Knowledge Organiser Energy year 9

SCIENCE

Kinetic energy-Energy of a moving object due to its motion. Joules, J
Mass-The quantity of matter in an object. Kilograms, kg
Elastic potential energy-Energy stored in an elastic object when work is done to change its shape. Joules, J
Gravitational potential energy-The energy of an object due to its position in a gravitational field. Joules, J
Power- Energy transferred every second. Watts, W
Work done- Energy transferred by a force. Joules, J
System- an object or group of objects.
An open system- energy is transferred between stores or to the surroundings.
A closed system - no energy can escape to or enter from the surroundings.
Conduction-The transmission of heat through a solid substance from a region of high temperature to lower temperature.
Infrared radiation- Electromagnetic waves in between visible light and microwaves in the electromagnetic spectrum.
Insulator- A substance that is a poor conductor of heat and electricity. This is due to a lack of mobile electrons.
Insulation- materials that are good insulators and are used to keep you warm (clothes).
Non-renewable energy- it will run out; we are using it at a greater rate than it is produced.
Renewable energy- energy from natural sources that is always being replenished so it never runs out.
Biofuel- is any fuel taken from a living or recently living organism. Animal waste is an example.
Nuclear fuel- substance used in nuclear reactors that releases energy due to nuclear fission.

Energy stores

Kinetic	Energy an object has because it is moving
Gravitational potential	Energy an object has because of its height above the ground
Elastic potential	Energy an object has when it is stretched of compressed
Thermal (or internal)	Energy an object has because of its temperature (the total kinetic and potential energy of the particles in the object)
Chemical	Energy that can be transferred by chemical reactions involving foods, fuels and the chemicals in batteries
Nuclear	Energy stored in the nucleus of an atom
Magnetic	Energy a magnetic object has when it is near a magnet or in a magnetic field
Electrostatic	Energy a charged object has when it is near another charge object

Kinetic energy:

The kinetic energy of a moving object. The faster it moves the greater the kinetic energy.

kinetic energy, in joules, J

Gravitational potential energy:

When an object is off the surface of the Earth it has a store of potential energy.

The law of conservation of energy:

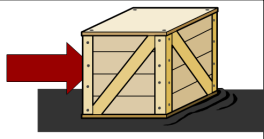
Energy cannot be created, or destroyed-it can only be transferred usefully, stored or dissipated.

Energy transfers

Energy can be transferred to and from different stores by:
Heating
Energy is transferred from one object to another object with a lower temperature.
Waves
Waves (e.g. light and sound waves) can transfer energy by radiation.
Electricity
When an electric current flows it can transfer energy.
Forces
Energy is transferred when a force moves or changes the shape of an object.

Work done:

Work done= energy transferred



Elastic energy:

The amount of energy stored in a stretched Or compressed spring or elastic material is called elastic potential energy.

Chemical energy:

The store of energy in food, batteries, petrol etc.

Power:

Power is defined as the rate at which energy is transferred or the rate at which work is done. It has the unit W.

Knowledge Organiser Energy year 9

SCIENCE

Energy resources:

The main ways we use the Earth's energy resources are:
- Generating electricity
- Heating
- Transport

The energy resources are either <u>renewable or non-renewable</u>.

Non- renewable:
- Coal
- Oil
- Gas
- Nuclear

Renewable:
- Wind turbines
- Biofuel
- Solar panels
- Hydroelectric power station
- Wave
- Tidal
- Geothermal

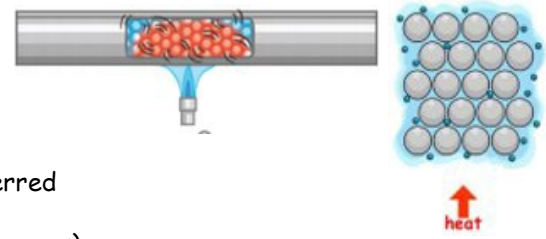
Non- renewable	Renewable
Are not replaced as quickly as they are used	Can be replaced at the same rate as they are used
Will eventually run out	Will not run out
Examples are fossil fuels and nuclear fission	Examples are solar, wave, wind, geothermal, biofuel and hydroelectric.

Heat transfers:

Heat energy or better vocabulary, thermal energy, transfers from hot to cold.

Thermal energy can transfer in 3 ways:

1. Conduction- when a solid is heated, the particles vibrate and collide more. Energy is transferred.



- <u>Metals</u>
- Free / delocalised electrons
- Increase kinetic energy
- Collisions
- Heat/ thermal energy transferred

2. Convection- in a fluid (liquid or gas).

3. Radiation- Infrared radiation is how thermal energy transfers as a wave. This can happen in a vacuum, an area where there are no particles. All objects emit (give out) and absorb (take in) IR. The higher the temperature of the object the more IR it emits. A good absorber of IR is also a good emitter.

Insulation is a way of reducing thermal energy transferring.

Energy resources key information

Non-renewable energy resources

Resource	Main uses	Source	Advantages	Disadvantages
coal	generating electricity	extracted from underground	enough available to meet current energy demands reliable – supply can be controlled to meet demand relatively cheap to extract and use	will eventually run out release carbon dioxide when burned – one of the main causes of climate change release other polluting gases, such as sulfur dioxide (from coal and oil) which causes acid rain oil spills in the oceans kill marine life
oil	generating electricity transport heating			
natural gas	generating electricity heating			
nuclear fission	generating electricity	mining naturally occurring elements, such as uranium and plutonium	no polluting gases or greenhouse gases produced enough available to meet current energy demands large amount of energy transferred from a very small mass of fuel reliable – supply can be controlled to meet demand	produces nuclear waste, which is: • dangerous • difficult and expensive to dispose of • stored for centuries before it is safe to dispose of nuclear power plants are expensive to: • build and run • decommission (shut down)

Insulating buildings:

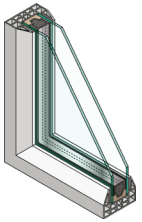
Heating bills are expensive and so it is important to reduce heat loss from buildings.

Some factors that affect the rate of heat loss from a building are:

1. Th thickness of its walls and roof
2. The thermal conductivity of its walls and roof
3. Lower thermal conductivity = lower rate of heat loss

The thermal conductivity of the walls and roof can be reduced by using thermal insulators. A material with a low thermal conductivity. The rate of energy transfer through an insulator is low.

Your winter coat is another example of an insulator.



Knowledge Organiser Describing forces and motion year 9

Key vocabulary:

- Vector- has magnitude and direction
- Scalar- magnitude only
- Magnitude- size
- Displacement- distance in a direction
- Newton- unit of force
- Driving force forwards force from an engine
- Friction- a force that acts when two surfaces are in contact
- Resultant force- a single force with the same effect as all of the forces acting
- Balanced forces- forces are the same size and opposite direction
- Unbalanced forces- the force on one side is not the same side as the force on the other side
- Weight- downwards force when gravity acts on an objects mass
- Air resistance- friction between air and another object
- Stretching force (tension) a force applied to a string or a rope
- Gravity- 9.8N/kg on Earth
- Moments- a turning force

Forces

Forces are everywhere and anywhere that two objects are interacting. Whenever you push, pull, stretch, squash, lift or throw an object, you are exerting a force.
Forces can act to change the **speed** of an object, the **direction** it is moving in, or its **shape**.

