is called characterisation. All people are different. The actor must use their skills to portray a character consistently throughout their performance. When creating characters, you need to consider **voice**, **body language**, **facial expression** and **gesture.**

Characterisation: Voice

Does your character have an accent? What is the tone of their voice like? How quickly do they speak? Do they have any vocal mannerisms that are particular to them?

Key Words

Volume: Loud to quiet
Crescendo: Increasing volume
Pitch: Deep or squeaky
Pace/Tempo: Fast or slow
Rhythm: Fluctuations in pace
Pause: Breaks in speech
Inflection: Emphasis on a word
Articulation: Emphasis on letters.
Tone: Emotion
Clarity: Clearly say words
Accent: A way of speaking that denotes where you are from

Characterisation: Body Language

This is what your character's movements and way of using their body says about them. A character who is very nervous and stressed may fidget a lot or have their shoulders hunched up tight to indicate tension.

Key Words

Movement: e.g. rushing in or stamping their foot excitedly.
Stance: How the character stands.
Gait: The way the character walks.
Posture: How the character stands or sits e.g. slouch or straight.
Proxemics: The space between the characters creates meaning. e.g. **distance** may mean enemies and **contact** may mean intimacy
Levels: Suggest status e.g. a dominant character may be higher up
Use of space: The character can demand a lot of space or hide in a small corner.

Characterisation: Facial Expression

Does your character move their face a lot? What does their facial expression say about their character? Do they have a very expressive face or do they try not to give much of themselves away?

Performing in a large theatre auditorium might mean that many of the audience are a long way away. It's the actors' job to communicate their role to fit the space effectively. Facial expressions, like body language, may be **heightened** or **exaggerated** so that the character's intentions are clear for all.

Characterisation: Gesture

A gesture is a movement expresses meaning. For example, the wagging admonitory finger accompanying words like 'I have told you time and time again that this behaviour is unacceptable' is probably among the most familiar of all gestures. They tend to work as emphasis.

However, gestures can also amplify a question, such as pointing in a particular direction as you say 'Do you mean this way?' They can also convey a mood, such as a shrug of the shoulders to convey indifference.

Rehearsal Techniques

These are exercises that the actors engage in BEFORE they perform live to an audience**.** They help the actors to understand their **characters** and realise their **intentions**. They also help to develop the plot and structure of a **devised** play.

Understand your character

The rehearsal techniques below help the actor to deepen their understanding of the character they are playing and become more familiar with their **intentions**.

- **Hot-Seating**
  An actor sits in the hot-seat and is questioned **in role.** They spontaneously answer questions.

- **Role on the Wall**
  Draw an outline of your character. Annotate it to reflect the character's thoughts, feelings, fears, circumstances etc.

- **Inner Thoughts**
  Whilst rehearsing a scene, one person will shout "Freeze, inner thoughts". The actor should freeze and spontaneously say out loud what the **character** is thinking.
- **Conscience Corridor**
  Performers make two lines facing each other. The **protagonist** poses a question such as "Should I put Grandad in a basket and leave him by the side of the road"? Actors on each side of the corridor give reasons for and against.

Improve how you play your character

These rehearsal techniques improve how you perform physically on stage.

- **Bigger Bigger Bigger**
  Rehearse one scene several times increasing the energy in gesture/movement, exaggeration of facial expression and volume
- **Non-Verbal Body Language**
  Perform a scene without speaking. Create meaning through mime.

Foundation Skills

Foundation skills are the drama strategies that can be used to help improve the way that you reveal your **plot** to your **audience**.
Always remember, it's not just the story you tell that is important, but also how you tell it!

Role Play
Pretending to be somebody else.

Improvisation
Performing a scene spontaneously without **rehearsal**.

Marking the Moment
This is a way of highlighting the most important moment in a scene in order to draw the audience's attention to its significance.

Still Image
This is a frozen picture which communicates meaning. It's sometimes called a **freeze frame** or **tableau.**

Narration
A narrator is like a storyteller informing the audience about the plot.

Thoughts in the Head
This is when a character steps out of a scene to address the audience about how they're feeling.

Alter Ego
Allowing the audience to hear/see the positive and negative thoughts of a character. It is sometimes called **Angels and Devils.**

Chorus
A group on stage say the same words and gestures.

Flashback
A performance of a scene from the past.

Soundscape
Performers make sounds to create an atmosphere.

Slow Motion
Acting as if time has slowed down. Often used to highlight an important movement.

Mime
Telling a story through movement. Creating characters and objects without spoken word.

Diaries & Letters
Allowing the audience to hear or see the content of a diary or letter on stage.

Stanislavski

Given circumstances
The given circumstances are the information about the character.
Emotional memory
Emotional memory is when the actor finds a real past experience
Method of physical actions
Imagine a simple activity like cleaning your teeth and then imagine a husband cleaning his teeth whilst thinking about how to tell his wife about his mistress. This is a simple illustration of how a physical action can release the necessary emotions.
Magic If
Stanislavski said that the character should answer the question, 'What would I do if I was in this situation?'.
Subtext
The subtext is the actual meaning and motivation behind the lines that are spoken and the actions taken.
Objective, super-objective and the through line
An **objective** is the reason for our actions. The **super-objective** is an over-reaching objective. If that journey is perceived as a clear path to the super objective, then you have your **through line**.
Circles of attention
Stanislavski believed that an actor needed a sense of isolation in order to produce a characterisation and avoid unnecessary tension. They needed to concentrate on themselves. This is the **first circle of attention**.
Tempo and rhythm
He linked tempo to the speed of an action or feeling and the rhythm to the intensity or depth of the experience.
Physical action
Stanislavski felt that an actor should train their body to perform effectively. Stanislavski didn't want to accept that an actor couldn't measure up to the physical demands of a role. The demands of a role may not just be athletic, but may have to do with vocal power or intensity of emotion.
Improvisation
Improvisation is a crucial part of the rehearsal process and Stanislavski wanted the actor to reach far into themselves in creating the role. If all the actors in a production took their emotions into the inner circle of attention, it's easy to see that a production could lose cohesion. It's the director's job to keep that cohesion, at the same time as drawing out as much truth in performance as possible from each performer.

Brecht

Political Message: Brechtian plays have a political message.
Narration: Narration is used to remind the audience that what they're watching is a presentation of a story.
Speaking the Stage Directions: This device helps distance the actor from the character they're playing. It also reminds the audience that they're watching a play.
Direct Address and Step Out: Speaking directly to the audience breaks the fourth wall and destroys any illusion of reality.
Placards: Using placards might be as simple as holding up a card or banner or more complex using a PowerPoint.
Symbolic Props: Often one item can be used in a variety of ways. A suitcase might become a desk, or a car door or a bomb.
Episodes: Brecht called scenes 'episodes', with each scene being relatively self-contained.
Minimal set / costume / props: Set, costume and props are all kept simple and representational. Elaborate costumes might mean that the sense of theatre, of pretending to be something else, was lost.
Shock Tactics: Brecht would often try to shock the audience so that they would really consider his political message.
Multi-roling: Multi-roling is when an actor plays more than one character onstage.
Split-role: This is where more than one actor plays the same character. For instance, the actor playing the main character might rotate from scene to scene.
Stylised Lighting: Brecht believed in keeping lighting simple as he didn't want the production values to overshadow the message.
Spass: Spass literally translates as 'fun'. Brecht wanted to make his audience think. He realised that while we are laughing we are also thinking.
Gestus: Brecht wanted his actors to demonstrate a type of character not a specific character. For example, the boss who is corrupt and smoking a fat cigar as his workers starve is representative of every boss who profits through the exploitation of others.
Song, Nursery Rhyme, Dance and Movement: This reminds the audience of the fact they are watching a play.
Ensemble: All members of the cast working together on behalf of the play, rather than emphasising individual actors or characters. There is no central protagonist.

Physical Theatre

General Physical Theatre Skills

Motif: Short phrase of movement
Canon: Motif A performed then Motif B one after the other
Unison: Moving together in time
Mirroring: Copying someone (don't have to face each other)
Opposition: Mirroring but the other side moves
Formations: Shapes line, triangle, square etc
Proxemics: Distance between characters suggests meaning
Character: Physicality and actions to create person
Contact work: Holding or making physical contact with others
Counter balances: Holding each other's weight
Lifts: Picking up partners in a controlled way (not in studio)
Dynamics: Speed and energy of the movement
Focus: Where your eyes should be focused during play
Power of the Hand: Symbolic fight

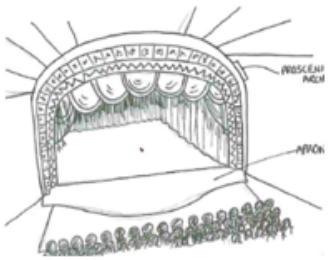
Frantic Assembly Skills

- Push hands
- Round by through
- Chairs
- Hymns Hands
- Jet Pack
- Connect, Effect, Disconnect



Staging Configurations and Stage Positions

Proscenium Arch



Proscenium Arch is a common form of theatre. The proscenium is the frame around the stage. The area in front of the arch is called an **apron**.

