YEAR 11 KNOWLEDGE ORGANISER
LENT TERM

Name:

Family Group:

Trinity

INSIGHTFUL

INDEPENDENT

RESILIENT

REFLECTIVE

KNOWLEDGEABLE

OPEN MINDED

COURAGEOUS

PRINCIPLED

CARING

LEARNING - LOVING - LIVING

KNOWLEDGE ORGANISER AND REVISION GUIDANCE

The knowledge organiser is a book of **EVERYTHING** that you should know for the whole term and should be used as a revision tool for ALL subjects **along side** your **subject book** and other resources from your subject teacher.

Other revision tools include:
-FREE **online** revision tools such as www.senecalearning.com, the recently updated BBC BITESIZE and YouTube.

-Other **online** platforms and **apps** like https://mathswatch.co.uk and Duolingo.

-Subject **revision guides** (some available at school and book shops)

-Practice **exam questions** (see your teacher)

-**Past Papers** from your teacher or exam board websites.

WELLBEING DURING REVISION AND EXAMS- YOUNG MINDS

1. Always take a moment just to breathe, whether in the exam, before or after.

2. Remember that school does offer support, just reach out and ask!

3. Keep your work balanced. Spend time revising, but socialise and relax too.

4. Keep a self-care routine so that your revision is the most productive it can be whilst you feel as good as possible.

5. Break up revision with food and exercise to make sure you stay energised.

6. Remember that results do not define you.

7. Find a revision space and style that works for you: silence, background chatter, music with or without lyrics.

8. Work to your own pace – everyone is different in how they work.

9. If you feel nervous about the time pressure of an exam, practice timing yourself when you revise, or try some test papers.

10. Plan in some treats to reward yourself, and celebrate when it's all over!

Vs SCHOOL STRESS
Tips to fight revision stress
Have a period of quiet reflection to help you take in what you've learnt.
#gettingthroughit   youngmindsvs.org.uk

Vs SCHOOL STRESS
Tips to fight revision stress
Make sure you eat and drink well.
#gettingthroughit   youngmindsvs.org.uk

Vs SCHOOL STRESS
Tips to fight revision stress
Get out of the house. Go for a walk or meet a friend so that you don't feel trapped in a cycle of revision.
#gettingthroughit   youngmindsvs.org.uk

Vs SCHOOL STRESS
Tips to fight revision stress
If you're struggling, talk to someone you trust.
#gettingthroughit   youngmindsvs.org.uk

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Revision timetable

	4pm	5pm	6pm	7pm
Monday				
Tuesday				
Wednesday				
Thursday				
Friday				
Saturday				
Sunday				

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.

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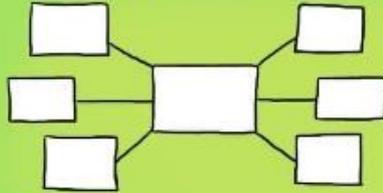
Give yourself a time limit, say 3 minutes, then have a look at your books & add a few things you forgot.

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?
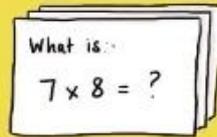
What is:
$7 \times 8 = ?$

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.

Definition	Draw a picture
Examples	Non-examples

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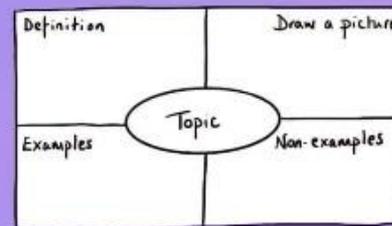
You can use knowledge organisers to learn new vocab & make links in between subjects or ideas.

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'.

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.

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'.

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

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.
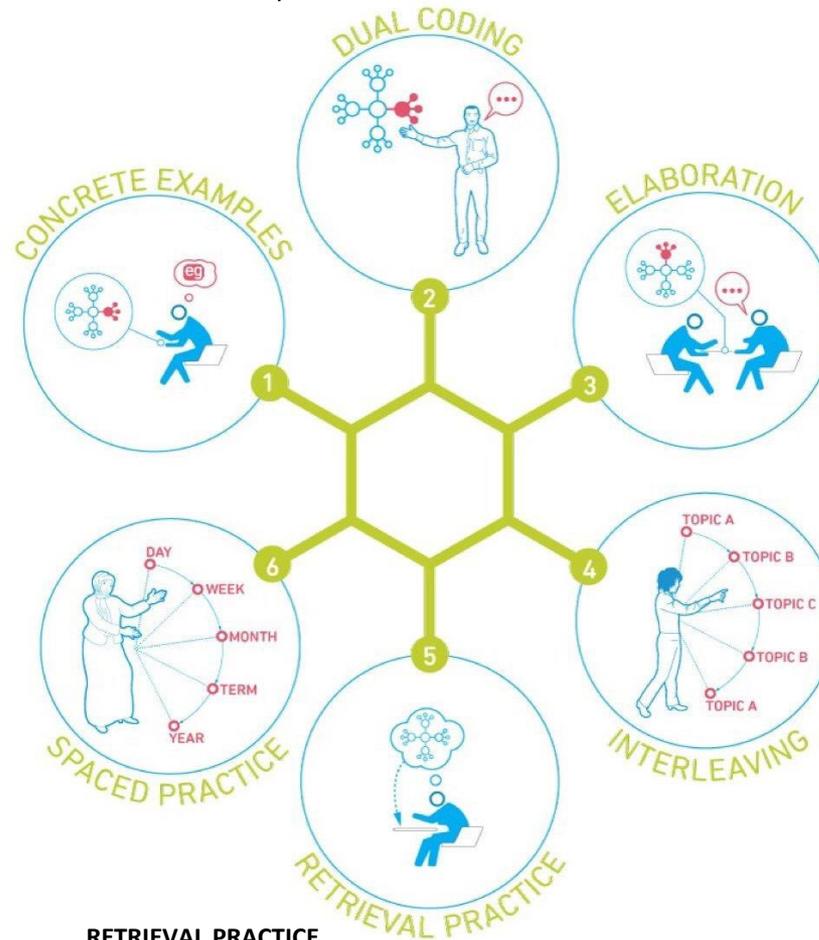
RETRIEVAL PRACTICE

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.

Chapter 1:Story of the door:

Who	What	Notes
Utterson	Never lighted by a smile	U is 'austere', serious, strict, avoids frivolity
	Austere	U represses his desire for pleasure. Strives to conform to restrictive social mores
	I let my brother go to the devil in his own way.	Avoids gossip, doesn't judge: is he tolerant or selfish here?
	When the wine was to his taste something eminently human beaconed from his eye	U's 'austere' demeanour could be an act/veneer-drink removes his inhibitions.
Setting	The buildings are so packed together	Setting is claustrophobic and restrictive, mirroring the social mores. Gothic fiction involves entrapment!
	Neither bell nor knocker	House is private, mirroring the theme of secrecy.
Utterson	Though he enjoyed the theatre, had not crossed the doors of one for twenty years	U is Paranoid: extreme obsession with reputation results in bizarre/absurd behavior. U avoids frivolity
U and E	Looked singularly dull BUT chief jewel of each week	U and E walk in public to enhance reputation. Contrived.
Enfield	You start a question its like starting a stone The more it looks like Queer Street, the less I ask	E avoids gossip: is he being tolerant or selfish here? E is a hypocrite: he is fascinated by Hyde's story!
Hyde	Tramples 'calmly' on a child 'like some damned juggernaut'	H attacks the vulnerable. H is cold, callous. gratuitous violence, like an automaton.
Enfield	Make his name stink	E threatens to ruin H's reputation and cause a scandal. H pays money to avoid trouble. E and H are immoral!
Enfield on Hyde	Gave me one look so ugly that it brought out the sweat on me like running	H is repulsive, abhorrent, causes psychosomatic reaction in E. Links to U.Class stereotypes of lower class (a group seen as deviant, criminal, immoral).
	There is something wrong with his appearance; something displeasing, something downright detestable A strong feeling of deformity, although I couldn't specify the point	Link to Uncanny: ambiguous/vague. Victorians thought certain physiologies caused criminality (Physiognomy): ugly=criminal.

Chapter 2: The Search for Mr Hyde:

Who	What	Notes
Lanyon	Boisterous and decided manner	Stevenson commenting on arrogance of science (challenged traditional/religious beliefs).
L on J	Jekyll became too fanciful for me, he began to go wrong, wrong in mind Such unscientific balderdash	J=transcendental medicine. L=empirical science. J=Victorians associated science with supernatural because incomprehensible. L=Victorians associated science with arrogance/immorality (challenged the church)
U meets H	Fronted about with an air of defiance	H defies social mores/is immoral/doesn't conform. H represents U.Class repressed desires.
	Snarled aloud into a savage laugh	H is sinister, feral, atavistic (represents Victorian fears of evolution)
	Pale and dwarfish	H is depraved/disease to society. J is 'tall fine build of a man'. Hierarchy of status: J is superior (like class system)
	Murderous mixture of timidity and boldness	H is antithetical. Contradictory nonsensical description (like U.Class prejudice=incoherent/irrational)
H	Troglodytic	Link to Victorian fears of evolution. Caveman=uncivilized/feral. U.Class repress all savage/uncivilized impulses.
U on J	The ghost of some old sin, the cancer of some concealed disgrace	U suspects J has past vices. U suspects blackmail. 'cancer'=moral depravity and sin are a societal disease to be avoided.
U	Humbled to the dust by the many ill things he had done	U is archetypal Victorian Gent-he is perfect! (here U is paranoid and insecure)

Chapter 3: Dr Jekyll was quite at Ease

Who	What	Notes
J on L	Hide bound pedant, Lanyon	J (transcendental) vs L (Empirical). Victorian fears and disdain for science
J on H	It isn't what you fancy; it is not so bad as that	J implicitly referring to blackmail/illicit homosexuality
Jekyll	Asks U to help Hyde if J disappears	Close bonds of support and secrecy between U.Class men

Chapter 4: Carew Murder Case

Who	What	Notes
Hyde	Ape like fury	Feral, brutal, savage, malevolent, uncivilized, relentless,
The Attack	1) Unprovoked attack: SDC was bowing to greet H. SDC was genteel and polite (paragon of propriety and decorum). SDC is antithesis of H.	
	2) Victim: old, frail, vulnerable. MP=symbolizes society and civilization-H attacks the establishment	
	3) Nature of attack: No valuables taken. Makes H hard to understand-he is motivated by sadism. H is volatile	
	4) Weapon left=H doesn't care about ramifications or being caught	
	5) 'bones audibly shattered'= visceral, barbaric attack	
	6) Maid faints: accentuates brutality of attack.	

Chapter 5: Incident of the Letter:

Who	What	Notes
Utterson	Suspects J is covering for H (blackmail/homosexual subtext)	
	Handwriting of J and H are similar	Graphology (Victorian pseudo-science) claimed that personality/morality could be judged by handwriting

Chapter 6: Remarkable Incident of Dr Lanyon

Who	What	Notes
Lanyon	his flesh had fallen away	Shock of seeing H transform to J (explained in CH9) kills L. Links to idea that science is a threat/Victorian fears of science. H symbolizes
	Deep seated terror of the mind	human capacity for evil: L is shocked by this-like all U.Class men, L aims for perfection/represses desires for sin. When confronted with the
	A doomed man	thing he tries to ignore (evil/transgression) he is shocked and dies

Chapter 7: Incident at the Window:

Who	What	Notes
Jekyll	Slams the window to avoid E and U seeing transformation	J cannot control the transformations now
E and U	E and U see J through the window	Symbolizes lack of privacy for U.Class men

Chapter 8: The Last Night:

Who	What	Notes
Poole on J	My master is a tall fine build of a man	Compare to H 'pale and dwarfish' hierarchy between them: J is supposed to be on top but H ends up more powerful
Poole on H	That masked thing like a monkey	Atavism/fears of evolution/feral/primitive/bestial
Hyde	H has been asking Poole to get a drug for him	Theme of addiction: to drug/sin/freedom/

Chapter 9: Dr Lanyon's Narrative

Who	What	Notes
Lanyon	My life is shaken to its roots	Link to idea that science is a threat/Victorian fears of science
Lanyon	After J's party in CH6, L receives letter from J asking L to get a drawer from J's house (containing notebook and vial)	Notebook explains that slowly the potion has stopped working: J has built up tolerance/become immune. Symbolises the normalization of transgression: the more you do, the more acceptable it becomes?
Hyde	Transformation in front of Jekyll	Gothic/supernatural/fears of science. L witnesses (like maid witnessing H battering SDC): reader encouraged to share their shock

Chapter 10: Henry Jekyll's Full Statement of the Case

Who	What	Notes
Jekyll	That man is not truly one, but truly two	Duality of man. Evil+Good
	Extraneous evil	J claims H is separate (contradicts himself: compare to 'not truly one, but truly two' Is 'extraneous evil' the social mores?
	A solution to the bonds of obligation	H is a 'solution' to problem of restrictive social mores. 'bonds'=Victorian society is imprisoning/an entrapment (Gothic theme)
	Like a school boy, strip off these lendings and spring headlong into the sea of liberty	H excites J: 'like a school boy'=exhilarating. 'sea of liberty'=ignore social mores/indulge in transgressions and immorality.
	Commingled out of good and evil	Human psyche is a mixture not two separate things. evil and good are intertwined
	Like a thick cloak	Similar to 'extraneous evil'. J claims H is separate (contradicts himself) but WHY? 1) human psychology is too complex to comprehend 2) J is deliberately being evasive to avoid culpability 3) J is deluded and is lying to himself to avoid guilt and shame
	I was slowly losing hold of my original and better self, and becoming slowly incorporated with my second and worse	H eventually overpowers J. Evil side begins to take control
	If I am the chief of sinners, I am the chief of sufferers also	'sufferers'=J suffers under societal expectations. Repressing his desire to sin=suffering. Guilt of actions as H=suffering. Evil side taking control=suffering. Denying innate capacity for transgression=suffering.
	The animal within me	Atavism/fears of evolution-humans are similar to animals
	this brief condescension to evil finally destroyed the balance of my soul'	Temptation leads to further damage. repressing sin 'brief condescension' avoids moral depravity.
	Men have before hired bravos to transact their crimes, while their own person and reputation sat under shelter	Secrecy/reputation. Public behavior is a veneer/act. H is a 'bravos' and a 'thick cloak' to 'shelter' J from judgment and criticism
	Secret pleasures	Perhaps he only initially wanted to indulge in transgressions like drinking/prostitution not murder

LEARNING - LOVING - LIVING

Important Ideas

Use SOH CAH TOA...	FOR RIGHT ANGLE - TRIANGLES
	Sine Ratio: $Sin\theta = \frac{Opposite}{Hypotenuse}$ Cosine Ratio: $Cos\theta = \frac{Adjacent}{Hypotenuse}$ Tangent Ratio: $Tan\theta = \frac{Opposite}{Adjacent}$
HISTOGRAMS	FREQUENCY = Area of each bar Frequency Density = $\frac{frequency}{class\ width}$
FRACTIONAL INDICES	...Tell us to take the 'roots' $a^{-1} = \frac{1}{a}$ and $a^{-m} = \frac{1}{a^m}$ $a^{\frac{1}{2}} = \sqrt{a}$ and $a^{\frac{1}{m}} = \sqrt[m]{a}$ $a^{\frac{n}{m}} = (a^{\frac{1}{m}})^n = (\sqrt[m]{a})^n$
NEGATIVE INDICES	...Tell us to take the reciprocal
SIMILAR SHAPES	If s.f. for length = k s.f for area or surface area = k^2 s.f. for volume = k^3

Vocabulary

Class Width	is the difference between the two boundaries of a **class interval**
Reciprocal	1 divided by the number (numerator and denominator are swapped)
Similar Shapes	Two shapes whose angles are all equal, and corresponding sides are in proportion
Congruent Shapes	Two shapes whose angles and corresponding sides are equal
Scale Factor (s.f.)	is a number which scales, or multiplies, some quantity

Q& A

Calculate the value of x.

$$\sin 52° = \frac{13}{x}$$
$$x = \frac{13}{\sin 52°}$$
$$\therefore x = 16.5\ m$$

Calculate the Frequencies from the frequency density table

And complete the frequency Density Table

Weight (w kg)	Frequency	Frequency Density
0 < w ≤ 10	40	?
10 < w ≤ 15	6	?
15 < w ≤ 35	?	2.6
35 < w ≤ 45	?	1

DON'T FORGET CLASS WIDTH

Evaluate:
$$\frac{(81x^2y^8)^{\frac{1}{2}}}{(3x^3y^2)^3}$$

$$(81x^2y^8)^{\frac{1}{2}} = \sqrt{(81x^2y^8)} = 9xy^4$$

$$(3x^3y^2)^3 = (3x^3y^2)(3x^3y^2)(3x^3y^2)$$
$$= 3*3*3 * x^3x^3x^3 * y^2y^2y^2$$
$$= 27x^9y^6$$

MathsWatch References

168, 218, 201-203	trigonometry
205, 186	Histograms, Cumulative Frequency Charts
29, 82, 154, 188	Indices
144, 200	Similar Shapes

Key Facts & Formula

Sine & Cosine rules for ALL triangles

$$\frac{a}{Sin\ A} = \frac{b}{Sin\ B} = \frac{c}{Sin\ C}$$

$$a^2 = b^2 + c^2 - 2bc(CosA)$$
$$b^2 = a^2 + c^2 - 2ac(CosB)$$
$$c^2 = a^2 + b^2 - 2ab(CosC)$$

CUMULATIVE FREQUENCY CURVES AND BOX PLOTS

Extend the the working out lines below the x axis

Minimum value · LQ · Median · UQ · Maximum value

Draw the box plot like this
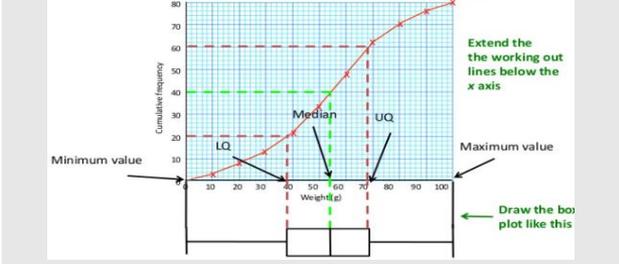
Each QUARTILE is 25% of the dataset

Similar These pairs of shapes are *similar*.	Not Similar These pairs of shapes are *not similar*.

Converting Units of Measurement

1m = 100cm

1m

Area = 1m x 1m = $1m^2$
= 100 cm x 100 cm
= $(100)^2\ cm^2$ = 10 000cm^2
Therefore - $1m^2$ = 10 000cm^2

BIDMAS — N3

...or BODMAS. Use the correct order of operations; take care when using a calculator.
- Brackets
- Indices (or pOwers)
- Division and Multiplication
- Addition and Subtraction

Types of number — N4

Integer: a "whole" number
Factors; the divisors of an integer
→ Factors of 12 are 1, 2, 3, 4, 6, 12
Multiples; a "times table" for an integer (will continue indefinitely)
→ Multiples of 12 are 12, 24, 36 ...
Prime number: an integer which has exactly two factors (1 and the number itself). Note: 1 is not a prime number.

HCF, LCM — N4

Highest Common Factor (HCF)
→ Factors of 6 are 1, 2, 3, 6
Factors of 9 are 1, 3, 9
HCF of 6 and 9 is 3
Lowest Common Multiple (LCM)
→ Multiples of 6 are 6, 12, 18, 24, ...
Multiples of 9 are 9, 18, 27, 36, ...
LCM of 6 and 9 is 18

Prime factors — N4

Write a number as a product of its prime factors; use indices for repeated factors:
→ $720 = 5 \times 3^2 \times 2^4$

Powers and roots — N6, N7

Special indices: for any value a:
$$a^0 = 1$$
$$a^{-n} = \frac{1}{a^n}$$
→ $3^{-4} = \frac{1}{3^4} = \frac{1}{81}$

Calculating with fractions — N8

Adding or subtracting fractions; use a common denominator...
→ $\frac{4}{5} - \frac{1}{3} = \frac{12}{15} - \frac{5}{15} = \frac{7}{15}$
Multiplying fractions; multiply numerators and denominators...
→ $\frac{4}{7} \times \frac{2}{3} = \frac{8}{21}$
Dividing fractions; "flip" the second fraction, then multiply...
→ $\frac{2}{7} \div \frac{5}{6} = \frac{2}{7} \times \frac{6}{5} = \frac{12}{35}$

Fractions, decimals — N10

Fraction is numerator ÷ denominator
→ $\frac{5}{8} = 5 \div 8 = 0.625$
Use place values to change decimals to fractions. Simplify where possible.
→ $0.45 = \frac{45}{100} = \frac{9}{20}$
Learn the most frequently used ones:

$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{3}{4}$
0.5	0.25	0.1	0.2	0.75

Surds — N8

Look for the biggest square number factor of the number:
→ $\sqrt{80} = \sqrt{16 \times 5} = 4\sqrt{5}$

Standard form — N9

Standard form numbers are of the form $a \times 10^n$ where $1 \le a < 10$ and n is an integer.