Contact forces:

- **Friction**
- **Air resistance**
- **Tension**
- **The normal contact force**

Non- contact forces:

- **Magnetism**
- **Gravitational force**
- **Electrostatic force**

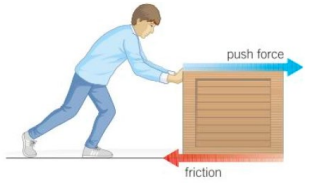
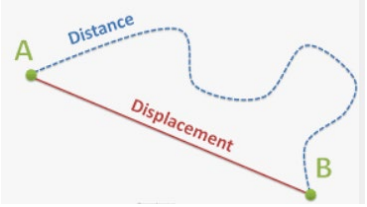


Figure 2 *Overcoming friction*

Speed and Velocity

Speed is a **scalar** quantity; it is how fast something travels, it has the unit m/s.
Velocity is a **vector** quantity. It is speed in a given direction, it has the unit m/s.
Distance is a **scalar** quantity, and it is how far something has travelled and has the unit m.
Displacement is a vector quantity, and it is distance in a direction. If an object returns to its starting point the displacement is zero.



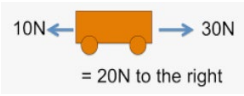
Speed= distance/ time
(m/s) (m) (s)

Typical speeds of people:

- **walking ~ 1.5 m/s**
- **running ~ 3 m/s**
- **cycling ~ 6 m/s**

Resultant force

A resultant force is a single force that has the same effect as all the forces acting.
Balanced forces- Same size and opposite direction
Unbalanced forces- The movement depends on the size and direction of the resultant force.



Balanced forces, resultant force is zero:

- objects at rest remains stationary
- object moving keeps moving at a constant speed

Unbalanced forces:

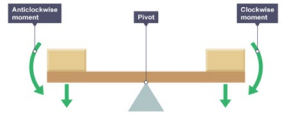
- Depends on the size and direction of the resultant force

Work done

Work is done by a force when an object is moved a distance.
Work done is energy transferred and has the unit joules, J.

Moment

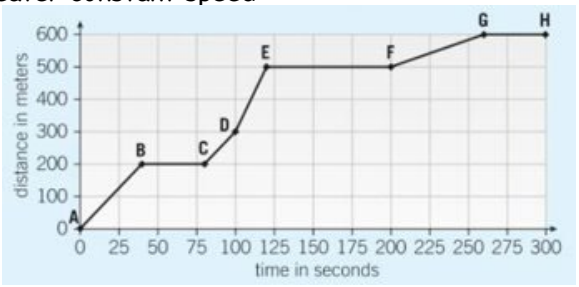
A force or system of forces may cause an object to turn.
A moment is the turning effect of a force. Moments act about a point in a clockwise or anticlockwise direction. The point chosen could be any point on the object, but the pivot - also known as the fulcrum - is usually chosen.



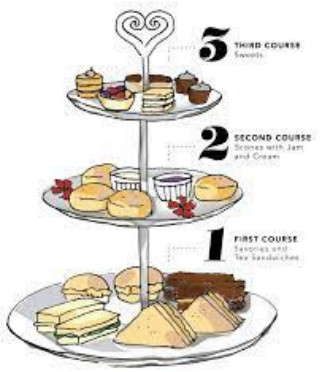
moment of a force = force × distance
(Nm) (N) (m)

Distance time graphs

The gradient on a distance time graph represents the speed.
A-B shows **constant speed** as it is a straight line
B-C shows the object is **stationary** as the distance is not changing
C-D is also **constant speed** but as the gradient is **steeper** is a greater constant speed



YEAR 9 Afternoon Tea SKO SPRING TERM



Presentation plates and ideas:
Select plates/stands and dishes that will showcase your dishes. Think about how the dishes will allow you to plate up and the ease in which the customer will be able to select the dishes to eat.

KEY VOCABULAR	
Fine Dining	Caters to an upscale clientele and provides the highest quality of food. A fine dining restaurant has a formal atmosphere, is almost always a sit down restaurant, and has a
Afternoon tea	Afternoon Tea is a tea-related ritual, introduced in Britain in the early 1840s. It evolved as a mini meal to stem the hunger and anticipation of an evening meal at 8pm.
Presentation techniques	Techniques used to make food look more attractive and appetising.
Creaming method	Cake making method where the butter and sugar is mixed together first, then the egg added and then the flour folded in gently
All-in one method	Cake making method where all the ingredients are whisked together.
Finger sandwich	Sandwich that is easy to handle and can be eaten in two-three bites.
Egg wash	A beaten egg is used to brush the top of bread/ pastry prior to baking.

POINTS TO CONSIDER	
Skills of staff	Dishes can only be put on the menu if the staff have the skills to produce them.
Themes	If there is a theme to the menu every element of the dish on the menu must fit with that theme. As this is what the customer will expect.
Seasonality	Seasonal foods that foods that are grown naturally in the in each season e.g. asparagus in spring, pumpkin in autumn.
Ingredients/equip ment available	Dishes can only be put on the menu if the kitchen have the ingredients and equipment available to make those dishes
Types of customer	Different customers will have different needs and requirements from a product: Customers are people who purchase and/or consume the product.

Piping	Using piping bags and different nozzles to create different patterns using buttercream/ fresh cream or meringue by squeezing the filled bag.
Modelling	Use fondant icing to create shapes for decoration
Feathering	Where you cover your baked item with one colour of icing and then pipe thin parallel lines using a different coloured icing. Then you drag a skewer through the lines to create a wavy effect.
Lattice	Criss-crossing pattern of strips. Weaving lines of pastry over and under other strips of pastry.
Glazing	Coating of food such as bread or pastry before baking used egg, milk or another liquid to create an attractive finish
Crimping	Crimping the edges of pastry not only looks pretty but it helps keep the filling inside.
Positioning	The way you position the food on a plate can dramatically alter it's appearance. Centre foods that are the same shape as the plate.

