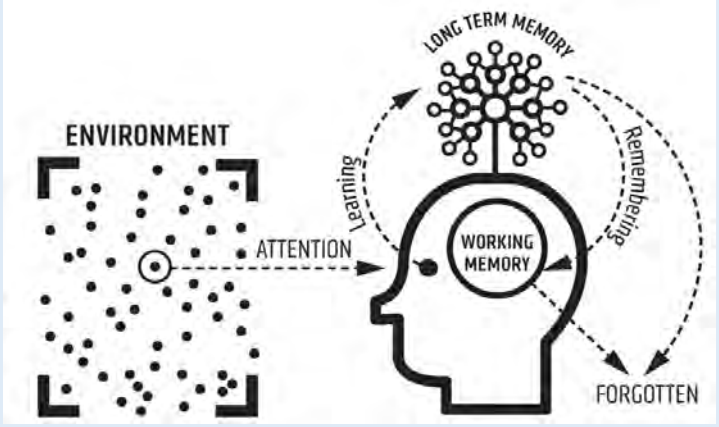
Knowledge Organiser Booklet Year 10 Term 3 Core

Our working memories can only store a limited amount of information, whereas our long term memories can store limitless information. To learn successfully, we need to store core knowledge into our long term memories, so we can retrieve it when we need it.

For instance, if you are at work or in the shops and need to work out a 25% discount, you can't memorise 25% of every number, so you need to be able to quickly recall the method for calculating a percentage. Committing core knowledge to our long-term memories is a life-hack. It makes thinking about difficult things easier.

Using a knowledge organiser with regular retrieval activities is a way for you to store core knowledge & subject specific words, into your long term memory so it is there when you need it.

Click here to be taken to the knowledge organiser part of the school website.



Contents

Clicking on the subjects below will take you directly to the knowledge organisers for each subject. These are to support learning that has taken place this past term. Use these to help reinforce the key knowledge. Use some of the strategies explained in the introduction to help you retain this important information.

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Blended Learning Expectations

Make sure you have **access to a computer at home** (If you don't please make pastoral staff aware or email langley.homelearning@taw.org.uk)

Download Microsoft Teams on both your phone and computer. (If you don't know how to do this please ask a member of staff or do this in your next computing lesson)

Spend at least 2 hours a week using teams EVERY WEEK. (Engagement in teams can be tracked and monitored). You need to be accessing each of your class teams and recapping on the previous learning or completing additional tasks set by your class teacher.

If you have any issues with teams (e.g. login problems or missing classes etc then please email langley.homelearning@taw.org.uk)

Teams is a tool to support ongoing learning and should **only be used for educational purposes.**

How to complete homework your teacher has set

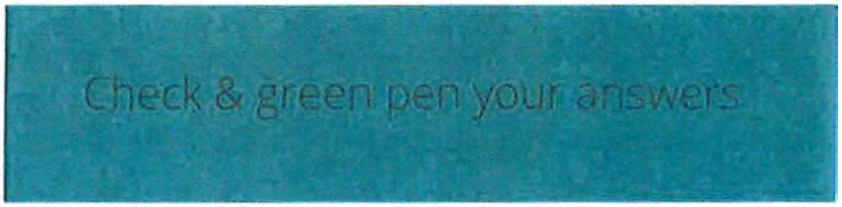
	LOOK, COVER, WRITE, CHECK	DEFINITIONS TO KEY WORDS	FLASHCARDS	DUAL CODING
STAGE 1	Look at & study an area of your knowledge organiser	Write down the key words & definitions	Write key words, dates/formulae, equations/quotes on one side & answers on the other	Draw pictures/diagrams/ cartoon strips
STAGE 2	Cover up your knowledge organiser and write everything you remember	Cover up the definitions. How many can you remember? Repeat.	Include pictures or diagrams if it helps. Read through them.	Label your pictures/diagrams/ cartoon strips
STAGE 3	Check. Correct mistakes in green and add anything you missed. Repeat	Check. Correct mistakes in green pen. Which ones do you find hard to remember?	Test yourself and get someone to test you.	Explain out loud to yourself or family/friend what your images show

	SELF QUIZZING	MINDMAPS	PAIRED RETRIEVAL	SPEAK, COVER, WRITE, CHECK
STAGE 1	Use your knowledge organiser to create quiz questions.	Create a mindmap of everything you can remember from your knowledge organiser	Give a family member/friend the knowledge organiser to hold	Read out loud the information from the knowledge organiser several times.
STAGE 2	Write down the answers to your quiz	Check your knowledge organiser & use a green pen to make any corrections.	Get them to test you using the knowledge organiser	Cover up your knowledge organiser and write everything you remember
STAGE 3	Keep self-quizzing until you get all the answers correct	Add additional information to your mindmap or make connections to other knowledge	Write down your answers to their questions	Check. Correct mistakes in green and add anything you missed. Repear.

Retrieval Placemat

Look at your knowledge organiser. Now cover it up and write down Key vocabulary & definitons from memory:

First time: Look. Cover. State 3 facts	Second time: Look. Cover. State 3 facts	Third time: Look. Cover. State 3 facts



Look at the knowledge organiser again. Now cover it up and without looking, explain a concept or idea in your own words

Re-read your answer above. Look at the knowledge organiser again. Now cover it up and improve on your previous explanation in green pen.

Retrieval Relay

Look at your knowledge organiser. Now cover it up.

First time: Write down everything you can remember

Second time: Look. Cover. Write down everything you can remember

Third time: Look. Cover. Write down everything you can remember

Write down everything here that you didn't remember:

Vocabulary focus 1

Look at your knowledge organiser. Select a key word and write it here:

Write a definition of the key word in your own words - not the same as the one on the knowledge organiser:

Write a sentence with the key word in it:

Create a question where the key word is the answer:

What other words are connected to this key word?

Draw a picture or diagram to help you remember this key word:

Vocabulary focus 2

Definition:

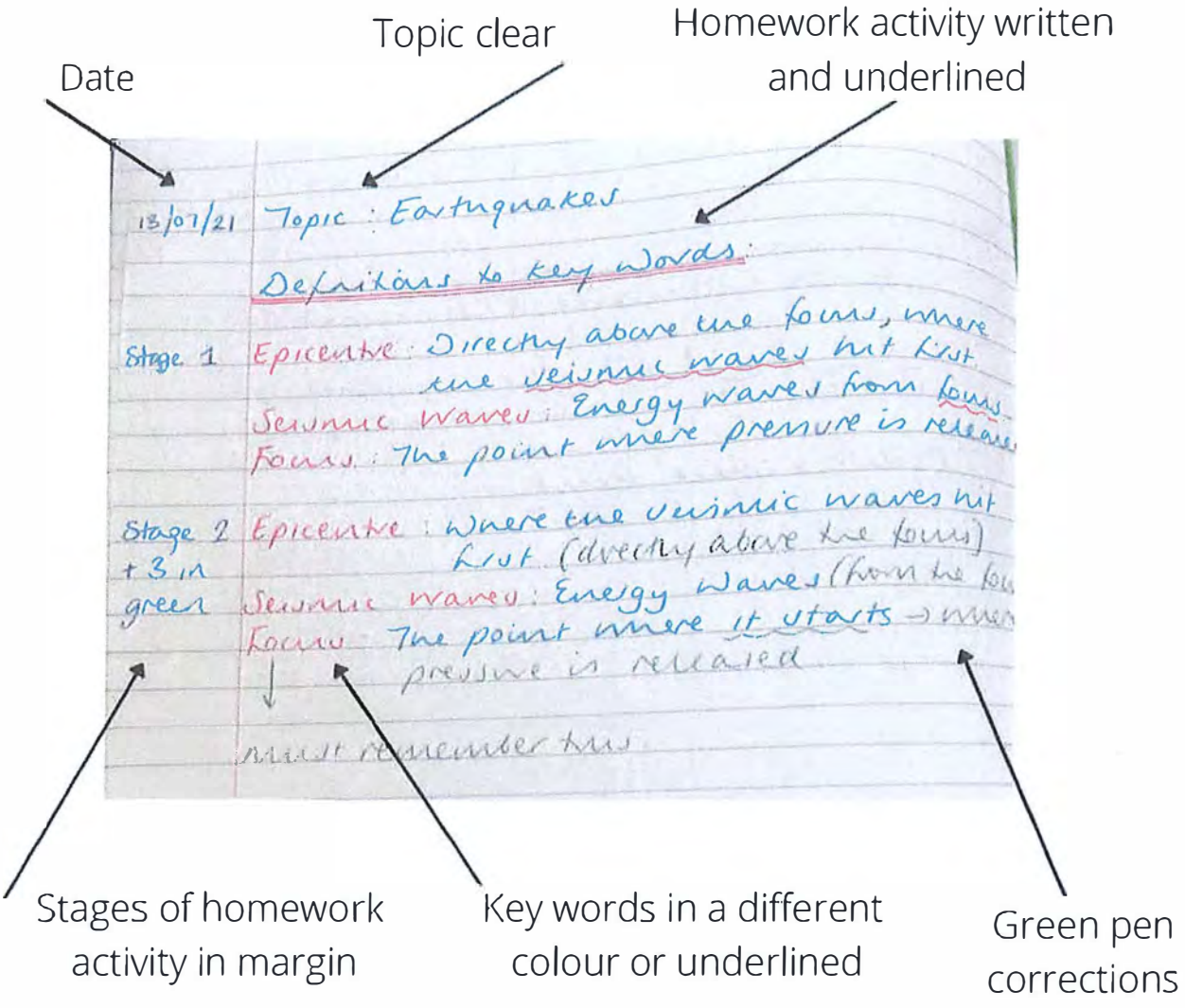
Characteristics:

Key word:

Examples:

Non-examples:

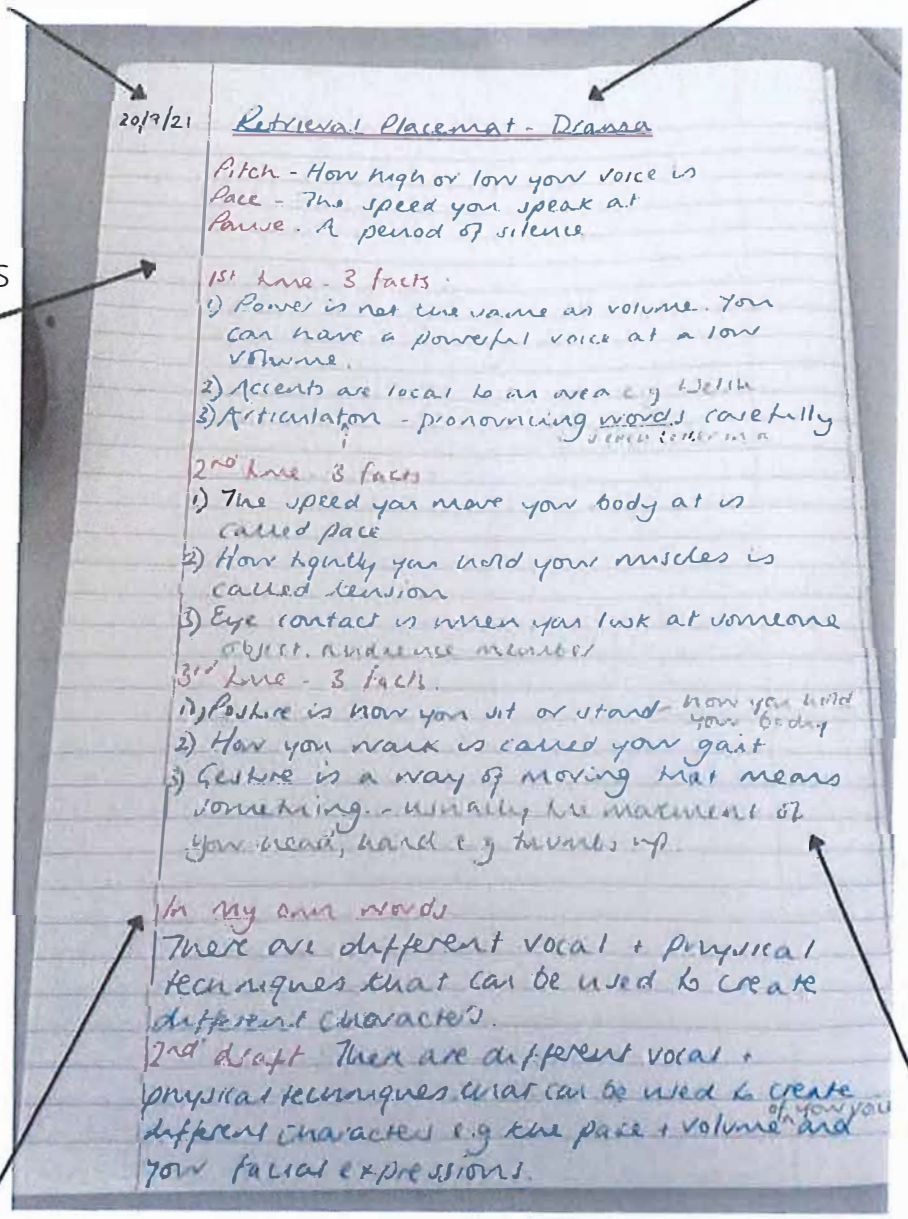
What should my knowledge organiser homework look like?



What should my knowledge organiser homework look like?

Homework activity written and underlined

Date



Key words in a different colour

Green pen corrections

Stages of homework activity as subtitles

Biology

Variation

Threshold Concept

All living things need to change to live.

Keywords

Variation……. any difference between the individuals in a species or groups of organisms of any species

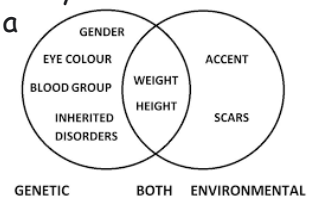
Evolution ……. the change in the characteristics of a species over several generations and relies on the process of natural selection

Adaptation……. the adjustment of organisms to their environment in order to improve their chances at survival in that environment

Natural Selection……. the process through which populations of living organisms adapt and change

Variation

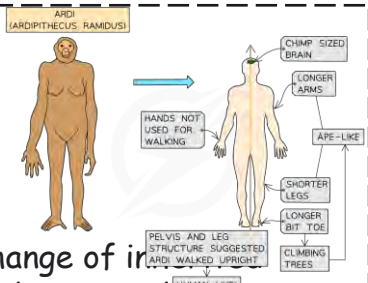
Individuals in a population are usually similar to each other, but not identical. Some of the variation within a species is genetic , some is environmental - the conditions in which they have developed and some is a combination of both



Natural Selection

In any environment, the individuals that have the best adaptive features are the ones most likely to survive and reproduce

Evolution



Evolution is the change of inherited characteristics within a population over time through natural selection, which may result in the formation of a new species

Five main processes that lead to evolution:

-mutation
-non-random mating
-gene flow
-finite population size (genetic drift)
-natural selection.

Selective Breeding

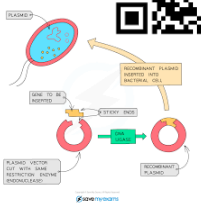
Selective breeding or artificial selection is when humans breed plants and animals for particular genetic characteristics. Humans have bred food crops from wild plants and domesticated animals for thousands of years

Fossils

A fossil is the preserved remains of a dead organism from millions of years ago. **Evidence for early forms of life comes from fossils**. By studying fossils, scientists can learn how much (or how little) organisms have changed as life developed on Earth

Genetic Engineering

Genetic engineering involves modifying the genome of an organism by introducing a gene from another organism to result in a desired characteristic



Required Practical

Equations for this topic

Chemistry

Making salts

Threshold Concept

How do metals and acids react to make salts and water

Keywords

Reactivity – the ability for an atom or molecule to undergo a chemical reaction
Salt – a substance made of positive and negative ions
Sulphuric acid – an acid that contains sulphate ions
Nitric acid – an acid that contains nitrate ions
Hydrochloric acid – an acid that contains chloride
Balanced – equal on both sides
Symbol equation – a chemical equation using chemical symbols
Acidic – a solution that contains H^+ ions
Alkaline – a solution that contains OH^- ions

Neutralisation

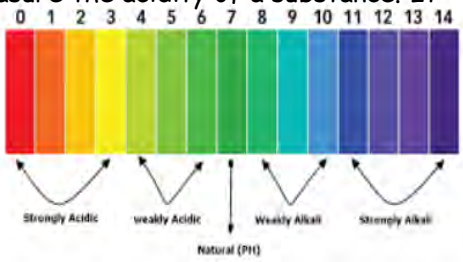
When an acid and alkali react they form neutral product water.
The H+ ions from the acid react with the OH- ions from the alkali to form water.
This can be represented using the following ionic equation:

$$H^+ + OH^- \rightarrow H_2O$$

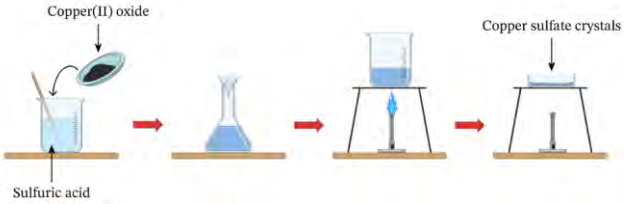
The pH scale

Acids contain H^+ ion and alkalis contain OH^- ions. The pH scale is used to measure the acidity of a substance. It ranges from 0-14.