Standard units — N13

1 tonne = 1000 kilograms
1 kilogram = 1000 grams

1 kilometre = 1000 metres
1 metre = 100 centimetres
= 1000 millimetres
1 centimetre = 10 millimetres

1 day = 24 hours
1 hour = 60 minutes = 3600 seconds
1 minute = 60 seconds

Rounding — N15

Truncate the number, then use a "decider digit" to round up or down. Decimal places: use the decimal point
→ 162.3681 to 2dp;
162.36 | 81 = 162.37 to 2dp
Significant figures: use the first non-zero digit.
→ 162.3681 to 2sf;
16 | 2.3681 = 160 to 2sf
→ 0.007 039 to 3sf;
0.007 03 | 9 = 0.007 04 to 3sf

Error intervals — N15

Find the range of numbers that will round to a given value:
→ $x = 5.83$ (2 decimal places)
$5.825 \le x < 5.835$
→ $y = 46$ (2 significant figures)
$45.5 \le y < 46.5$
Note use of $\le$ and $<$, and that the last significant figure of each is 5

Algebraic notation — A1

$$ab = a \times b$$
$$3y = y + y + y$$
$$a^2 = a \times a$$
$$a^3 = a \times a \times a$$
$$a^2b = a \times a \times b$$
$$\frac{a}{b} = a \div b$$

Equations and identities — A3

An equation is true for some particular value of x
→ $2x + 1 = 7$ is true if $x = 3$
...but an identity is true for every value of x
→ $(x + a)^2 \equiv x^2 + 2ax + a^2$
(note the use of the symbol $\equiv$)

Laws of indices — A4

For any value a:
$$a^x \times a^y = a^{x+y}$$
$$\frac{a^x}{a^y} = a^{x-y}$$
$$(a^x)^y = a^{xy}$$
→ $\left(\frac{2pq^4}{p^3q}\right)^2 = \frac{8p^2q^{12}}{p^6q^2} = \frac{8q^8}{p^4}$ or $8q^8p^{-4}$

Standard graphs — A12
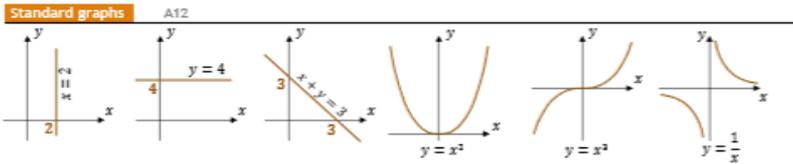
y = mx + c — A9

Equation of straight line $y = mx + c$
m is the gradient; c is the y intercept:
→ Find the equation of the line that joins $(0, 3)$ to $(2, 11)$
Find its gradient...
$$\frac{11 - 3}{2 - 0} = \frac{8}{2} = 4$$
...and its y intercept...
Passes through $(0, 3)$, so $c = 3$
Equation is $y = 4x + 3$

Parallel lines: gradients are equal;
→ $y = 2x + 3$ and $y = 2x - 5$ both have gradient 2 so are parallel.

Expanding brackets — A4

$$p(q + r) = pq + pr$$
→ $5(x - 2y) = 5x - 10y$
$(x + a)(x + b) = x^2 + ax + bx + ab$
$(2x - 3)(x + 5)$
$= 2x^2 - 3x + 10x - 15$
$= 2x^2 + 7x - 15$
Reverse of expanding is factorising - putting an expression into brackets.

Quadratics — A18

Solve a quadratic by factorising.
→ Solve $x^2 - 8x + 15 = 0$
Put into brackets (taking care with any negative numbers)...
$(x - 3)(x - 5) = 0$
...then either $x - 3 = 0$ or $x - 5 = 0$
so that $x = 3$ or $x = 5$.

Difference of two squares — A4

$$a^2 - b^2 = (a + b)(a - b)$$
→ $x^2 - 25 = (x + 5)(x - 5)$

Simultaneous equations — A19

→ Solve $\begin{cases} 2x + 3y = 11 \\ 3x - 5y = 7 \end{cases}$
Multiply to match a term in x or y
$\begin{cases} 10x + 15y = 55 \\ 9x - 15y = 21 \end{cases}$
Add or subtract to cancel...
$19x = 76$, so $x = 4$
Finally, substitute and solve...
$2 \times 4 + 3y = 11$, so $y = 1$

Rearrange a formula — A5

The subject of a formula is the term on its own. Use rules that "balance" the formula to change its subject
→ Make x the subject of
$2x + 3y = z$
Here, subtract $3y$ from both sides...
$2x = z - 3y$
...then divide both sides by 2
$$x = \frac{z - 3y}{2}$$

Right angled triangles — G20, G22

Pythagoras Theorem.
Links all three sides.
No angles.
$$a^2 + b^2 = c^2$$

The longest side of any right angled triangle is the hypotenuse; check that your answer is consistent with this.

Trigonometry.
Links two sides and one angle.
SOH | CAH | TOA

$\sin\theta = \frac{opp}{hyp}$ $\cos\theta = \frac{adj}{hyp}$ $\tan\theta = \frac{opp}{adj}$

Use "2ndF" or "SHIFT" key to find a missing angle

Special values of sin, cos, tan
Learn (or be able to find without a calculator)...

$\theta°$	$\sin\theta°$	$\cos\theta°$	$\tan\theta°$
0	0	1	1
30	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$
45	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{2}}$	1
60	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$
90	1	0	
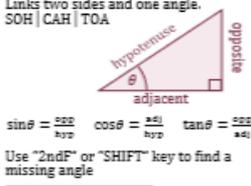
Areas and volumes — G16, G17, G18, G23

Area of triangle $= \frac{1}{2} \times$ base $\times$ height   Volume of cuboid = length $\times$ width $\times$ height

Area of trapezium $= \frac{1}{2}(a + b) \times h$
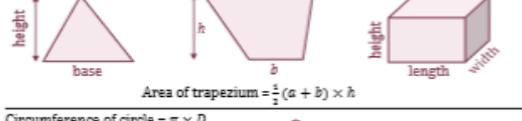
Circumference of circle $= \pi \times D$
Area of circle $= \pi \times r^2$

Arc length $= \frac{\theta}{360°} \times \pi \times D$

Area of sector $= \frac{\theta}{360°} \times \pi \times r^2$ Volume of cylinder $= \pi r^2 \times$ height   Volume of prism = area of cross section $\times$ length

Transformations — G7, G8

Reflection
- Line of reflection
Translation
- Vector

Rotation
- Centre of rotation
- Angle of rotation
- Clockwise or anticlockwise

Enlargement
- Centre of enlargement
- Scale factor (if SF < 1 the shape will get smaller).

Angle facts — G3

Equal angles in parallel lines: always use correct terminology...

Alternate angles   Corresponding angles

Angles on a straight line total 180°

Angles in a full turn total 360°

Interior angles in a triangle total 180°

Use this for the interior angles of any polygon...

Exterior angles always total 360°

...or 180° × (n − 2)
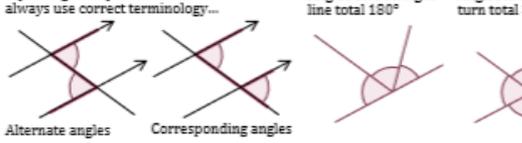
Sequences — A24, A25

Triangular numbers:

	1st	2nd	3rd	4th	5th
	1	3	6	10	15

Square numbers ($n^2 = n \times n$):

1^2	2^2	3^2	4^2	5^2
1	4	9	16	25

Cube numbers ($n^3 = n \times n \times n$):

1^3	2^3	3^3	4^3	5^3
1	8	27	64	125

nth term of an arithmetic (linear) sequence is $an + d$
→ nth term of 5, 8, 11, 14, ... is $3n + 2$ (always increases by 3 first term is $3 \times 1 + 2 = 5$)
Geometric sequence; multiply each term by a constant ratio
→ 3, 6, 12, 24, ... (ratio is 2)
Fibonacci sequence; make the next term by adding the previous two ...
→ 2, 4, 6, 10, 16, 26, 42, ...

Probability — P8, P9

$p = \frac{n(\text{equally likely favourable outcomes})}{n(\text{equally likely possible outcomes})}$

| $p = 0$	impossible
$0 < p < 0.5$	unlikely
$p = 0.5$	evens
$0.5 < p < 1$	likely
$p = 1$	certain

Probability rules — P8, P9

Multiply for independent events
→ P(6 on dice and H on coin)
$$\frac{1}{6} \times \frac{1}{2} = \frac{1}{12}$$
Add for mutually exclusive events
→ P(5 or 6 on dice)
$$\frac{1}{6} + \frac{1}{6} = \frac{2}{6}$$
Apply these rules to tree diagrams.

Parts of a circle — G9
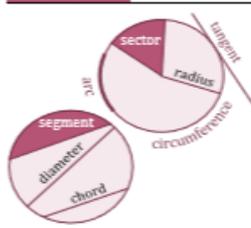
Division using ratio — R5

Use a ratio for unequal sharing
→ Divide £480 in the ratio 7 : 5
$7 + 5 = 12$, then £480 ÷ 12 = £40
$7 = £40 = £280$, $5 = £40 = £200$
(check: £280 + £200 = £480 ✓)

Ratio and fractions — R8

Link between ratios and fractions
→ Boys to girls in ratio 2 : 3
$\frac{2}{5}$ are boys, $\frac{3}{5}$ are girls.

Percentages — R9

y percent of $x = \frac{y}{100} \times x$
→ Increase £58 by 26%.
$$\frac{26}{100} \times £58 = £15.08$$
$£58 + £15.08 = £73.08$

y as a percentage of $x = \frac{y}{x} \times 100\%$
→ The population of a town increases from 3500 to 4620 Find the percentage increase.
$$\frac{1120}{3500} \times 100\% = 32\%$$
Note: fraction = $\frac{\text{increase}}{\text{original}}$
Learn the most frequently used ones:

$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{1}{100}$
50%	25%	10%	20%	1%

Speed, distance, time — R11

$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$
→ A car travels 90 miles in 1 hour, 30 minutes. Find its average speed.
90 miles ÷ 1.5 hours = 60 mph

Averages — S4

Mode: most frequently occurring
Median: put the data in numerical order, then choose the middle one
Mean $= \frac{\text{total of items of data}}{\text{number of items of data}}$

Correlation — S6

Positive correlation   Negative correlation
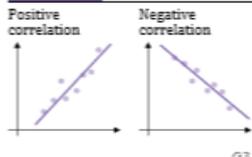
Important Ideas

Angle Facts

Vertically opposite angles are equal.

$a = b$
$s = t$

Angles at a point add up to 360^0.

$s + a + b + t = 360^0$

Angles between Parallel Lines

Alternate | Corresponding | Co - interior

Alternate angles are equal
Corresponding angles are equal
Co-interior angles sum to 180^0

Coordinates

Name of point
Point
A
$(3, 4)$
x-coordinate
y-coordinate

Area, Surface Area and Volume

Square — Area $= a^2$ or $a \times a$
Example:
$a = 5cm$
Area $= 5^2 = 25cm^2$

Cube — Surface Area $= 6 \times a^2$
Example:
$a = 5cm$
Surface Area $= 150cm^2$

Volume $= a^3$ or $a \times a \times a$
Example:
$a = 5cm$.
Volume $= 125cm^3$

Vocabulary

Surface Area	The area of all the faces of a 3D object
Proportion	As one variable increases, another increases by the same rate

Q& A

Calculate Volume

Cuboid A
   8cm x 10cm x 11cm = 880cm³
Cuboid B
   13cm x 5xm x 11cm = 715cm³
Total = 880cm³ + 715cm³ = 1595cm³

Calculate x

Use the Polygon Exterior Angles Theorem to write and solve an equation.

$x° + 2x° + 89° + 85° = 360°$

Polygon Exterior Angle Theorem. Combine like terms.

$3 \ x + 174 = 360$
$3x = 186$
$x = 62$

Solve for x.

Calculate the slope of the line.

$(-1, 4)$
$(2, -2)$
down 6
over 3

slope $= \dfrac{rise}{run} = \dfrac{-6}{3} = -2$

Negative -- and the line is going downhill

MathsWatch References

45, 120-122	Angle Facts
8, 113, 149	Coordinates and Equations of Straight Lines
53-56, 114a&b, 117	Areas and surface Area
115, 119	Volumes
42, 142	Proportion & Compound Units

Key Facts & Formula

Area

Square	Area $= a^2$ or $a \times a$ Example: $a = 5cm$ Area $= 5^2 = 25cm^2$	
Rectangle	Area $= w \times h$ Example: $w = width = 10cm$ $height = 20cm$ Area $= 10 \times 20 = 200cm^2$	
Triangle	Area $= b \times h \times 0.5$ Example: $b = base = 20cm$ $h = vertical\ height = 15cm$ Area $= 20 \times 15 \times 0.5 = 150cm^2$	
Reg Polygon	Area $= n \times s \times a \times 0.5$ Example: $n = number\ of\ sides = 6$ $length\ of\ side = 5cm$ $a = apothem = 15cm$ Area $= 6 \times 5 \times 15 \times 0.5 = 225cm^2$	
Circle	Area $= \pi \times r^2$ Example: $\pi = pi = 3.14$ $r = radius = 5cm$ Area $= 3.14 \times 5^2 = 3.14 \times 5 \times 5 = 78.5cm^2$	

Volume

Cuboid		lbh
Cube		a^3
Right circular cylinder		$\pi r^2 h$
Right circular cone		$\frac{1}{3}\pi r^2 h$

Interior Angles of a Polygon

How to find the sum of the interior angles

180^0 180^0 180^0

Split the shape up into triangles
Each triangle contains $180°$
$3 \times 180° = 540°$

LEARNING - LOVING - LIVING

Listing strategies — N5
Product rule for counting:
→ $4 \times 3 \times 2 \times 1 = 24$ ways to arrange the letters P, I, X and L

Powers and roots — N6, N7
Special indices: for any value a:
$$a^0 = 1$$
$$a^{-n} = \frac{1}{a^n}$$
$$a^{\left(\frac{p}{q}\right)} = \sqrt[q]{a^p}$$
→ $3^{-4} = \frac{1}{3^4} = \frac{1}{81}$
→ $8^{\left(\frac{2}{3}\right)} = \sqrt[3]{8^2} = 4$

Surds — N8
Look for the biggest square number factor of the number:
→ $\sqrt{80} = \sqrt{16 \times 5} = 4\sqrt{5}$

Rationalise the denominator — N8
Multiply the numerator and denominator by an expression that makes the denominator an integer:
→ $\frac{4}{\sqrt{7}} = \frac{4 \times \sqrt{7}}{\sqrt{7} \times \sqrt{7}} = \frac{4\sqrt{7}}{7}$
→ $\frac{2}{4 + \sqrt{5}}$
$= \frac{2}{4 + \sqrt{5}} \times \frac{4 - \sqrt{5}}{4 - \sqrt{5}} = \frac{2(4 - \sqrt{5})}{11}$

Standard form — N9
Standard form numbers are of the form $a \times 10^n$, where $1 \le a < 10$ and n is an integer.

Recurring decimals — N10
Make a recurring decimal a fraction:
→ $n = 0.2\dot{3}\dot{6}$
(two digits are in the recurring pattern, so multiply by 100)
$100n = 23.\dot{6}$
(this is the same as 23.636)
$99n = 23.\dot{6}36 - 0.2\dot{3}\dot{6} = 23.4$
$n = \frac{23.4}{99} = \frac{234}{990} = \frac{13}{55}$

Error intervals — N15
Find the range of numbers that will round to a given value:
→ $x = 5.83$ (2 decimal places)
$5.825 \le x < 5.835$
→ $y = 46$ (2 significant figures)
$45.5 \le y < 46.5$
Note use of $\le$ and $<$, and that the last significant figure of each is 5

Equations and identities — A3
An equation is true for some particular value of x
→ $2x + 1 = 7$ is true if $x = 3$
...an identity is true for every value of x
→ $(x + a)^2 \equiv x^2 + 2ax + a^2$
(note the use of the symbol $\equiv$)

Laws of indices — A4
For any value a:
$$a^x \times a^y = a^{x+y}$$
$$\frac{a^x}{a^y} = a^{x-y}$$
$$(a^x)^y = a^{xy}$$
→ $\left(\frac{2pq^4}{p^2q^3}\right)^3 = \frac{8p^3q^{12}}{p^6q^9} = \frac{8q^3}{p^3}$ or $8q^3p^{-3}$

Difference of two squares — A4
→ $a^2 - b^2 = (a + b)(a - b)$
→ $x^2 - 25 = (x + 5)(x - 5)$

Rearrange a formula — A5
The subject of a formula is the term on its own. Rearrange to
→ Make x the subject of
$2x + ay = y - bx$
$2x + bx = y - ay$
$x(2 + b) = y - ay$
$x = \frac{y - ay}{2 + b}$

Functions — A7
Combining functions:
$fg(x) = f(g(x))$
→ If $f(x) = x + 3$ and $g(x) = x^2$
$fg(x) = x^2 + 3$
$gf(x) = (x + 3)^2$

The inverse of f is f^{-1}
→ If $f(x) = 2x + 5$ then
$f^{-1}(x) = \frac{x - 5}{2}$

$y = mx + c$ — A9
Equation of straight line $y = mx + c$
m is the gradient; c is the y intercept
→ Find the equation of the line that joins $(0, 3)$ to $(2, 11)$
Find its gradient...
$\frac{11 - 3}{2 - 0} = \frac{8}{2} = 4$
...and its y intercept...
Passes through $(0, 3)$, so c = 3
Equation is $y = 4x + 3$

Parallel lines: gradients are equal; perpendicular lines: gradients are "negative reciprocals".
→ $y = 2x + 3$ and $y = 2x - 5$ are parallel to each other; $y = 2x + 3$ and $y = -\frac{1}{2}x + 3$ are perpendicular

Transformations of curves — A13
Starting with the curve $y = f(x)$:
Translate $\binom{0}{a}$ for $y = f(x) + a$
Translate $\binom{-a}{0}$ for $y = f(x + a)$
Reflect in x axis for $y = -f(x)$
Reflect y axis for $y = f(-x)$

Velocity - time graph — A15
Gradient = acceleration (you may need to draw a tangent to the curve at a point to find the gradient);
Area under curve = distance travelled.

Standard graphs — A12

$y = x^2$ $y = x^3$ $y = \frac{1}{x}$ $y = a^x$ $y = \sin(x°)$ $y = \cos(x°)$ $y = \tan(x°)$
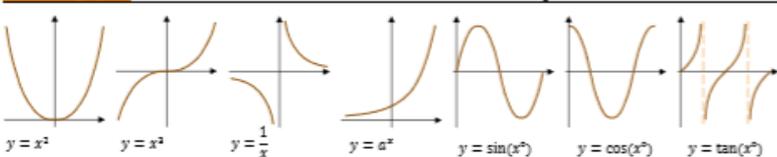
Quadratics — A11, A18
If a quadratic equation cannot be factorised, use the formula
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$
→ Solve $2x^2 + 3x - 7 = 0$
$x = \frac{-3 - \sqrt{9 - (-56)}}{2 \times 2} = -2.73$
or x $= \frac{-3 + \sqrt{9 - (-56)}}{2 \times 2} = 1.23$

Complete the square to find the turning point of a quadratic graph.
→ $y = x^2 - 6x + 2$
$y = (x - 3)^2 - 9 + 2$
$y = (x - 3)^2 - 7$
Turning point is at $(3, -7)$

Equation of a circle — A16
$x^2 + y^2 = r^2$ is a circle with centre $(0, 0)$ and radius r.
→ $x^2 + y^2 = 25$ has centre $(0, 0)$ and radius 5

Simultaneous equations — A19
One linear, one quadratic:
→ Solve $\begin{cases} x + 3y = 10 \\ x^2 + y^2 = 20 \end{cases}$
Rearrange the linear, and substitute into the quadratic
$x = 10 - 3y$
so $(10 - 3y)^2 + y^2 = 20$
Expand and solve the quadratic
$100 - 60y + 9y^2 + y^2 = 20$
$10y^2 - 60y + 80 = 0$
$y = 2$ or $y = 4$
Finally, substitute into the linear and solve, pairing values...
$x + 3 \times 2 = 10$ so $(x, y) = (4, 2)$
$x + 3 \times 4 = 10$ so $(x, y) = (-2, 4)$

Sequences — A24, A25
nth term of an arithmetic (linear) sequence is $bn + c$
→ nth term of 5, 8, 11, 14, ... is 3n+2 (always increases by 3 first term is $3 \times 1 + 2 = 5$)
nth term of a quadratic sequence is $an^2 + bn + c$
→ First three terms of $n^2 + 3n - 1$ are 3, 9, 17, ...
Geometric sequence; multiply each term by a constant ratio
→ 3, 6, 12, 24, ... (ratio is 2)
Fibonacci sequence; make the next term by adding the previous two ...
→ 2, 4, 6, 10, 16, 26, 42, ...

Right angled triangles — G20
Pythagoras Theorem.
Links all three sides.
No angles.
$a^2 + b^2 = c^2$
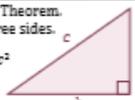
Trigonometry.
Links two sides and one angle.
SOH | CAH | TOA
$\sin\theta = \frac{\text{opp}}{\text{hyp}}$ $\cos\theta = \frac{\text{adj}}{\text{hyp}}$ $\tan\theta = \frac{\text{opp}}{\text{adj}}$
Use "2ndF" or "SHIFT" key to find a missing angle

The longest side of any right angled triangle is the hypotenuse; check that your answer is consistent with this.