Year 9 Spring Food RESEARCH

Remember that this does not need to be in written format BUT photographs of displays, printouts from the computer, leaflets, etc. must be produced as evidence that you have carried out the research or investigation. Answer the following questions using the internet to find out:

What is afternoon tea?
·Where does it originate from? · What time is it eaten?
· How is it served? What beverages are served with afternoon tea?
· How much does it cost for 2 people to eat afternoon tea at e.g. Betty's or Harvey Nichols?
· How is afternoon tea presented?
· What does it look like?
· Consider the nutritional content of afternoon tea products. Analyse the nutritional content of a few items . Use bbcgoodfood.com (i.e. Mini quiche, ham and mustard sandwich, profiteroles). Comment whether these products are high in fat, salt, sugar, low in fibre, contain vitamins/minerals/protein are a carbohydrate etc.
· How are the products decorated?
· Draw a mind map of different dishes that could be served.
· Produce a table of suitable recipes you could make for the task.
· List the level of skill; high, medium or basic.
· Make an image board to show recipe ideas.
· Trial and test recipes in practical lessons.
· Watch demonstrations of recipes.
· Carry out a survey of varieties of products available for sale. Record your results in a table.
· Taste testing of different dishes suitable for afternoon tea.
· Make a fact file or information leaflet that could be used in a Hotel or restaurant to promote afternoon tea

REASONS FOR CHOICE

JUSTIFICATION AND REASONS FOR CHOICE Research recipes and choose what you will make in the practical session. Remember the practical carries the most marks so make sure your choice is: • Suitable for the brief – each recipe must be suitable for afternoon tea. • You have the time, skill and equipment to make. • Recipes show a variety of colour, texture and flavours. • Show skills which reflect your ability.

Higher Level Skills: · Pastry making – short crust, pate sucre, choux · Roux based sauces · Meringues and pavlovas · Meat and fish cookery (using high risk foods) · Decorated cakes and gateaux · Rich yeast doughs including pizza, shaped bread rolls. · Complex accompaniments and garnishes e.g. piping cream, coulis sauce, vegetable accompaniments.

Medium Level Skills: · Puff pastry items that need shaping but use readymade pastry · Vegetable and fruit dishes requiring even sizes · Cheesecakes and similar desserts · Simple sauces e.g. red wine sauce · Simple cakes, biscuits, cookies and scones · Complex salad with a homemade dressing such as mayonnaise

Basic Skills: · Crumbles · Sandwiches · Pizza with readymade base · Jacket potatoes · Simple salads · Assembling products e.g. using prepared sauces, bought meringue nests etc.

JUSTIFICATION AND REASONS FOR CHOICE Create a table with your 4 chosen dishes in. List the skills and cooking methods for each product. Write an introduction to the dishes you are going to make. Did you trial any of these dishes?

Dish	Skills	Cooking methods
Victoria sandwich cake	Creaming method Decorating, piping	Baking
Strawberry Gateau	Whisking method, fruit preparation, piping cream and making chocolate curls.	Baking and chilling.
Stilton & vegetable quiche	Shortcrust pastry, making custard, vegetable preparation.	Baking and sauté.
Shortbread biscuits	biscuit made by the rubbing in method	baking.

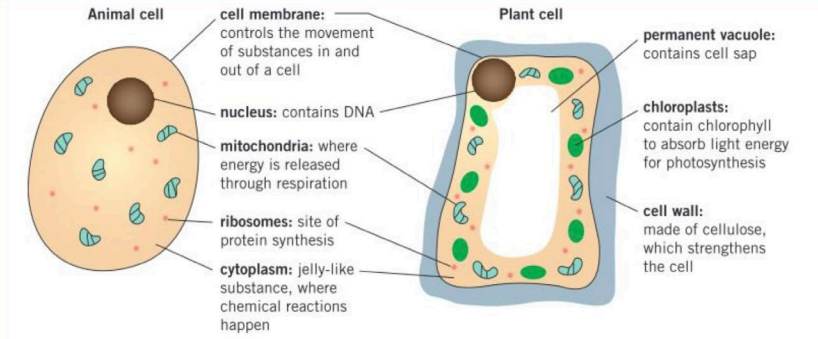
Write a paragraph for each product you are making. Explain why you are making the product, and how it is suitable for afternoon tea. i.e. Victoria Sandwich Cake Read the examples below and tailor these to your dish. This dish shows a variety of colours; state the colours used in each dish. I have trialled this dish so I know how long it will take to make/I know what it will look lke. This dish is nutritionally balanced (contains carbohydrates, protein, vitamins and minerals, is low in salt, low in fat) This dish shows a variety of textures; chewy, crunchy, soft, crisp etc. This dish will demonstrate a range of skills such as….(creaming, pastry making, whipping, proving) This dish shows a variety of flavours. · Cost – state how economical the dishes chosen are. Use of staple or store cupboard ingredients, ingredients which are in season etc. ·This dish can be made in time available. This dish look attractive with accompaniments and/or garnishing. This dish is saleable – customers in restaurant would want to buy them. This dish is easy to portion control and to serve. State how you will portion dishes; use of spoons, ladles etc. This dish would be suitable for making in bulk. This dish can be chilled/frozen for use another time. Chilled at 1-5GC and frozen at -18GC. Make a menu card to show the dishes you are making. Present attractively. You will need to display this with your food during the practical .

Year 9 Cells and Organisation 2A

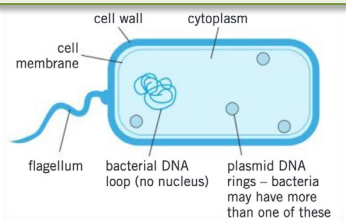
Knowledge Organiser

Animal and Plant Cells

Animal and plant cells are eukaryotic cells. They have genetic material (DNA) that forms chromosomes and is contained within a nucleus.



Bacterial cells



Bacteria have the following characteristics:

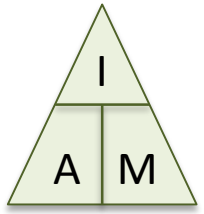
- Single-celled
- No nucleus – have a single loop of DNA
- Have small rings of DNA called plasmids
- Smaller that eukaryotic cells

Comparing sub-cellular structures

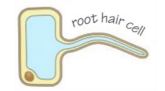
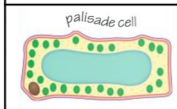
Structure	Animal	Plant	Bacteria
cell membrane	/	/	/
cytoplasm	/	/	/
nucleus	/	/	-
cell wall	-	/	/
chloroplasts	-	/	-
permanent vacuole	-	/	-
DNA free in cytoplasm	-	-	/
plasmids	-	-	/

Microscopes

Light microscope	Electron microscope
Uses light to form images	Uses a beam of electrons to form images
Living samples can be views	Samples cannot be living
Relatively cheap	expensive
Low magnification	High magnification
Low resolution	High resolution



Specialised cells

Specialised cell	Function	Adaptations
	Fertlise an ovum (egg)	- Tail to swim to the ovum and fertilse it - Lots of mitochondria to release energy from respiration, enabling the sperm to swim to the ovum
	Transport oxygen around the body	- No nucleus so more room to carry oxygen - Contain a red pigment called hemoglobin that binds to oxygen molecules - Flat bi-concaved disc shape to increase surface area-to-volume ratio
	Contract and relax to allow movement	- Contains protein fibres, which can contract to make the cells shorter - Contains lots of mitochondria to release energy from respiration, allowing the muscles to contract
	Carry electrical impulses around the body	- Branched endings, called dendrites, to make connections with other neurones or effectors - Myelin sheath insulates the axon to increase the transmission speed of the electrical impulses.
	Absorb mineral ions and water from the soil	- Long projection speeds up the absorption of water and mineral ions by increasing the surface area of the cell - Lots of mitochondria to release energy for the active transport of mineral ions from the soil
	Enable photosynthesis in the leaf	- Lots of chloroplasts containing chlorophyll to absorb light energy - Located at the top surface of the leaf where it can absorb the most light energy