Acidic = pH < 7
Neutral = pH 7
Alkaline = pH > 7



Making salts required pract



$$CuO(s) + H_2SO_4(aq) \longrightarrow CuSO_4(aq) + H_2O(l)$$

Reactions of acids

Acids react with metals, alkalis and carbonates to form a salt and either hydrogen, water or water and carbon dioxide. Each acid forms a different salt.

Acid Used	Salt Produced
hydrochloric	chloride
nitric	nitrate
sulfuric	sulfate

acid + metal → salt + hydrogen

hydrochloric acid + zinc → zinc chloride + hydrogen

$2HCl + Zn \rightarrow ZnCl_2 + H_2$

acid + alkali → salt + water

nitric acid + sodium hydroxide → sodium nitrate + water

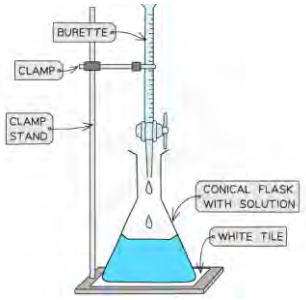
$HNO_3 + NaOH \rightarrow NaNO_3 + H_2O$

acid + carbonate → salt + water + carbon dioxide

sulfuric acid + zinc oxide → zinc sulfate + water

$H_2SO_4 + ZnO \rightarrow ZnSO_4 + H_2O$

Titration req prac (triple)



Redox reactions (higher tier)

Redox reactions are when oxidation and reduction (in terms of electron transfer) take place at the same time.

For example:

$2H^+ + Ca \longrightarrow Ca^{2+} + H_2$

The ionic equation can be further split into two half equations.

$Ca \longrightarrow Ca^{2+} + 2e^-$

Oxidation is loss of electrons.

$2H^+ + 2e^- \longrightarrow H_2$

Reduction is gaining of electrons.

Strong and weak acids

Strong acids are acids that fully ionise in water

$$HCl \longrightarrow H^+ + Cl^-$$

Weak acids are acids that partially ionise in water

$$CH_3COOH \rightleftharpoons H^+ + CH_3COO^-$$

English Language

Threshold Concept- Year 10- Language- Reading:

TC1 -Understanding texts: identifying explicit and implicit information; selecting accurate and precise quotations.

TC2 – Demonstrate and appreciation of the writer's craft through analysis and critically evaluative comments.

TC4 – Evaluate writer's craft including comparison skills.

Showing your understanding of texts- use PEEZL to structure your answers.

Point- rephrase key words from question to start your answer.

Evidence- introduce quotation(s). Mention techniques here!

Explanation- explain what quotations shows.

Zoom- pick a single word choice made by the writer and explain what it implies.

Link to reader – mention how reader may react and why.

You should use this info to get the base knowledge needed to confidently answer the different types of question on component 1 and 2.

Frequent, short quotations weaved into your answers and explained will make your work even more successful!

Component 1, Question 2 response- 5/5 marks.

The writer creates the impression that there is a misunderstanding between the characters of Emma and Robbie. For example the writer describes how Robbie "was well known for his grumpiness", yet "Emma mistook it for shyness". The fact that Emma mistakes his grumpy attitude for being shy emphasises how the couple do not fully understand each other as they misinterpret each other's behaviour.

The writer also creates the impression that Emma and Robbie are both very different people. Whilst Robbie is "twenty years older than her" and quite grumpy, Emma is impressionable and slightly naive as she believes "he was more mature than he was" as a result of his sulking attitude. This impression is reiterated when the writer explains how after a week "Emma was feeling the need for some time apart from Robbie". This highlights the distant nature of their relationship and suggests it may not be as strong or loving as she believes.

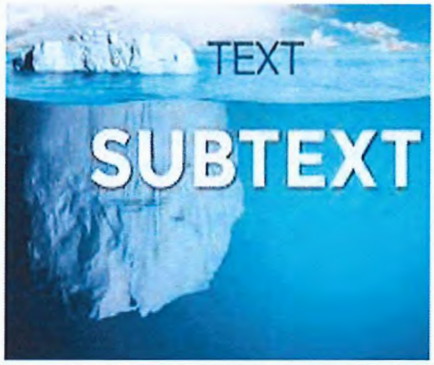
Expressing higher order ideas in explanations (for analysis/evaluation).

Text = what is directly written in a piece of Literature.

(Don't include in your explanations- you'll just be repeating yourself/ retelling the story.)

Subtext = the meanings beneath the surface of what is written.

These are the thing that show you are thinking deeply about the writer's choices.



What happens.

Connotations of words.

Implied emotions of characters.

Alternative interpretations.

Writer's intentions.

Use this to transform your responses from this…

The quotation: "as strong as a bull" reflects that the man is like a strong cow. X

To this…

The quotation "as strong as a bull" shows that the man in question is a powerful physical specimen. It may also reflect the man is mentally tough, perhaps even stubborn. The noun "bull" might reflect the writer's intention to show that the man is aggressive, perhaps foreshadowing harm he does to others later in the story. ✓

Identifying language and structural features.

0 2 Read lines 7-16.

What impressions does the writer create of Emma and Robbie in these lines? [5]

You must refer to the language used in the text to support your answer, using relevant subject terminology where appropriate.

Whenever you see the highlighted words, try to identify and mention the writer's technique choices in your essays.

Common language techniques	Common structural features
Simile Metaphor Personification Adjective Adverb	Lists Repetition of words Lexical (word) patterning Repetition of a technique Tone shift

Make sure you can confidently identify these!

Use this to transform your responses from this…

The quotation: "as strong as a bull" shows…

To this…

The quotation: "as strong as a bull" is a simile, which shows…

Comparing successfully- using comparative connectives.

Words that signal a comparison	Words that signal a contrast
As	however
Also	Although
Like	Whereas
Alike	In contrast
Likewise	Yet
Resembles	Differs from
Similar	Instead
Just as	Unlike
Just like	On the contrary
Equally	Different from
Same both	On the other hand

Platinum answers may include: The words "more" "less" regularly AND comparative adjectives.

Words that end in 'er' that compare two things i.e. greater.

Use these frequently when comparing non-fiction texts.

Make sure you clearly mention which specific text you are discussing every time.

Both the `Penny Review` and the Chilean mining article finish with the miners being rescued. This creates a sense of drama as the rest of the texts build up tension and anticipation for their rescue. However, in the Chilean article the day of the rescue is also mentioned at the beginning: the "scenes of jubilation erupted" as the miners were rescued. This dramatic verb `erupted` portrays the excitement and

Threshold Concept- Year 10- Writing:

TC5 - Communicate clearly, effectively, and imaginatively, selecting and adapting tone, style and register for different forms, purposes and audiences.

TC6 - Organise information and ideas, using structural and grammatical features to support coherence and cohesion of texts

TC7 - Use a range of sentence structures for clarity, purpose and effect, with accurate punctuation and spelling.

Vocabulary:

Common word	Better word
Big	Vast
Small	Microscopic
Happy	Elated
Sad	Melancholy
Scary	Blood-curdling
Scared	Petrifying
Loud	Thunderous
Quiet	Soundless
Said	Declared
Red	Vermillion

Ask yourself these questions:

-Do I know, use and spell correctly plenty of better words for common words?

-Do I push myself to use more ambitious words in all my work- not just English?

To be a successful writer, you need to juggle all of these different skills.

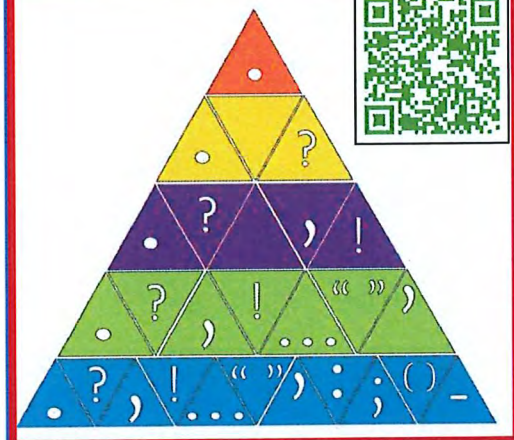
Techniques:

Ask yourself these questions:

-Do I know what all these techniques are?

-Do I use a range of these (and maybe even some others!) in my own writing?