Advanced trigonometry — G21, G22

A is opposite a
B is opposite b
C is opposite c

Sine Rule
Use if you are given an angle-side pair
Missing side: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
Missing angle: $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$

Cosine Rule
Use if you can't use the sine rule
Missing side: $a^2 = b^2 + c^2 - 2bc\cos A$
Missing angle: $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

Special values of sin, cos, tan
Learn (or be able to find without a calculator)...

$\theta°$	$\sin\theta°$	$\cos\theta°$	$\tan\theta°$
0	0	1	1
30	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$
45	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{2}}$	1
60	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$
90	1	0	

Circle theorems — G10
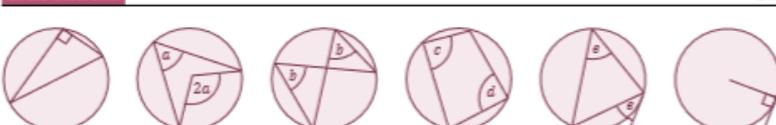
Angle in a semicircle is 90°   Angle at the centre is double the angle at the circumference   Angles in the same segment are equal   Opposite angles in a cyclic quadrilateral total 180°   Alternate segment theorem   Tangent and radius are perpendicular

Areas and volumes — G16, G17, G18, G23
Circumference of circle $= \pi \times D$
Area of circle $= \pi \times r^2$
Area of triangle $= \frac{1}{2}ab\sin C$

Arc length $= \frac{\theta}{360°} \times \pi \times D$
Area of sector $= \frac{\theta}{360°} \times \pi \times r^2$
Area of trapezium $= \frac{1}{2}(a + b) \times h$
Volume of prism = area of cross section × length
Volume of cone $= \frac{1}{3}\pi r^2 h$
Volume of frustum is difference between the volumes of two cones
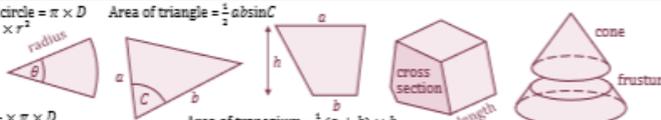
Transformations — G7, G8
Reflection
• Line of reflection
Translation
• Vector

Rotation
• Centre of rotation
• Angle of rotation
• Clockwise or anticlockwise

Enlargement
• Centre of enlargement
• Scale factor (if −1 < SF < 1 the shape will get smaller).

Iteration — A20
You will be given the formula to use:
→ Solve $x^3 + 6x + 4 = 0$ by using the iteration $x_{n+1} = \sqrt[3]{6x_n - 4}$
Start with $x_1 = -2.8$
$x_2 = \sqrt[3]{6 \times (-2.8) - 4} = -2.750...$
$x_3 = \sqrt[3]{6 \times (-2.750...) - 4} = ...$
Repeat until you know the solution, or you do as many as the question says.

Percentages: multipliers — R9, R16
Percentage increase or decrease; use a multiplier (powers for repetition)
→ Initially there were 20 000 fish in a lake. The number decreases by 15% each year. Estimate the number of fish after 6 years.
$20\,000 \times 0.85^6 = 7500$ (2sf)

Formula for compound interest
Total accrued $= P\left(1 + \frac{r}{100}\right)^n$
→ I invest £600 at 3% compound interest. What is my account worth after 5 years?
$£600 \times \left(1 + \frac{3}{100}\right)^5 = £695.56$

Direct & inverse proportion — R10
y is directly proportional to x:
$y = kx$ for a constant k
→ b is directly proportional to a^2
$a = 6$ when $b = 90$ Find b if $a = 8$
$b = ka^2$ $a = 6$ and $b = 90$ for k
$90 = k \times 6^2$ so $k = 2.5$, $b = 2.5a^2$
$b = 2.5 \times 8^2 = 160$
y is inversely proportional to x
$yx = k$ or $y = \frac{k}{x}$ for a constant k

Probability rules — P8, P9
Multiply for independent events
→ P(6 on dice and H on coin)
$\frac{1}{6} \times \frac{1}{2} = \frac{1}{12}$
Add for mutually exclusive events
→ P(5 or 6 on dice)
$\frac{1}{6} + \frac{1}{6} = \frac{2}{6}$
Apply these rules to tree diagrams.

In general...
$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$
$P(A \text{ and } B) = P(A \text{ given } B) \times P(B)$

Histograms — S3
Frequency = frequency density multiplied by class width. This means that bars with the same frequency have the same area.

equal areas;
equal frequencies
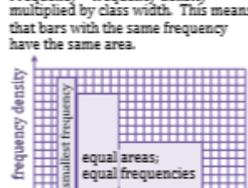
Box plots — S4
Interquartile range (IQR) = UQ − LQ

minimum
lower quartile (LQ)
median
upper quartile (UQ)
maximum

Similar shapes — G19
Ratios in similar shapes and solids:
• Length/perimeter   1 : n   a : b
• Area $1 : n^2$ $a^2 : b^2$
• Volume $1 : n^3$ $a^3 : b^3$
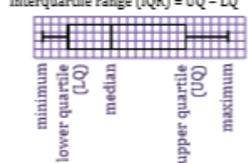
Ecology and Interdependence

Ecology is the study of everything from individual organisms to the whole biosphere (everywhere that life is found on Earth). An ecosystem is an interconnected network of living organisms and their environment.

The feeding relationships are one way in which organisms depend on each other. To begin with, almost all organisms rely on the Sun as the original source of energy for their ecosystem. **Plants** and **algae** can make use of the Sun's energy to produce food molecules, in the process of photosynthesis. This is why they are called **producers**. Other types of organism can't do this, so they rely on the plants and algae. **Consumers** eat the producers, so the energy from the sun flows through the ecosystem. Molecules (which are stores of energy) also flow through, and get recycled when organisms produce waste (poo and wee!) and after they die and decay. The diagram helps to show this.

You can see that all the organisms in the ecosystem depend on each other. This is called **interdependence**. The consumers wouldn't survive without the producers capturing energy from the sun, the producers wouldn't survive without the decomposers recycling molecules for them to use (e.g. nutrients from the soil), and the decomposers need the waste from other organisms, and their bodies once they die. A stable community is one where all the species' populations and the abiotic factors are in balance; as a result, population sizes don't change much in stable communities.

Biotic and abiotic factors affecting organisms

Communities of organisms are obviously affected by the environmental factors of their habitat. Factors that are non-living are called **abiotic** factors; those that are living are called **biotic** factors. These may affect the distribution of organisms (i.e. how they are spread out in the environment), their population size, their growth, behaviour or anything else really.

Examples of abiotic factors: light intensity; temperature; moisture levels; soil pH and mineral content; wind intensity and direction; carbon dioxide level for plants; oxygen levels dissolved in water for **aquatic** animals.

Examples of biotic factors: food availability; new predators arriving; new pathogens; competition between species. Competition can actually lead to extinction of a species – if another species outcompetes it, the first one may end up without sufficient numbers to breed.
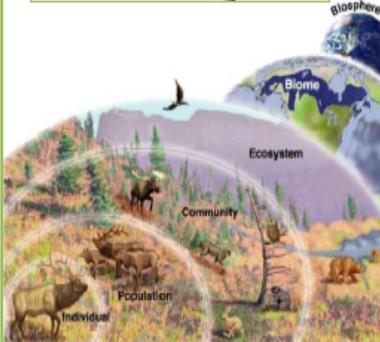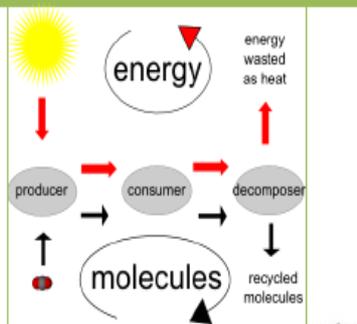
Key Terms	Definitions
biosphere	Wherever life is found on Earth (and in the atmosphere).
biome	A large zone of life with particular characteristics – e.g. tropical rainforest, arctic tundra.
ecosystem	A complex network of **communities** of organisms, which all depend on each other and which are adapted to the biotic and abiotic conditions they live in.
community	A group of **interdependent** organisms. Communities interact with each other and with the physical environment – **ecosystem** refers to the interaction of living communities with the non-living environment.
habitat	A specific set of conditions, usually a specific location, where an organism (or organisms) is adapted to live.
population	A whole group of organisms – for instance, all the buffalo on the savannah, or all the greenfly on one rose bush.
interdependence	All organisms in a community rely on one another – for food, shelter, pollination, seed dispersal, nutrient recycling and so on.
biotic	Living factors affecting a community.
abiotic	Non-living factors affecting a community (e.g. light intensity, temperature, soil pH).

Adaptations

ALL organisms, now matter how simple they might seem, are adapted to their natural environment. Their features, or adaptations, enable survival in the particular conditions where they live. Adaptations can be:
- **Structural:** adaptations in terms of body form and shape. This would include examples like: streamlined shape for speed; long stem to maximise light exposure
- **Behavioural:** adaptations of behaviour – for instance, hunting behaviours, using tools, plants growing in the direction of a source of light.
- **Functional:** adaptations in terms of how the body works. For instance: being able to digest a certain food, maintaining a constant body temperature and so on.

Some organisms are adapted to live in what we would consider to be extreme environments – for instance, very high temperatures, high pressures, high salt concentration. The organisms that can survive in these kinds of conditions are called **extremophiles**. A great place to find extreme conditions and extremophiles is around and inside deep sea hydrothermal vents.

Organisation of ecosystems

Apart from some ecosystems in deep sea vents, ALL biomass on Earth is produced by **photosynthetic** organisms. So, these organisms are called **producers**. This is vital for other organisms, since these producers start off food chains. **Food chains** represent the feeding relationships in a community. The producer is usually a green plant or algae, and they make **glucose** by photosynthesis.

The producers are eaten by **primary consumers**, which might be eaten by the next trophic level – **secondary consumers**. The secondary consumers may be eaten by **tertiary consumers**. Of the consumers, if they kill and eat other animals, they are called **predators**. The animals eaten by predators are their **prey**. In a *stable* community (one that stays pretty steady in terms of population sizes), the population size of predators and their prey rise and fall in cycles, as the graph shows. When there aren't many predators, the prey population grows rapidly. When it rises, there is more food for predators so their population increases. This puts pressure on the prey so their population drops – cycles, see.

Key Terms	Definitions
photosynthetic	Describes any organism that can carry out photosynthesis, producing biomass from simple chemicals (CO_2 and H_2O)
biomass	The materials that living things are made from: proteins, carbohydrates and lipids.
food chain	Used to represent the feeding relationships in a community. Starts with a producer and shows what organism eats what, as well as how energy and biomass are transferred in the community.
distribution	Describes how organisms are spread in an ecosystem.
abundance	How many individuals of a particular species there are.
quadrat	A square frame used for sampling plants in an ecosystem. Can be used for counting plants for measuring the coverage of the ground by a particular species.
transect	Sampling method where a quadrat is laid down at regular intervals along a line. This is used to measure the change in distribution of organisms when a particular factor changes, such as light intensity.
interval	The spaces between measurements – e.g. on a transect, the interval might be 1 m.

The carbon cycle

In all ecosystems, many materials have to be cycled through the biotic and abiotic components of the ecosystem – e.g. water, carbon, minerals, nitrogen. Microorganisms play a key role in cycling such materials. Carbon can appear in abiotic locations (the air as CO_2, in soil minerals) and biotic locations (in the carbohydrates, lipids and proteins that living organisms are built from). When we say it is cycled through these components, we mean that carbon atoms don't stay in any material for ever. They are cycled by various processes:
- **Photosynthesis** – takes carbon from the atmosphere (in the form of CO_2) and converts it to biomass
- **Respiration** – all living organisms, including plants and microorganisms, respire, which converts biomass into CO_2, which enters the atmosphere. While decay is taking place, carried out by microorganisms, they respire, which releases CO_2.
- **Feeding** – when consumers eat other organisms, the carbon in the other organism's biomass is transferred to the consumer.

Prey–Predator Cycles

Measurements of ecosystems

Biologists measure both the **distribution** and **abundance** of organisms in ecosystems to help us understand them (see definitions). It would be impractical to attempt to count e.g. all the seaweed on a beach, so biologists use **sampling** techniques. If you just want to measure the abundance in an area, or to compare two locations for abundance of e.g. seaweed, *random sampling* would probably be used of the area. To count plants, quadrats are used. If, however, you are interested in how the distribution (spread) of organisms changes as a factor changes, you measure along a **transect**. For instance, with the seaweed example, you could set up your transect line down the beach towards the water (just using a long tape measure) and measure the coverage by seaweed at 2 metre **intervals**, or some other suitable interval. Data may be summarised using means, modes or medians, and graphs can be produced to represent differences between locations, or the change in distribution along a transect.

The water cycle

Like carbon, **water is constantly cycled** in ecosystems between abiotic and biotic components of the ecosystem. Water is released in aerobic respiration by all organisms. In terms of the abiotic components, water is constantly evaporated and precipitated (so, goes from land/waterways to the atmosphere and back again). The water precipitated provides fresh water for organisms on land before draining into the sea.

Biodiversity

Biodiversity, the *variety of all the species of organisms*, can be measured at the level of a community, ecosystem or the whole earth (biosphere). A large biodiversity increases the stability of ecosystems, because it reduces the dependence of one species on another, for instance for food. So, for example, if a species has only one food source (think: pandas and bamboo shoots), it may be easily threatened by environmental changes.

In spite of our future as a species on Earth depends totally on maintenance of biodiversity, many human activities threaten biodiversity. Indeed, in many ecosystems, we have already significantly reduced biodiversity. For instance, **deforestation** had damaged biodiversity in all kinds of forest. Our **waste**, **polluting** land, air and sea, has negatively affected biodiversity in many areas. And the big one: **global warming** is already having measurable effects on global biodiversity. It is only recently that humans have taken any measures to try to prevent our damage to biodiversity going too much further – obviously, we don't yet know if these measures will be enough.

Land use

Humans reduce the amount of land available for other organisms by: building, quarrying, farming and dumping waste (landfill). This in turn can reduce biodiversity.

Peat bogs are made of peat, a type of fossil fuel formed from dead plants. Peat bogs are destroyed as peat can be used as a fuel and is a very good fertiliser if you're growing plants. This has seriously reduced the area of this habitat and reduced biodiversity as a result. Furthermore, using peat as a fuel produces CO_2 (contributing to global warming) and using it as a fertiliser (in compost) allows it to decay, which also produces CO_2.

Key Terms	Definitions
evaporated	Water changing state from liquid to vapour.
precipitated	Water changing from vapour to liquid/solid form – i.e. rain, hail, snow.
biodiversity	The variety of all the different species of organisms.

Waste management

Since the human population is growing at an incredible rate, and in general people's living standard is going up globally, we (the human population) is using more and more resources and producing more and more waste. Our waste causes pollution, which can occur:
- In **water**, thanks to sewage, fertilisers running off farmland, or toxic chemicals used in industry;
- In the **air**, from smoke, waste gases and acidic gases (e.g. sulphur dioxide)
- On **land**, from landfill (rubbish dumps) and from toxic chemicals.

Pollution kills organisms; therefore it can reduce biodiversity.

Deforestation

Deforestation on a large scale happens to provide land, with the largest areas cleared for raising cattle, to plant rice fields and to grow crops that can be made into biofuels. Our food and fuel needs conflict with the need to preserve forests and rainforests so biodiversity is maintained.

Global warming

As you'll know, since the industrial revolution, human activities have dramatically increased the levels of **greenhouse gases** in the atmosphere. The main gases involved are **carbon dioxide** and **methane**. The molecules of these gases absorb infrared (heat) radiation and re-radiate it, causing gradual but measurable increases the atmosphere's, and therefore Earth's, temperature. Global warming as caused by humans used to be controversial; now, thousands of peer-reviewed publications later, the global scientific consensus is that humans are definitely causing climate change through global warming.

Maintaining biodiversity

As you've seen, many human activities have negative effects on biodiversity. However, as the scale of our negative influence has become more and more apparent, scientists and concerned citizens have brought in programmes to try to reduce our negative influences. Here are the key examples you should know:

- **Breeding programmes** for endangered species. For instance, tigers and pandas are bred in captivity to ensure they do not become extinct.
- **Protection** and **regeneration** of rare habitats. This includes passing laws to ensure people leave certain areas alone (e.g. parts of the Great Barrier Reef). Regeneration means activity trying to bring a habitat back to its former glory.
- Reintroduction of **field margins** and **hedgerows** in agricultural areas where farmers only grow one kind of crop. Growing one sort of crop (called monoculture) is bad for biodiversity because it only provides a habitat for a few species. So, farmers are encouraged to used hedges (not fences) and leave a margin around the edge of their crop fields, so wild plants can grow there, which in turn allows other organisms (e.g. insects) to survive there too. This improves biodiversity on agricultural land.
- Reduction of **deforestation** and carbon dioxide by some governments. There have been numerous attempts, not always totally successful, to get governments of countries around the world to agree to specific targets for how much carbon dioxide they emit, since global warming is, of course, a worldwide problem. As with many things in politics, agreement is very difficult to obtain... but progress has been made in these international agreements.
- **Recycling** resources rather than dumping in landfill. You are used to recycling as much of your household waste as you can. Work continues to increase the range of materials that can be recycled so we can continue to reduce the amount of waste dumped in landfill.

Key Terms	Definitions
breeding programme	Producing offspring, especially of endangered species to protect their population.
field margin	The area around the edge of a field between the crop and the fence/hedge/wall.
hedgerow	The barrier at an edge of a field made of growing plants, as opposed to a fence or wall.

A lovely big field margin, and hedgerow on the left

Recap: Extraction of Metals

A metal ore is a compound found in rock, dug out of the ground, that contains enough metal that it is **economical** to extract it.

Other methods of extraction

The amount of some metals is running out, this means people are finding new ways to extract metals like copper.

Phytomining uses plants to absorb copper from the soil, the plants are then burnt and the copper extracted.

Bioleaching involves using bacteria to make a **leachate** that contains metal compounds. Scrap iron can also be used to **displace copper** from a solution.

Crude Oil

Crude oil is a mixture of chemicals called hydrocarbons. These are chemicals that contain **hydrogen and carbon only.** It made from **ancient biomass,** mainly plankton. Crude oil straight out of the ground is not much use, as there are too many substances in it, all with **different boiling points**.

Before we can use crude oil we have to separate it into its different substances. We do this by fractional distillation.

How does fractional distillation work?

· Crude oil is heated and vaporises/boils.

· Vapours rise up the column, gradually cooling and condensing.

· Hydrocarbons with different size molecules condense at different levels/temperatures

· The crude oil is separated into a series of fractions with similar numbers of carbon atoms and boiling points.

As the number of carbon atoms increases:

· Molecules become larger and heavier

· Boiling point increases

· Flammability decreases (catches fire less easily)

· Viscosity increases (liquid becomes thicker)

Key Terms	Definitions
hydrocarbon	A compound which contains only hydrogen and carbon (covalently bonded)
fractional distillation	The process where crude oil is separated into different compounds through evaporation
viscosity	The ability of a liquid to flow

Fractional Distillation Column

Below is a diagram of a fractionating column; you need to know the <u>pattern in properties</u> on the right, the <u>uses</u> but not the names of each fraction:
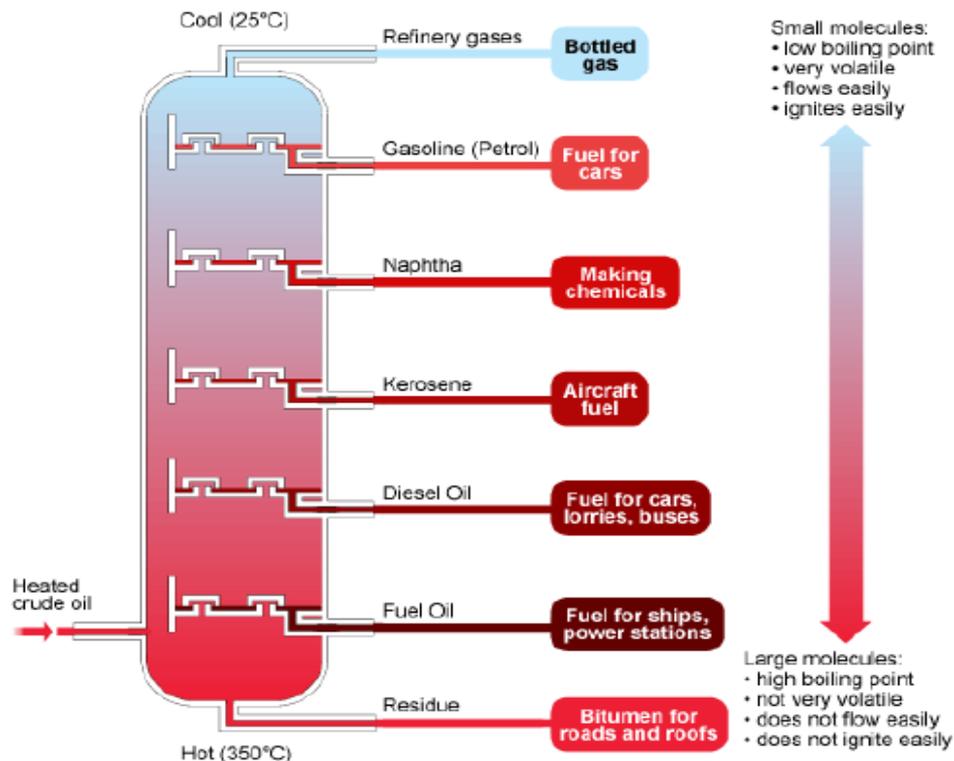
Alkanes

Crude oil is largely made up of a family of **hydrocarbons** called alkanes; these contain only a single (covalent) carbon to carbon bond.