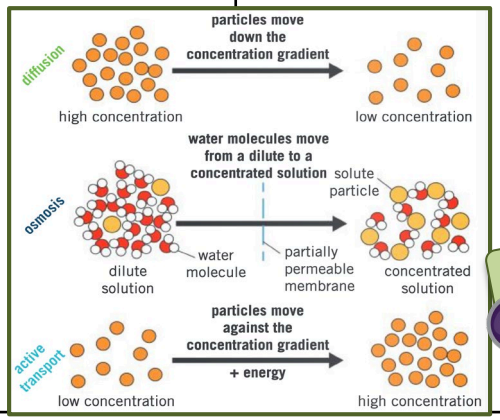
Key terms

chloroplast chromosome cytoplasm eukaryotic prokaryotic resolution ribosome

Year 9 Cells and Organisation 2A

Knowledge Organiser

	Diffusion	Osmosis	Active Transport
Definition	The spreading out of particles, resulting in a net movement from an area of higher **concentration** to an area of lower concentration.	The diffusion of water from a dilute solution to a concentrated solution through a partially permeable membrane.	The movement of particles from a more dilute solution to a more concentrated solution using energy from respiration.
Movement of particles	Particles move down the concentration gradient – from an area of high concentration to an area of low concentration.	Water moves from an area of lower solute concentration to an area of higher solute concentration.	Particles move against the concentration gradient – from an area of low concentration to and area of high concentration.
Energy required?	No – passive process	No – passive process	Yes – using energy released during respiration
Examples	Humans: • Nutrients in the small intestine diffuse into the blood in the capillaries through the villi. • Oxygen diffuses from the air in alveoli into the blood in the capillaries. Carbon dioxide diffuses from the blood in the capillaries into the air in the alveoli. • Urea diffuses from cells into the blood for excretion by the kidney. Fish: • Oxygen from water passing over the gills diffuses into the blood in the gill filaments. • Carbon dioxide diffuses from the blood in the gill filaments into the water. Plants: • Carbon dioxide used for photosynthesis diffuses into leaves through the stomata. • Oxygen produced during photosynthesis diffuses out of the leaves through the stomata	Plants: Water moves osmosis from a dilute solution in the soil to a concentrated solution in the root hair cell.	Humans: Active transport allows sugar molecule to be absorbed from the small intensive when the sugar concentration is higher in the blood than in the small intensive. Plants: Active transport is used to absorb mineral ions into the root hair cells from more dilute solutions in the soil.



Factors that affect the rate of diffusion

1) Concentration gradient

The steeper the concentration gradient the faster the rate of diffusion.

2) Temperature

The higher the temperature, the faster the rate of diffusion.

3) Surface area of the membrane

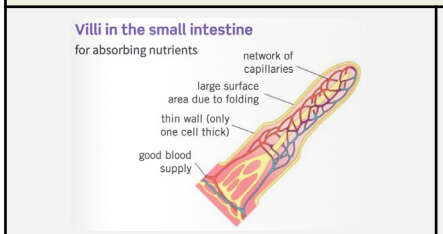
The larger the membrane surface area the faster the rate of diffusion.

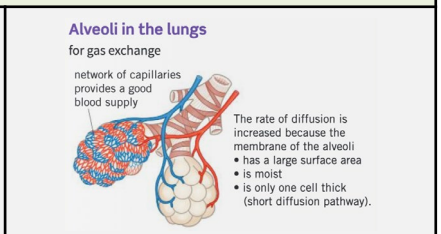
Adaptations for exchanging substances

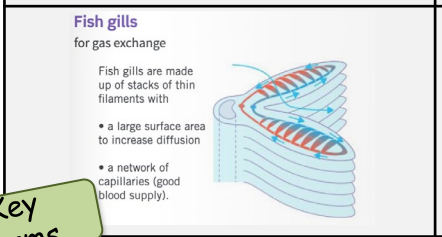
Single-celled organisms have a large surface area-to-volume ratio. This allows enough molecules to move across their cell membranes to meet their needs.

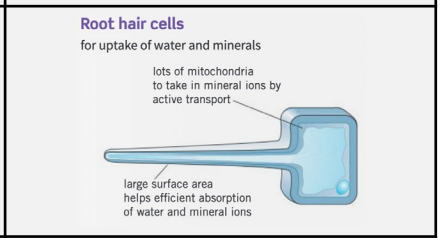
Multicellular organisms have a small surface area-to-volume ratio. This means they need specialized organs systems and cells to be transported into and out of their cells.

Exchange surfaces work most efficiently when they have a large surface area, a thin membrane, and a good blood supply.









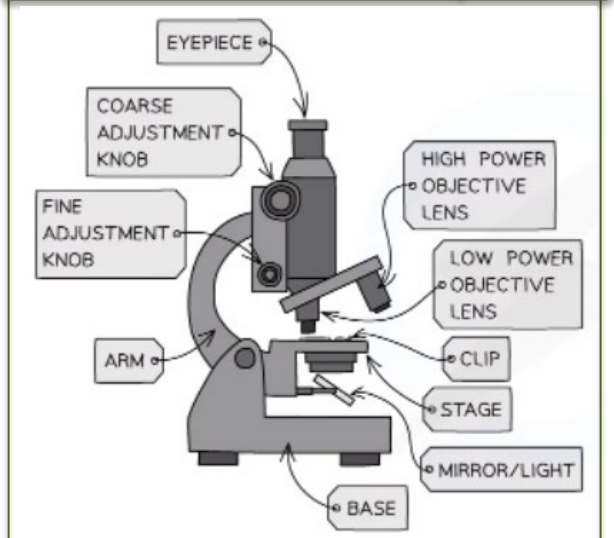
Key terms

concentration partially permeable membrane passive process gradient stomata urea villi capillaries alveoli diffusion active transport dilute