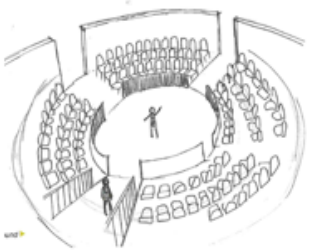
- **Advantages**: Backdrops and large scenery can be used without blocking sightlines. There may be **fly space** and **wing space** to store scenery. The frame around the stage adds to the effect of a fourth wall.
- **Disadvantages**: Audience members may feel distant from the stage. **Audience interaction** is more difficult. It can feel very formal and rigid.

End on Staging

End on Staging is similar to a Proscenium stage as the audience sit on one side of the stage directly facing it. However it doesn't have the large proscenium frame.

- **Advantages**: The audience all have a similar view. Stage pictures are easy to create. Large backdrops or projections onto a **cyclorama** may be used.
- **Disadvantages**: Audience members in the back rows may feel distant from the stage. It may not have **wing** or **fly** areas.

Theatre in the Round



Theatre in the Round is a staging conficuration when the audience are seated in a circle all around the stage.

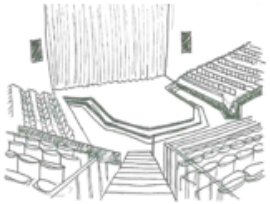
- **Advantages**: Intimate space for a performance. It engages the audience because the actors enter and exit the stage through the audience. There is also no 'forth wall'
- **Disadvantages**: One cannot use **backdrops** or **flats**. Stage furniture needs to be small so as not to obstruct **sightlines**. Actors have to be carefully **blocked** so that they do not always have their back to one section of the audience.

Promenade Theatre

Promenade Theatre is where the audience stand or follow the actors through a performance. This can happen in a theatre, but more often happens in a **site specific** show.

- **Advantage**: It is an interactive and exciting type of theatre where the audience feel involved.
- **Disadvantage**: Audience may get tired standing and walking. Actors or crew need to be skilled at moving the audience around. There can be health and safety risks.

Thrust Staging



In a Thrust Stage, there is audience on three sides of the stage. This is one of the oldest theatre types of stage.

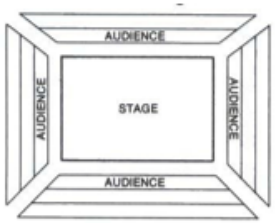
- **Advantage**: As there is no audience on one side of the stage, **backdrops**, **flats, cycloramas** or large **scenery** can be used. The audience may feel closer to the action as there are three front rows (one on each of the stages three sides).
- **Disadvantage**: **Sight lines** for those on extreme sides may be limited. The audience on the right and left have each other in view. **Box sets** (three sides of the room are constructed) cannot be used as this would block audience views.

Traverse Staging

On a Traverse Stage the acting area is a long central space with audience seated on either side facing each other. Like a catwalk.

- **Advantages**: Audience feel very close to the stage. They can see the reaction of the other side who are facing them which can work well for interaction. Sometimes extreme ends of the stage can be used to create extra acting space.
- **Disadvantages**: Big **scenery**, **backdrops** and **sets** block **sightlines**. The long and thin acting area makes **blocking** difficult. Does not have **wing** or **fly** areas.

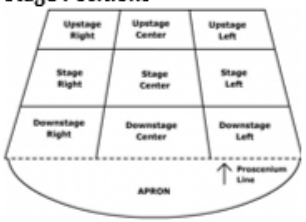
Arena Staging



Arena Staging is a similar configuration to Theatre in the Round. The audience sit on all sides of the stage, however they tend to sit in straight lighes. This type of staging is often used in sporting venues.

- **Advantages**: Intimate space for a performance. It engages the audience because the actors enter and exit the stage through the audience. There is also no 'forth wall'
- **Disadvantages**: One cannot use **backdrops** or **flats**. Stage furniture needs to be small so as not to obstruct **sightlines**. Actors have to be carefully **blocked** so that they do not always have their back to one section of the audience.

Stage Positions



In order to discuss theatre, you need to be able to explain quickly and simply where you want something to occur. To do this, theatre makers divide the stage up into a grid.

Points to Remember

- Some stages are **raked** which means they are higher at the back. Therefore **upstage** is at the back and **downstage** at the front.
- The direction of stage is always seen from the perspective of the actor. This can be confusing as you will need to swap your left and right if looking at the stage from an audience perspective.

KEYWORDS

1- Programmed drum track: Information inputted to a DAW.

2- Synth Patch: A saved user or pre-set setting on a musical device - a patch that sets the functions of a synthesiser.

3- Sampler: A device for recording and/or playing back audio.

4- Internal Routing: Activities required or undertaken to conserve the original condition of an item.

5- sends: An auxiliary output from a physical or software mixer.

5- inserts: A direct break in a channel strip to insert a device or processor.

5- automation: The recording or programming data for the use in playback.

5- plug-in: A software processor that can affect the audio

5- mixer: A physical or software device for the combining of signals

Planning your EXAM project (1000 words)

Personal Aims

You will need to think about your contribution to the recording. Your statement should describe your personal aims in relation to the recording.

You may want to think about the following questions:

What do I want to achieve with my contribution?
What skills do I have that I can use?
How will I know if I have achieved it?

Project Timeline

You must produce a project timeline that will map out the DAW project you are undertaking. This can be presented as a flow chart, Gantt chart, or any other way that adequately displays the time taken on different aspects of the brief. The content of this chart should be led by the assessment criteria.

Audience Expectation

You must address the briefs scenario.
What do you think the audience will be looking for? How will you meet or exceed their expectations?

Resources

You will need to consider the resources that will be used during this project. List and describe the resources that you will need to complete your work.

EXAM – Creating your Project (1200 words)

3-5 Minute composition with at least 8 TRACKS

A programmed DRUM TRACK
Simple/effective & creative/more complex drum patterns

Create & Saved SYNTH PATCH
Some creativity/creative/very creative in synth & sample patches

Create & save patch within a SAMPLER – min. 3 audio files

Internal Routing: two alternative signal paths
Some basic/good/greater insight into architecture (incl. internal routing), using some/range/more complex operations
Use Sequencer to edit note data & velocity
Simple quantisation/correct usage using basic/beyond basic snap parameters
Some/clear/efficient use editing

AUTOMATION: mixer, plug-in, instrument
Simple/creative & developed automation

Save all work in one folder & create mp3 mixdown

Evaluation (800 words)

Review the project in light of feedback:
- Look back at your aims and review the success of your project as a whole
- Make use of feedback from tutors and peers.

SCREENSHOTS:
Annotated screenshots of the project…
…that are basic but outline the essentials
…that are relevant and clear
…that are detailed, relevant and clear.

Highlight Strengths & areas of development:
- How successful was your DAW project in regard to the brief?
- What areas of the project were you happy with and why?
- What areas of the project could be improved in the future, why? How?

Keyword	Description
7. Embroider	Using sewing and thread to add decoration
2. Stencil	How an image is separated into tones to allow for processes such as spray painting
3. Highlight	Areas of light in an image/ the areas on a surface upon which there is the highest intensity of light being reflected
4. Distort	pull or twist out of shape. "a grimace distorted her fine mouth"
5. Proportion	The correct, attractive, or ideal relationship between one thing and another or between the parts of a whole."perceptions of colour, form, harmony, and proportion"
6. Contemporary	living or occurring at the same time.
7. Collage	a piece of art made by sticking various different materials such as photographs and pieces of paper or fabric on to a backing.

B. Command Words

Keyword	Description
8. Refine	To improve, enhance and change elements of your work for the better.
9. Response	To produce personal work generated by a subject, theme, starting point, or design brief.
10. Investigate	To enquire into, examine in depth, and/or analyse the relevance of a chosen subject and associated sources.
11. Research	To study in detail, discover and find information about.

C. Technique

C1. **Grid method** requires you to measure and draw a grid over an image
C2 The Grid method provides accurate spacing for your image
C3 Acrylic Paint is a paint that will dry as a plastic
C4 Acrylic paint can be used to paint bold layered painting as it dries quickly
C5 Carbon Paper is paper that is coated in carbon to be used for transferring images

D. Types of Equipment and Materials

Keyword	Description
D1 Round Brushes	Round **brushes** are the most **versatile** and widely used brushes. Their shape makes them suitable for small details and delicate lines. They can also be used to make broader strokes and washes.
D2 Flat Brush	**Flat brushes** aren't as versatile as round brushes but they're useful for blending and creating washes
D3 Spotter Brush	**Spotter brushes** are small round brushes with shorter bristles to give extra control. They are excellent for precise details.
D4 Wash Brush	**Wash brushes** are similar to flat brushes, but are much wider. They are suitable for blending or applying lots of paint.