You can either represent alkanes with a **molecular formula**, e.g.:

CH_4 C_2H_6 C_3H_8 C_4H_{10}

Methane   Ethane   Propane   Butane

Or a **displayed formula**:

Methane   Ethane   Propane   Butane

[H = Hydrogen, C = Carbon, - indicates a chemical bond between atoms]

Cracking

Smaller hydrocarbons make better fuels as they are easier to ignite. However, crude oil contains a lot of longer chain hydrocarbons. To break a longer chain hydrocarbon down into a smaller one we use a process known as **cracking.**

Cracking

So large/long alkanes get CRACKED, which means they get broken in two.
· They are **heated**, turned into a vapour and passed over a hot catalyst
· Cracking produces two molecules:
1. One shorter (useful as a fuel) alkane
2. One alkene (used to make polymers).

Summary

Long Chain Alkane →   Short Chain Alkane + Alkene

    $C_{10}H_{22}$ → C_8H_{18} + C_2H_4

Key Terms	Definitions
alkane	A hydrocarbon that contains only carbon to carbon single bonds
cracking	A process where longer chain hydrocarbons are broken down into smaller more useful ones.
alkene	A hydrocarbon that contains at least one carbon to carbon double bond.

Alkenes

These hydrocarbons have at least one double bonds between the carbon atom. The general formula for alkenes is C_nH_{2n}

Alkenes are **more reactive** than alkanes. They react with <u>bromine water</u> and make it go from orange to colourless.

Alkanes do not have a double bond so the bromine water stays orange.

Alkane   Alkene   + **Bromine Water**   Alk

brominewater[1]

Has reacted with the bromine.
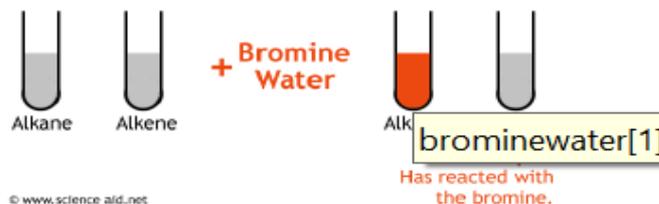
© www.science aid.net

Cracking

Experimental set up for cracking in the lab:

Porcelain chips

Bunsen valve fits here if desired

Product gas

Hard-glass boiling tube

Mineral wool soaked in liquid paraffin
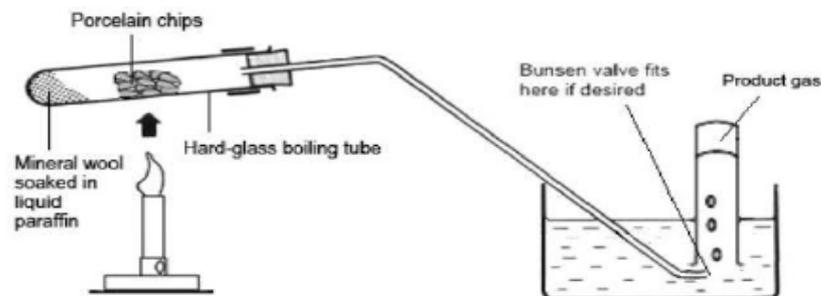
The Atmosphere

For 200 million years, the amount of different gases in the atmosphere have been much the same as they are today:
- 78% nitrogen
- 21% oxygen
- The atmosphere also contains small proportions of various other gases, including carbon dioxide, water vapour and noble gases.

The Greenhouse Effect

The Earth has a layer of gases called the **Greenhouse layer.** These gases, which include carbon dioxide, methane and water vapour, maintain the temperature on Earth high enough to support life.

The greenhouse layer allows the short wave infrared radiation emitted by the Sun to pass through it but absorbs the long wave infra red radiation which is emitted by the Earth, preventing rapid heat energy transfer to space. This is how it insulates the Earth.

Some human activities increase the amounts of greenhouse gases in the atmosphere. These include:

- combustion of fossil fuels
- deforestation
- methane release from farming
- more animal farming (digestion, waste decomposition)
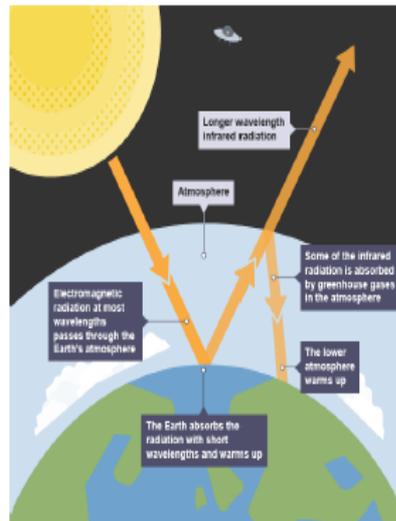
Key Terms	Definitions
greenhouse layer	The layer of gases which absorb infra red radiation emitted from the Earth

The Evolution of the Atmosphere

Scientists are not sure about the gases in the early atmosphere, as it was so long ago (4.6 billion years) and there's a lack of evidence. Many scientists believe the early atmosphere was made up of mainly carbon dioxide, water vapour and small amounts of methane, ammonia and nitrogen, released by **volcanoes. There was little or no oxygen around at this time.** The early Earth was very hot, but as it cooled the water vapour in the atmosphere condensed and **formed the oceans.**

As the oceans formed, carbon dioxide dissolved in the ocean. The carbon dioxide formed carbonates and precipitated out (formed solids). This process reduced the amount of carbon dioxide in the atmosphere.

Approximately 2.7 billion years ago, plants and algae evolved. This decreased the amount of carbon dioxide in the atmosphere and increased the amount of oxygen in the atmosphere.

When sea animals evolved they used the carbon dioxide in the ocean to form their shells and bones (which are made of carbonates). When these sea creatures died their shells and bones became limestone (calcium carbonate), which is a sedimentary rock.

Once enough oxygen was in the atmosphere, it could support animals, which carry out respiration. These processes have caused the levels of gases in the atmosphere to be where they are today.

Changes in the atmosphere

Recent activity by humans has changed the composition of the atmosphere.
- Combustion of fossil fuels has increased the amount of carbon dioxide in the atmosphere
- It has increased the amount of harmful gases such as **nitrous oxides**, which are made by nitrogen reacting with oxygen from the air in engines.
- Sulphur is also present in many fuels; this has increased the amount of **sulphur dioxide**, which causes acid rain.
- **Carbon particles (aka particulates)** can also released, which cause smog
- The toxic gas **carbon monoxide** is produced during incomplete combustion

The Enhanced Greenhouse Effect

In the last 100 years humans have added to the greenhouse effect through combustion of fossil fuels, increased farming and deforestation. Many scientists believe this has lead to a **rise in global temperature.**
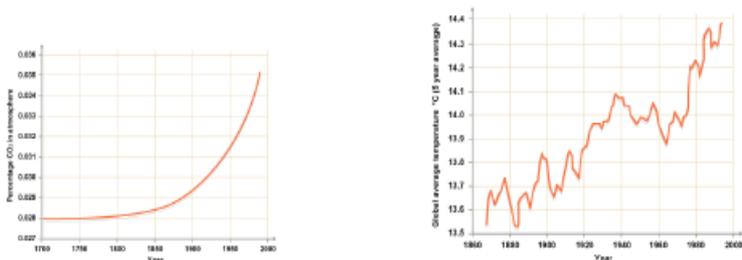
However, this is such a complex system that misunderstandings of it can lead to **inaccurate or biased** opinions being reported in the media.

Consequences of Climate Change

An increase in average global temperature is a major cause of **climate change.**
The potential effects of global climate change include:
- sea level rise, which may cause flooding and increased coastal erosion
- more frequent and severe storms
- changes in the amount, timing and distribution of rainfall
- water shortages for humans and wildlife
- changes in the food producing capacity of some regions
- changes to the distribution of wildlife species.

Students should be able to discuss the scale, risk and environmental implications of global climate change.

Waste water and Sewage

Waste water from houses and farming needs to **be treated** before it can be released into rivers and lakes. It is firstly filtered to remove large particles and is then left so that the sediment drops to the bottom. The "sludge," this is the name given to the sediment at the bottom, is then anaerobically digested (broken down by bacteria) to make methane gas. Any remaining **effluent** is broken down by aerobic respiration. The water is then released back into the rivers and lakes.

Key Terms	Definitions
carbon footprint	The **carbon footprint** is the total amount of carbon dioxide and other greenhouse gases released over the life of a product
carbon neutral	There is no net increase in **carbon dioxide in the atmosphere**

Carbon Footprint

The **carbon footprint** is the total amount of carbon dioxide and other greenhouse gases released over the life of a product. Many people or businesses look to reduce their carbon footprint by:
- increased use of alternative energy supplies
- energy conservation
- carbon capture and storage
- carbon taxes and licences

People also try to **offset** their carbon by planting trees.
If something is carbon neutral, this means that there is no net increase in **carbon dioxide in the atmosphere** when it is used.

Water

Water of appropriate quality is **essential for life**. For humans, drinking water should have low levels of dissolved **salts and microbes**. Water that is safe to drink is called **potable water.**
The methods used to produce potable water depend on available supplies of water and local conditions.
In the United Kingdom (UK), rain provides water with low levels of dissolved substances (fresh water) that collects in the ground and in lakes and rivers, and most potable water is produced by:
- passing the water through filter beds to remove any solids
- sterilising to kill microbes, using chlorine or UV light

In some parts of the world there is not enough fresh water so the salt has to be removed from water. This process is called **desalination.**
Desalination can be done by distillation or reverse osmosis. This requires a **large amount of energy.**

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LCAs

Life cycle assessments (LCAs) are carried out to assess the environmental impact of products in each of these stages of a products life:

1. extracting and processing raw materials
2. manufacturing and packaging
3. use and operation during its lifetime
4. disposal at the end of its useful life, including transport and distribution at each stage.

Some things are easy to measure; for example: the energy required to make the product. However some things like how much pollution it releases are hard to measure and therefore difficult to give a value to.

Example of two Life Cycle Assessments:

Product	Plastic Bag	Paper Bag
Raw Material	Crude Oil	Timber
Manufacturing and Packaging	Made form crude oil by fractional distillation, then cracking and polymerisation, high energy process. Little waste as other fractions are used for other things	Made by pulping timber. Lots of waste, high energy process
Use of product	Has multiple uses, can be reused.	Usually only used once.
Disposal/End of Life	Can be recycled but are not biodegradable	Can be recycled and are biodegradable

Key Terms	Definitions
LCA	An evaluation of the environmental impact a product had over its lifetime

Recycling

Many of the Earth's resources are finite: for example, metals and crude oil. It is therefore vital we recycle resources. The processes for extracting these materials are often high energy and damaging to the environment.

Metals can be recycled by melting and **recasting or reforming** into different products.

Some products, such as glass bottles, can be reused. Glass bottles can be **crushed and melted t**o make different glass products. Other products cannot be reused and so are recycled for a different use.

Number	Key term	Definition
1	**Biome**	A large scale ecosystem
2	**Latitude**	Measures how far north or south a location on the Earth's surface is from the equator.
3	**Biosphere**	A living layer of Earth between the lithosphere and atmosphere
4	**Precipitation**	Anything wet falling from the sky i.e. rain, sleet, snow.
5	**Ecosystems**	A localised biome made up of living things and non living environment.
6	**Altitudinal Zonation**	The change in ecosystem at different altitudes, caused by alterations in temperature, precipitation, sunlight and soil type.
7	**Biotic**	Living part of an ecosystem (flora and fauna)
8	**Abiotic**	Non living part of an ecosystem (atmosphere, water, rock and soil)
9	**Goods**	Physical materials of products that have value to us.
10	**Services**	Functions that satisfy our need.
11	**Indigenous people**	The original people of a region.

Number	Key term	Definition
12	**Ecosystem services**	Is a collective term for all the ways humans benefit from ecosystems.
13	**Provisioning Services**	Products obtained from ecosystems. Food, nuts, berries, fish, game, crops, fuel wood, firewood.
14	**Regulating Services**	Services link to other physical systems and keep areas and the whole planet healthy. = Storing carbon, emitting oxygen, purifying water, regulating the hydrological cycle.
15	**Supporting Services**	These keep the ecosystems healthy so it can provide the other services: nutrient cycling, photosynthesis and soil formation
16	**Cultural Services**	These are benefits people get from visiting or living in a healthy ecosystem: Recreation and tourism, education and science, spiritual well being and happiness.
17	**Carbon Sink**	Natural stores for carbon-containing chemical compounds, like carbon dioxide or methane.
18	**Nutrient Cycle**	Nutrients like nitrogen and phosphorous move between the biomass, litter and soil as part of the continuous cycle which keeps both plants and soil healthy.

Number	Key term	Definition
19	**Biodiversity**	Means the number of different plants and animal species in an area.
20	**Emergent layer**	Hardwood, evergreen trees that have broken through the dense canopy layer below to reach the sunlight. Monkeys and birds live up there/
21	**Canopy layer**	The dense canopy layer is home to tree snakes, birds, tree frogs and other animals because there is so much food available.
22	**Understory Layer**	This layer contains young trees and those with large leaves to capture sunlight; huge numbers of insects live in the understory layer.
23	**Forest floor**	The darkness of the forest floor means shade loving ferns with large leaves live here along with mammals like the jaguar.
24	**Biomass**	The total of living matter in the ecosystem.
25	**Leaching**	When nutrients are washed out of the soil by water moving through it.
26	**Taiga**	Biome located 50°C and 60°C latitude mostly in the northern hemisphere. Sometimes it is referred to as boreal forest.

Number	Key term	Definition
27	**Taiga Climate**	Short wet summers. Three months when temperatures can get up to 20°C. Long cold, dry winters with several months of below freezing, as low as -20°C. Low precipitation- below 20mm for 5 months of the year.
28	**Hibernate**	Animals go into a dormant state in the winter months to avoid the cold and food shortage.
29	**NPP**	Net primary productivity- is a measure of how much new plant and animal growth- biomass- is added each year. It is measured in grams per square meter.
30	**Deforestation**	The deliberate cutting down of forests to exploit forest resources.
31	**Direct threats**	This involve deliberate cutting down of trees for timber, to make roads or to convert forest into farm land.
32	**Indirect threats**	These come from pollution, global warming or disease.
33	**Wildfire**	Uncontrolled burning through forest, grassland or shrub. Such fires can "jump" roads and rivers and travel at high speed.
34	**Invasive species.**	Is a (sometimes called alien species) plant, animal or disease introduced from one area to another.

Number	Key term	Definition
35	Non-renewable	Finite resources such as the fossil fuels (coal, oil and gas)
36	Renewable	These will never run out and can be used over and over again e.g. wind power, solar power and HEP.
37	Recyclable	These provide energy from sources that can be recycled or reused i.e. biofuel energy.
38	Energy poor	Lack of access to energy sources either due to a lack of resource of a lack of money.
39	Energy diversification	Getting energy from a variety of different sources to increase energy security.
40	Energy Security.	Having access to reliable and affordable energy sources.
41	Ecological debt	When the Earth's resources are being used up faster than the Earth can replace them.
42	Ecological footprint	This is a calculation measured in global hectares (gha). It is the amount of land and water required to produce resources to deal with waste from each country.

Number	Key term	Definition
43	Black gold	A term used for oil as it is regarded as such a valuable commodity.
44	Peak oil	The theoretical point at which half of the known reserves of oil in the world have been used.
45	OPEC	Organisation of Petroleum Exporting Countries. This was established to regulate the global oil market, stabilise prices and ensure a fair return for its 12 member states who supply 45% of the world's oil.
46	Demand	High demand causes prices to rise, and falling demand causes lower prices.
47	Supply	Supply affects the price- too much oil and the price falls, too little and it rises.
48	Fracking	Water is blasted at very high pressure into rock fractures to extract shale gas.
49	Liquefaction of natural gas.	Converting gas into liquid.
50	Tar Sands	A mixture of sand, clay, water and a very dense sticky form of petroleum called bitumen.
51	Biofuels	Any kind of fuel made from living things, or from the waste they produce.

	Key events	
	Early Tensions	
1	Ideological differences	Capitalism vs Communism- differences between superpowers
2	Nazi Soviet Pact	Wartime alliance between Hitler and Stalin. Eventually broken by Hitler
3	The Grand Alliance	USA (Roosevelt), UK (Churchill), USSR (Stalin) wartime alliance.
4	Tehran Conference, 1943	First conference held between Grand alliance to discuss defeat of Germany
5	Yalta Conference, 1945	Second conference held between Grand alliance to discuss Germanys defeat
6	Potsdam Conference, 1945	Final conference held between superpower. Changed of leadership causes problems
7	Hiroshima	Atomic Weapon dropped. Started the Arms race
8	The Long and Novikov telegrams	messages sent by ambassadors that show distrust between USA and USSR
9	Iron curtain speech	Churchill speech that outlined the ideological divide between East and West Europe
10	Satellite States	A country under the domination of a foreign power.
	The Cold War develops	
11	Truman Doctrine	US President Truman's ideas to prevent the spread of communism.
12	Marshall Plan	Economic aid ($ & goods) to western Europe after WWII
13	Comecon	The Council for Mutual Assistanc
14	Cominform	The Communist Information Bureau
15	NATO	North Atlantic Treaty Organisation - A **Western military alliance** to protect the freedom and security of its members
16	Bizonia and Trizonia	UK, USA and French Zones in Germany uniting under a capitalist banner.
17	Berlin Airlift	Supplying of food and resources by the West into West Berlin.
18	FRG and DDR	Official division and names of East and West Germany.
	The Cold War intensifies	
19	Warsaw Pact	Military alliance formed of communist soviet controlled countries.
20	Arms Race	The building of weapons in a race to have a bigger military than the other country.
21	Destalinisation	The removal of Stalin's influence following his death in 1953
22	Hungarian Uprising	A revolt caused by liberal reforms in Hungary to break out of communism
23	Soviet Invasion of Hungary	Khrushchev's response to the Hungarian Uprising.

Key People		
1	Franklin Roosevelt	USA President 1933-1945
2	Harry S Truman	USA President 1945-1953
3	Dwight Eisenhower	USA President 1953-1961
4	Josef Stalin	USSR leader 1923-53
5	Nikita Khrushchev	USSR leader 1953-1964
6	Winston Churchill	UK Prime Minister 1940-1945
7	Clement Atlee	UK Prime Minister 1945 –1951
8	George F Kennan	US Ambassador to USSR
9	Nikolai Novikov	Soviet Ambassador to USA

Key Terms		
1	Cold War	**War waged against an enemy** by all ways except fighting each other.
2	USSR/ Soviet Union	Union of Soviet Socialist Republics. (Russia after the 1917 revolution)
3	USA	United States of America.
4	Capitalism	A **belief that everyone should be free** to own property and businesses and make money.
5	Communism	A belief that all property, including homes and businesses, **should belong to the state**, to ensure that every member of society has a fair share.
6	Ideology	A set of **political ideas** about how society should be run.
7	Democracy	A **political system where the leader is** chosen in free elections.
8	Containment	**US policy to limiting the spread of communism** into non-communist countries using influence and military resources.
10	Reparations	Compensation to be **paid to other countries** by Germany after WW2.
11	Superpower	A country or state that has **great global power**.
12	United Nations	International body set up in 1945 to **promote peace**, international cooperation and security.
13	Satellite state	A country **under the influence** or control of another state.
14	Blockade	The surrounding of a place with troops or ships to **prevent the entry or exit** of supplies.
15	Buffer Zone	Eastern Europe, a protective 'buffer' between the USSR & Germany

Term	Definition
Containment	US policy of opposing expansion of Communism into non-Communist countries.
Sphere of influence	Area of the world where one state is dominant.
Warsaw Pact	A military association between Soviet Union and satellite states.
brinkmanship	he tactic of seeming to approach the verge of war in order to persuade one's opposition to retreat.
Berlin Ultimatum	Khrushchev's demand for western allies to leave Berlin.
Brezhnev Doctrine	Policy justifying intervention for military intervention by Warsaw Pact forces in event of other Warsaw Pact state attempting to leave Soviet sphere or betraying Communism
CIA	US office coordinating espionage and intelligence activities.
Defect	To leave one's country in order to join a rival state.
Détente	An attempt to reduce tension between superpowers.
Disarmament	To withdraw, reduce of abolish military weapons and force.
Dissident	Person who disagrees with the government.
Guerilla tactics	Use of ambushes, raids and sabotage by smaller group of combatants against larger military forces.
MAD	Mutually Assured Destruction. Belief that nuclear weapons made each side less likely to attack and therefore safer.
Nuclear Non-proliferation Treaty.	Agreement that banned non-Nuclear states from gaining nuclear weapons by manufacture or transfer of technology.
Outer Space Treaty	Promise signed by superpowers not to send nuclear weapons into space.
Limited Test Ban Treaty	Ban on testing nuclear weapons in the atmosphere, outer space or under water.
Prague Spring	Series of reforms by Alexander Dubcek introducing 'moderate socialism' into Czechoslovakia.
Six Day War	War between Israel and Arab neighbours.
Strategic warheads	Warheads delivered by rockets and missiles that are linked to their delivery vehicle and ready to launch.
Vietnam War	Conflict from 1954 to 1975 between Communist North Vietnam and government of South Vietnam supported by USA.