Year 9 Using a microscope

Knowledge Organiser

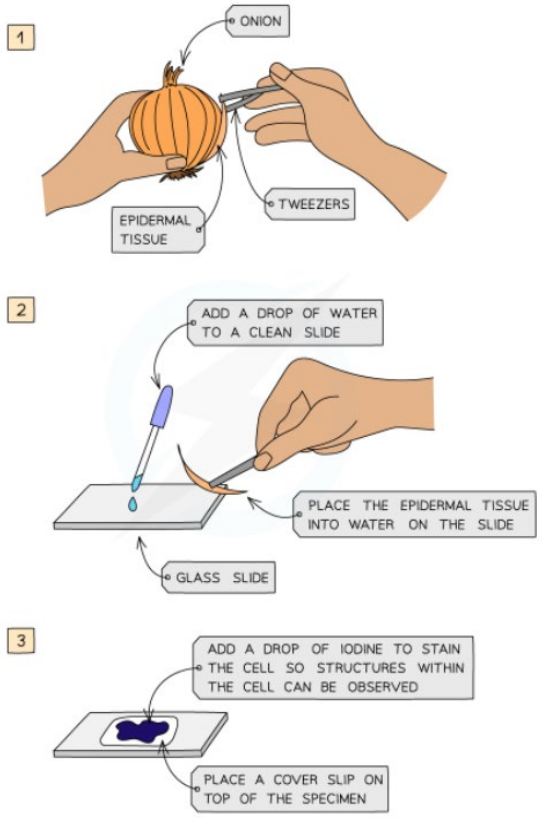
Parts of a microscope



Using a microscope

1. Clip slide onto the stage
2. Ensure the lowest powered objective lens is over the slide.
3. Use the coarse adjustment knob to bring the stage up just below the lens.
4. Look down the eye piece and gradually move the stage downwards using the coarse adjustment knob. Stop when the image is roughly in focus.
5. To bring the image into focus adjust the fine adjustment knob until a clear image is obtained.
6. To observe the image with a higher magnification, change the objective lens to a higher power and readjust the stage using the coarse and fine adjustment knobs.

Making an onion slide



Conversions

To convert micrometres into millimetres you should divide the measurement by 1000.

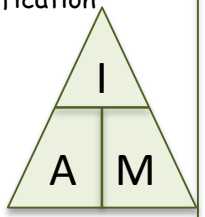
To convert millimetres into micrometres you should multiply the measurement by 1000.

Calculations

magnification = image size / actual size

actual size = image size / magnification

image size = actual size x magnification



total magnification = eye piece x objective

Microscopes

Light microscope	Electron microscope
Uses light to form images	Uses a beam of electrons to form images
Living samples can be views	Samples cannot be living
Relatively cheap	expensive
Low magnification	High magnification
Low resolution	High resolution

Pure and impure substances
Knowledge Organiser

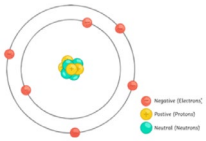
Atoms

All substances are made of atoms. An atom is the smallest part of an element that can exist.

Atoms are very small, having a radius of about 1 x 10^{-10}m. The radius of the nucleus us less than 1/10000 of that of the atom.

In an atom, the number of electrons is equal to the number of protons in the nucleus, Atoms have no overall electric charge.

Particle	Relative Mass	Relative Charge
Proton	1	+1
Neutron	1	0
Electron	Very small	-1



Atomic Number and Mass Number

The number of protons in an atom of an element is its **atomic number**. All atoms of a particular element have the same number of protons. The sum of the protons and neutrons in an atom is its **mass number**.

Electronic structure

The electrons in an atom occupy the lowest available energy level. The electronic structure can be represented by numbers or by a diagram. For example, the electronic structure of carbon (above) is 2,4.

Elements, compounds and mixtures

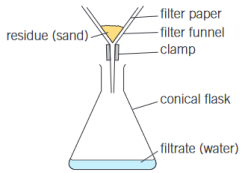
Elements are substances that only contain one type of atom. These are represented by chemical symbols, e.g. O represents oxygen. There are about 100 different elements on the periodic table.

Compounds are formed when two of more different elements chemically bond together, in fixed proportions. Compounds can only be separated by **chemical reactions**.

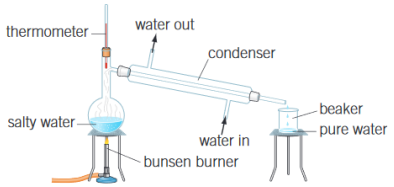
Mixtures consist of two or more elements or compounds **not** chemically combined together. **Mixtures** can be separated by **physical processes**.

Separating techniques

Filtration



Distillation



Evaporation

Development of the atomic model

Scientist	Period	Discovery	Model
John Dalton	1808	Atoms described as solid spheres	
JJ Thomson	1897	Plum Pudding model – the atom is a ball of positive charge with scattered electrons	
Ernest Rutherford	1911	Alpha Scattering – concentrated positive mass in the centre. Atoms are mostly empty space.	
Niels Bohr	1913	Electrons are in shells orbiting the nucleus	
James Chadwick	1932	Neutrons in the nucleus	

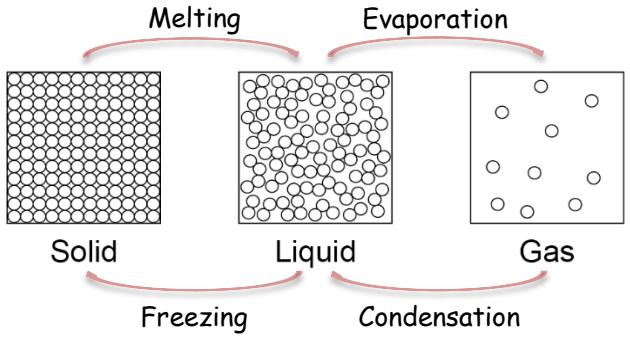
Key terms

atom | atomic number | compound | electron | mass number | neutron | nucleus | proton | element

Pure and impure substances
Knowledge Organiser

States of matter

The three states of matter are solid, liquid and gas. They can be represented using the particle model, by small solid spheres.



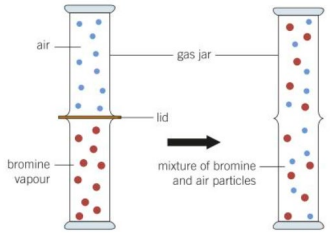
The amount of energy needed to change the state of the substance depends on the strength of the forces between the particles. The stronger the forces between the particles, the higher the melting and boiling point of the substance. There are limitations to this model, due to the following assumptions:

- No forces between the particles
- Particles are all solid spheres

In chemical equations, the three states of matter are shown as (s), (l) and (g), with (aq) for aqueous solutions.

Diffusion

The particles in fluids are able to move. When they collide, they change direction causing the motion to appear random. Over time, the particles spread out from a region where there are many particles to a region where there are fewer particles. This is called **diffusion**.