YEAR 10– LENT TERM - FOOD AND NUTRITION – WHY FOOD IS COOKED?

You must be able to know and understand the reasons why food is cooked and how heat is transferred to food. Know the reasons for selecting different cooking methods. Understand protein denaturation and coagulation. Know about the properties of protein in gluten formation. Understand enzymic browning and oxidation in fruit and vegetables. Understand the functional and chemical properties of carbohydrates, which are gelatinisation, dextrinization and caramelisation. Understand the processes of raising or aerating using physical and mechanical methods. Know and understand the working properties of chemical and biological raising agents.

Key words

1. Palatability
2. Microwave
3. Radiation
4. Conduction
5. Convection

Keywords

1. Denaturation
2. pH level
3. Marinade
4. Enzymic Browning
5. Oxidation

Keywords

1. Gelatinisation
2. Viscosity
3. Consistency
4. Dextrinisation
5. Caramelisation

Keywords

1. Shortening
2. Plasticity
3. Aeration
4. Creaming
5. Foam
6. Emulsification.

Keywords

1. Physical raising agents
2. Chemical raising agents
3. Yeast
4. Bicarbonate of soda
5. Baking Powder
6. Fermentation
7. Carbon Dioxide

Quick Test

1. Name three types of heat transfer.
2. Why is food cooked?
3. What is the term used to explain the way heat changes the texture of egg proteins?
4. What causes the browning of cut fruit and vegetables?
5. What is the main heat transfer method when boiling food?
6. What sort of heat transfer commonly causes dextrinization?
7. What term describes thickening a sauce using starch?
8. What term describes how fat makes a short texture product?
9. Which basic cake making process traps air into the cake?
10. How does egg white trap air?

Key Points

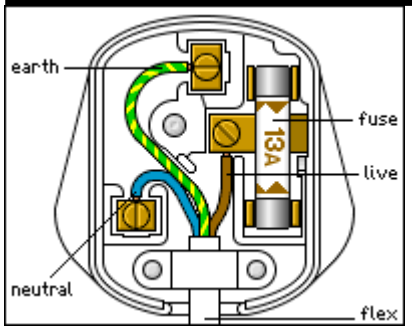
1. Cooking food makes it safe, allows it to keep for longer and makes it more palatable.
2. Cooking methods can achieve specific characteristics in food.
3. Heat is transferred by conduction, convection and radiation. Cooking commonly uses a combination of heat transfer methods.
4. Proteins are denatured during cooking. Egg proteins coagulate or set when they are heated.
5. Wheat flour contains the protein gluten. Gluten forms the structure of pastries, breads and cakes.
6. Enzymes can cause the browning of fruit and vegetables. Fruit and vegetables need careful handling during preparation to prevent enzymic browning.
7. Gelatinisation is the function of starches as thickening agents.
8. Sauces can be different thicknesses when the proportion of ingredients is altered.
9. Dextrinisation is the term used to describe browning of starch caused by heat.
10. Caramelisation is the browning of sugars caused by heat.
11. Fat makes pastry short and crumbly.
12. Fats give colour and flavour to pastry. The plasticity of fat allows it to be used for rubbing in, spreading and creaming.
13. Fats can help aeration in baking.
14. Emulsions are mixtures of liquids that do not normally mix. E.g oil and water. Egg yolks contain lecithin, a natural emulsifier. Eggs help stabilise mayonnaise.

	Nutrient	Source	Function	Effects of deficiency and excess
MACRONUTRIENTS	**1. Carbohydrates**	**1.** Starches – found in cereal grains such as rice, wheat, oats, plus starchy tubers (potatoes and sweet potatoes) and vegetables (carrots, beets, corn) **2**. Sugars – lactose found in milk and dairy, fructose found in honey, fruits and some vegetables (peppers, tomatoes etc.) **3.** Glycaemic Index – how quickly carbs convert to blood sugars. High GI convert quickly e.g. white bread, cornflakes, white rice, pineapple Medium – brown rice and oats Low GI – convert slowly – most fruits, carrots, wholewheat bread, beans, peas, lentils	**1.** Starches (polysaccharides) provide energy when broken down – slow release energy to the body (wholegrain provide slower release carbohydrates). provide fibre **2**. Sugars (Disaccharides and Monosaccharides) provide quick release energy to the body's' cells. Known as empty calories **1g carbs = 3.75Kcal** **3.** Intrinsic sugars – found in naturally in food eg fruit, vegetables **4**. Extrinsic sugars – added to foods eg white sugar, honey, artificial sweeteners	**1**. Deficiency of carbohydrates is extremely rare in the UK. Short term – weak, hungry and tired. Long term lack of carbohydrates in the diet can cause **2.** Ketosis – a condition where the body switches to using protein as an energy source. **3.** Excess – converts to fat – obesity, type 2 diabetes, heart disease, some cancers. Excess sugars – tooth decay **4.** No more than 5% of daily calories should come from sugar
	2. Proteins	**1.** Protein is digested by the body into its component parts – called amino acids. There are 8 which are essential for adults and 12 for children**. HBV** protein foods contain all the essential amino acids**. LBV** have one or more missing. **2.** High Biological Value (HBV) protein: Meat, fish, poultry, eggs, Quorn, milk, soya, Quinoa **3.** Low Biological Value (LBV) protein: Tofu, beans, nuts, seeds, grains eg wheat	**1.** Protein is needed for growth and repair, the production of body chemicals eg enzymes and hormones 2. Is also a source of secondary energy **1g protein = 4Kcal** **3. Complementary proteins** – eating a mixture of LBV proteins in order to get all the essential amino acids eg Beans on toast	**1.** Protein deficiency can cause: • Wasting of muscle & muscle loss • Oedema – build up of fluids in the body • Slow growth in children **2.** Severe deficiency leads to kwashiorkor → **3.** Excess – some is removed as waste. Rest is stored as fat. **4.** Adults need 55g of protein a day
	3. Fats	**1**. Saturated fats - Butter, cheese, meat, lard. Contain low density lipoproteins LDL (bad) which raise blood cholesterol levels and clog artery walls. **2**. Unsaturated fats – olive oil, avocado oil, fish oils. These contain **high density lipoproteins HDL** (good) which help to remove cholesterol by taking it to the liver where it is processed and removed.. **3.** Visible fats – fat on meat, bacon rind Invisible fats – cheese, avocados, nuts. **4**. Oils are turned into solid fats by hydrogenation. These fats are unhealthy.	**1. Fat** is a term used to describe **lipids** – this can refer to solid fats and oils. Fat is broken down by the body and used for energy. 1 **g fat = 9Kcal** **2.** Fat **provides** warmth when stored under the skin. **Protects** organs eg heart, liver. **3.** Fat Carries fat soluble vitamins A, D, E & K. **4.** Fat is important for hormone production **5. Contains** essential fatty acids that the body is unable to make itself **6.** Omega 3 and 6 are essential fatty acids which promote heart and brain development and prevent depression.	**1.** Lack of fat in the diet can lead to deficiencies of fat soluble vitamins A, D, E & K. **2.** Excess fat (either type) – obesity and all diseases linked to it. **3.** Excess unsaturated fat - build up of cholesterol on artery walls which can lead to a heart attack. **5.** Adults men need 95g fat and women 70g. No more than 30g or 20g saturated fat

COMMON FEATURES OF ENGINEERING DRAWINGS

- Geometry – the shape of the object; represented as views; how the object will look when it is viewed from various angles, such as front, top, side, etc.
- Dimensions – the size of the object is captured in accepted units. The dimension is the numerical value expressed in appropriate units of measurement and indicated graphically on technical drawings with lines, symbols and notes.
- Tolerances – the allowable variations for each dimension. Tolerancing is the practice of specifying the upper and lower limit for any permissible variation in the finished manufactured size of a feature. The difference between these limits is known as the tolerance for that dimension.
- Material – represents what the item is made of.
- Finish – specifies the surface quality of the item, functional or cosmetic. For example, a mass-marketed product usually requires a much higher surface quality than, say, a component that goes inside industrial machinery.
- Scale – The scale to be chosen for a drawing shall depend upon the complexity of the object to be depicted and the purpose of the representation. In all cases, the selected scale shall be large enough to permit easy and clear interpretation of the information depicted. The scale and the size of the object, in turn, shall decide the size of the drawing.