Punctuation:



Ask yourself these questions:

-Am I aware of the function and when to use each of these pieces of punctuation?

-Do I consistently use all these pieces of punctuation in my writing?

Structure:

For fiction texts- SCIT:

40 min successful plot structure- SCIT.

Section 1: Describe the setting.

Section 2: Describe the main character.

Section 3: Describe ONE incident.

Section 4: Describe how the setting/character has now transformed.

For non-fiction texts- PAF:

Purpose	WHY you are writing your non-fiction text.	Inform, persuade, advise, review, entertain.
Audience	WHO you are writing to/for.	Wide audience, council, parents, tourists, teenagers.
Form	WHAT you are writing and HOW it is uniquely laid out.	Letter, magazine article, newspaper article advertisement, speech.

Ask yourself these questions:

- Does my writing achieve what I want it to?
- Do I adapt my writing (i.e. word/language choices) based on the task I am set?

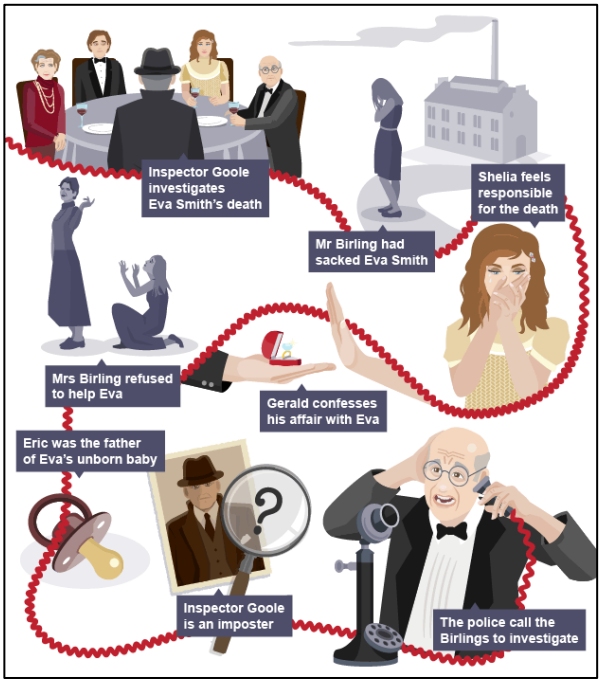
English Literature

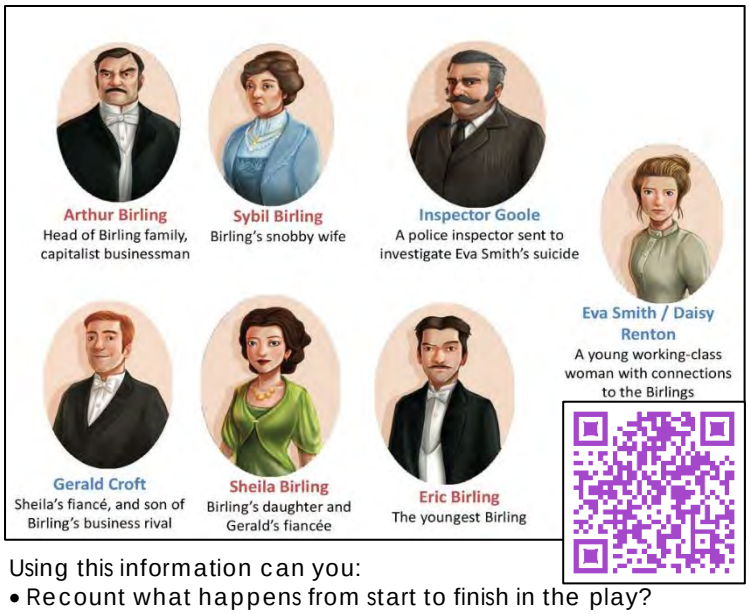
Threshold Concept- Year 10- An Inspector Calls:

TC1 - Understanding texts

TC2 - Demonstrate an appreciation of the writer's craft through analysis and critically evaluative comments.

A plot and character summary of 'An Inspector Calls:' Full text (if on MS Teams) = [An Inspector Calls audiobook]





Using this information can you:

- Recount what happens from start to finish in the play?
- Explain who the primary characters are, and what makes them unique?

You should use this information to get the base knowledge needed for **J.B. Priestley's play.** → E.g. Mr Birling is an ignorant Capitalist who sacked Eva Smith for demanding equal pay.

How to analyse the writer's craft- mention **the writer's name and all of the choices they make**. Example on Sheila (focus on trying to write explanations like you see in green here.)

The character of Sheila Birling is used to reflect that the younger generation have a chance to be different to their elders. The quotation: "these girls aren't cheap labour, they're people" shows Sheila's new understanding that women (regardless of class) should be treated more equally to men. J.B. Priestley has her criticise her male relatives who treat females as lower beings. The adjective "cheap" is used by the writer to show that she feels they are worth more than how society sees them. The original audience may dislike a woman challenging a man at this time as it is not the norm at all, though Sheila would be celebrated by a more modern audience as she is seen more so as a strong feminist figure, similar to the suffragettes.

Key quote written down

Technique identified.

What it shows

Audience reaction(s).

In order to be successful, you must know a range of different moments from the whole play. For example, other moments where Sheila is important include:

- Sheila's introduction as Sheltered and childish "mummy" "daddy"
- Sheila's new-found power in her speech and interruptions "(cutting in)"
- Sheila's change and refusal to accept Gerald's engagement ring. "No…I must think"

Developing this further- discussing audience reaction.

A really effective way to showcase your understanding of the text is by comparing how an original audience might react vs. how a modern audience might react (see the blue part of the WAGOLL above). This is how we do this:

ORIGINAL AUDIENCE MIGHT THINK

Edna is lucky to work for the Birlings. She has a stable job and an opportunity to live in a beautiful house. (Original theatre-goers more likely to have maids and be Capitalists.)

MODERN AUDIENCE MIGHT THINK

Edna is unlucky to work for the Birlings. She would earn very little indeed and has to wait on a whole family at all hours of the day. (Modern audiences more sympathetic to working-class)

Try to consider, as you read the play, your own reactions to characters/ events. Then compare this to how an audience in 1946 (with very different views to us) would react.

Maths

YEAR 10 – DELVING INTO DATA...

@whisto_maths

Collecting, representing and interpreting

What do I need to be able to do?

By the end of this unit you should be able to:

- Construct and interpret frequency tables and polygon, two-way tables, line, bar, & pie charts
- Find and interpret averages from a list and a table
- Construct and interpret time series graphs, stem and leaf diagrams and scatter graphs

Keywords

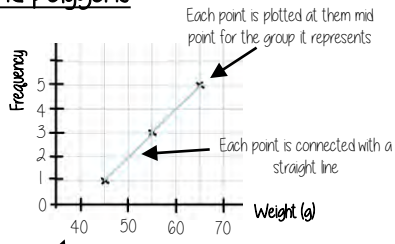
Population: the whole group that is being studied
Sample: a selection taken from the population that will let you find out information about the larger group
Representative: a sample group that accurately represents the population
Random sample: a group completely chosen by change. No predictability to who it will include.
Bias: a built-in error that makes all values wrong by a certain amount
Primary data: data collected from an original source for a purpose.
Secondary data: data taken from an external location. Not collected directly.
Outlier: a value that stands apart from the data set

Frequency tables and polygons

x Weight(g)	Frequency
$40 < x \leq 50$	1
$50 < x \leq 60$	3
$60 < x \leq 70$	5

We do not know from grouped data where each value is placed so have to use an estimate for calculations

MID POINTS
Mid-points are used as estimated values for grouped data. The middle of each group



Mid-point
Start point + End point
2

Two way tables

60 people visited the zoo one Saturday morning. 26 of them were adults. 13 of the adult's favourite animal was an elephant. 24 of the children's favourite animal was an elephant.