Key People

1	Dwight Eisenhower	President of USA from 1953 to 1961
3	John F Kennedy	President of USA from 1961 to 1963
4	Lyndon Johnson	President of USA from 1963 to 1968
5	Nikita Khrushchev	USSR leader 1953-1964
6	Richard Nixon	President of USA from 1969 to 1974
7	Fidel Castro	Leader of Cuba from 1959 to 2011.
8	Alexander Dubcek	Chairman of Slovak Communist party
9	Lenoid Breznev	Leader of USSR from 1964 to 1982

Key events timeline

	Crisis 1: Berlin	
1	1958	Refugee problem and 'Brain Drain'
2	1958	Berlin Ultimatum
3	1959-1960	Summit meetings
4	1961	Building the Berlin Wall
6	1963	JFK's visit to the wall
	Crisis 2: Cuba	
8	1959	Cuban Revolution
10	1961	Bay of Pigs Invasion
	1962	US spy planes
11	1962	Cuban Missile Crisis
12	1962	13 days
14	1963	Hotline Set up
15	1963	Outer Space Treaty
16	1963	Limited test ban treaty
	Crisis 3: Prague	
	1968	The Prague Spring
19	1968	The Brezhnev Doctrine
20	1969	Jan Palachsets fire to himself in Prague

Timeline of events

1	1972	SALT I signed
2	1974	Nixon visits Moscow
3	1975	Helsinki Agreements
4	1979	Soviet invasion of Afghanistan
5	1980	USA boycotts Moscow Olympics
6	1983	Reagan announced the Strategic Defense Initiative
7	1984	USSR boycotts Los Angeles Olympics
8	1985	Reagan and Gorbachev first meeting at Geneva
9	1986	Reagan and Gorbachev meet in Reykjavik
10	1987	Intermediate Nuclear Forces Treaty
11	1989	Pulling down of the Berlin Wall
12	1990	Conventional Armed Forces in Europe Treaty (CFE)
13	1990	Collapse of the Soviet Union
14	1991	START Treaty signed between Gorbachev and Bush
15	1991	Gorbachev resigns

Key people

16	Richard Nixon	President of USA from 1969 to 1974
17	Leonid Brezhnev	Leader of USSR from 1964 to 1982.
18	Jimmy Carter	President of the USA from 1977 to 1981
19	Ronald Reagan	President of the USA from 1981 to 1989
20	Mikhail Gorbachev	Leader of USSR from 1985 to 1991
21	Lech Walesa	Leader of Solidarity movement in Poland
22	George H Bush	President of USA from 1989 to 1993
23	Erich Honecker	Leader of GDR from 1971 to 1989

Key Terms

24	ABM system	Anti-Ballistic missiles detect and destroy incoming ICBMs.
25	ICBM	Inter-continental ballistic missile.
26	ABM Treaty	Part of Salt I agreements; limiting ABM systems.
27	Carter Doctrine	Carter announced US prepared to use military force to protect oil interests in Persian Gulf region.
28	Conventional Armed Forces in Europe Treaty.	Agreement signed by NATO and Warsaw Pact to reduce conventional forces.
29	Demilitarisation	Removing all armed forces from an area.
30	Disarmament	To withdraw, reduce or abolish military weapons and force.
31	Dissident	A person who disagrees with the Government.
32	Helsinki Agreements	Series of agreements between 35 nations over security and co=operation.
33	INF Treaty	Intermediate-Range Nuclear Forces. An agreement to get rid of nuclear and conventional cruise missiles.
34	Islamic fundamentalism	Opposes secular western society and seeks to set up a state based on Islamic law.
35	Glasnost	Gorbachev policy of 'openness' encouraging freedom of expression and ending censorship.
36	Perestroika	Gorbachev policy of economic restructuring.
37	START Treaty	Reduction and Limitation of Strategic Arms. Commitment for US & USA to reduce nuclear forces.
38	NUTS	Nuclear Utilization Target Selection. Idea that there could be a victor in a nuclear war.
39	SDI	Reagan research initiative to use space technology to create shield against nuclear attack.

Peace: being in harmony with oneself and others, the opposite of war	
Islam means peace and one of Allah's characteristics is 'Source of Peace'.	'God does not love arrogant or boastful people' (Qur'an, Surah 31)
When Muslims greet each other they say al-salamu 'alaykum which means 'peace be upon you'.	'When you come across people who speak with scorn… turn away from them' (Qur'an, Surah 49)
'Give food and greet everyone with peace.' – Prophet Muhammad (The Sahih Al-Bukhari book of Hadith)	'God invites everyone to the Home of Peace.' (Qur'an, Surah 10)

Conflict:	Key ideas	Stretch and challenge
Causes	Politics/ ideology – different views/policies e.g. Korean war Nationalism / ethnicity – one ethnic group is superior over the other e.g. Kosovo war, Rwanda genocide Religion – defending or when beliefs clash e.g. Sunni & Shia fighting in Iraq	The Arab-Israeli conflict: After WWII Israel was given to the Jews and Palestine was given to the Arabs. This has caused conflict as Israel is very special to both.
What do Muslims think?	1. Peace, put differences aside but if all efforts have failed war is permissible. 2. Situation ethics – do whatever the most loving thing is	'Fight in God's cause against those who fight you: God does not love those who overstep the limits.' (Qur'an, Surah 2)
What do Non-Religious think?	1.Political wars may be needed but religious wars should not. 2. No war can ever be 'holy' or be fought on behalf of a belief in a supernatural being.	'The horrors of war have made many people question the existence of a benevolent and omnipotent deity.' (British Humanist Association)
Muslim responses to non-Rel	1.Pro Mo fought in self defence to achieve peace. 2.Unfair to blame God for genocides as people misused their free will 3.Most wars have nothing to do with religion	'History simply does not support the hypothesis that religion is the major cause of conflict' (Rabbi Alan Lurie)

Peacemaking (process of making peace by preventing and settling disputes)	Why is it important?	How are Muslims working for peace?
'Be a community that calls for what is good' (Qur'an, Surah 3)	Reconciliation: restoring harmony after relationships have broken down.	Muslim Peace Fellowship – 'gathering of peace and justice-oriented Muslims of all backgrounds who are dedicated to making the beauty of Islam evident in the world.' MPF: work against injustice and for peace at home, communities and nations
When inviting people to Islam do so peacefully. 'Argue with them in the most courteous way' (Q, S 16)	Teaches that disagreements are natural but efforts to forgive others and bring peace must be made.	
A Jew and Muslim were arguing about which the greatest prophet was: Moses or Muhammad. Pro Mo said: 'Do not give me superiority over Moses' (Hadith – Sahih Al-Bukhari)	Teaches God blesses those who do this and bring desired reconciliation.	Reach out to people of other religions for mutual understanding and respect Conferences

Types of pacifism	Teachings	Passive Resistance: non-violent opposition to authority
Absolute pacifism: never right apart from self defence	'If you raise your hand to kill me, I will not raise mine to kill you.' (Qur'an, Surah 5) Adam's sons Cain & Abel	If government permits Muslims to practice their religion freely then they should be obeyed. Loyalty to your country is important. But if government takes this away then passive resistance is allowed.
Conditional pacifism: war is wrong but fighting may be necessary as a last resort	'If anyone kills a person – unless in retribution for murder or spreading corruption in the land – it is as if he kills all mankind.' (Q, S 5)	
Selective pacifism: oppose use of nuclear, chemical, biological weapons	Pacifism promotes sanctity of life.	The Arab Spring 2010 – civilian protests against corrupt governments and dictatorships. Led to overthrow of regimes in Libya, Egypt & Tunisia.
Active pacifist: take part in non-violent protests	Pacifism is used to promote human rights and justice through passive resistance	Prophet Muhammad – suffered persecution and injustice in Mekkah but did not retaliate. Committed to non-violence until they had to fight as last resort.

Just War Conditions – non-Muslim	Just War within Islam	Is a just war possible today? Muslim views
1. *Just cause*: reasons to fight to uphold justice 2. *Comparative justice*: victims should have a better future 3. *Legitimate authority*: recognised leader can sanction a war 4. *Right intention*: motive to fight should be for peace & restore human rights 5. *Probability of success*: strong likelihood war will be won 6. *Last resort:* all efforts for peace have been tried & failed 7. *Proportionality*: force used must be in proportion to problem.	Just War is very similar to rules of war in the Qur'an written by ProMo. 'Fight them until there is no more persecution.' (Q,S 8) Muslims do not start conflict but fight as a last resort. (**Lesser jihad**) 'Why should you not fight in God's cause and for those oppressed men, women and children?' (Q, S 4) – Early Muslims were killed so migration is the first response. If it continues then Muslims may fight in self-defence. (**Lesser jihad**) Situation Ethics – most loving thing.	Yes – lesser jihad. 'The Qur'an has saddled Muslims with a heavy responsibility of fighting tyranny, corruption, exploitation and colonialism and defending oppressed and exploited.' (Ayatollah Ibrahim Amini) No – disagreement on who is legitimate authority. Many reject ISIS Sunni leader – Abu Bakr al-Baghdadi. Terrorists and not Muslim. No – conditions were given to Muhammad in 5th century Arabia. Not applicable in 2017 UK.

Holy War Teachings (Harb –al-Maqadis)	Peace in Islam
Pro Mo & early Muslims were killed and persecuted. Were peaceful for 13 years but then fought in war. 'Fight them until there is no more persecution' (Q,S 2)	1.Prophet commanded to make peace 2. Must greet with peace to non-believers. 3. Following battle Muslims must make a pact with non-believers to avoid further confrontations.
Conditions for holy war/ lesser jihad: 1. Persecution (suffering due to belief) 2. Freedom of belief is taken away 3. Self-defence when under attack 4. Authorised by a Muslim leader (prophet/ Khaliah) 5. Last resort ***Forbidden to target/harm innocent civilians or attack leaders. Cannot initiate war, convert to Islam. Cannot kill fellow Muslims.***	**Different interpretations of Surah 8 –** 'And if they incline to peace, then incline to it [also] and rely upon Allah' (q, S 8) Some interpret as message of peace. BUT others interpret to start holy wars to spread Islam and convert others.

Issues Surrounding Conflict: Terrorism: unlawful use of violence, including against innocent civilians, to achieve a political or religious goal.

Terrorist	Peaceful	Non-Religious
'God is sure to help those who help His cause – God is strong and mighty.' (Qur'an, Surah 22)	No compulsion to religion and that Allah has made all life sacred.	Some atheists & humanists blame religions for violence and extremism.
'If anyone kills a person – unless in retribution for murder – it is as if he kills all mankind. (Qur'an, Surah 22)	ProMo and early Muslims opposed war & hated shedding human blood. Only did to resist further oppression.	But 94% terrorist attacks USA 1980-2005 **non-Muslims** (US Department of Justice).
	Muslim Council of Britain consistent in saying terrorism must be challenged by Muslim communities.	2009-2013, less than 2% of terrorist attacks in Europe were religiously motivated (ThinkProgress Organisation)

Weapons of Mass Destruction	Muslim Teachings:	Non-Religious Attitudes:
(Nuclear, biological or chemical weapons that cause widespread devastation and loss of life) **Benefits:** 1. Effective deterrent – nations are less likely to attack if there is a threat. 2. Losses suffered by the side that uses them is minimal 3. Quicker end to conflicts 4. Better course of action than invasion	Many references to development of WMD in Qur'an. Will bring devastation. 'He will be thrust into the Crusher! It is God's Fire, made to blaze.' (Q,S 104) Reject use: 'If anyone kills a person – it is as if he kills all mankind.' (Q, S 5)	Atheists and humanists are cautious. They accept some benefits but also agree there are problems. Some who follow utilitarianism believe in 'the greatest good for the greatest number' – may be a reason to use them.
Negatives: 1. Scale of destruction is immeasurable & damage caused cannot be undone. 2. Civilian and non-combatant deaths are inevitable. 3. Long-term ill-effects, which can extend to future generations 4. Using them could amount to a war crime.	Breaks sanctity of life. 'Do not kill'	

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Key Quotes	Linked Topics
'Uphold justice and bear witness to God, even if it is against yourselves, your parents, or your close relatives.' **Surah 4**	Justice
'God commands justice, doing good.' **Surah 16**	Justice, Crime
'With intoxicants and gambling, Satan seeks only to incite enmity and hatred among you, and to stop you remembering God and prayer.' **Surah 5**	Crime, Hudud
'Good and evil cannot be equal. (Prophet), repel evil with what is better.' **Surah 95**	Good, evil and suffering
'We created man from a drop of mingled fluid to put him to the test.' **Surah 76**	Good, evil and suffering
'We have prepared chains, iron collars, and blazing Fire for the disbelievers.' **Surah 76**	Crime, Hudud, Evil
'As for those who did evil, each evil deed will be requited by its equal.' **Surah 10**	Punishment, Qisas
'Do not kill each other, for God is merciful to you.' **Surah 4**	Aims of Punishment
'But if you overlook their offences, forgive them, pardon them, then God is all forgiving, all merciful.' **Surah 64**	Forgiveness
'Do not let hatred of others lead you away from justice.' **Surah 5**	Justice, crime, treatment of criminals
'Fair retribution saves life for you.' **Surah 2**	'...the married adulterer, a life for life, and the deserter of his Din (Islam).' **Hadith**	Justice, death penalty, Qisas

Topic	Muslim View	Importance	Impact on Muslims Today
Justice	• Justice is fairness in practice within society. • Muslims recognise the important of justice from the Qur'an. • The law of Allah teaches that Muslims should be fair.	• Justice is a key idea promoted in the Qur'an. • Shariah law has strict rules about justice. • Muslims believe that Allah considered justice in creation.	• Muslims will act fairly and justly towards others. • This can be done in everyday interactions. • Muslims act justly as it will affect their afterlife. • Muslims share wealth through Zakah.
Crime	• Crime is an action someone commits against the state. • It breaks the law of the land (e.g. murder or theft). • Crime is considered to be a problem in society.	• Allah orders Justice. • Crime is a distraction from Allah. • The Ummah – Helping those affected by crime. • ProMo taught the importance of living a good life.	• **Muslim Chaplains' Association** – Supports Muslim chaplains working in prisons as well as prisoners in and out of prison. • Mosaic – Supports people of all backgrounds growing up in deprived communities.
Good, evil and suffering	• Muslims have clear teachings on good, evil and suffering. • These ideas are seen to be related to each other through the ideas of reward for good behaviour and the infliction of suffering for evil behaviour.	• Suffering is part of Allah's plan. • Suffering is a test of faith and character. • Suffering is a reminder of sin and Allah's revelation • Some suffering is due to human action.	• Muslims believe that Allah is always watching, so they try to live their lives helping others (e.g. food banks). • Some suffering is due to human action which means that Muslims will try to act morally correctly.
	Non-religious views: Humans are responsible for their own actions. Natural disasters can't be controlled. Evil and suffering are not punishments. Evil proves there is no God. Therefore no afterlife.		
Punishment	• In order for the law to work properly, those who break the law should be punished. • Punishment is justice – retribution for victims. • Shariah law sometimes dictates punishment.	• Punishment helps build a peaceful society. • Creates a stable society and prevent more crimes. • Gives offenders a chance to change (reform). • Make some amends for the crime committed.	• There is a difference of opinion where Shariah law differs from western law in societies like the UK. • Muslims think that punishment is important to ensure crimes do not happen again and law is maintained.
Aims of Punishment	• Punishment has a number of key aims: Protection, Retribution, Deterrence and reformation.	• Punishment establishes peace and justice on Earth as Allah intended. • The aim should be on reform and deterring crime.	• Muslims may have divergent views about which of these aims is most important. • Those who do wrong should be encouraged to change.
Forgiveness	• Forgiveness is accepting someone's apology for their misdeed and moving on. • It is considered important in Islamic life. • Islam is a religion of peace.	• Allah is compassionate, merciful and forgives. • When a person truly repents, they should be forgiven. • A killer may be forgiven if they pay compensation to the family (Qur'an).	• People will try to match Allah's compassion and mercy. • Muslims believe that those who repent will be forgiven on the day of judgement, so behave suitably. • Restorative justice is a good method to overcome conflict.
Treatment of Criminals	• Muslims believe that it is important for criminals, even though they have committed crimes, to be treated in a fair way. • This usually means a fair trial at least.	• The Qur'an teaches that even someone who has done wrong and is being kept captive deserves to be treated in the correct, humane way. • Some believe that when someone has done wrong, their freedoms and rights should be limited.	• Muslims think people should be treated equally, although they accept that criminals deserve punishment for crimes. • Muslims believe that criminals should have a fair trial and this should include a trial by jury. • Torture is always wrong and disproportionate.
The Death Penalty	• Capital punishment is also known as the death penalty. • Both religious and non-religious views support or are against capital punishment. • It has been abolished in the UK but not in some countries. • The purpose includes deterrent for others.	**Muslim views For:** • The Qur'an, Shariah and the Prophet Muhammad teach that it was acceptable. • ProMo sentenced people to death	• The Hadith teaches that the death penalty can be used for the crimes of murder and for Muslims who refuse their Islamic duty. • The Qur'an also says the death penalty can be for rape, homosexuality and working against Islam (apostasy)

HEALTH, FITNESS AND SEDENTARY LIFESTYLES

1.Health – A state of complete physical, mental and social wellbeing and not merely the absence of disease.

2. Fitness – The Ability to meet/cope with the demands of the environment.

3. Wellbeing – A mix of physical, social and mental factors that gives people a sense of being comfortable, healthy, and/or happy.

4. Physical Health
- All the body's systems working well
- Free from illness and injury
- Are able to carry out every day tasks
- Being active and taking part in physical activity

5. How can taking part in regular physical activity impact your physical healthy?
- Improving heart function
- Improve the efficiency of the body systems (e.g. heart and lungs)
- Reduce the risk of some illness e.g. diabetes
- Help prevent obesity
- Carry out every day tasks without getting tired
- Provide the feeling that you can perform activities without difficulty to increase enjoyment.

6. Mental Health
- A state of wellbeing in which every individual realises his or her own potential.
- Someone with good mental health can cope with the stresses of every day life, can work productively, and can make a contribution to the community.

7. How can taking part in physical activity effect mental health and wellbeing?
- Reduce stress/tension levels
- Release feel-good hormones in the body such as serotonin
- Enable a person to control their emotions and work productively

8. Social Health
- Basic needs are being met (e.g. food, shelter, clothing)
- Individuals have friendships and support and some value in society.
- Individual suffers little stress in social circumstances.
- Sport offers an opportunity for people to mix and socialise with one another.

9. How can taking part in regular physical activity affect social wellbeing?
- Provide opportunities to social/make friends
- Encourage co-operation skills
- Encourage team-working skills
- Ensure that essential human needs are met

10. Sedentary Lifestyle
A person's choice to engage in little, or irregular physical activity.
A sedentary person makes the choice to make NO effort to take part in physical activity.
Here is an example of an adult who leads a sedentary lifestyle:

11. What are the consequences of a Sedentary Lifestyle?
Lifestyle choices are simply the choices we make about how we live our lives. This could include: not smoking, not drinking alcohol, exercising, eat balanced diet.

If you are sedentary you could be/have:
Gaining weight, becoming obese
Heart disease
Lack of friends
Tired and lethargic
Hypertension
Poor sleep
Poor self esteem
Diabetes

Gets out of house into car and drives to work.

Gets into work, sits down all day (8 hours) at a desk with a computer

Drives home straight to front door.

Sits down in front of the TV, laptop or play-station for most of the evening.

Goes to bed and lies down for 5-8 hours of sleep
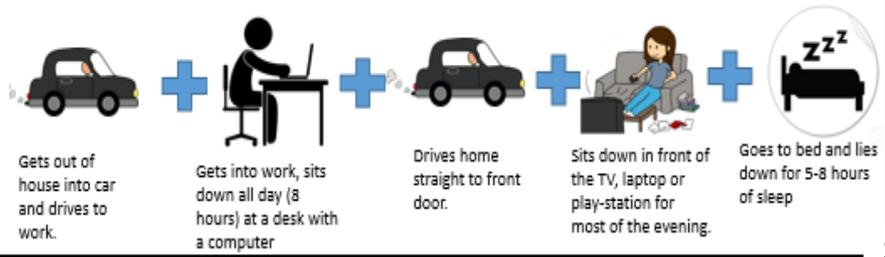
SOMATOTYPES, OBESITY AND NUTRITION

1. Endomorph

Characteristics:
A lot of body fat, A lot of fat on the upper arms, stomach and thighs, Pear shaped
Sporting Examples:
- ✓ Sumo Wrestler
- ✓ Forward in Rugby

2. Mesomorph

Characteristics :
Very little body fat, Large muscle content, Broad shoulders and narrow waist
Sporting Examples:
- ✓ Body Builder
- ✓ Rugby player
- ✓ 100m Sprinter
- ✓ Boxer

3. Ectomorph–

Characteristics
Very little muscle or body fat, Narrow hips and shoulders and chest, Thin and long legs and arms, Thin face/high forehead
Sporting Examples:
- ✓ Long distance runner
- ✓ GK or GS in Netball
- ✓ Basketball Player

4. Obesity

A term used to describe people with a large fat content – caused by an imbalance of calories consumed to energy expenditure. BMI of over 30.