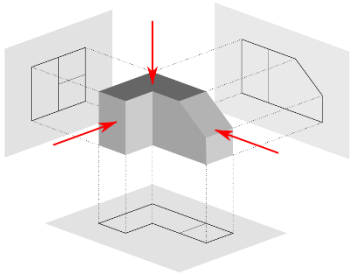
PLUGS AND FUSES



Most appliances are sold with moulded plugs already fitted. Nevertheless, it is still important to understand the correct wiring of a plug because enough of the old plugs still exist. It is also the case when you bring in equipment overseas. British Standard compliant adaptors are not always available for such non-UK plugs. You are very likely to need to change a plug at some time in your life. In the UK mains electricity is 230 V. (In Hong Kong, it is 220 V.) If you were to touch a live wire a current would flow through your body to the ground. This current may be enough to kill you.

The cable from the appliance usually consist of three wires, an earth and two other wires, live and neutral, which carry the current to and from the power station (live is from the power station and neutral is back to the power station). The wires are made of copper surrounded by an insulation casing. The casing is made of plastic and is coloured:

A fuse is simply a very thin wire. The wire has quite a low melting point. As current flows through the wire it heats up. If too large a current flows, it melts, breaking the circuit. Fuses are used to protect the flexible lead between the plug and the appliance. If too large a current flows through a lead it may overheat or catch fire. Fuses are unlikely to act quickly enough to prevent human electrocution – their main purpose is to prevent fires due to large currents.



MULTI VIEW PROJECTION

A multiview projection is a type of orthographic projection that shows the object as it looks from the front, right, left, top, bottom, or back (e.g. the primary views), and is typically positioned relative to each other according to the rules of either first-angle or third-angle projection.
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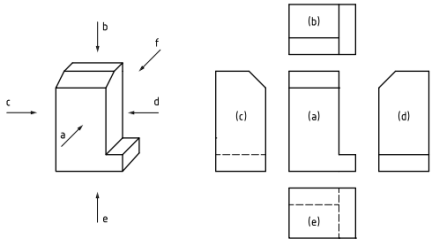
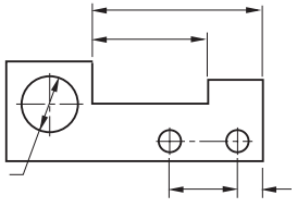
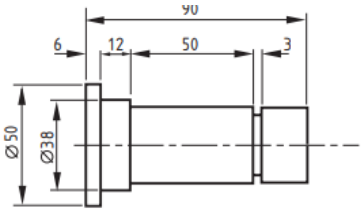


THIRD ANGLE PROJECTION METHOD (above)

With reference to the front view (a), the other views shall be arranged as follows (see Figure 8). • The view from above (b) shall be placed above. • The view from below (e) shall be placed underneath. • The view from the left (c) shall be placed on the left. • The view from the right (d) shall be placed on the right.



Dimension lines are added to show the length of a line. They have an arrowhead at each end.



Dimension lines always move from the smallest to largest – You can see the largest dimension line (90mm) is at the top

SI BASE UNITS

unit	abb	physical quantity	Smallest - - - - - - - - - - Largest
metre	m	length	Micrometer, millimeter, centimeter, meter
second	s	time	Microsecond, millisecond, seconds
kilogram	kg	mass	Milligram, gram, kilogram
ampere	A	electric current	Micro amp, milliamp, amp, kiloamp
kelvin	K	thermodynamic temperature	Kelvin, degrees Celsius
candela	cd	luminous intensity	Microcandela, millicandela, candela
mole	mol	amount of substance	Nanomole, micromole, millimole, mole

ENGINEERING DISCIPLINES

Mechanical	Hydraulics, gears, pulleys
Electrical	Power station, household appliances, integrated circuits
Aerospace	Aircraft, space vehicles, missiles
Communications	Telephone, radio, fibre optic
Chemical	Pharmaceuticals, fossil fuels, food and drink
Civil	Bridges, roads, rail
Automotive	Cars, motorcycles, trains
Biomedical	Prosthetics, medical devices, radiotherapy
Software	Applications, systems, programming

UNDERSTAND THE MAKING PROCESS

1	Preparation	Drawing, CAD, sketches, plans.
2	Marking Out	Pencil, scribe, steel rule, tri square, marking gauge, calipers, centre punch.
3	Modification	Saw, jigsaw, scroll saw, laser cutter, pliers, hammer, drill, file, glass paper.
4	Joining	Riveting gun, spanner, screwdriver, hot glue, gun , soldering iron, nail gun.
5	Finishing	Hand sander, glass paper, disc sander, buffing wheel, polish, spray paint, varnish.

HEALTH & SAFETY LEGISLATION

Health and Safety at work Act	Personal Protective Equipment	Manual Handling Operations	Control of Substances Hazardous to Health	Reporting of Injuries RIDDOR

Semaine 1

En vacances	On holiday
l'Algérie	Algeria
l'Allemagne	Germany
l'Angleterre	England
l'Autriche	Austria
la Belgique	Belgium
la Croatie	Croatia
l'Espagne	Spain
les États-Unis	USA
la France	France
le Japon	Japan
le Pakistan	Pakistan
les Pays-Bas	Netherlands
le pays de Galles	Wales
la Pologne	Poland
la Suisse	Switzerland
Normalement, je passe mes vacances en/au/à l'/aux …	Normally, I spend my holidays in …
Je vais au bord de la mer/à la campagne/ à la montagne.	I go to the seaside/the countryside/ the mountains.
Je voyage en train/avion/ferry/voiture.	I go by train/plane/ferry/car.
Je fais du camping.	I go camping.
Je loge dans un gîte/un hôtel/chez ma tante.	I stay in a holiday cottage/a hotel/ with my aunt.
Je vais avec ma famille/mes grands-parents/mon petit frère	I go with my family/my grandparents/ my little brother.
C'est génial/extra/assez ennuyeux.	It's great/excellent/quite boring.
Je me lève tôt.	I get up early.
On se couche tard.	We go to bed late.
Je me repose/me prépare.	I rest/get ready.
Je m'habille.	I get dressed.
Je vais à la plage.	I go to the beach.
Je me baigne dans la mer.	I bathe/swim in the sea.
Je me promène.	I go for a walk.
Je rentre à l'hôtel.	I go back to the hotel.
Je sors au restaurant.	I go out to a restaurant.
On peut …	You can …
faire une visite de Paris	visit Paris
faire de l'escalade	go climbing
visiter les musées/monuments	visit museums/monuments
aller à la pêche/à la plage	go fishing/to the beach
jouer à la pétanque	play petanque, boules

Semaine 2 + semaine 1

Les vacances passées et futures	Holidays past and future
Tous les ans/Normalement/Tous les étés, …	Every year/Normally/Every summer, …
j'achète/je fais/je vais …	I buy/do/go …
Hier/L'année dernière/Le week-end dernier, …	Yesterday/Last year/Last weekend, …
j'ai vu/visité/acheté …	I saw/visited/bought …
je suis allé(e) à …	I went to …
L'année prochaine/Le week-end prochain/ Demain, …	Next year/Next weekend/Tomorrow, …
je vais faire/prendre/aller/visiter …	I'm going to do/take/go/visit …

Des vacances de rêve	Dream holidays
Je logerais …	I would stay …
dans un gîte à la campagne	in a holiday cottage in the countryside
dans un hôtel 4 étoiles	in a 4-star hotel
dans une auberge de jeunesse	in a youth hostel
dans une caravane	in a caravan
dans une chambre d'hôte	in a bed and breakfast
dans une tente, sur une île déserte	in a tent on a desert island
sur un bateau	on a boat
Je voyagerais …	I would travel …
avec mes copains/copines	with my friends
avec ma famille	with my family
avec mes parents	with my parents
avec mes grands-parents	with my grandparents
avec mon lycée	with my school
avec une organisation	with an organisation
seul(e)	alone
Je regarderais le coucher du soleil.	I would watch the sunset.
Je nagerais avec les poissons tropicaux.	I would swim with tropical fish.
Je ferais des randonnées.	I would go hiking.
Je ferais du canoë-kayak.	I would go canoeing.
Je me reposerais.	I would rest.
Je m'amuserais avec mes copains/copines.	I would have fun with my friends.
Je mangerais bien.	I would eat well.
Il y aurait …	There would be …
un café qui serait ouvert toute la nuit	a café which would be open all night
une salle de jeux	a games room
des feux d'artifice tous les soirs	fireworks every night
des spectacles son et lumière	sound and light shows
des visites guidées	guided tours
Il n'y aurait aucun bruit!	There would be no noise!
Il n'y aurait pas beaucoup d'adultes!	There wouldn't be many adults!
Ce serait …	It would be …
formidable	tremendous
luxueux	luxury
merveilleux	wonderful
passionnant	exciting
pittoresque	picturesque
reposant	restful
tranquille	quiet