Extract information to input to the two-way table

Subgroups each have their own heading

	Adult	Child	Total
Elephant	13	24	37
Other	13	10	23
Total	26	34	60

Needs subgroup totals

Overall total

Draw and interpret Pie Charts

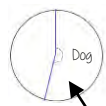
Type of pet	Dog	Cat	Hamster
Frequency	32	25	3

There were 60 people asked in this survey (Total frequency)

$\frac{32}{60}$ "32 out of 60 people had a dog"

This fraction of the 360 degrees represents dogs

$\frac{32}{60} \times 360 = 192°$



Use a protractor to draw. This is 192°

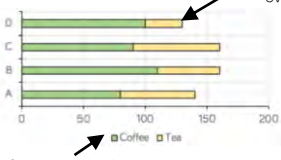
Multiple method
60 goes into 360 – 6 times.
Each frequency can be multiplied by 6 to find the degrees (proportion of 360)

Comparing Pie Charts:
You NEED the overall frequency to make any comparisons

Bar and line charts

Compare the bars green compared to yellow. The size of each bar is the frequency. Overall total easily comparable

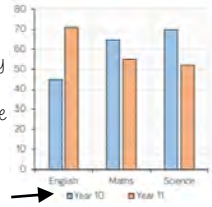
Composite bar charts



Categories clearly indicated

Dual bar charts

Bars are compared side by side
Easier to compare subgroups



Categories clearly indicated

Averages from a table

Non-grouped data

Number of Siblings	0	1	2
Frequency	6	8	6
Subtotal	0	8	12

Overall Frequency: 20

Total number of siblings: 20

The data in a list: 0,0,0,0,0,0,1,1,1,1,1,1,1,1,2,2,2,2,2,2

Mean: $\frac{\text{total number of siblings}}{\text{Total frequency}} = 1$

Grouped data

x Weight(g)	Frequency
$40 < x \leq 50$	1
$50 < x \leq 60$	3
$60 < x \leq 70$	5

Mid Point	MP x Freq
45	45
65	195
65	325

Overall Frequency: 9
Overall Total : 565

Mean: 62.8g

The data in a list: 45, 55, 55, 55, 65, 65, 65, 65, 65

Averages from lists

The Mean

A measure of average to find the central tendency... a typical value that represents the data

24, 8, 4, 11, 8,

Find the sum of the data (add the values)

55

Divide the overall total by how many pieces of data you have

$55 \div 5$

Mean = 11

The Mode (The modal value)

This is the number OR the item that occurs the most (it does not have to be numerical)

24, 8, 4, 11, 8,

This can still be easier if it the data is ordered first

Mode = 8

The Median

The value in the center (in the middle) of the data

24, 8, 4, 11, 8,

Put the data in order: 4, 8, 8, 11, 24

Find the value in the middle: 4, 8, 8, 11, 24

Median = 8

NOTE: If there is no single middle value find the mean of the two numbers left

For Grouped Data

The modal group – which group has the highest frequency

YEAR 10 – DELVING INTO DATA...

@whisto_maths

Collecting, representing and interpreting

What do I need to be able to do?

By the end of this unit you should be able to:

- Construct and interpret frequency tables and polygon, two-way tables, line, bar, & pie charts
- Find and interpret averages from a list and a table
- Construct and interpret time series graphs, stem and leaf diagrams and scatter graphs

Keywords

Population: the whole group that is being studied
Sample: a selection taken from the population that will let you find out information about the larger group
Representative: a sample group that accurately represents the population
Random sample: a group completely chosen by change. No predictability to who it will include.
Bias: a built-in error that makes all values wrong by a certain amount
Primary data: data collected from an original source for a purpose.
Secondary data: data taken from an external location. Not collected directly.
Outlier: a value that stands apart from the data set

Stem and leaf

A way to represent data and use to find averages

This stem and leaf diagram shows the age of people in a line at the supermarket

0	7 9
1	4 5 6 8 8
2	1 3
3	0

Key: 1|4 Means 14 years old

Stem and leaf diagrams:
Must include a key to explain what it represents
The information in the diagram should be ordered

Back to back stem and leaf diagrams

Girls		Boys
5	14	
7, 5, 5, 5, 4	15	3, 8, 9
8, 4, 2, 1, 0	16	2, 5, 7, 7, 7, 8, 8, 9
9, 8, 7, 6, 6, 4, 2, 1, 1, 0, 0	17	0, 2, 3, 6, 6, 7, 7
	18	0, 1, 4, 5

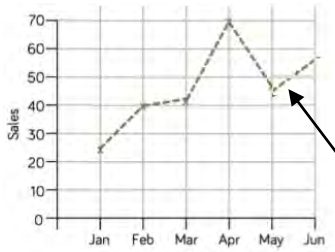
15 | 3,
Means 153 cm tall

Back to back stem and leaf diagrams
Allow comparisons of similar groups
Allow representations of two sets of data

Time-Series

R

This time-series graph shows the total number of car sales in £1000 over time



Look for general trends in the data. Some data shows a clear increase or a clear decrease over time.

Readings in-between points are estimates (on the dotted lines). You can use them to make assumptions.

Comparing distributions

Comparisons should include a statement of average and central tendency, as well as a statement about spread and consistency.

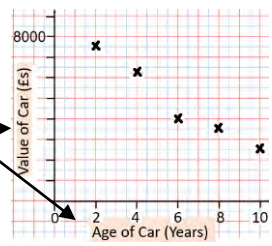
Mean, mode, median – allows for a comparison about more or less average
Range – allows for a comparison about reliability and consistency of data

Draw and interpret a scatter graph

R

Age of Car (Years)	2	4	6	8	10
Value of Car (£s)	7500	6250	4000	3500	2500

- This data may not be given in size order
- The data forms information pairs for the scatter graph
- Not all data has a relationship



All axes should be labelled

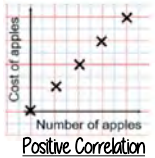
The axis should fit all the values on and be equally spread out

"This scatter graph show as the age of a car increases the value decreases"

The link between the data can be explained verbally

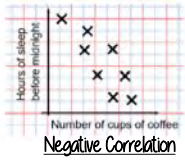
Linear Correlation

R



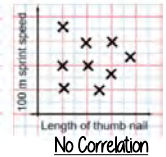
Positive Correlation

As one variable increases so does the other variable



Negative Correlation

As one variable increases the other variable decreases



No Correlation

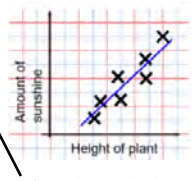
There is no relationship between the two variables

The line of best fit

R

The Line of best fit is used to make estimates about the information in your scatter graph

Things to know:
- The line of best fit **DOES NOT** need to go through the origin (The point the axes cross)
- There should be approximately the same number of points above and below the line (It may not go through any points)
- The line extends across the whole graph



It is only an estimate because the line is designed to be an average representation of the data

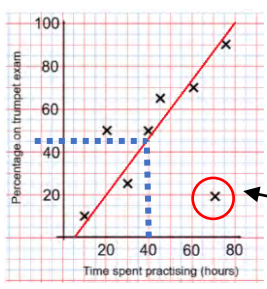
It is always a **straight line.**

Using a line of best fit

R

Interpolation is using the line of best fit to estimate values inside our data point.

e.g. 40 hours revising predicts a percentage of 45.



Extrapolation is where we use our line of best fit to predict information outside of our data.
This is not always useful – in this example you cannot score more that 100%. So revising for longer can not be estimated

This point is an "**outlier**"
It is an outlier because it doesn't fit this model and stands apart from the data

YEAR 10 – USING NUMBER...

Non-calculator methods

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What do I need to be able to do?

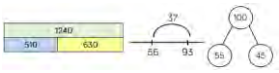
By the end of this unit you should be able to:

- Use mental/written methods for the four number operations
- Use four operations for fractions
- Write exact answers
- Round to decimal places and significant figures
- Estimate solutions
- Understand limits of accuracy
- Understand financial maths

Keywords

Truncate: to shorten, to shorten a number (no rounding), to shorten a shape (remove a part of the shape)
Round: making a number simpler, but keeping its place value close the what it originally was
Credit: money that goes into a bank account
Debit: money that leaves a bank account
Profit: the amount of money after income - costs
Tax: money that the government collects based on income, sales and other activities
Balance: The amount of money in a bank account
Overestimate: Rounding up – gives a solution higher than the actual value
Underestimate: Rounding down – gives a solution lower than the actual value

Addition/ Subtraction



Modelling methods for addition/ subtraction

- Bar models
- Number lines
- Part/ Whole diagrams

Addition is commutative

6 + 3 = 3 + 6

The order of addition does not change the result

Subtraction the order has to stay the same

360 – 147 = 360 – 100 – 40 – 7

- Number lines help for addition and subtraction
- Working in 10's first aids mental addition/ subtraction
- Show your relationships by writing fact families

Formal written methods

R

	H	T	O
	1	8	7
+	5	4	2

	H	T	O
	4	2	7
–	2	4	9

Remember the place value of each column. You may need to move 10 ones to the ones column to be able to subtract

Decimals have the same methods remember to align the place value

Division methods

3584 ÷ 7 = 512

Short division

$$7\overline{)3^{3}5\ 8^{1}4}\quad 5\ 1\ 2$$

Complex division

÷ 24 = ÷ 6 ÷ 4

Break up the divisor using factors

Division with decimals

The placeholder in division methods is essential – the decimal lines up on the dividend and the quotient