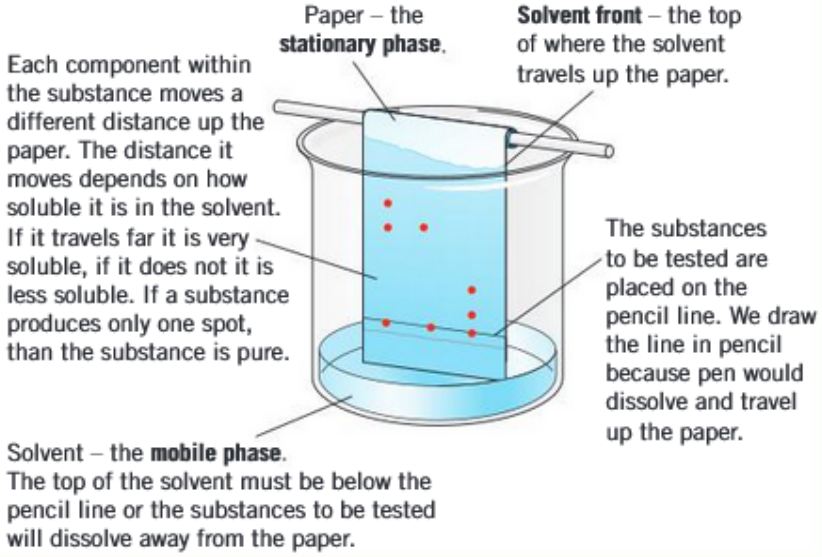


Chromatography

Chromatography can be used to separate different components in a mixture. Chromatography involves a stationary and a mobile phase. Separation depends on the distribution of substances between the phases. The Rf value is a ratio of the distance moved by a compound to the distance moved by the solvent.

$$R_f = \frac{\textit{Distance moved by substance}}{\textit{Distance moved by solvent}}$$

Different compounds have different Rf values in different solvents and at different temperatures. Rf values for particular substances can be used to identify a substance. Rf values are always between 0 and 1.



Key terms

Chromatography | mobile phase | Rf value | solvent | stationary phase | diffusion | high concentration | low concentration

Atoms and periodic table A
Knowledge Organiser

Periodic table

In the early 1800s, elements were arranged by **atomic weights**. The periodic table was not complete because some of the elements had not been found and some elements were put in the wrong group.

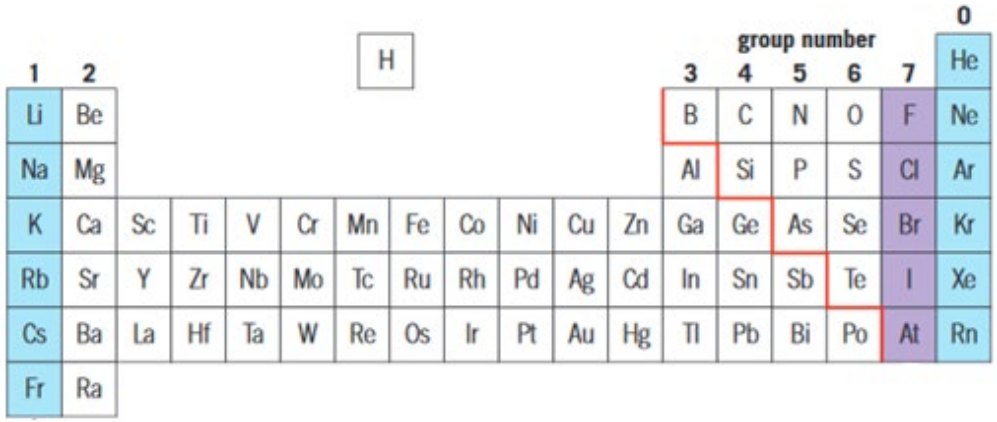
Dimitri Mendeleev (1869) left gaps in the periodic table to account for elements he thought had not yet been discovered. He put them in order of **atomic number**. Elements with properties predicted were discovered and filled the gaps. The existence of isotopes supported ordering by atomic number.

Modern Periodic table

The red step shows the divide between metals and non-metals. **Metals** are on the **left** and **non-metals** on the right.

Groups are the columns in the periodic table – they go downwards. The group number shows the number of **electrons** in the **outer shell**. Elements in the same group normally follow the same trends in properties.

Periods are the rows in the periodic table – they go sideways. Each **period** shows another full shell of electrons.

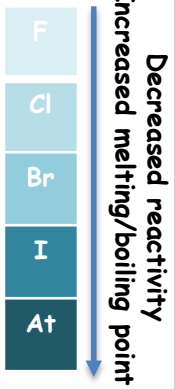


Group 0 – Noble gases

Noble gases: **helium**, **neon** and **argon** are all **non-metals** with **low** melting and boiling points. The boiling points all increase as they go down the group due to greater intermolecular forces. They are colourless gases at room temperature. Group 0 elements are typically unreactive.

Group 7 - Halogens

Halogens: fluorine, chlorine, bromine and iodine are all **non-metals**. The reactivity **decreases** as they go down the group due to an increase in difficulty gaining an extra electron. The melting and boiling points become **higher** down the group.



Group 1 – Alkali metals

Alkali metals: lithium, sodium, potassium and rubidium are all soft reactive **metals**. The reactivity **increases** as they go down the group. They get bigger and it is easier for them to lose and electron if it is further from the nucleus. The melting and boiling points become **lower** down the group.

Key terms

alkali metals | group 1 | group 7 | group 0 | halogen | noble gas | Period | Trend

Year 9 – Computing – Python – Knowledge Organiser

Key Words	
Syntax	The rules of grammar used in a coding language.
Indentation	A standard used to signify the start and end of a block of code.
Function	A block of code that performs an action and, once defined, can be reused.
Variable	An identifier for a memory location, used to store data or is assigned a value that can be changed while the program is running.
String	Data type used to store a string of characters.
Integer	Data type used to store whole numbers.
Float/Real	Data type used to store decimal numbers.
Boolean	Data type used to store yes/no, true/false values.
Casting	Define or change a variables data type.
Concatenating	Joining character strings end-to-end.
Selection	A programming construct . An option of statements (blocks of code) are provided and different code is executed dependent upon a condition being met.
Iteration	A programming construct. Code is executed/run repeatedly/is looped, until a condition is met/while a condition is true/a set number of times.

Variable

Comparison

```
name = input("What is your name? ")
while name != "Bob":
    print("Where is Bob?")
    name = input("What is your name? ")
print("Hello Bob")
```

String

Iteration

Function

Python Rules

Never use the shell – You MUST create a new file

You run a program by pressing F5

You save your program every time you run it, so double check you don't save over anything you need!

Casting

- `str()` `str(animal_name)`
- `int()` `int(goals_scored)`
- `float()` `float(share_price)`

Selection

`if` `elif` `else`

Remember you can only use IF and ELSE once when using selection!

Iteration

```
fruits = ["apple", "banana", "cherry"]
for x in fruits:
  print(x)
```

This code prints each fruit in a fruit list.

While loops are condition controlled.

For loops are count controlled.

```
i = 1
while i < 6:
  print(i)
  i += 1
```

This code prints i as long as i is less than 6.

Operators

Arithmetic

These are used to perform calculations on any number data type.

+	Addition
-	Subtraction
/	Division
*	Multiplication

Comparison

These are used to compare values on any number data type.