Semaine 3 et 4

Semaine 5

À l'hôtel	At the hotel
Nous avons passé X jours dans cet hôtel/cette chambre d'hôte.	We spent X days at this hotel/ bed and breakfast.
Ça s'est très bien passé.	It all went very well.
C'était charmant/propre/bien situé très pratique/pas cher/super.	It was charming/clean/well located very handy/not expensive/super.
Le service était impeccable.	The service was impeccable.
Le Wi-Fi fonctionnait très bien.	The Wi-Fi worked very well.
Le petit-déjeuner était offert.	Breakfast was included.
Il y avait …	There was …
un parking tout près	a car park nearby
un micro-ondes/la climatisation dans la chambre	a microwave/air-conditioning in the room
Il y avait un très bon rapport qualité–prix.	It was very good value for money.
Nous y avons passé un super séjour.	We had a great stay there.
Je voudrais une chambre …	I would like a room …
pour une personne	for one person
pour deux personnes	for two people
avec un lit simple	with a single bed
avec un grand lit	with a double bed
avec une salle de bains	with a bathroom
avec une douche	with a shower
avec une vue sur la mer	with a sea view
Votre chambre est …	Your room is …
au rez-de-chaussée	on the ground floor
au premier/deuxième étage	on the first/second floor

Semaine 1

Au restaurant	At the restaurant		
Je préférerais une table …	*I would prefer a table …*	L'accueil était très chaleureux.	*The welcome was very warm.*
en terrasse/à l'intérieur	*on the terrace/inside*	Nous avons dû attendre plus de cinq minutes.	*We had to wait more than five minutes.*
Je vais prendre …	*I will have/take …*		
le plat du jour/le menu à 30 euros	*the dish of the day/the 30-euro set menu*	L'ambiance était vraiment agréable.	*The ambiance was really pleasant.*
		L'atmosphère était super bruyante.	*The atmosphere was very noisy.*
(la soupe à la tomate) en entrée	*(the tomato soup) for a starter*	Le serveur/La serveuse était …	*The waiter/waitress was …*
(le filet de loup de mer) comme plat principal	*(the fillet of seabass) for the main course*	très attentionné(e)/médiocre	*very attentive/mediocre*
		À recommander!	*To be recommended!*
(la mousse au chocolat) comme dessert	*(the chocolate mousse) for dessert*	Je n'y retournerai jamais!	*I will never go back there!*
Qu'est-ce que vous avez, comme desserts?	*What desserts do you have?*	un couteau	*a knife*
On peut avoir l'addition, s'il vous plaît?	*Could we have the bill, please?*	une cuillère	*a spoon*
Les prix n'étaient pas excessifs.	*The prices weren't excessive.*	une fourchette	*a fork*
C'était cher.	*It was expensive.*	une serviette	*a napkin*

Semaine 2

Les plats	The dishes		
entrées	*starters*	loup (m) de mer	*sea bass*
brochettes (fpl) de crevettes	*prawn skewers*	poulet (m) basquaise	*Basque-style chicken*
escargots (mpl)	*snails*	rôti (m) de veau	*roast veal*
soupe (f) à la tomate	*tomato soup*	desserts	*desserts*
tarte (f) à l'oignon	*onion tart*	crème (f) brûlée	*crème brûlée*
plats principaux	*main dishes*	mousse (f) au chocolat	*chocolate mousse*
épaule (f) d'agneau	*lamb shoulder*	roulé (f) au chocolat	*chocolate roll*
cuisse (f) de canard	*duck leg*	sorbet (m)	*sorbet*
gratin (m) dauphinois	*dauphinoise potatoes*	tarte (f) au citron	*lemon tart*
lasagnes (fpl) végétariennes	*vegetarian lasagne*	tarte (f) aux pommes	*apple tart*

Semaine 3

En route!	On the road!		
Si j'avais le choix, pour aller …	*If I had the choice, to go …*	ennuyeux/fatigant/cher	*boring/tiring/expensive*
en Inde/Russie/Chine	*to India/Russia/China*	un billet	*a ticket*
au Sénégal/Vietnam/Brésil	*to Senegal/Vietnam/Brazil*	un aller simple	*a single*
… je voyagerais …	*… I would travel …*	un aller-retour	*a return*
en car/train/avion	*by coach/train/plane*	en première classe	*in first class*
à moto	*by motorbike*	en deuxième classe	*in second class*
… car c'est/ce n'est pas …	*… because it is (not) …*	les horaires	*travel time(s)*
rapide/confortable/pratique	*quick/comfortable/practical*	le guichet	*ticket office*
une aventure/la classe	*an adventure/cool*	le quai	*platform*
bon pour l'environnement	*good for the environment*	la salle d'attente	*waiting room*

Semaine 4 + semaine 3

Acheter les souvenirs	Buying souvenirs		
Je pense acheter (ce tagine).	*I'm thinking of buying (this tagine).*	Je cherche (une lanterne).	*I'm looking for (a lantern).*
Qu'est-ce que tu en penses?	*What do you think of it?*	Je prends celle-ci ou celle-là?	*Shall I take this one or that one?*
Que penses-tu de (cette théière)?	*What do you think of (this teapot)?*	J'ai envie de m'acheter des (gants).	*I feel like buying some (gloves).*
Je crois que je vais acheter (ces bijoux).	*I think I'm going to buy (this jewellery).*	Tu trouves celles-ci comment?	*What do you think of these ones?*
Je veux acheter (un foulard).	*I want to buy (a scarf).*	Je déteste faire du shopping.	*I hate going shopping.*
Tu préfères celui-ci ou celui-là?	*Do you prefer this one or that one?*	Je suis accro au shopping.	*I'm addicted to shopping.*

Semaine 5

C'était catastrophique!	It was catastrophic!		
Avant de partir, j'avais …	*Before leaving I had …*	j'ai raté l'avion	*I missed the plane*
réservé mon billet d'avion	*booked my plane ticket*	j'ai pris un coup de soleil affreux	*I got terribly sunburnt*
fait ma valise/des recherches	*packed my case/done some research*	le camping-car est tombé en panne	*the camper van broke down*
		on m'a volé mon sac à main	*my handbag was stolen*
découvert/décidé que …	*discovered/decided that …*	Alors/Donc …	*So …*
tout préparé	*prepared everything*	j'ai dû aller au commissariat/ à l'hôpital/chez le médecin	*I had to go to the police station/ hospital/doctor's*
J'étais allé(e) à l'agence de voyages.	*I had gone to the travel agent's.*	Quelle horreur!	*How awful!*
Mais/Pourtant …	*But/However …*	J'étais triste.	*I was sad.*
je me suis cassé la jambe	*I broke my leg*	On était bien déçus.	*We were really disappointed.*
j'ai oublié mon passeport	*I forgot my passport*		

Semaine 6 - Traduction spéciale en français : tout le vocabulaire plus …

Les mots essentiels	High-frequency words		
ce matin	*this morning*	certainement	*certainly, definitely*
cet après-midi	*this afternoon*	du coup	*as a result*
demain	*tomorrow*	entre temps	*meanwhile, in the meantime*
hier	*yesterday*	finalement	*finally, at last*
l'année dernière/prochaine	*last/next year*	franchement	*frankly, downright*
le dernier soir	*on the last evening*	toute la journée	*all day*
le week-end dernier/prochain	*last/next weekend*	puis	*then*
tous les ans/étés	*every year/summer*		

Semana 1

En mi ciudad	In my town
Hay… / Mi ciudad tiene…	*There is/are… / My town has…*
un ayuntamiento	*a town hall*
un bar / muchos bares	*a bar / lots of bars*
un castillo (en ruinas)	*a (ruined) castle*
un cine	*a cinema*
un mercado	*a market*
un museo / unos museos	*a museum / a few museums*
un parque	*a park*
un polideportivo	*a sports centre*
un puerto	*a port*
muchos restaurantes	*lots of restaurants*
un teatro	*a theatre*
una biblioteca	*a library*
una bolera	*a bowling alley*
una iglesia	*a church*
una piscina	*a swimming pool*
una playa / unas playas	*a beach / a few beaches*
una Plaza Mayor	*a town square*
una pista de hielo	*an ice rink*
una oficina de Correos	*a post office*
una tienda / muchas tiendas	*a shop / lots of shops*
muchos lugares de interés	*lots of sights*
algo / mucho que hacer	*something / a lot to do*
no hay nada que hacer	*there is nothing to do*
Vivo en un pueblo…	*I live in a … village*
histórico / moderno	*historic / modern*
tranquilo / ruidoso	*quiet / noisy*
turístico / industrial	*touristy / industrial*
bonito / feo	*pretty / ugly*
Está situado/a en … del país.	*It is situated in … of the country.*
el norte / el sur / el este / el oeste	*the north / the south / the east / the west*