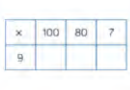
24 ÷ 0.02 → 24 ÷ 0.2 → 240 ÷ 2

All give the same solution as represent the same proportion
Multiply the values in proportion until the divisor becomes an integer

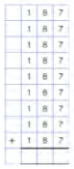
R

Multiplication methods

Long multiplication (column)



Grid method



Repeated addition

Less effective method especially for bigger multiplication

Multiplication with decimals

R

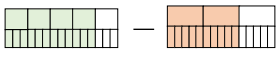
Perform multiplications as integers
e.g 0.2 x 0.3 → 2 x 3

Make **adjustments** to your answer to match the question: 0.2 x 10 = 2
0.3 x 10 = 3
Therefore 6 ÷ 100 = 0.06

Four operations with fractions

Addition and Subtraction

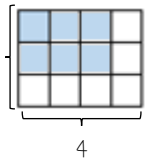
$$\frac{4}{5}-\frac{2}{3}$$



$$\frac{12}{15}-\frac{10}{15}=\frac{2}{15}$$

Multiplication

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



$$=\frac{6}{12}=\frac{1}{2}$$

Division

$$\frac{2}{5}\div\frac{3}{4}$$

$$\frac{2}{5}\times\frac{4}{3}$$

Multiplying by a reciprocal gives the same outcome

$$=\frac{8}{15}$$

R

Exact Values

Leave in terms of π

$$=\frac{120}{360}\times 36\pi$$

$$=\frac{1}{3}\times 36\pi=12\pi$$

Leave as a surd

$$\text{Tan}30=\frac{1}{\sqrt{3}}$$

Rounding

R

2.46192 (to 12dp) - Is this closer to 246 or 247

246 ← 2.46|192 → 247

This shows the number is closer to 246

Significant Figures

370 to 1 significant figure is 400
37 to 1 significant figure is 40
3.7 to 1 significant figure is 4
0.37 to 1 significant figure is 0.4
0.00000037 to 1 significant figure is 0.0000004

SF: Round to the first nonzero number

Estimation

R

Round to 1 significant figure to estimate

21.4 x 3.1 ≈ 20 x 3 ≈ 60

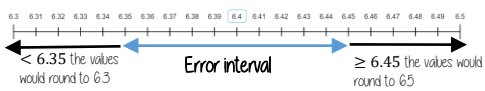
The equal sign changes to show it is an estimation

This is an **underestimate** because both values were rounded down

It is good to check all calculations with an estimate in all aspects of maths – it helps you identify calculation errors

Limits of accuracy

W width w has been rounded to 6.4cm correct to 1dp

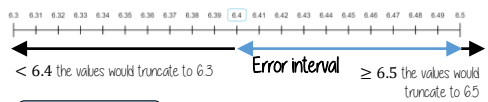


< 6.35 the values would round to 6.3 | Error interval | ≥ 6.45 the values would round to 6.5

The error interval: $6.35 \leq w < 6.45$

Any value within these limits would round to 6.4 to 1dp

W width w has been truncated to 6.4cm correct to 1dp



< 6.4 the values would truncate to 6.3 | Error interval | ≥ 6.5 the values would truncate to 6.5

$6.4 \leq w < 6.5$

Any value within these limits would **truncate** to 6.4 to 1dp

YEAR 10 – USING NUMBER...

@whisto_maths

Types of number & sequences

What do I need to be able to do?

By the end of this unit you should be able to:

- Understand factors and multiples
- Express numbers as a product of primes
- Find the HCF and LCM
- Describe and continue sequences
- Explore sequences
- Find the nth term of a linear sequence

Keywords

Factor: numbers we multiply together to make another number
Multiple: the result of multiplying a number by an integer.
HCF: highest common factor. The biggest factor that numbers share.
LCM: lowest common multiple. The first multiple numbers share.
Arithmetic: a sequence where the difference between the terms is constant
Geometric: a sequence where each term is found by multiplying the previous one by a fixed nonzero number
Sequence: items or numbers put in a pre-decided order

Multiples

The "times table" of a given number

All the numbers in this lists below are multiples of 3.

3, 6, 9, 12, 15...

This list continues and doesn't end

$3x$, $6x$, $9x$ ...

x could take any value and as the variable is a multiple of 3 the answer will also be a multiple of 3

Non example of a multiple

4.5 is not a multiple of 3 because it is 3 x 1.5

Not an integer

Factors

Arrays can help represent factors

5 x 2 or 2 x 5

Factors of 10
1, 2, 5, 10

10 x 1 or 1 x 10

The number itself is always a factor

Factors and expressions

$6x \times 1$ OR $6 \times x$

Factors of $6x$
6, x, 1, $6x$, $2x$, 3, $3x$, 2

$2x \times 3$

$3x \times 2$

Prime numbers

- Integer
- Only has 2 factors
- and itself

2

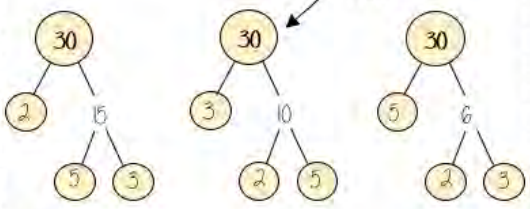
The first prime number
The only even prime number

Learn or how-to quick recall...

2, 3, 5, 7 , 11, 13, 17, 19, 23, 29...

Product of prime factors

Multiplication part-whole models



All three prime factor trees represent the same decomposition

$30 = 2 \times 3 \times 5$ ← Multiplication of prime factors

Using prime factors for predictions

e.g. **60**	30 x 2	2 x 3 x 5 **x 2**
150	30 x 5	2 x 3 x 5 **x 5**

Finding the HCF and LCM

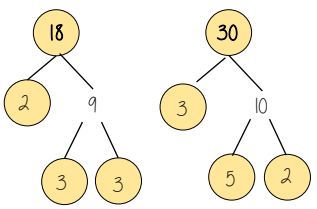
HCF – Highest common factor

HCF of 18 and 30

18: 1, 2, 3, 6, 9, 18
30: 1, 2, 3, 5, 6, 10, 15, 30

6 is the biggest factor they share

HCF = 6



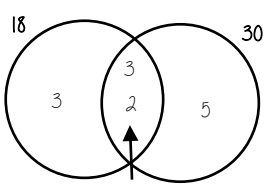
LCM – Lowest common multiple

LCM of 18 and 30

18: 18, 36, 54, 72, 90
30: 30, 60, 90

The first time their multiples match

LCM = 90



LCM = 90

HCF = 6

Arithmetic/ Geometric sequences

Arithmetic Sequences change by a common difference. This is found by addition or subtraction between terms

Geometric Sequences change by a common ratio. This is found my multiplication/ division between terms.

Term to term rule – how you get from one term (number in the sequence) to the next term.

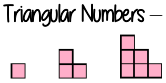
Position to term rule – take the rule and substitute in a position to find a term. E.g. Multiply the position number by 3 and then add 2.

Other sequences

Fibonacci Sequence
1, 1, 2, 3, 5, 8 ...

Each term is the sum of the previous two terms

Triangular Numbers – look at the formation



1, 3, 6, 10, 15 ...

Square Numbers – look at the formation

1, 4, 9, 16...

Sequences are the repetition of a pattern

Finding the nth term

This is the 4 times table → 4, 8, 12, 16, 20....

$4n$

This has the same constant difference – but is 3 more than the original sequence

7, 11, 15, 19, 22

$4n + 3$

This is the constant difference between the terms in the sequence

This is the comparison (difference) between the original and new sequence

YEAR 10 – USING NUMBER...

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Indices & Roots

What do I need to be able to do?

By the end of this unit you should be able to:

- Identify square and cube numbers
- Calculate higher powers and roots
- Understand powers of 10 and standard form
- Know the addition and subtraction rule for indices
- Understand power zero and negative indices
- Calculate with numbers in standard form

Keywords

Standard (index) Form: A system of writing very big or very small numbers
Commutative: an operation is commutative if changing the order does not change the result.
Base: The number that gets multiplied by a power
Power: The exponent – or the number that tells you how many times to use the number in multiplication
Exponent: The power – or the number that tells you how many times to use the number in multiplication
Indices: The power or the exponent.
Negative: A value below zero.
Coefficient: The number used to multiply a variable

Square and cube numbers

R

Square numbers

1, 4, 9, 16...