==	Equal to
>	Greater than
<	Less than
!=	Not equal to
>=	Greater than or equal to
<=	Less than or equal to

Data Types

Integer e.g. 23
Float/Real e.g. 23.7
String e.g. Hello all!
Boolean e.g. TRUE or FALSE

Keyboard Shortcuts

Ctrl + C = Copy 

Ctrl + V = Paste 

Ctrl + X = Cut 

Ctrl + A = Select All

Ctrl + Z = Undo

Ctrl + Y = Redo

Ctrl + B = Bold

Ctrl + I = Italic

Ctrl + U = Underline

Ctrl + S = Save

⊞ + ⇧ + S = Snipping Tool

F5 = Refresh

F11 = Fullscreen Mode

F7 = Spelling & Grammar check

Y9 Wonderful Biomes

Make sure you know the 'bare bones' (the basics) of this unit.

Keywords:

- **Biome** - Biomes are areas of our planet with similar climates, landscapes, animals and plants
- **Ecosystem** - interaction of the living and non- living parts of an environment- they can be much smaller than a biome.
- **Climate –** the average temperature and rainfall
- **Characteristics –** the main features of the area
- **Fauna -** animals
- **Flora / Vegetation** – plants
- **Biodiversity** - the range of plants and animals that living in an ecosystem
- **Interdependence** – plants and animals needing each other to survive.
- **Deforestation** – trees being cut down to use them to sell or use the land left behind; this is usually for the country to make money for their economy
- **Soil erosion** – when trees are cut down they no longer hold the soil together, when it rains the soil is washed away
- **Extreme environment –** an ecosystem that is very difficult to survive in
- **Permafrost –** found in the tundra, it this is the layer of frozen soil under the Earth's surface.
- **Inaccessibility** – when it is difficult to reach a location it is not very accessible

Small Scale Ecosystem

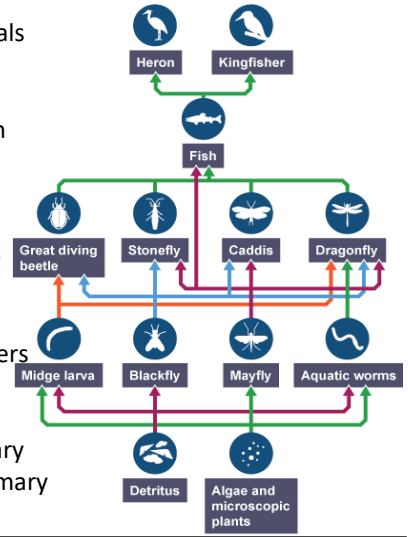
In a small scale ecosystem plants and animals rely on each other to survive.

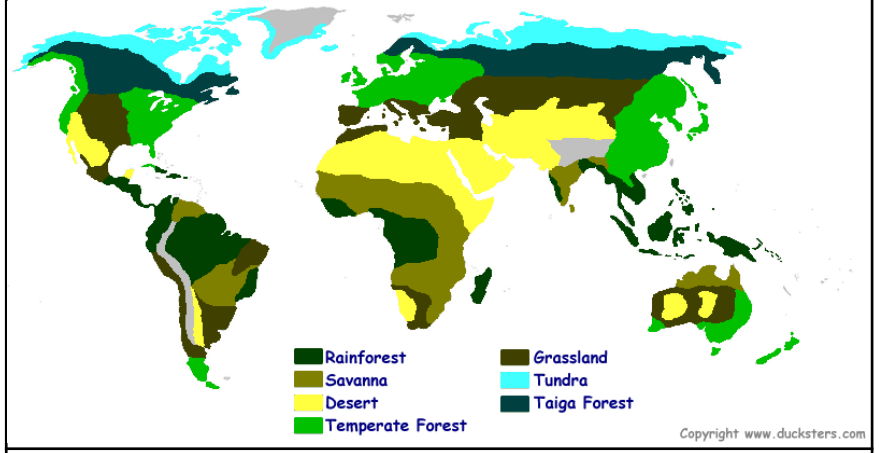
A food web shows you the complex links oh who eats who in an ecosystem.

The producers are always on the bottom (your green plants and algae which provide food to the consumers).

The next level shows your primary consumers (the herbivores which eat the producers).

The final layer (or layers) show the secondary consumers (the carnivores who eat the primary consumers).





Types of Global Biomes

Tropical forests -near the equator, they are hot and humid and contain a huge variety of plants and animals

Savanna - hot and dry, lots of grass with some trees. They have a dry season when the vegetation dies, and a rainy season when it grows rapidly

Desert - driest and hottest of areas with less than 250mm of rainfall

Temperate grasslands - grass and trees and large bushes are rare. Weather is mild with moderate rainfall.

Temperate deciduous forests - have trees that lose their leaves and are found across Europe and USA. The weather is mild and wet. They have 4 seasons.

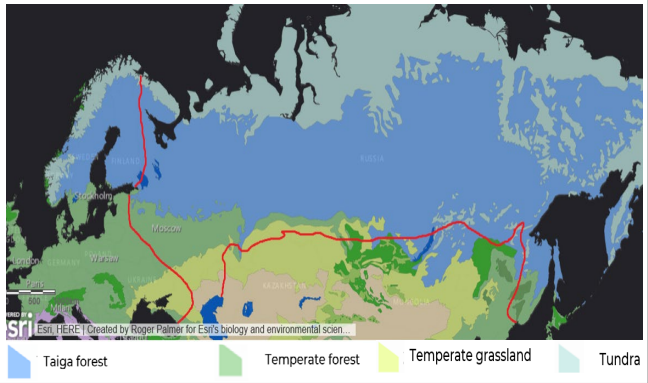
Tundra surrounds the North and South poles. They have an extremely cold climate, with limited numbers of plants and animals able to survive there.

Taiga Forest (also known as boreal) evergreen coniferous trees with needles. Summer temperatures rarely rise above 10°C and in the winter, it can be -30°C. Precipitation is low and mainly falls as snow.

Russia – one country, four Biomes

Russia has **more** forest cover than any other country in the world, **20%** of the world's forest cover is in Russia.

The four main biomes in Russia are Taiga forest, tundra, temperature grasslands and temperate forest



Taiga

Deforestation is a threat to the taiga forest. Russia has the third highest rate of deforestation in the world.

A huge problem is illegal logging in the Taiga, especially in the eastern Siberia areas. This is occurring as there is a high demand from China so they can use the timber for economic development in businesses such as furniture and manufacturing.