5. What is BMI?

Is a score to tell you whether you are the correct height for your age.
Less than 20 = underweight; 20-25 = correct weight; 25-30 = overweight; 30+ = obese.

6. Balanced Diet

A balanced diet is eating all nutrients in the right amounts to benefit your health.
Reasons for a balanced diet:
- Unused energy is stored as fat, which could cause obesity (particularly saturated fat)
- Suitable energy can be available for an activity
- The body needs nutrients for energy, grown and hydration.

7. Carbohydrates (55-60%)

'Carbohydrates are one of the main and preferred source of energy'.
There are 2 types of Carbohydrates
- Simple and Complex.
Simple: Sugary foods give a quick burst of energy e.g. Cakes, sweets, cereal
Complex: Starchy foods give a long lasting release of energy e.g. rice, wholegrain pasta and bread, green vegetables.
Carbohydrates are really important to athletes, especially those who work at high intensity like boxers, sprinters etc.

8. Fats (25-30%)

'Fats are a source of energy for the body' It provides more energy than carbohydrates but only at low intensities.
Saturated fats are BAD, e.g. butter, animal fat, ice-cream, deep fried foods
Unsaturated fats are GOOD e.g. Nuts, avocado and seeds
Fats are a good source of energy for activities that require a low level of intensity like yoga.

9. Proteins (15-20%)

'Proteins are very important in the growth of new muscle tissue and repair of existing muscle tissues'
Protein can me founds in many different foods. However, there are some foods that have higher percentage of protein in them such as: Chicken, turkey, nuts, peanut butter, Greek yoghurt etc. There are many protein products now available on the market.
Protein is essential for all athletes. Many athletes will eat protein after they have trained or competed to help aid with muscle repair as part of their recovery.

10. Kcalories or Kcal

for short is the measurement of energy and is obtained from the food we eat. We need energy for: Growth; Repair; Movement (of any kind! Not just exercising)

Memory

The computer will have memory that can hold both data and also the program processing that data. In modern computers this memory is RAM.

Control Unit

The control unit will manage the process of moving data and program into and out of memory and also deal with carrying out (executing) program instructions - one at a time. This includes the idea of a 'register' to hold intermediate values. In the illustration above, the 'accumulator' is one such register. The 'one-at-a-time' phrase means that the Von Neumann architecture is a **sequential processing machine**.

Input - Output

This architecture allows for the idea that a person needs to interact with the machine. Whatever values that are passed to and forth are stored once again in some internal registers.

Arithmetic Logic Unit

This part of the architecture is solely involved with carrying out calculations upon the data. All the usual Add, Multiply, Divide and Subtract calculations will be available but also data comparisons such as 'Greater Than', 'Less Than', 'Equal To' will be available.

Bus

Notice the arrows between components? This implies that information should flow between various parts of the computer. In a modern computer built to the Von Neumann architecture, information passes back and forth along a 'bus'. There are buses to identify locations in memory - an 'address bus'

The Von Neumann or Stored Program architecture
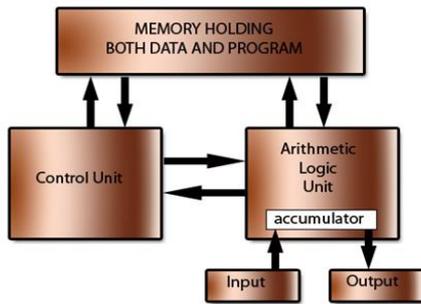
(c) www.teach-ict.com

Computer Systems

The Input-Process-Output model
Different systems, pros & cons:
- Input-Process-Output model:

- Resumes
- Recommedations
- Credit Reports
- Academic records
- Portfolio of jobs

- Interviews
- Diagnostic tests
- Industrial psychologist review
- Problem-solving exercise

- Six month job performance rating
- Job satisfaction review
- Hiring manager assessment
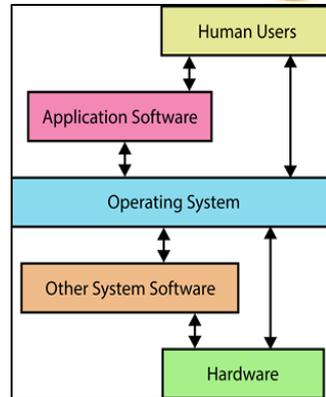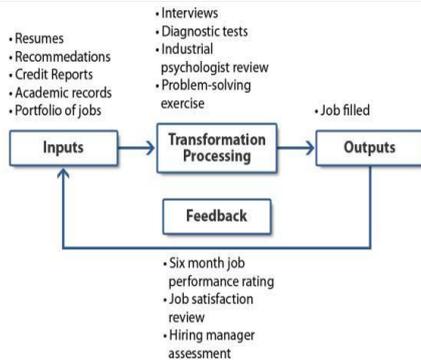
Types of Software
- **Applications**: Software for the End-User
    - Word processor
    - Spreadsheets
    - Image Editor
    - SIMS
    - Ticket booking system
- **Find out about Utilities, what do each of the following do?**
    - Antivirus
    - Firewall
    - System clean up
    - Defragmentation
    - Task Manager

System software
- Software that controls the hardware: What is an OS and a Driver

Secondary storage (list facts about them)

Magnetic hard disk

Optical disk - Flash memory - Cloud Storage

Non-volatile (disappears after shutting down)

Internal/Removable: *Considerations for selecting storage:* Capacity / Speed / Portability / Durability / Reliability

General-purpose systems: Personal computers, including <u>desktops</u>, <u>notebooks</u>, <u>smartphones</u> and <u>tablets</u>, Embedded systems: **embedded systems** are MP3 players, mobile phones, video game consoles, digital cameras, DVD players, and GPS. Household appliances, such as microwave ovens, washing machines and dishwashers, include **embedded systems** to provide flexibility and efficiency
Expert systems: MYCIN: It was based on backward chaining and could identify various bacteria that could cause acute infections. ...
DENDRAL: **Expert system** used for chemical analysis to predict molecular structure.

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		$F = A \cdot B$ 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).   **33**

Act One- Reverend Parris' house
- In Salem, 1692, some girls have been caught dancing in the forest.
- The younger girls are frightened and pretend to be ill.
- The town's minister, Parris, is worried that word will get out that his daughter Betty and his niece Abigail were among the girls. He is worried about his reputation.
- The Putnam's arrive at Parris's house and are please to find that the minister's daughter is ill.
- They jump to witchcraft as an explanation. This suits them as they want revenge on the neighbours for appointing Parris for the position that they wanted a relation to get.
- Abigail threatens to hurt the girls if they tell anyone that she drank a potion to kill John Proctor's wife, Elizabeth.
- John Proctor comes in. He had an affair with Abigail when she was his servant. Abigail confesses it is not witchcraft to blame for Betty's illness and tries to rekindle the affair but Proctor refuses her advances. Abigail loses her temper, mentioning that she blames his wife.
- Betty wakes up and starts screaming, bringing the others back into the room.
- Reverend Hales, a famous witchcraft 'expert' arrives and begins to look for signs of witchcraft.
- When questioned about the dancing Abigail accuses the black slave Tituba of summoning the devil. Tituba confesses and starts accusing others. Abigail and Betty join the confession.

Act Two- The Proctors' house, a week later
- The witchcraft trials have started. Mary Warren the Proctors' servant has been at the court all day.
- Elizabeth wants her husband to go to court and denounce Abigail. Proctor is reluctant.
- Mary Warren returns from court and brings Elizabeth a 'poppet' (a doll). Thirty- nine women are in jail for witchcraft. Elizabeth's name has been mentioned in court.
- Reverend Hale arrives to question Elizabeth. Giles Corey and Francis Nurse burst in- their wives have been arrested.
- Two court officials come to arrest Elizabeth, and they have been instructed to search the House for 'poppets'
-They find such a doll with a needle stuck in its stomach. Abigail claims Elizabeth's spirit stuck a needle in her that same evening.
- John tells Mary she must tell the court that Abigail is lying. Elizabeth is arrested.

Act Three- The Courtroom
- Giles Corey goes to court to try to save his own wife.
- Proctor arrives to present evidence that Abigail and the girls have been lying all along. He has persuaded Mary Warren to tell the truth about the girls but she is very nervous.
- Lots of villagers have signed a testimony to say Elizabeth, Martha Corey and Rebecca Nurse aren't witches. Danforth orders everyone who signed it to be arrested.
- Abigail pretends that Mary is sending her spirit out to attack her.
- Proctor confesses to his affair with Abigail to ruin her reputation. Elizabeth's brought in and asked if it's true. She denies it to protect him which destroys John's case again her.
- Abigail screams that she is being attacked by a bird sent by Mary Warren. The girls join in.
- This frightens Mary so much that she sides with Abigail and says that Proctor is the Devil's man. John is arrested.

Act Four- Salem Jail, Autumn 1692
- Tituba and Sarah Good are to be hanged. Hale tries to persuade the accused to confess rather than hang.
- We learn that Abigail has run off with Parris's money.
- There are rumours of rebellion against trials. Parris is frightened for his life.
- John Proctor is given a last chance to confess to witchcraft and so save his life.
- Elizabeth is asked to persuade John to confess. John decides that he will confess.
- Over a hundred people have confessed. Giles Corey wouldn't plead guilty or not guilty, so he was tortured to death.
- Proctor refuses to allow his signed confession to be posted on the door of the church.
- Proctor chooses to die rather than give up his good name.
- Parris and Hale ask Elizabeth to persuade John to confess again, but she refuses

Key characters	Key themes	Historical context	Stylistic features and symbols
John Proctor-local farmer. **Elizabeth Proctor**- John's wife **Reverend Parris**- Minister of Salem **Abigail Williams**- Parris's niece. She had an affair with Proctor. Leader of the girls. **Reverend Hale**- Witchcraft 'expert' **Marry Warren**- shy girl who works for Proctor **Rebecca Nurse**- local farmer's wife. She's known for her goodness and courage **Deputy- Governor Danforth**- judge in charge of trials **The Putnams**- Local couple **Giles Corey**- local farmer **Tituba**- Black Slave girl from Barbados	Loyalty Fear Identity & Reputation Envy & Revenge Conflict Religion Courage & Integrity Tyranny Lies and Betrayal Greed	▪ English settlers came to America in 1626 and founded a settlement in Massachusetts. They were Christians who followed the teachings of the Bible extremely strictly; they were *Puritans*. ▪ Salem society was a *Theocracy*- a society ruled by people who are considered to be guided by God. Community was extremely important. ▪ Puritan Women were seen as socially inferior and had less power than men. Children were seen as young adults with no time to play and punished if they misbehaved. ▪ Puritans believed in the Devil and witchcraft. They blamed Smallpox, attacks from Indians and crops not growing on the devil. The Crucible is based on the real Salem Witch Trials that happen in 1692 where trials led to mass hysteria and over 150 people accused of witchcraft. ▪ McCarthyism was a real- life 'Witch Hunt'. Joe McCarthy organised a twentieth-century version of witch hunting. It ruined 100s of reputation and careers. It was used as a way for revenge and those accused were encouraged to accuse friends and colleagues to clear their own name. ▪ Miller wrote The Crucible after being accused of communism. Miller refused to name any of his colleagues as communist similar to John Proctor.	**Allegory**- *The Crucible* can be read as an allegory of the anti-communist investigations in the USA in 1950s. **Colloquial**- Miller uses colloquial language within the characters dialogue to make it sound more realistic and remind the audience that the play's based on real events. Less educated characters have more rural sounding patterns. **Latin** -More educated use Latin such as Hale and Danforth **Tragic Hero**- character who makes an error of judgment or has a fatal flaw. **Natural Light** throughout the play contrasts with the unnatural accusations. **Stage Directions** reveal a lot about the characters including background information shows Millar wanted the play to be read as well as performed. **Bird Imagery** represent people's Spirit **The Title**- A crucible is a container that can be heated to high temperature and separate the pure bits of metal from the not pure.

Context – *The Woman in Black* was written by Susan Hill in 1983 and adapted by Stephen Mallatratt. It was first performed first performed at the Stephen Joseph Theatre in Scarborough in 1987. It is currently being performed at the Fortune Theatre in London.

Susan Hill – Susan Hill CBE (born 1942) is an English author of both fiction and non-fiction works. Many of her texts are written in a descriptive gothic style. She has expressed a keen interest in the traditional English ghost story, enjoying its use of suspense and atmosphere to create an impact. Her novella *The Woman in Black* was turned into a play in 1987 and has continued to run in the West End since. The book was adapted into a play by Stephen Mallatratt	Unwed Motherhood – To give birth out of wedlock was frowned upon as recently as the mid-twentieth century. However, in the Victorian era, the situation was even worse, as many unmarried women were forced to give up their babies for adoption. It was deemed that no woman could raise a child born outside marriage and remain in 'polite society.' In *The Woman in Black,* the unmarried Jennet is forced to give up her child.
The Victorian Era– The Victorian era describes the period in which Queen Victoria sat on the English throne – between 1837 and 1901. Whilst this was a time of industrial revolution, it was also an extremely harsh time to live, and the differences between the lives of the richest and the poorest were exacerbated. The Victorian era was a period of great change. In this time, the population of England doubled – from 16.8 million 1851 to over 30 million in 1901. Many of the events of *The Woman in Black* take place in this harsh period of English history.	Health and Death– Healthcare was more of a luxury at the time, and medicine was nowhere near as advanced today, Many diseases were rife, and childbirth and poverty were very real dangers to people living in the era. As a result, a middle class person may expect to live to 45 at the time, whereas a working class person would have been lucky to live half that time. In *The Woman in Black* Jennet Humfrye dies from a wasting disease at a relatively young age – this would have been far more common than now.
The Supernatural – In the Victorian era and the early twentieth century (when the different plot elements of *The Woman in Black* take place) science and understanding of the world was far less advanced than in the present day. As a result, people at the time would be far more likely to believe that unexplained events were the result of supernatural activity. This lack of scientific enlightenment makes the era highly suitable for a story featuring supernatural elements.	The North of England– The setting for Eel Marsh House is in the north of England. Even today, the north of the country is far more sparsely populated than the south, but in the time when the story was set, this would have been even more so the case. This idea of remote isolation adds to the cold, ghostly atmosphere that runs throughout the novella. Susan Hill herself was born and raised in Scarborough, a seaside town in North Yorkshire.

Main Characters – Consider what Hill intended through her characterisation of each of the below…

Arthur Kipps – Arthur is the main protagonist of the story. He tells the events several years later, although he is clearly still internally haunted by the events at Crythin Gifford many years earlier, when he visited Eel Marsh House as young solicitor. He is rational and pragmatic, who at first casts aside apparitions as features of reality. In the end, he has his wife and young child unfairly taken from him.	Sam Daily – Sam is a large, friendly, prosperous local man who befriends Arthur on his trip to Crythin Gifford. Aside from Keckwick, he is the only person in the town who offers to help Arthur. He returns to Eel Marsh House to help him when worried about his welfare and lends Arthur his dog, Spider, to keep him company. In the end, he is the character who reveals the truth to Arthur.
Quote: *"I clung to the prosaic, the visible and tangible."*	**Quote**: *"big man, with a beefy face and huge raw-looking hands"*
Mr Jerome – Mr Jerome is a local land agent, who dealt with Alice Drablow before her death. Throughout much of his appearances in the book, Jerome lives in fear of the Woman in Black (there is even a chapter named 'Mr Jerome is Afraid) although crucially, he never reveals the cause of his fear to Arthur. Jerome often appears as a 'broken man' – it is later revealed that he lost a child to the woman.	Keckwick – Keckwick is the driver of the pony and trap, who delivers Arthur to and from Eel Marsh House – the only character (barring Sam Daily at the end) who will set foot near the place. He is a quiet character, who barely says a word to Arthur throughout their journey. However, he does represent Arthur's one link to the town - helpful when considering his father died in the marshes.
Quote: *"I'm afraid I can't offer you help, Mr. Kipps. Oh, no."*	**Quote**: *"For answer, he simply pulled on the pony's rein"*
The Woman in Black – The Woman in Black is the ghost of Jennet Humfrye, filled with anger and vengeance over the death of her young son years before. She is bitter about giving up her child to Alice Drablow, and this increases exponentially after she watches him die in Alice's care. As the Woman in Black, she returns as the pale, wasted version of herself from just before her death, and causes the death of a child every time that she is seen.	Mr Bentley – Mr Bentley is Arthur's employer, who is the one who sends Arthur off to Crythin Gifford in the first place. Although Arthur doesn't blame Bentley for the events that follow, it is clear that Bentley at least partially blames himself. Through compliance towards his boss's orders, not only did Arthur need to venture north to Eel Marsh House, but he also remained there even when it was clear that something was wrong – he felt a need to get the job done.
Quote: *"I shall kill us both before I let him go."*	**Quote**: *"He had always blamed himself for what happened to me."*

Themes – A theme is an idea or message that runs throughout a text.

Isolation – The Woman in Black is set pretty much in the middle of nowhere, near an extremely remote coastal town in the north. Eel Marsh House itself is separated from both the town and the rest of the world by the fogs and bogs of its tidal causeway. This sense of extreme isolation adds to the feeling of melancholy and despair. Even as an older man, Arthur is isolated by the thoughts of his horrific past.
Revenge – Jennet Humfrye commits her hauntings after death, each time causing the death of a child. She does so, seemingly, in revenge for the death of her own son, Nathaniel. Even though his death was an accident, Jennet's anger at not being allowed to raise her child herself causes her to take revenge on other people's children, even Arthur's in the end.
Mental and Physical Illness – Witnessing her son Nathaniel's death drives Jennet Humfrye to both mental and physical sickness – mental illness in the sense that she longs for revenge and becomes obsessed with others suffering the same pain as her (even after death) and physical because she contracts some form of violent wasting disease, which makes her skin shrink to her bones until her death.
The Supernatural – The presence of both the Woman in Black herself and the pony and trap add supernatural features. Arthur becomes aware of this despite the fact that he previously did not believe. As an older man, he finds it insulting when others tell grotesque stories of horror and gore, knowing that these are nowhere near as painful or horrific as a 'real-life' haunting such as his.

Sound

Diegetic – sound that comes 'from the world of a story'. This means any sound that is part of the action, and therefore experienced by the actors 'on stage'. Can include sound effects (SFX) and background noise.

Non-Diegetic doesn't come directly from the world of the story 'onstage'. Characters are not aware of it. It usually creates the atmosphere.

Mark a moment:	Various ways including Sound Effects (SFX) or silence
Volume:	Loud to quiet
Crescendo	Gradually getting louder
Pitch:	High to low
Pace:	Fast to slow
Pause:	Breaks in sound
Silence:	The removal of all sound
Contrast:	Opposing sounds (e.g. Loud/quiet, fast pace/slow pace)
Length of notes:	Sustained (Long notes) Staccato notes (Short sharp notes)
Reverb:	Echoing effect
Atmosphere:	The feeling created e.g. cold, scary, romantic, tense, relaxed/calm
Entrance:	How the sound is first played. (e.g. Dynamic and loud or soft fade in)
Foley sound:	Replace an original sound (e.g. the digital sound of footsteps)
Sound Bridge:	The sound from one scene carries over into the next scene.

Lighting

Stylised Lighting State

Covers specific sections of the stage, harsh colours, hard edges. This does not look like how the sun would light the stage. It is more alien in its appearance.

Naturalistic Lighting State

Soft lighting, covers whole stage, gentle colours. This would look like how the sun would like the stage.

Key Lighting Terms

Lantern: The correct term for stage lights
Gels: Sheets placed in front of the lights to change the colour
Intensity: Full beam or low light or black out
General Wash: Covering the stage with light
Spot Light: Focusing the light on a specific area of the stage
Transition: Slow fade or snap (quick) fade
Edge: The edges of the light can be soft or hard
Gobo: Create shapes in lighting (e.g. Batman's emblem)
Floor Lantern: Light from below. Creates non-naturalistic shadows. Can look scary
Cyclorama: Large white sheet onto which images are projected
Projection: Projected images onto a cyclorama
Crossfade: When the light travels from one side of the stage to the other
Lighting State: The light(s) used in a specific scene
Blackout: When the stage is completely dark

Costume, Hair and Makeup

Costume, hair and make-up can suggest character, time and the style of the play, eg naturalistic or abstract. Look at the four pictures of actor Adrian Lester. Note how the change of costume helps the audience to understand the role he is playing.

Things to consider when designing costume, hair and make-up:

When is the play set?
Is the play naturalistic or non naturalistic?
What is the character's personality?
What is your character's status?
Do the actors need to change?
What materials will be used?
What colours will be used?

Make-Up
Bright stage lighting can wash out facial features and make performers appear pale, so make-up is used to enhance features and make sure that the audience can see the actors' facial expressions. It can also be used to age an actor who is playing an older character or to create fantasy characters. It is worn by both male and female actors.