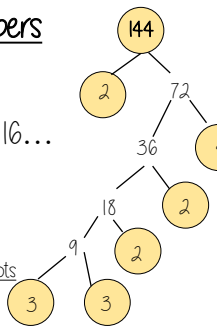
144 = 2 x 2 x 2 x 2 x 3 x 3

(2 x 2 x 3) x (2 x 2 x 3)

12 x 12

Prime factors can find square roots

$\sqrt{144} = 12$



Cube numbers

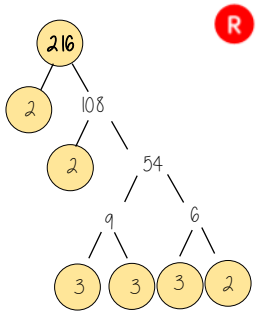
1, 8, 27, 64, 125...

216 = 2 x 2 x 2 x 3 x 3 x 3

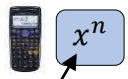
(2 x 3) x (2 x 3) x (2 x 3)

6 x 6 x 6

$\sqrt[3]{216} = 6$



Higher powers and roots



x^n ← n – power (number of times multiplied by itself)

x – the base number.

$\sqrt[n]{x}$ ← Finding the nth root of any value

Other mental strategies for square roots

$\sqrt{810000} = \sqrt{81} \times \sqrt{10000}$

$= 9 \times 100$

$= 900$

Standard form

R

Any integer

Any number between 1 and less than 10

$A \times 10^n$

0.001

$1 \times \frac{1}{1000}$

1×10^{-3}

10	1	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1000}$
10^1	10^0	10^{-1}	10^{-2}	10^{-3}
10	1	0.1	0.01	0.001

Any value to the power 0 always = 1

Negative powers do not indicate negative solutions

Example

3.2 x 10^4

= 3.2 x 10 x 10 x 10 x 10

= 32000

Non-example

0.8 x 10^4

5.3 x $10^{0.7}$

Numbers in standard form with negative powers will be less than 1

3.2 x 10^{-4} = $3.2 \times \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10} \times \frac{1}{10}$ = 0.00032

Addition/ Subtraction Laws

$a^m \times a^n = a^{m+n}$

$a^m \div a^n = a^{m-n}$

Zero and negative indices

$x^0 = 1$

Any number divided by itself = 1

$\frac{a^6}{a^6} = a^6 \div a^6$

$= a^{6-6} = a^0 = 1$

Negative indices do not indicate negative solutions

$2^2 = 4$
$2^1 = 2$
$2^0 = 1$
$2^{-1} = \frac{1}{2}$
$2^{-2} = \frac{1}{4}$

Looking at the sequence can help to understand negative powers

Powers of powers

$(x^a)^b = x^{ab}$

$(2^3)^4 = 2^3 \times 2^3 \times 2^3 \times 2^3$

The same base and power is repeated. Use the addition law for indices

$(2^3)^4 = 2^{12}$ ← $a \times b = 3 \times 4 = 12$

NOTICE the difference

$(2x^3)^4 = 2x^3 \times 2x^3 \times 2x^3 \times 2x^3$

The addition law applies ONLY to the powers. The integers still need to be multiplied

$(2x^3)^4 = 16x^{12}$

Standard form calculations

R

Addition and Subtraction

Tip: Convert into ordinary numbers first and back to standard form at the end.

$6 \times 10^5 + 8 \times 10^5$

Method 1

= 600000 + 800000

= 1400000

= 1.4 x 10^5

Method 2

= (6 + 8) x 10^5

= 14 x 10^5

This is not the final answer

= 1.4 x 10^1 x 10^5

= 1.4 x 10^5

Multiplication and division

$\frac{1.5 \times 10^5}{0.3 \times 10^3}$ ← Division questions can look like this

$(1.5 \times 10^5) \div (0.3 \times 10^3)$

$1.5 \div 0.3 \times 10^5 \div 10^3$

$= 5 \times 10^2$

For multiplication and division you can look at the values for A and the powers of 10 as two separate calculations

PSHE

Physics

Particle Models of Matter

Threshold Concept

Changes of state are caused by energy changes

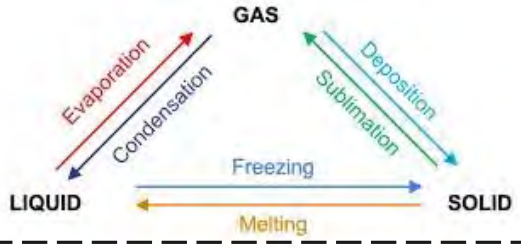
Keywords

States of matter – solid, liquid or gas.
Particles – the smallest part that a substance can be broken down into.
Energy – a property of a substance that is stored or transferred in order for things to be done.
Density – how compact a substance is.
Pressure – continuous force acted on or against an object.

States of matter

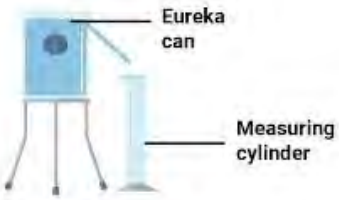
Solid Liquid Gas

Changes of state

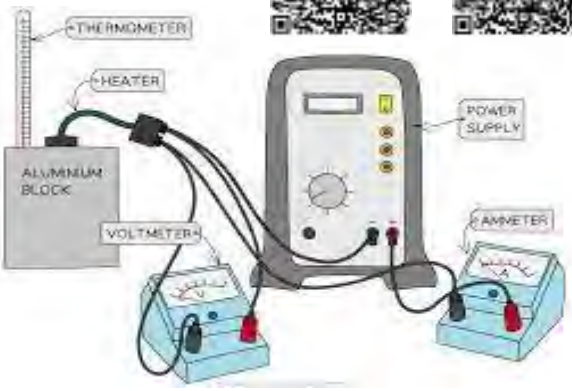


Required Practical

Density



Specific Heat Capacity



Links to information on the whole topic, consisting of slides, videos, and quizzes

Equations for this topic

P=F/A Pressure = Force / Area

P = m/V Density = mass / volume

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ΔE = m x L Change in Energy = mass x Specific Latent Heat

P = ρ x g x h Pressure in a liquid column = density x gravity x height (TRIPLE ONLY)

For gases: p x v = constant For Gases: pressure x volume = constant (TRIPLE ONLY)

Electromagnetism

Threshold Concept

Magnets have two poles that attract or repel.

Keywords

Permanent Magnet - A material that has its own magnetic field without needing to be helped by another magnetic material.
Induced Magnet - a material that only becomes a magnet when placed in another magnetic field.
Magnetic Field - a region around a magnet where the force of magnetism acts.
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Electromagnet - a soft, iron core placed inside a solenoid.

Common magnetic materials

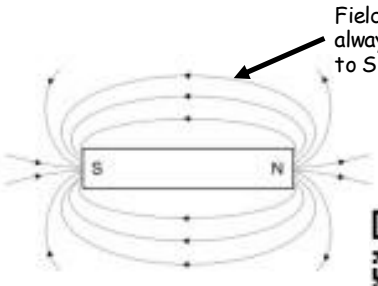
Iron

Nickel

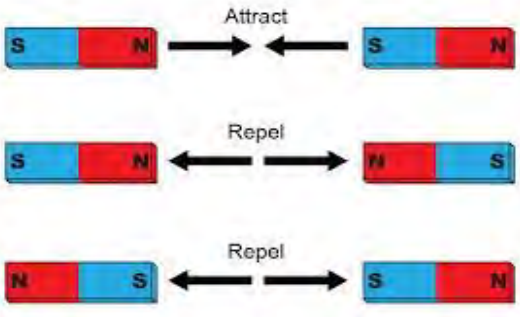
Cobalt

Steel

A bar magnet and its magnetic field



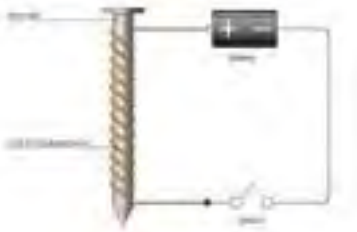
Attraction and repulsion



Electromagnets

Building an electromagnet

Electromagnets



Required Practical

Equations for this topic

Force = Magnetic Flux Density x Current x length of wire

$F = B \times I \times l$

RSE

Triple Science

Variation

Threshold Concept

All living things need to change to live.