Semana 2

¿Por dónde se va al / a la…?	How do you get to the…?
¿Dónde está el / la…?	*Where is the…?*
¿El / La …. está cerca / lejos?	*Is the …nearby / far away?*
sigue todo recto	*go straight on*
gira a la derecha / izquierda	*turn right / left*
toma la primera / segunda / tercera	*take the first / second / third*
calle a la derecha / a la izquierda	*road on the right / left*
pasa el puente / los semáforos	*go over the bridge / the traffic lights*
cruza la plaza / la calle	*cross the square / the street*
coge el autobús número 37	*take the number 37 bus*
está…	*it is…*
en la esquina / al final de la calle	*on the corner / at the end of the street*
al lado del museo / enfrente de…	*next to the museum / opposite…*

Semana 3

¿Cómo es tu zona?	What is your area like?
está situado/a en un valle	*it is situated in a valley*
entre el desierto y la sierra	*between the desert and the mountains*
al lado del río / mar Mediterráneo	*by the river / Mediterranean sea*
Está…	*It is…*
rodeado/a de volcanes / sierra	*surrounded by volcanoes / mountains*
lleno/a de bosques / selvas	*full of woods / forests*
a … metros sobre el nivel de mar	*at … metres above sea level*
Tiene…	*It has…*
unos impresionantes paisajes naturales	*some amazing natural landscapes*
varias influencias culturales	*various cultural influences*
el bullicio del una ciudad	*the hustle and bustle of a city*
acogedor/a / atractivo/a	*welcoming / attractive*
famoso/a / conocido/a por	*famous for / well-known for*
una región muy húmeda	*a very humid region*
una zona muy montañosa / pintoresca	*a mountainous / picturesque area*
tan fácil desplazarse	*so easy to get around*
Se puede…	*You / One can…*
estar mucho tiempo al aire libre	*spend lots of time in the open air*
subir a la torre	*go up the tower*
hacer un recorrido en autobús	*do a bus tour*
disfrutar de las vistas / del ambiente	*enjoy the views / the atmosphere*
viajar en el AVE	*travel on the AVE high-speed train*
pasear por los lagos artificiales	*go boating on the artificial lakes*

Semana 4

El clima es…	*The climate is…*
soleado / caluroso / seco / templado / frío	*sunny / hot / dry / mild / cold*
llueve (muy) poco / a menudo	*it rains (very) little / often*
en primavera / verano / otoño / invierno	*in spring / summer / autumn / winter*
hay mucha marcha	*there is lots going on*
Es…	*It is…*
mi ciudad natal / mi lugar favorito	*My home town / my favourite place*
apreciar la arquitectura variada	*appreciate the variety of architecture*
aprovechar el buen tiempo	*make the most of the good weather*
Se pueden…	*You / One can…*
probar platos típicos	*try local dishes*
practicar deportes acuáticos	*do water sports*
ver edificios de estilos muy diferentes	*see buildings with very different styles*
alquilar bolas de agua	*hire water balls*
practicar senderismo y ciclismo	*go hiking / trekking and cycling*

Semana 5

En la oficina de turismo	At the tourist office
¿Me puede dar…?	*Can you give me…?*
un plano de la ciudad	*a map of the town / city*
más información sobre…	*more information about…*
¿Cuánto cuesta una entrada?	*How much is a ticket?*
para adultos / niños	*for adults / children*
¿Dónde se pueden sacar las entradas?	*Where can you get tickets?*
¿A qué hora…?	*What time…?*
sale el autobús?	*does the bus leave?*
abre…?	*does…open?*
¿Hay visitas guiadas?	*Are there guided tours?*
¿Me puede recomendar…?	*Can you recommend…?*
un restaurante típico	*a typical restaurant*
un hotel / una excursión	*a hotel / a trip*

Semana 6

¿Qué haremos mañana?	What will we do tomorrow?
Sacaré muchas fotos.	*I will take lots of photos.*
Subiremos al teleférico.	*We will go up on the cable car.*
Bajaremos a pie.	*We will go down on foot.*
Pasaremos entre las nubes.	*We will go through the clouds.*
Iremos a la playa / a la montaña / de excursión en barco.	*We will go to the beach / to the mountains / on a boat trip.*
Haremos piraguïsmo.	*We will go canoeing.*
Podremos hacer paddlesurf.	*We will be able to go paddlesurfing.*
Podrás comprar regalos.	*You will be able to buy presents.*
será genial / mejor	*it will be great / better*
nos llevará	*he/she will take us*
Estoy (muy) a gusto.	*I am feeling (very much) at home.*
¡Buena idea!	*Good idea!*
de acuerdo	*OK*
¡Qué pena! / ¡Qué mal (rollo)!	*What a shame! / What a nightmare!*
¡Qué triste!	*How sad!*

¿Qué tiempo hará?	What will the weather be like?
Hará sol / viento.	*It will be sunny / windy.*
Habrá…	*There will be…*
nubes / claros / chubascos	*clouds / clear spells / showers*
una ola de calor	*a heat wave*
truenos y relámpagos	*thunder and lightning*
temperaturas más altas / bajas	*higher / lower temperatures*
granizos / brisas fuertes	*hail / strong winds*
periodos soleados	*sunny periods*
lloverá (bastante)	*it will rain (quite a bit)*
Las temperaturas subirán / bajarán.	*The temperatures will rise / fall.*
El tiempo…	*The weather….*
será variable	*will be variable*
se despejará	*will clear up*
cambiará	*will change*
no nos importará	*will not matter to us*

Semana 1

Las tiendas	Shops		
el banco	*bank*	la tienda de ropa	*clothes shop*
el estanco	*tobacconist's*	la zapatería	*shoe shop*
la cafetería	*café*	un regalo	*a present*
la carnicería	*butcher's*	sellos	*stamps*
la estación de trenes	*train station*	una carta / unas cartas	*a letter / a few letters*
la farmacia	*pharmacy / chemist*	recoger	*to pick up*
la frutería	*greengrocer's*	mandar	*to send*
la joyería	*jeweller's*	horario comercial / horas de apertura	*business hours / opening hours*
la librería	*book shop*	de lunes a viernes	*from Monday to Friday*
la panadería	*bakery*	abre a la(s)… / cierra a la(s)…	*it opens at… / it closes at…*
la papelería	*stationery shop*	no cierra a mediodía	*it doesn't close at midday*

Semana 2

la papelería	*stationery shop*	no cierra a mediodía	*it doesn't close at midday*
la pastelería	*cake shop*	cerrado domingo y festivos	*closed on Sundays and public holidays*
la peluquería	*hairdresser's*	abierto todos los días	*open every day*
la pescadería	*fish shop*		

Recuerdos y regalos	Souvenirs and presents		
el abanico	*fan*		
el chorizo	*chorizo (sausage)*	las pegatinas	*stickers*
el llavero	*key ring*	¿Me puede ayudar?	*Can you help me?*
el oso de peluche	*teddy bear*	Quiero comprar…	*I want to buy…*
los pendientes	*earrings*	¿Tiene uno/a/os/as más barato/a/os/as?	*Do you have a cheaper one / cheaper ones?*
la gorra	*cap*	un billete de (cincuenta) euros	*a (fifty) euro note*
la taza	*mug*	tengo cambio	*I have change*
las golosinas	*sweets*		

Semana 3

Quejas	Complaints		
Quiero devolver…	*I want to return…*	¿Qué me recomienda?	*What do you recommend?*
está roto/a	*it is broken*	¿Qué tal…? / ¿Qué te parece(n)…?	*What about…? / What do you think of…?*
es demasiado estrecho/a / largo/a	*it is too tight / long*	Te queda bien.	*It suits you.*
tiene un agujero / una mancha	*it has a hole / a stain*	Te quedan demasiado grandes.	*They are too big on you.*
falta un botón	*it's missing a button*	una talla más grande / pequeña	*a bigger / smaller size*
¿Puede reembolsarme (el dinero)?	*Can you reimburse me (the money)?*	en rebajas	*on sale*
Podemos hacer un cambio.	*We can exchange (it).*	Me lo/la/los/las llevo.	*I'll take it / them.*

Semana 4

De compras	Shopping		
Normalmente voy… / Suelo ir…	*Usually I go… / I tend to go…*	es más económico / práctico / cómodo	*it's cheaper / more practical / more convenient*
a los centros comerciales	*to shopping centres*	es un buen sitio para pasar la tarde	*it's a good place for spending the afternoon*
de tiendas con mis amigos	*shopping with my friends*	hay más variedad / demasiada gente	*there is more variety / there are too many people*
Nunca me ha gustado / Prefiero / Odio…	*I've never liked / I prefer / I hate…*	los precios son más bajos	*the prices are lower*
comprar en…	*shopping in…*	hay más ofertas	*there are more offers*
cadenas / grandes almacenes	*chain stores / department stores*	ropa alternativa / de moda	*alternative clothing / fashionable clothing*
tiendas de diseño / segunda mano	*designer shops / second-hand shops*		
comprar por Internet / en la red	*shopping on the internet / online*	gangas	*bargains*
hacer cola	*queueing*	artículos de marca	*branded items*
porque…	*because…*		