Colour can be used symbolically. White may represent innocence and purity, and red may represent danger.

Green = nature / harmony
Black = sadness / darkness / worry
Red = danger / romance/extrovert
White = peace / purity / innocence

Set and Props

Set means the scenery and furniture onstage. Some theatre sets are very elaborate and detailed (naturalistic). However, a simple or minimalistic set can be also be very effective (non-naturalistic). The two images show a row of houses in two different plays. Which one is naturalistic and which one in non naturalistic?

Things to consider when designing Set and Props:

When is the play set?
Is the play naturalistic or non naturalistic?
How can levels create meaning?
How can proxemics create meaning?
Are there set changes?
What materials will be used?
What colours will be used?
Will images be projected onto a cyclorama or painted onto flats?

Props
Items that the actors use on stage.

Key Terms for Set and Props

Flats: Large sheet of canvas or wood that the scenery is painted on to.
Fly: Ropes used to pull flats on/off stage.
Wings: The side of the stage
Apron: A small piece of stage in front of the Proscenium Arch
Trap door: Door covering exit hole in the stage
Cyclorama: A large cloth onto which scenery can be projected
Gobo: Creates shapes that can be projected
Birdseye View: Draw the stage looking down on it.

A row of houses in 'Curious Incident'

A row of houses in 'Blood Brothers'

Melody	• Sequences • Arpeggiated (arpeggio)/broken chords • Stepwise/conjunct • Leaps/disjunct • Fanfare • Intervals • Ornamentation • Scalic • Syllabic (vocal pieces ONLY) • Melismatic (vocal pieces ONLY) • Range/tessitura (vocals) • Subject and countersubject	Rhythm (incl. tempo & metre)	**TEMPO** Allegro; Grave; Andante; free tempo; Moderato; 112bpm; 100bpm; rubato; Allegro di molto e con brio; ritardando **METRE** 4/4; 12/8; 2/4; 6/8; 3/2; 2/2 **RHYTHMIC DEVICES** • Syncopated • Triplets • Dotted rhythm • Swung • Sextuplets/septuplets • Semiquaver runs • Anacrusis

Texture	• Monophonic
	• Homophonic
	    Melody-dominated/melody & accompaniment
	    Chordal accompaniment
	• Polyphonic
	    Imitation
	    Antiphony (antiphonal)
	    Counterpoint (contrapuntal)
	• Heterophonic *(world music only)*
	• *2-part, 3-part, 4-part*
		Instrument
		
		(sonority)
			ACCOMPANIMENT
			• Describe what you hear the parts underneath the melody playing!!
			• Basso Continuo
			ORCHESTRATION/INSTRUMENTATION
			• Describe what instruments are doing
			• Describe what they are playing
			INSTRUMENT TECHNIQUES (SONORITY)
			• Articulation – legato/staccato
			• Double-stopping
			• Glissando/portamento
			• Hammer ons/pull offs
			• Pizzicato
			• Tremolo

Genre	• Glam Rock • Baroque • Classical • Romantic • Concerto Grosso • Musical Theatre • Film Music • Fusion • Celtic • African • Bossa Nova	Harmony	• **HARMONY** = Frequently references successions of chords, r single chords. However, in a general manner, a HARMONIC DEVICE is anything that backs up and supports the tonality a piece is in. • **HARMONIC DEVICES** include: Chords, chord sequence, cadences, basslines (in relationship to other parts), dissonance, chromaticism, diatonic, drone, intervals, pedal, riff, ground bass, intervals, ostinato; extended chords; altered chords; open 5ths; circle of fifths; functional
Tonality	• **TONALITY** = The relationship of notes within a sclae or mode to a principal note. A wider term than KEY but often used synonymously with it. • Atonal, chromatic, major, minor, modal, pentatonic; ambiguous; bitonal	Structure	Verse-Chorus Form Da Capo Aria Ground Bass Ternary Form Fugal – subject and answer Sonata Form – Exposition, Development, Recapitulation, Coda Strophic
Dynamics	Forte (loud) Piano (Quiet) Crescendo (getting louder) Decrescendo (getting quieter)	Music Tech	Overdubbing Reverb Flanger Distortion

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A. Key Terms

Keyword	Description
7. Silhouette	**SILHOUETTE**: the dark shape and outline of someone or something visible in restricted
2. Sky-Line	**T**he thickness of a mark or brushstroke
3. Landscape	**to BLOCK IN**: to fill in an empty area in an image with a certain colour before adding fine details such as shadows and highlights.
4. Texture	how objects or figures are arranged in the frame of an image
5. Contemporary	Living or occurring at the same time.
6. Negative Space	When drawing shapes, you must consider the size and position as well as the shape of the area around it. The shapes created in the spaces between shapes are referred to as **negative space**.
7. Geometric	characterized by or decorated with regular lines and shapes. "a geometric pattern"

B. Command Words

Keyword	Description
8. Demonstrate	To show, exhibit, prove or express such things as subject specific knowledge, understanding and skills.
9. Evidence	**EVIDENCE:** To show, prove, support and make clear or verify something.
10. Organise	N **ORGANISE**: To collect, collate, arrange and combine elements of your work into a clear and logical submission.
11. Research	**RESEARCH**: To study in detail, discover and find information about.

C. Formal Elements

LINE — the path left by a moving point, e.g. a pencil or a brush dipped in paint. It can take many forms. e.g. horizontal, diagonal or curved.

TONE — means the lightness or darkness of something. This could be a <u>shade</u> or how <u>dark</u> or <u>light</u> a colour appears

TEXTURE — the surface quality of something, the way something feels or looks like it feels. There are two types : <u>Actual</u> and <u>Visual</u>

SHAPE — an area enclosed by a <u>line</u>. It could be just an outline or it could be <u>shaded</u> in.

PATTERN — a design that is created by repeating <u>lines</u>, <u>shapes</u>, <u>tones</u> or <u>colours</u>. can be <u>manmade</u>, like a <u>design</u> on fabric, or natural, such as the markings on animal fur.

COLOUR — There are 2 types including Primary and Secondary . By mixing any two <u>Primary</u> together we get a <u>Secondary</u>

C. Art Criticism

12. Art Criticism is when you analyse and present your own opinions of an artists work. Memorise the 4 steps to help you annotate your book.

4 steps of art criticism

13**. describe:** Tell what you see (the visual facts)

14. **Analyse:** Mentally separate the parts or elements, thinking in terms of textures, shapes/forms, light/dark or bright/dull colours, types of lines, and sensory qualities. In this step consider the most significant art principles that were used in the artwork. Describe how the artist used them to organize the elements.

15. **interpret:** seeks to explain the meaning of the work based on what you have learned so far about the artwork, what do you think the artist was trying to say?

16. **judgment.** personal evaluation based on the understandings of the work(s)

Scientific method for NEA 1

Research
Gathering data or information about the ingredient(s) that you are investigating.

Investigation
practical work that is undertaken by experimentation to prove or disprove the hypothesis.

Analysis
Explanation of the results linked to the data. Link back to research

Hypothesis
An idea, prediction or explanation that you then test through experimentation

Annotate
Add information to a photograph or chart

Fair test
An experiment that tests exactly the same thing during the investigation. E.g biscuits made should be cut out using the same cutter

Control
The part of the experiment that stays the same. This ensures that a 'Fair Test is carried out.

Independent variable
The part of the experiment that is changed

Dependent variable
The outcome of the experiment that can be measured

Sensory testing and tasting
Measuring the outcomes of experiment using the senses to describe outcomes

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Aeration
Incorporating air into a mixture.

Agitate
To stir, shake or disturb a liquid.

Al dente
'Firm to the bite', a description of the texture of correctly cooked pasta.

Ambient
Foods that can be stored, at room temperature (ordinary room temperature 19°C to 21°C), in a sealed container. All foods found on supermarket shelves are ambient foods.

Amino acids
The building blocks of proteins.

Antioxidant
A molecule that is able to stop the oxidisation process in other molecules and therefore can be useful in stopping foods from deteriorating. Antioxidants can prevent or slow down damage to the body which otherwise can lead to diseases such as heart disease. Antioxidants also improve our immune system.

Antioxidant vitamins
Vitamins A, D and E, found in fruits and vegetables.

Bacteria
Pathogenic microscopic living organisms, usually single-celled, that can be found everywhere. They can be dangerous, such as when they cause infection, or beneficial, as in the process of fermentation (for wine).

Baking
Convection-conduction, cooking foods in a hot oven.

Basted
When fats or juices are poured over something (usually meat) while cooking in order to keep it moist, eg roasting meats.

Batter
A mixture of flour, milk or water, and usually an egg.

Bind
To bring the ingredients in a mixture together using an ingredient, eg egg.

Biological catalysts
Substance which speeds up a chemical reaction.

Biological raising agent
Using yeast to produce CO2 gas.

Biological value
The number of amino acids that a protein food contains.

Blanching
A method of cooking where food is cooked very quickly in boiling water for a short period of time. It stops enzyme actions which can cause loss of flavour, colour and texture. Conduction-convection.

Blanching
A method of cooking where food is cooked very quickly in boiling water for a short period of time. It stops enzyme actions which can cause loss of flavour, colour and texture. Conduction-convection.

Braising
Conduction-convection, sealing meat/vegetables in hot fat, then cooking slowly in a covered dish with some cooking liquid.

Bridge hold
Use thumb and forefinger and grip either side of the ingredient, use knife under the bridge to cut.

Calcium
Main mineral in the body, teeth and bones. It needs vitamin D to help absorption.

Caramelisation
Breaking up of sucrose molecules (sugar) when they are heated. This changes the colour, flavour and texture of the sugar as it turns brown into caramel.

Carbohydrates
Macronutrients required by all animals; made in plants by the process of photosynthesis.

Chemical raising agent
Uses baking powder or bicarbonate of soda to produce CO^2 gas

Choux pastry
A light, crisp, hollow pastry used to make profiteroles, éclairs and gougères.

Claw grip
Tips of fingers and thumb tucked under to hold the ingredient before chopping.

Coagulation
The setting or joining together of lots of denatured protein molecules during heating or change in PH. An irreversible change to the appearance and texture of protein foods.

Coat
To add another ingredient to create an attractive finish, or to create a protective layer on food when cooking.

Conduction
Transfer of heat through a solid object into food.

Consistency
Thickness or viscosity.

Convection
Transfer of heat through a liquid or air circulation into food.

Cook's knife
A large general purpose knife with a deep blade, used for cutting, chopping, slicing and dicing.

Danger zone
Range of temperatures between 5°C to 63°C at which bacteria begin to multiply rapidly s.

Deglazing
To loosen the browned juices on the bottom of the pan by adding a liquid to the hot pan and stirring while the liquid is boiling.

Denaturation
Chemical bonds in the protein food have broken, causing the protein molecule to unfold and change shape.

.**De-seed**
To remove seeds before using.

De-skin
To remove the skin by either putting the fruit or vegetable into boiling water or, for peppers, placing on direct heat.

Dextrinisation
Breaking up of the starch molecules into smaller groups of glucose molecules when exposed to dry heat, eg toast.

Dietary fibre
Complex carbohydrate/non-starch polysaccharide, eg whole grain cereals and cereal products.

Disaccharide
A carbohydrate made from two sugar molecules.

Discrimination tests
Test used to find out whether or not people can tell the difference between similar samples of food.

Dry-frying
Heating food on a low heat without any fat or oil. Conduction.

Efficacy
Power or capacity to produce a desired effect; effectiveness.

Enzymic action
Causes fruit to ripen, change colour, texture, flavour and aroma; maturing of fruits and vegetables.

Enzymic browning
The discolouration of a fruit or vegetable due to the reaction/chemical process where oxygen and enzymes in the plant cells of the food to react and cause the surface to become brown. This process cannot be reversed.

Emulsification
Refers to the tiny drops of one liquid spread evenly through a second liquid. An emulsifier (such as egg yolk) is used to stabilise an insoluble mixture.

Enzymes
Biological/natural substances (catalysts) which speed up biochemical reactions without being used up themselves.

Fats
Macronutrient which supplies the body with energy.

Fat soluble vitamins
Vitamins (the A, D E, and K groups) that dissolve in fat.

Filleting knife
A thin, flexible, narrow blade knife used to fillet fish.

Fluoride
Strengthens the bones and teeth, helps prevent tooth decay.

Foam formation
Foams are formed when gases (mainly air) are trapped inside a liquid, for example meringue, whisked sponge.

Free range
A method of farming husbandry where the animals, for at least part of the day, can roam freely outdoors.

.**Free sugars**
All monosaccharides and disaccharides added to foods by the manufacturer, cook, or consumer, plus sugars naturally present in honey, syrups, and fruit juices.

Fruit sugars
Carbohydrate, which is the natural sugar in fruit –mostly in the form of fructose, or glucose.

Gelatinisation
When starch granules swell when cooked with liquid, then burst open and release the starch, causing the liquid to thicken.

Gliadin and glutenin
The core proteins of the gluten part of wheat seeds.

Gluten formation
Formed from the two wheat proteins gliadin and glutenin, in presence of water. Gluten is developed by kneading.

Gluten free
Food which does not contain gluten (crucial for those with Coeliac disease).

Grading tests
Put in order particular characteristics of a food product.

Grilling
Radiation cooking foods under intense heat.

Hedonic rating test
People give their opinion of one or more food products by filling out a table that uses a preference scale.

High Biological Value (HBV)
Protein foods that contain all the essential amino acids.

Iron
Needed to make haemoglobin in the red blood cells, requires Vitamin C for absorption.

Julienne
Cutting vegetables into matchstick strips.

Knead
To manipulate dough by pushing it across a work surface and pulling it back. This is essential to develop the gluten.

Knock back
To knead out the carbon dioxide in risen dough to remove large air pockets to ensure an even texture.

Lactose
A natural sugar found in milk and dairy products.

Lactose intolerant
A condition which means you cannot digest disaccharide sugar lactose.

Layer
To make up a dish with differing ingredients one on top of another.

Marinade
To soak foods such as fish, meat, poultry and vegetables in a liquid to help develop the flavour, tenderise and in some instances colour the food before it is cooked. The liquid can be acidic or a salty solution. Protein is denatured by marinating.

Mash
To reduce to a soft mass by using a masher.

Mechanical raising agent
Whisking, beating, sieving, creaming, rubbing in or folding to trap air into the mixture.

Micro filtered
All bacteria in milk are removed, by forcing it through filtration membranes, then pasteurised and homogenised.

Micronutrients
Nutrients required in small quantities to facilitate a range of physiological functions.

Microorganisms
Tiny forms of life, usually single cell microscopic organisms such as bacteria, moulds and fungi.

Milk sugars (lactose)
A single molecule of glucose linked to a single molecule of galactose to form a carbohydrate, known as lactose.

Milling
Breaking cereal grains (seeds) down and separating the layers, turning grain into flour.

Minerals
Chemical substances found in a wide variety of foods.

Mix
To combine two or more ingredients together to become one.

Monosaccharide
A simple carbohydrate. Mono means one, saccharide means sugar.

Monounsaturated fats
Fats that contain one double bond in the molecule.

Nutrients
The properties found in food and drinks that give nourishment – vital for growth and the maintenance of life. The main nutrients needed by the human body are carbohydrates, proteins, fats, vitamins and minerals.

Nutritional analysis
Nutritional information for different foods, creating a nutritional profile of the specific nutrients in the food.

Oil in water emulsion
Keeping drops of oil or fat suspended in a liquid to prevent them from joining together, for example butter.

Olfactory systems
The receptors found in the back of the nose that are responsible for our sense of smell/aromas.

Oxidation
Substances pick up oxygen from the air; they then oxidise to undergo a chemical reaction, resulting in food losing freshness and colour.

Palatability
Reward provided by foods or fluids that are agreeable with regard to the satisfaction of nutritional, water, or energy needs.

Paired preference
People given two similar samples of food and they have to say which one they prefer.

Paring knife/vegetable knife
A small multi-purpose knife mainly used for slicing and dicing.

Pasteurisation
The process of heating a food to a specific temperature for a specific period of time in order to kill microorganisms that could cause disease, spoilage or undesired fermentation.

Phosphorous
Helps calcium to mineralise the teeth and bones.

Poaching
A method of cooking where food is cooked in a liquid that is just below boiling point. Conduction-convection.

Polysaccharide
A complex carbohydrate: many sugar molecules joined together, they do not taste sweet.

Polyunsaturated fats
Fats that contain several double or even triple bonds in the molecule.

Plasticity
The ability of fat to soften over a range of temperatures to hold its shape, or be shaped and spread.

Preservatives
Used to prevent food from spoilage by microorganisms; increases the shelf life of commodities.

Profiling
People asked to rate the intensity of a food product from 1–5 against a set of sensory descriptors.

Protein
A macronutrient that is essential to building muscle mass.

Protein alternatives
Manufactured protein food products consumed in place of meat or fish.

Proving
The last rising of the bread dough in its final shape before it is baked.

Radiation
A heating process that does not require physical contact between the heat source and the food being cooked. Instead, energy is transferred by waves of heat or light striking the food. Two kinds of radiation heat are used in the kitchen: infra-red and microwave.

Ranking
People asked to rank order samples of food according to a criteria.

Rating
People asked to rate a food sample for a specific characteristic.

Raising agents
An ingredient or process that introduces a gas into a mixture so that it rises when cooked.

Reduction
The process of simmering a liquid over heat until it thickens. It is also the name of the concentrated liquid that forms during this process.

Roasting
Convection-conduction, cooking foods in oil or fat in a hot oven.

Saturated fats
This type of fat is mostly from animal sources; they are normally solid fats. All of the carbon atoms in the fatty acid molecules are linked by single bonds.

Scientific principles
Demonstrates how science of the ingredients are at work in producing, processing, preparing, preserving, and metabolising foods.

Segment
To peel and pull apart, for example an orange.

Sensory properties
Smell, appearance and texture, mouth feel influence what we select to eat.

Sensory testing methods
A way of measuring the sensory qualities of food and is used by chefs, food manufacturers and retailers to analyse a food product.

Shallow frying
A quick method of cooking where a small amount of fat is used to cook food in a frying pan.

Shortening
The ability for fat to shorten the length of the gluten molecules in pastry or shortbread, for example butter, lard or other fat that remains solid at room.

Shred
To slice into long, thin strips.

Simmering
Water that is heated to just below boiling point.

Skewer
A long metal or wooden pin used to secure food on during cooking; to skewer is to hold together pieces of food using a metal or a wooden pin.

Sodium (salt)
Controls the amount of water in the body.

Snip
To cut (usually with a pair of scissors) with a small, quick stroke.

Stabilisers
Help stop substances separating again after they have been mixed stabilise an emulsion.

Starch
A polysaccharide, a complex carbohydrate.

Steaming
A method of cooking where food is cooked in the steam coming from boiling water. Conduction-convection.

Sterilised
Heated in sealed bottles to 110°C for 30 seconds

Stir-frying
A quick method of cooking where small pieces of food are fast-fried in a small amount of oil in a wok.

Taste receptors
Special cells on the tongue that pick up flavours.

Tasting panel
A process of testing foods. The process must be fair and realistic controlled conditions.

Temperature control
Range of temperature for the storage of food correctly.

Temperature probes
Give an accurate reading of the core temperature (centre) of the food. Food probes must be used correctly.

Triangle test
People given three samples of a food product to try. Two samples are identical, the third something is different; they need to discriminate between the samples.

Ultra Heat Treatment (UHT)
Heated very quickly in a heat exchanger to 72°C for 15 seconds cooked rapidly to below 10°c (normally 4°C).

Unsaturated fats
Fats that contain a high ratio of fatty acid molecules with at least one double bond. Unsaturated fats are normally liquid oil.

Vegan
People who do not eat flesh or any animal products. They can eat plant protein soya, TVP, tofu.

Vegetarian
A lacto-vegetarian diet includes dairy products and plants, and a lacto-ovo vegetarian diet includes eggs, dairy products and nuts.

Vitamin B2 (Riboflavin)
Enables energy to be released from carbohydrate, fat and protein in the body found in many foods, such as milk, eggs, rice. Deficiency is rare.

Vitamin B3 (Niacin)
Enables release of Vitamin C (ascorbic acid) needed for absorption of iron, to maintain body cells. Found in citrus fruits, green vegetables.

Vitamin B12
Works with folic acid, found in meat, fish fortified cereals.

Water based
Using liquid to transfer heat via convection.

Water in oil emulsion
Where liquid is suspended in oil or fat and prevents them from separating out, for example mayonnaise.

Water soluble vitamins
Soluble vitamins (the B group and vitamin C) in water of energy in the body. Found in wheat flour, eggs, milk some meats. Deficiency is called pellagra.

Yeasts
A microscopic fungus consisting of single oval cells that reproduce by budding, and capable of converting sugar into alcohol and CO2 gas. Also ferments in the correct conditions to make bread rise.

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.

TITLE BLOCK

The title block (T/B, TB) is an area of the drawing that conveys header-type information about the drawing, such as:

| Author	Drawing Number	Date	Title
Materials	Scale	Sheet Number	Measurement

BRITISH STANDARD BBS8888

BS8888 is a set of standards relating to the layout of technical drawings, the various ways of indicating required dimensions, the way in which tolerances and surface finishes are identified, as well as the recognised systems for adding other annotations, symbols, and abbreviations.