Keywords

Variation……. any difference between the individuals in a species or groups of organisms of any species

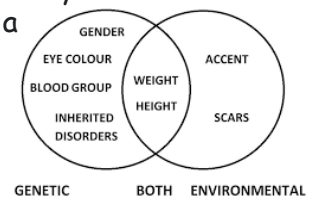
Evolution ……. the change in the characteristics of a species over several generations and relies on the process of natural selection

Adaptation……. the adjustment of organisms to their environment in order to improve their chances at survival in that environment

Natural Selection……. the process through which populations of living organisms adapt and change

Variation

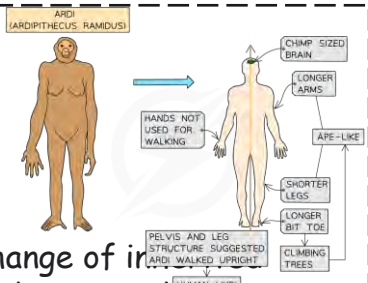
Individuals in a population are usually similar to each other, but not identical. Some of the variation within a species is genetic , some is environmental - the conditions in which they have developed and some is a combination of both



Natural Selection

In any environment, the individuals that have the best adaptive features are the ones most likely to survive and reproduce

Evolution



Evolution is the change of inherited characteristics within a population over time through natural selection, which may result in the formation of a new species

Five main processes that lead to evolution:

-mutation
-non-random mating
-gene flow
-finite population size (genetic drift)
-natural selection.

Selective Breeding

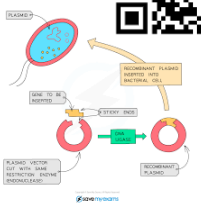
Selective breeding or artificial selection is when humans breed plants and animals for particular genetic characteristics. Humans have bred food crops from wild plants and domesticated animals for thousands of years

Fossils

A fossil is the preserved remains of a dead organism from millions of years ago. **Evidence for early forms of life comes from fossils**. By studying fossils, scientists can learn how much (or how little) organisms have changed as life developed on Earth

Genetic Engineering

Genetic engineering involves modifying the genome of an organism by introducing a gene from another organism to result in a desired characteristic



Required Practical

Equations for this topic

Making salts

Threshold Concept

How do metals and acids react to make salts and water

Keywords

Reactivity – the ability for an atom or molecule to undergo a chemical reaction
Salt – a substance made of positive and negative ions
Sulphuric acid – an acid that contains sulphate ions
Nitric acid – an acid that contains nitrate ions
Hydrochloric acid – an acid that contains chloride
Balanced – equal on both sides
Symbol equation – a chemical equation using chemical symbols
Acidic – a solution that contains H^+ ions
Alkaline – a solution that contains OH^- ions

Neutralisation

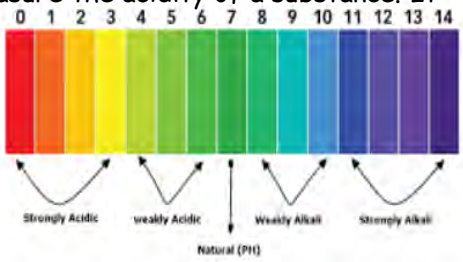
When an acid and alkali react they form neutral product water.
The H+ ions from the acid react with the OH- ions from the alkali to form water.
This can be represented using the following ionic equation:

$$H^+ + OH^- \rightarrow H_2O$$

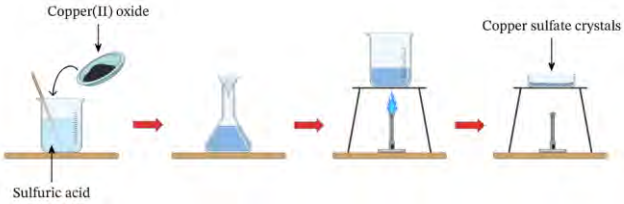
The pH scale

Acids contain H^+ ion and alkalis contain OH^- ions. The pH scale is used to measure the acidity of a substance. It ranges from 0-14.

Acidic = pH < 7
Neutral = pH 7
Alkaline = pH > 7



Making salts required pract



$$CuO(s) + H_2SO_4(aq) \longrightarrow CuSO_4(aq) + H_2O(l)$$

Reactions of acids

Acids react with metals, alkalis and carbonates to form a salt and either hydrogen, water or water and carbon dioxide. Each acid forms a different salt.

Acid Used	Salt Produced
hydrochloric	chloride
nitric	nitrate
sulfuric	sulfate

acid + metal → salt + hydrogen

hydrochloric acid + zinc → zinc chloride + hydrogen

$2HCl + Zn \rightarrow ZnCl_2 + H_2$

acid + alkali → salt + water

nitric acid + sodium hydroxide → sodium nitrate + water

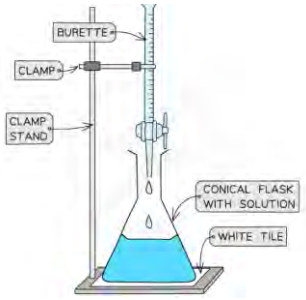
$HNO_3 + NaOH \rightarrow NaNO_3 + H_2O$

acid + carbonate → salt + water + carbon dioxide

sulfuric acid + zinc oxide → zinc sulfate + water

$H_2SO_4 + ZnO \rightarrow ZnSO_4 + H_2O$

Titration req prac (triple)



Redox reactions (higher tier)

Redox reactions are when oxidation and reduction (in terms of electron transfer) take place at the same time.

For example:

$2H^+ + Ca \longrightarrow Ca^{2+} + H_2$

The ionic equation can be further split into two half equations.

$Ca \longrightarrow Ca^{2+} + 2e^-$

Oxidation is loss of electrons.

$2H^+ + 2e^- \longrightarrow H_2$

Reduction is gaining of electrons.

Strong and weak acids

Strong acids are acids that fully ionise in water

$$HCl \longrightarrow H^+ + Cl^-$$

Weak acids are acids that partially ionise in water

$$CH_3COOH \rightleftharpoons H^+ + CH_3COO^-$$

Particle Models of Matter

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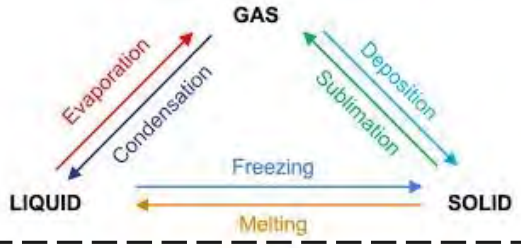
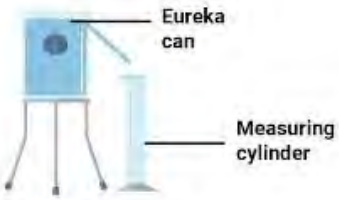


Required Practical

Density



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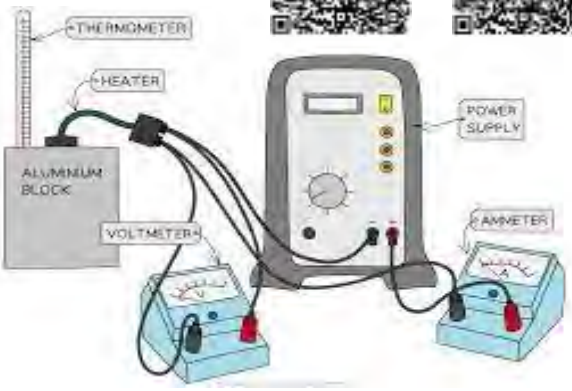

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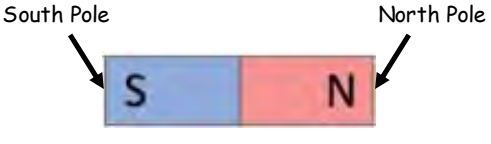

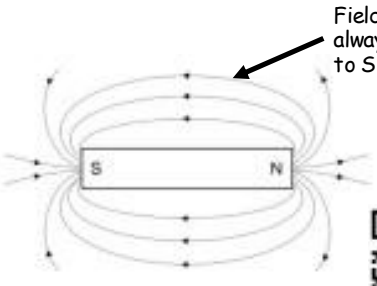

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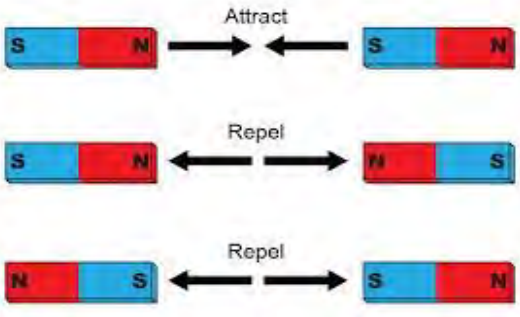

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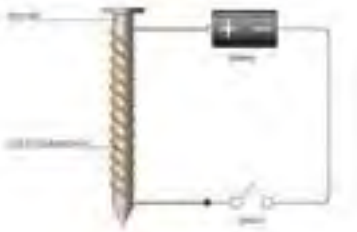

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