Semana 6

Los pros y los contras de la ciudad	The for and against of living in a city		
Lo mejor de vivir en la ciudad	*The best thing about living in a city*	hay tanto tráfico / tantos coches	*there is so much traffic / so many cars*
es que…	*is that…*	se lleva una vida tan frenética	*life is so frenetic*
es tan fácil desplazarse	*it's so easy to get around*	la gente no se conoce	*people don't know each other*
hay una red de transporte público	*there is a public transport system*	En el campo…	*In the countryside…*
hay tantas diversiones	*there are so many things to do*	el transporte público no es fiable	*public transport is not reliable*
hay muchas posibilidades de trabajo	*there are lots of job opportunities*	hay bastante desempleo	*there is quite a lot of unemployment*
Lo peor es que…	*The worst thing is that…*	no hay tantos atascos como antes	*there are not as many traffic jams as before*
el centro es tan ruidoso	*the centre is so noisy*	Yo conozco a todos mis vecinos	*I know all my neighbours*

Semana 7

¿Qué harías?	What would you do?		
Introduciría más zonas peatonales.	*I would introduce more pedestrian areas.*	Mejoraría el sistema de transporte.	*I would improve the transport system.*
Renovaría…	*I would renovate…*	Pondría / Crearía más áreas de ocio.	*I would put in / create more leisure areas.*
algunos edificios antiguos	*some old buildings*	Construiría un nuevo centro comercial.	*I would build a new shopping centre.*
las zonas deterioradas en las afueras	*the dilapidated areas on the outskirts*	Invertiría en el turismo rural.	*I would invest in rural tourism.*
		Controlaría el ruido.	*I would limit the noise.*

Destino Arequipa	Destination Arequipa		
Vi / Vimos lugares interesantes.	*I saw / We saw interesting places.*	Me quedé impresionado con la ciudad.	*I was really impressed by the city.*
Tuvimos un guía.	*We had a guide.*	Había vistas maravillosas.	*There were amazing views.*
Nos hizo un recorrido.	*He/She did a tour for us.*	La comida estaba muy buena.	*The food was very good.*
Nos ayudó a entender toda la historia	*He/She helped us to understand all of the history.*	La gente era abierta.	*The people were open.*
Recorrí a pie el centro histórico.	*I walked around the historic centre.*	Lo que más me gustó fue / fueron…	*What I liked most was / were…*
Compré tantas cosas.	*I bought so many things.*	¡Fue una experiencia única!	*It was a one-off experience!*
Alquilé una bici de montaña.	*I hired a mountain bike.*	¡Qué miedo!	*What a scare!*
Cogí un autobús turístico.	*I took a tourist bus.*	Volveré algún día.	*I will go back one day.*
subimos / bajamos	*we went up / we went down*	Aprenderé a hacer surf.	*I will learn to surf.*
Aprendí mucho sobre la cultura.	*I learned a lot about the culture.*	Trabajaré como voluntario/a.	*I will work as a volunteer.*

Important Ideas

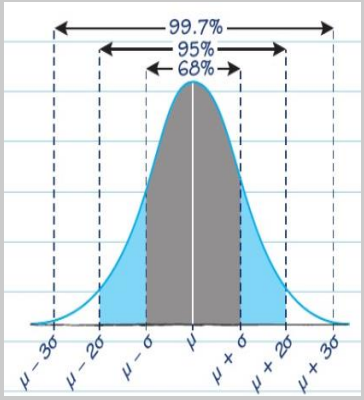
You can compare data sets using appropriate calculated or given measures of spread.

For a normal distribution values more than three standard deviations from the mean are very unusual

A sample set of means are more closely distributed that individual vales from the same population

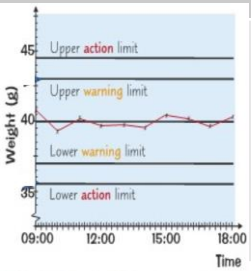
Quality assurance makes sure that certain measured values stay as close as possible to target values so that products are all of the same quality.

Vocabulary

Probability distributions	A model used to find expected probabilities of events.
Binomial distribution	Used to model the total number of "successes" (as long as certain conditions are met)
Normal distribution	Used to model data which has most values near the middle and fewer values further away . Drawn as a smooth curve. 

Question	Answer
Probability distributions	
On a spinner, the probability of landing on blue is 0.4 The spinner is spun 4 times. Let X be the number of times the spinner lands on blue. a) Work out P (x = 2) b) Work out P (X>2) c) Estimate the mean number of times the spinner will land on blue in 100 spins	*(i)* $p = 0.4$ so $q = 0.6$ $P(X=2) = 6 \times 0.4^2 \times 0.6^2 = 0.3456$ (ii) $P(X>2) = 4 \times 0.4^3 \times 0.6 + 0.4^3 = 0.1536 + 0.0256 = 0.1792$ (iii) For 100 spins, mean number of times for success = $100 \times 0.4 = 40$
Measures of dispersion	
The heights of a species of daffodil are normally distributed. 2.5% of the heights are greater than 16.5cm. 50% of the heights are greater than 13.5 cm. a) Find the mead and the standard deviation b) Work out the probability that the heights of the daffodils are greater than 18cm.	a) $\mu = 13.5$ $\mu + 2\sigma = 16.5$ so $\sigma = \frac{16.5 - 13.5}{2} = 1.5$ b) $\frac{18 - 13.5}{1.5} = 3$ Probability $= \frac{100 - 99.7}{2} = 0.15\%$

Key Facts & Formula

Conditions for a binomial distribution	• The number of trials is fixed • The trials are independent • There are two possible outcomes for each trial (success and failure)
Binomial expansion	$(p + q)^2 = p^2 + 2pq + q^2$ $(p + q)^3 = p^3 + 3p^2q + 3pq^2 + q^3$ Where p = success, q = failure and the index is the number of trials
Conditions for a normal distribution	• Data is continuous • The distribution is symmetrical and bell-shaped • The mode, median and mean are approximately equal.
Distribution of values	• 68% of values are within $\pm\sigma$ of the mean μ • 95% of values are within $\pm 2\sigma$ of the mean μ • 99.7% of values are within $\pm 3\sigma$ of the mean μ
Standardised scores	$\frac{\text{value} - \text{mean}}{\text{standard deviation}} = \frac{x - \mu}{\sigma}$
Control charts	

Important Ideas

When planning an investigation you should consider the five stages of the Statistical enquiry cycle and plan what you'll do at each stage.

Evaluating could involve planning more analysis.

Constraints are limitations due to the availability and reliability of data, practicalities of methods etc.

Draw conclusions relating to hypotheses:
- Discuss reliability
- - Identify weaknesses
- - Suggest improvements
- - Make refinements

Vocabulary

Planning	Chose your hypothesis, what to collect, and how to record and use it
Collecting data	Chose data sources and collections methods, identifying any constraints
Processing and presenting data	Chose diagrams and measures, considering use of technology
Interpreting results	Plan analysis in order to draw conclusions and make predictions
Communicating results clearly and evaluating methods	Being aware of the target audience

Question	Answer
Hypothesis	
Matt writes this hypothesis: Young people spend more time at the gym than old people (a) Explain why this is not a good hypothesis (b) Write a better hypothesis that Matt could use.	(a) The statement is not precise and not measureable. "Young" and "old" are not defined (b) People under 30 spend more time at the gym that people over 50
Designing investigations	
Zeedan wants to investigate whether people in the UK prefer to drink tea or coffee. He sends out a pilot survey to 270 people and gets 180 completed surveys back (a) Zeedan wants to get at least 400 completed surveys How many people should he send the survey to?	Using proportion: $\frac{180}{270} = \frac{400}{x}$ so $x = \frac{400 \times 270}{180}$ $= 600$

Worked example

A tourist board is planning to investigate the popularity of a particular beach. Their hypothesis is "the higher the temperature, the more people go to the beach". Give five examples of other details they should include in their plan, and say why each is appropriate.

Planning	Measure the air temperature at the beach to the nearest degree and observe the number of people there. Every Saturday at the same time of day for a year, o that the data Is recorded for all seasons and is consistent.
Collecting data	Collect your own data (primary data). This should be reliable because you can control how the data is collected (e.g. you can record the temperature at the same time each day
Processing and presenting data	Put the data in a spreadsheet, so that a scatter diagram and calculations can be produced easily and accurately.
Interpreting results	Interpret a scatter diagram to see if there's a relationship between temperature and number of people.
Communicating results clearly and evaluating methods	Describe what the scatter diagram shows to suit the target audience – this will be a clear visual representation of the results

1.1.1 Being an Entrepreneur:- An entrepreneur is someone with the foresight, drive and ambition to take a risk and solve business or consumer problems.