It works to allow interpretation of a technical drawing by persons with minimal engineering experience and even with limited grasp of the language in which the drawing was first created.

LINE TYPES

VISIBLE OBJECT LINES ————————

HIDDEN LINES — — — — — — —

SECTION LINES ————————

CENTERLINES — · — · — · — · —
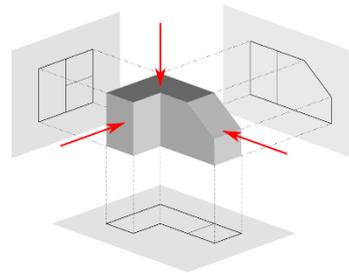
MULTI VIEW PROJECTION

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.
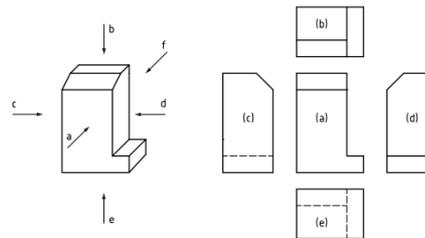
THIRD ANGLE PROJECTION METHOD (above)

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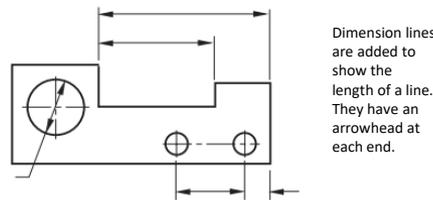
Dimension lines are added to show the length of a line. They have an arrowhead at each end.

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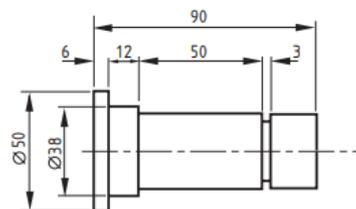
SI BASE UNITS

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

Les professions / Jobs

Français	English
Ma mère/Mon père est …	My mum/dad is a(n) …
Je voudrais être …	I would like to be a(n) …
acteur/-trice	actor/actress
agent de police	policeman/woman
agriculteur/-trice	farmer
architecte	architect
boucher/-ère	butcher
boulanger/-ère	baker
caissier/-ère	cashier
coiffeur/-euse	hairdresser
créateur/-trice de mode	fashion designer
dentiste	dentist
directeur/-trice	director
électricien(ne)	electrician
employé(e) de bureau	office worker
facteur/-trice	postman/postwoman
fonctionnaire	civil servant
infirmier/-ère	nurse
informaticien(ne)	computer scientist
ingénieur(e)	engineer
journaliste	journalist
maçon(ne)	builder
mécanicien(ne)	mechanic
médecin	doctor
professeur	teacher
secrétaire	secretary
serveur/-euse	waiter/waitress
soldat	soldier
steward/hôtesse de l'air	flight attendant
vendeur/-euse	sales assistant
vétérinaire	vet

L'orientation / Career paths

Français	English
Dans quel secteur voudrais-tu travailler?	In which area would you like to work?
l'audiovisuel et les médias	audiovisual and media
l'informatique et les télécommunications	IT and telecommunications
l'hôtellerie et la restauration	hotel and catering
les arts et la culture	arts and culture
le commerce	business
le sport et les loisirs	sport and leisure
la médecine et la santé	medicine and health
les sciences et les technologies	science and technology
Ça m'intéresserait de travailler dans …	I would be interested in working in …
Mon rêve serait de faire carrière dans …	My dream would be to have a career in ….
Mon ambition/Mon but est de trouver un poste dans …	My ambition/aim is to find a job in …
Le secteur/L'orientation qui m'attire/ m'intéresse (le plus), c'est …	The sector/career path that attracts/ interests me (the most) is ….
L'important pour moi est d'avoir un métier bien payé.	The important thing for me is to have a well-paid job.
Le plus important est de ….	The most important thing is to …
faire quelque chose de satisfaisant/ stimulant/gratifiant/d'intéressant	do something satisfying/ stimulating/rewarding/interesting
faire quelque chose pour améliorer la société/aider les autres	do something to improve society/ help others

Les ambitions / Ambitions

Français	English
Avant de continuer mes études, …	Before I continue my studies …
Après avoir terminé mes examens, …	After having finished my exams …
Après avoir quitté le collège, …	After having left school …
Plus tard/Un jour, …	Later on/One day, …
Je veux/J'aimerais/Je préférerais/ J'espère …	I want/I would like/I would prefer/ I hope to …
J'ai envie de/d' …	I want to …
J'ai l'intention de/d' …	I intend to …
Mon rêve serait de/d' ….	My dream would be to ….
aller à l'université/à la fac	go to university
entrer en apprentissage	do an apprenticeship
faire du bénévolat/travail bénévole	do charity/voluntary work
prendre une année sabbatique	take a gap year
J'espère me marier/me pacser.	I hope to get married/register a civil partnership.
J'ai l'intention de faire le tour du monde.	I intend to travel round the world.
Mon but est de fonder une famille.	My aim is to start a family.
Je ne veux pas avoir d'enfants.	I don't want to have children.
Je n'ai aucune intention de m'installer avec mon copain/ma copine.	I have no intention of moving in with my boyfriend/girlfriend.

Semaine 2

Français	English
Le salaire a moins d'importance/est très important pour moi.	The salary is less very important to me.
À mon avis, c'est un secteur d'avenir.	In my opinion, it's an area with prospects.
Je suis … depuis (trois) ans.	I have been a … for (three) years.
C'est un métier (stimulant).	It's a (stimulating) job.
La chose qui me plaît le plus, c'est …	What I like best is …
L'inconvénient, c'est que …	The disadvantage is that …
les horaires sont très longs	the hours are very long
c'est fatigant	it's tiring
Le mieux/pire, c'est ….	The best/worst thing is …
Je suis assez satisfait(e) de mon travail.	I'm quite satisfied with my job.
Avant, j'étais/je travaillais comme …	In the past, I was/worked as …
C'était affreux/stressant/mieux/pire.	It was awful/stressful/better/worse.
C'était mal payé.	It was badly paid.
Le travail était monotone.	The work was monotonous.
Il n'y avait aucune possibilité d'avancement.	There was no chance of promotion.
Je m'entendais mal avec mon patron.	I didn't get on well with my boss.
J'ai décidé de (suivre une formation).	I decided to (take a course).
Maintenant, je suis diplômé(e).	Now I am qualified.
Mon nouveau boulot est (plus créatif).	My new job is (more creative).
Mes collègues sont tous très sympa.	My colleagues are all very nice.

Année 11 Higher

Les langues / Languages

Français	English
Tu parles quelles langues?	Which languages do you speak?
Je parle bien/couramment/un peu/mal ...	I speak … well/fluently/a bit/badly,
Je me débrouille en ...	I get by in ...
Ma mère parle ...	My mother speaks. ...
Mon beau-père se débrouille en ...	My stepfather gets by in ....
Actuellement, ma sœur apprend....	Currently, my sister is learning ...
l'allemand	German
l'anglais	English
l'arabe	Arabic
le français	French
l'espagnol	Spanish
l'italien	Italian
le japonais	Japanese
le mandarin	Mandarin
le portugais	Portuguese
le russe	Russian
Mon frère ne parle aucune langue étrangère.	My brother doesn't speak any foreign languages.
Ma grand-mère parle seulement le hindi.	My grandmother only speaks Hindi.
évidemment	obviously
actuellement	currently
naturellement	naturally, of course
vraiment	really
seulement	only
bien	well
mal	badly
mieux	better
Savoir parler des langues ...	Knowing how to speak languages …
est indispensable pour certaines professions	is indispensable for certain jobs
ne sert à rien pour d'autres	is of no use for others
donne plus de possibilités de carrière	provides more career possibilities
est un atout	is an asset
On peut trouver plus facilement un bon emploi dans un autre pays.	You can find a job more easily in another country.
On comprend mieux sa propre langue.	You understand your own language better.
On a plus de chances d'obtenir une promotion.	You have more chance of promotion.
On peut mieux connaître les gens et la culture d'un pays.	You can get to know the people and culture of a country better.
On peut voyager/se faire des amis partout dans le monde.	You can travel/make friends all over the world.

Au téléphone / On the telephone

Français	English
Allô?	Hello?
Je voudrais parler avec ...	I would like to talk to ...
Sa ligne est occupée.	His/Her line is busy.
Est-ce que je peux laisser un message?	Can I leave a message?
Je vais vous transférer vers sa messagerie vocale	I will transfer you to his/her voicemail.
Ne quittez pas.	Stay on the line.
Je vous le passe.	I'll pass you over to him/her.
Je peux vous être utile?	Can I help you/be of help?
Au revoir!	Goodbye!

Un entretien d'embauche / A job interview

Français	English
Enchanté.	Pleased to meet you.
Asseyez-vous.	Sit down.
Parlez-moi un peu de ce que vous faites actuellement.	Talk to me a little bit about what you are doing at the moment.
Actuellement, je suis (au lycée).	At the moment, I am (in sixth form college).
Je suis en train de (préparer le baccalauréat/mes examens de GCSE).	I am in the middle of (preparing to take my baccalauréat/ my GCSE exams).
Quelles matières étudiez-vous?	What subjects are you studying?
J'étudie (huit) matières, dont (l'EPS).	I'm studying (eight) subjects, including (PE).
Qu'est-ce que vous ferez après vos examens?	What will you do after your exams?
Si je réussis mes examens, j'espère (aller à l'université).	If I pass my examens, I hope (to go to university).
J'aimerais également (prendre une année sabbatique).	I would also like (to take a gap year).
Pourquoi vous intéressez-vous à ce poste?	Why are you interested in this position?
Je crois que ce serait une bonne expérience pour moi.	I think it would be a good experience for me.
Quelles sont les qualités personnelles que vous apporteriez à ce poste?	What personal qualities would you bring to this position?
Je suis quelqu'un de (bien organisé/ de très motivé/de créatif).	I am a (well organised/very motivated/ creative) person.

Mon boulot dans le tourisme / My job in tourism

Français	English
Je suis étudiant(e) en ...	I am studying ...
J'apprends à devenir. ...	I'm learning to become ...
Il y a six mois, j'ai commencé à travailler dans/chez/en ...	Six months ago I started work in/ with ....
Je voudrais travailler à plein temps/ mi-temps dans (le tourisme).	I would like to work full-time/ part-time in (tourism).
Lorsque j'étais plus jeune, je rêvais d'être (infirmier/-ière).	When I was younger, I dreamed of being a (nurse).
J'ai décidé de changer d'orientation à cause de ...	I decide to change direction because of ...
Mon travail consiste à (accueillir les clients).	My work involves (welcoming clients).
Je m'occupe aussi (des réservations).	I also take care of (reservations).
Je vends (des billets).	I sell (tickets).
Je suis passionné(e) par mon travail.	I am passionate about my job.
J'apprécie surtout (le contact avec les gens).	I particularly enjoy (dealing with people).
Le seul inconvénient de mon métier, c'est que ...	The only disadvantage of my job is that....
Pour faire ce métier, il faut ...	To do this job you have to ...
savoir parler d'autres langues	know how to speak other languages
Plus tard/Quand je serai diplômé(e), ...	Later on/When I am qualified ....
je partirai en vacances	I will go on holiday
j'essaierai d'apprendre le japonais	I will try to learn Japanese

Les mots essentiels / High-frequency words

Français	English
au sujet de	about, on the subject of
avant tout	above all
malgré	despite, in spite of
non seulement	not only
plus tard	later
plutôt	rather, instead
quant à ...	regarding ...., as for ...

Semaine 4

Semaine 5

Semaine 6

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LEARNING - LOVING - LIVING

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Ce qui me préoccupe — What worries me

Français	English
Ce qui est important pour moi dans la vie, c'est d'abord …	The most important thing to me in life is above all …
Ensuite, c'est …	Then it's …
le sport	sport
la musique	music
ma santé	my health
ma famille	my family
l'argent (m)	money
mes études	my studies
mes animaux	my pets
mes amis	my friends
Ce qui me préoccupe/m'inquiète (le plus), c'est …	What worries me (the most) is …
l'état (m) de la Terre	the state of the Earth/planet
le réchauffement climatique	global warming
la pauvreté dans le monde	world poverty
l'injustice (f)	injustice
l'environnement (m)	the environment
les sans-abri	homeless people
les personnes qui sont emprisonnées à tort	people who have been wrongly imprisoned
les enfants qui n'ont pas assez à manger	children who don't have enough to eat
On peut/Il est possible de …	You can/It's possible to …
parrainer un enfant en Afrique	sponsor a child in Africa
faire un don à une association caritative	donate to a charity
faire du bénévolat	do voluntary work
Il faut …	We must/You have to …
lutter contre la faim	fight against hunger/famine
lancer des pétitions	launch petitions
écrire à son/sa député(e)	write to your MP
participer à des manifestations	take part in demonstrations
agir maintenant	act now
faire des campagnes de sensibilisation	carry out campaigns to raise awareness
Il ne faut pas ignorer (ces gens).	We must not ignore (these people).

Semaine 1

Notre planète — Our planet

Français	English
Le plus grand problème pour la planète, c'est …	The greatest problem for the planet is …
le changement climatique	climate change
le déboisement	deforestation
la destruction de la couche d'ozone	the destruction of the ozone layer
la destruction des forêts tropicales	the destruction of tropical rainforests
la disparition des espèces	species dying out
la guerre	war
le manque d'eau douce	the lack of fresh water
la pollution de l'air	air pollution
la sécheresse	drought
la surpopulation	overpopulation
un incendie (m)	a fire
une fuite de pétrole	an oil spill
des inondations (f)	flooding/floods
un tremblement de terre	an earthquake
un typhon	a typhoon

Semaine 2

Protéger l'environnement — Protecting the environment

Français	English
Que devrait-on faire pour sauver notre planète?	What should we do to save our planet?
Actuellement, je ne fais pas grand-chose pour protéger l'environnement.	Currently, I don't do much to protect the environment.
Je fais déjà pas mal de choses.	I already do quite a lot.
Je pourrais/On devrait …	I could/We ought to …
trier les déchets	separate the rubbish
faire du compost à la maison	make compost at home
éteindre les appareils électriques et la lumière en quittant une pièce	turn off appliances and the light when leaving a room
baisser le chauffage et mettre un pull	turn down the heating and put on a sweater
utiliser du papier recyclé	use recycled paper
éviter les produits jetables	avoid disposable products
acheter des produits verts	buy green products
privilégier les produits bio	where possible, choose organic products
utiliser les transports en commun	use public transport
favoriser le covoiturage	encourage car-sharing
aller au collège à vélo	go to school by bike
refuser les sacs en plastique	turn down plastic bags
apporter une bouteille d'eau au lieu de prendre un gobelet jetable	carry a bottle of water instead of using disposable cups
récupérer l'eau de pluie pour arroser le jardin	collect rainwater for watering the garden
fermer le robinet pendant qu'on se lave les dents	turn off the tap while you brush your teeth
boire l'eau du robinet	drink tap water
prendre une douche au lieu de prendre un bain	have a shower instead of having a bath
tirer la chasse d'eau moins fréquemment	flush the toilet less frequently
faire plus	do more

D'où vient ton tee-shirt? — Where does your T-shirt come from?

Français	English
Les produits pas chers sont souvent fabriqués dans des conditions de travail inacceptables.	Cheap products are often made in unacceptable working conditions.
Les ouvriers sont sous-payés.	The workers are underpaid.
Leur journée de travail est trop longue.	Their working day is too long.
Si un produit est bon marché, je ne l'achète pas.	If a product is cheap, I don't buy it.
Trop de travailleurs sont exploités/exposés à des risques.	Too many workers are exploited/exposed to risks.
À mon avis, on devrait …	In my opinion, people should …
boycotter les grandes marques qui ne respectent pas leurs ouvriers	boycott big brands that don't respect their workers
forcer les grandes marques à garantir un salaire minimum	force big brands to guarantee a minimum wage
acheter des habits issus du commerce équitable	buy fairly traded clothes
acheter des vêtements fabriqués en France	buy clothes made in France
réfléchir à l'impact sur l'environnement	think about the impact on the environment
essayer de respecter l'homme et l'environnement à la fois	try to respect mankind and the environment at the same time

Semaine 3

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Semaine 4

Faire du bénévolat — Volunteering

Français	English
Ça me permet d'élargir mes compétences.	It allows me to expand my skills.
Ça me donne plus confiance en moi.	It gives me more confidence in myself/ makes me feel more confident.
Ça me donne le sentiment d'être utile.	It makes me feel useful.
C'est important de participer à la vie en société.	It's important to participate in society.
On a la responsabilité d'aider les autres et de ne pas se focaliser sur soi-même.	We have a responsibility to help others and not focus on ourselves.
Il y a beaucoup de personnes qui ont besoin d'un peu de gentillesse.	There are lots of people who need a little kindness.
Je travaille ….	I work…
sur un stand d'Oxfam	on an Oxfam stand
dans un refuge pour les animaux	in an animal sanctuary
Je fais partie de l'organisation X.	I'm a member of X.
Je rends visite à une personne âgée.	I visit an elderly person.
Je participe à des projets de conservation.	I take part in conservation projects.
J'aide des enfants du primaire à faire leurs devoirs.	I help primary school children to do their homework.
Je soigne les animaux.	I look after/treat animals.
Je soutiens les SDF.	I support homeless people.
On s'adresse aux …	We appeal to …
sensibiliser	to raise awareness
prendre conscience de	to become aware of
soigner	to look after, treat
accueillir	to welcome
affronter	to face, confront
soutenir	to support

Semaine 5

Les grands événements — Big events

Français	English
Un avantage de cet événement, c'est que ….	An advantage of this event is that …
D'un côté, ça …	On the one hand, it …
En plus, ça …	What's more/Moreover, it …
met en avant la culture	promotes the culture
met en avant la ville hôte	promotes the host city
crée un sentiment de fierté nationale	creates a sense of national pride
permet aux gens de passer un bon moment	allows people to have a good time
encourage la pratique du sport	encourages participation in sport
unit les gens	unites people
donne des modèles aux jeunes	gives young people role models
crée du travail	creates jobs
attire des touristes	attracts tourists
Cependant, …	However, …
Un inconvénient, c'est que …	A disadvantage is that …
D'un autre côté, ….	On the other hand, ….
Par ailleurs, ….	What's more, ….
les ouvriers qui construisent les stades sont souvent exploités	the workers who build the stadiums are often exploited
les prix augmentent	prices rise
la ville hôte est souvent endettée après l'événement	the host city is often in debt after the event
ça laisse une empreinte carbone très importante	it leaves a significant carbon footprint
J'estime/Je trouve/Je suis persuadé(e) que/qu' …	I reckon/find/am convinced that …
il y a du pour et du contre	there are pros and cons
les festivals sont une chose positive/ négative pour un pays/une région	festivals are positive/negative for a country/region
les panneaux solaires	solar panels
les toilettes sèches	dry toilet
les véhicules électriques	electric vehicles
le papier recyclé	recycled paper

Semaine 6

Les mots essentiels — High-frequency words

Français	English
à part tout cela	apart from all that
bien que (+ subjunctive)	although
ceci dit	that said,…
comme ça …	in this way …
du coup, …	as a result, …
en ce qui concerne …	as far as … is concerned
en même temps	at the same time
en train de	in the process of (doing)
il s'agit de	it's about, it's a matter of
pas mal de	quite a lot of
quotidiennement	daily
tel(le)(s) que	like, such as
tout le monde	everyone

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 than individual values 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
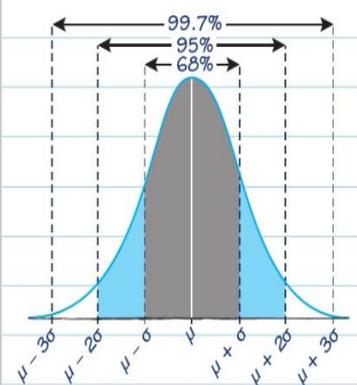
Probability distributions

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 mean 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 $\sigma = \dfrac{16.5 - 13.5}{2} = 1.5$

b)
$$\dfrac{18 - 13.5}{1.5} = 3$$

Probability $= \dfrac{100 - 99.7}{2} = 0.15\%$

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 $\pm2\sigma$ of the mean μ • 99.7% of values are within $\pm3\sigma$ of the mean μ
Standardised scores	$\dfrac{\text{value} - \text{mean}}{\text{standard deviation}} = \dfrac{x - \mu}{\sigma}$
Control charts	

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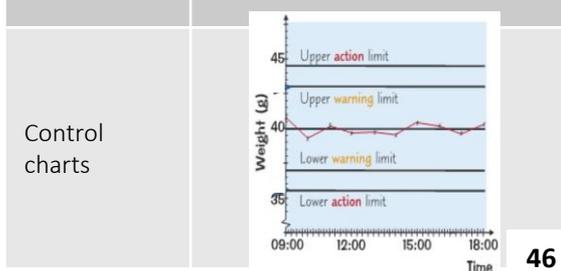
Important Ideas

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	Choose your hypothesis, what to collect, and how to record and use it
Collecting data	Choose data sources and collections methods, identifying any constraints
Processing and presenting data	Choose 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 $x = \dfrac{400 \times 270}{180}$ $= 600$

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, 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