What motivates entrepreneurs? Entrepreneurs are motivated by three main factors, they **financial, personal and social.**

1.1.2 Entrepreneurial characteristics and skills: - The characteristics and skills of an entrepreneur and their applications in business, including:

Confident, Motivated , Determined, Results focused, Initiative, Decision making, Analytical ability, Communication

Characteristic - a feature or quality belonging typically to a person to identify them. For example, someone is hard working.

Skills – an ability to do an activity or job well, especially because you have practiced it. For example, a chef will practice knife skills.

1.2.1 Financial Aims and Objectives

- **Break even -** is the point of balance making neither a profit nor a loss.
- **Profitability -** the degree to which a business or activity yields profit or financial gain.
- **Increasing revenue -** It means generate more money. If a company wants to generate more revenue, they can do so by selling more products or selling the same amount at a higher price.
- **Profit maximisation -** is the short run or long run process by which a firm may determine the price, input, and output levels that lead to the highest profit.

1.2.2 Non Financial Aims and Objections:

1. Customer satisfaction - can be defined as the number of customers, or percentage of total customers, whose reported experience with a business, its products, or its services exceeds specified satisfaction goals.

2. Expansion - As businesses grow, they may aim to expand further.

Ways a business can grow: Internal growth, external growth, franchising

4. Diversification is a corporate strategy to enter into a new market or industry in which the business doesn't currently operate, while also creating a new product for that new market.

5. Ethical and corporate responsibility - Some businesses believe that they have a responsibility to behave in a ethical manner. To do this they consider two questions.

Impact: who/what does my decision affect or harm?

Fairness: will my decision be considered fair by those affected?

1.3.1 Legal structure

There are a range of legal structures for businesses:

Sole Trader –This is a business that is owned, financed and managed by one person. Any profit that the business makes belongs entirely to this person.

Partnership - This is a business which is owned by two or more people. These people all share the profits and responsibility for managing the business.

Franchise - A franchise is created when an existing, successful business (known as the franchiser) gives another person (known as the franchisee) the right to use its company name, business ideas, branding, products, marketing, business processes, etc in exchange for a fee.

Private Limited Company (Ltd) – A private limited company (Ltd) is usually a smaller business such as an independent estate agent. Shares do not trade on the stock exchange.

Public Limited Company (PLC) - In the UK, a public limited company makes its shares available to be traded on the stock exchange. This means that anyone can buy or sell shares in these companies. Public limited companies can be subject to lots of regulations, but their management has limited liability when it comes to the business performance.

Co-operatives - These organisations are owned and run by its employees and/or customers, who share any profits that are made.

1.3.3 Restructuring

Delayering - to reduce the size of a business hierarchy, especially in terms of a reduction in management. This creates a flatter (less layered) organisational structure.

Redundancies – elimination of a job role.

1.4 Stakeholder Engagement:

All businesses and enterprises have stakeholders. A stakeholder is an individual, group or organisation who has an interest in the business or enterprise, and may be affected by the business.

Stakeholders can be… **internal** - within a business - Internal stakeholders are those people who have an interest in the business because they are directly linked to the business – they are within the business.

Stakeholders can be… **external** - outside a business - External stakeholders are outside of a business, but they are still interested in and potentially affected by the activity of the business.

The advantages of stakeholder engagement, including:

Staff motivation/retention - When an organisation acts in ways that engage employees/workers, then the organisation can benefit from high levels of staff retention and motivation.

Improved reputation - An organisation that is seen to be engaging effectively with stakeholders will benefit from being able to build a positive reputation.

New Ideas - By communicating effectively with stakeholders and listening carefully to their views/insights, an organisation may be able to identify ideas for new business opportunities and/or areas for improvement.

Increased share prices - If an organisation has shares and shareholders, the price of its shares is directly related to its performance and level of success.

2.1.1 Product Type:

What is a product? - A product is goods or a service that is sold to customers or other businesses. Customers buy products to meet their needs.

A **product** is goods or a service that is sold to customers or other businesses. **Goods** are a tangible product – something you can touch.

Services are intangible products – something you cannot touch.

2.1.3 Boston Matrix - The structure of a Boston Matrix and the characteristics of the four categories, including: - **Stars, Question Marks, Cash Cows and Dogs.**

What is market share? - Market share is the percentage of business or sales a company has out of total business or sales by all competitors combined in any given market.

What is market growth? - The increase in size or sales recorded within a given consumer group over a specified time frame.

Key term	Definition
1. Employment	When an individual works part-time or full-time under a contract of employment.
2. Labour market	The supply and demand for labour (employees provide the supply and employers the demand).
3. Labour force	All people who are of working age, and able and willing to work.
4. Employee	Someone who is paid to work for someone else.
5. Employer	A person or organization that you work for.
6. Salary	A fixed regular payment, typically paid on a monthly basis but often expressed as an annual sum.
7. Wage	A fixed regular payment earned for work or services, typically paid on a daily or weekly basis.
8. Bonus	An extra amount of money given to an employee, often based on work performance.
9. Contract	A contract is an agreement that sets out an employee's employment conditions, rights, responsibilities & duties.
10. Economy:	System of how money is made and used within a particular country or region.
11. Economic Growth	An increase in the capacity of an economy to produce goods and services.
12. Trade	To take part in the exchange, purchase, or sale of goods and services.
13. Industry	A group of manufacturers or businesses that produce a particular kind of goods or services.
14. Unemployment	When a person who is actively searching for employment is unable to find work.

The 5 Sectors of the Economy.

Primary Sector: this involves acquiring raw materials**.** For example, metals and coal have to be mined, oil drilled from the ground, rubber tapped from trees, foodstuffs farmed and fish trawled. This is sometimes known as extractive production.

Secondary Sector: this is the manufacturing and assembly process. It involves converting raw materials into components, for example, making plastics from oil. It also involves assembling the product, e.g. building houses, bridges and roads.

Tertiary Sector: this refers to the commercial services that support the production and distribution process, e.g. insurance, transport, advertising, warehousing and other services such as teaching and health care.

Quaternary Sector: this sector includes government, culture, libraries, scientific research, education, and information technology. These intellectual services and activities are what drives technological advancement, which can have a huge impact on short- and long-term economic growth.

Quinary Sector: this contains the highest levels of decision making in a society or economy, including top executives or officials in such fields as government, science, universities, non-profit, health care, culture, and the media. It may also include police and fire departments, which are public services as opposed to for-profit enterprises.

Key Term	Definition
1. Career	The job or series of jobs you do during your working life.
2. Occupation	Your job or profession.
3. Promotion	When an employee moves from one job or position to another that is higher in pay, responsibility, and status.
4. Redundancy	When an employer no longer requires the job role that is being carried out by an employee.
5. Retire	To leave your profession or job and end your active working life.
6. Pension	An amount of money paid regularly by the government or private company to a person who has retired.
7. Apprenticeship	Apprenticeships combine practical training in a job with study.
8. Internship	A period of work experience offered by an organization for a limited period of time, either paid or voluntary.
9. Traineeship	A traineeship is a course that includes a work placement. It can last from 6 weeks up to 6 months.
10. CV	A document that presents your skills and qualifications effectively and clearly.
11. Cover Letter	A letter that should accompany your application form or CV. It is short, introduces you, and explains why you are applying for a job.
12. Job Interview	A meeting in which an employer asks the person applying for a job questions to see whether they suitable.
13. Video Resume	A short video created by a candidate for employment and uploaded for prospective employers to review.
14. Entrepreneur	A person who sets up a business or businesses, taking on financial risks in the hope of profit.

What is the future of the Labour Market?

Young people will have longer careers. Rising life expectancy means young people will have an extended number of years in the workforce and will need to be **adaptable** and **flexible**.

A rise in average qualification levels will make a **lack of skills and qualifications** a bigger barrier to finding work and building a career.

More opportunities for young people to **work flexibly** with changes in technology and employment policy such as job share, remote working and flexible office space.

The working population will be **more diverse** with more younger, older, women & people with disabilities joining the labour market.

The growth in sectors such as **health** and **social care** are likely to continue to grow, and the nature of work will continue to change.

Key Term	Definition
1. Ambitious	Having or showing a strong desire and determination to work hard and succeed.
2. Motivated	Enthusiastic or determined to achieve goals.
3. Reliable	Someone who can be trusted to behave well, work hard and do what is expected of them.
4. Persistent	Refusing to give up or stop trying.
5. Team Player	A person who plays or works well as a member of a team
6. Self-Starter	A person sufficiently motivated or ambitious to work on their own initiative without needing direction.