Advantages

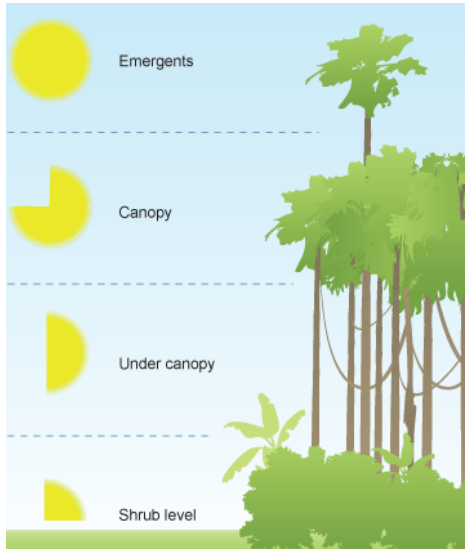
- Creates jobs in Russia which benefits the local economy

Disadvantages

- Leads to nutrients being washed from the soil so it becomes infertile (soil erosion)
- It destroys animal habitats reducing biodiversity (the range of plants and animals) e.g. there are only 450 amur tigers left in the wild

Tropical Rainforest

Located at 0° - 23.5° North and South of the Equator, tropical rainforests are hot and wet all year round with 12 hours of sunlight per day. The average temperature is 28°C and the annual (yearly) rainfall is 2,100mm



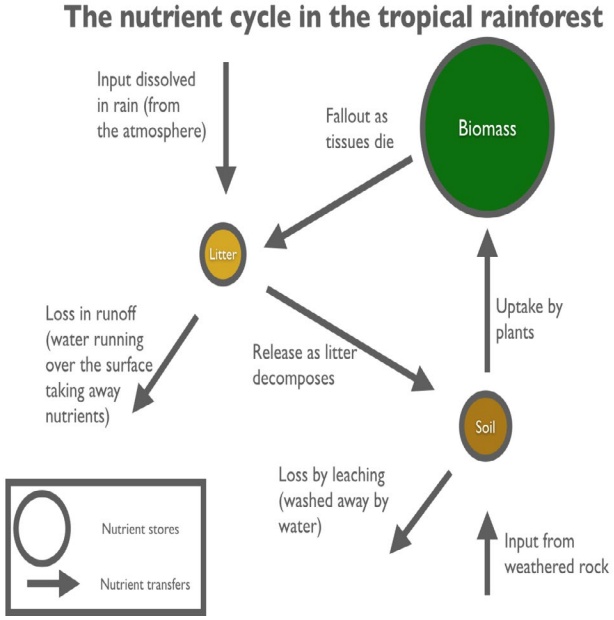
Rainforest Adaptations

Buttress roots - hold the tree into the ground so it can grow high to get sunlight for photosynthesis in the emergent layer

Drip tips - water runs off to give water to the plants below in the drier under canopy and does not weigh down the leaf

Sloth has long claws to hang onto trees away from predators. It is camouflaged to hide from predators.

Toucan has a hooked pointed beak to teach fruit in the tree. It changes its blood flow to help it cool down.

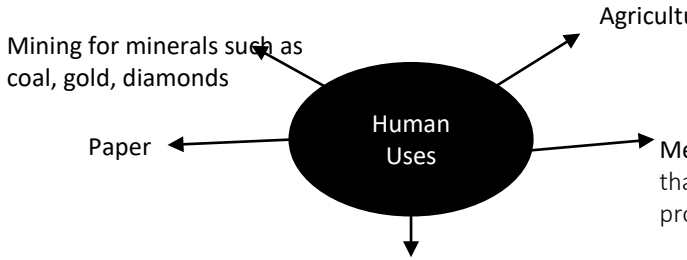


Tundra Climate: cold, windy and little rainfall. Snow covers the ground for much of the year. Average temperature -12°C to -6°C. The summer season lasts for 50-60 days and in the summer the permafrost melts. Permafrost is the top layer of frozen soil.

Animal adaptations: Arctic Fox – flat snout to dig through the snow, extra blood flow to their feet to keep them warm on the ice

Plant Adaptations: Bearberry Plant - low growing to avoid the cold wind, hairy stem to help it keep warm, thick bark to stop it breaking in the strong wind

Human Uses / Threats to the Tropical Rainforest



Threats to the Borneo Rainforest

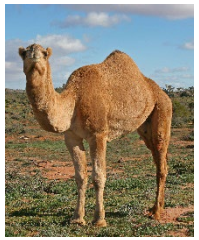
Threat	Positives	Negatives
Agriculture – palm oil production	Creates jobs for locals, generates tax for the government which can improve development	Trees are removed and burnt resulting in CO_2 emissions. Fewer trees cause soil erosion.
Hunting –e.g. pangolins and orangutans	None	Reduces biodiversity and will result in changes to the food web. The animals are at risk of becoming extinct.
Mining for coal	Creates jobs for the economy and coal can be exported to improve their GNI	Large areas of forest cleared, pollutants from the mine can contaminate local rivers

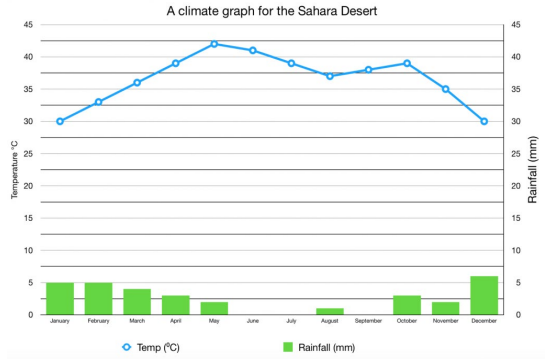
Deserts

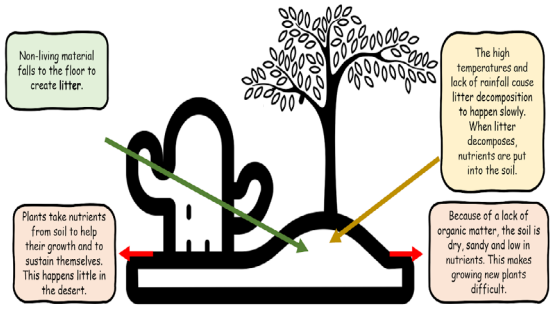
Climate: Deserts are very arid (dry). They get less than 250m of rainfall annually (per year) and the average temperature is 36°C

Animal adaptations: Camel – stores fat in hump so they can go for longer periods without food or water, long eye lashes to protect from sand storms, wide leathery feet to protect them from the hot sand.

Plant Adaptations: Cactus – needles stop predators from eating it, needles help to catch moisture from the air, wide base stores water







Quick Quiz

1. What is the difference between a biome and an ecosystem?
2. Name the worlds biomes
3. How many biomes are in Russia and what are they called?
4. What is happening to the Taiga (boreal) in Russia?
5. State 2 disadvantages of illegal logging in Russia
6. What is the average temperature of the rainforest?
7. What is the annual rainfall for the rainforest?
8. Name the 4 layers of the rainforest (bottom to top)
9. How has the toucan adapted to the rainforest?
10. How do buttress roots help rainforest trees survive?
11. What is the average temperate of the tundra?
12. How long is the summer in the tundra?
13. What is permafrost?
14. Name two plants in the tundra
15. Name two animals in the tundra
16. List the opportunities in Svalbard
17. How many tourists visit Svalbard?
18. How many jobs does tourism create in Svalbard?
19. What are the 2 challenges of living in Svalbard?
20. What is the average temperate in the desert?
21. How much rainfall is there in the desert?
22. How has the camel adapted to survive?
23. How has the cactus adapted to survive?
24. List the opportunities in the Mojave desert
25. What are the 2 challenges of living in the Mojave desert?
26. Why are the high temperatures a big problem in the Sahara?

Exam Questions

1. Describe the distribution of the tundra biomes (3) - remember distribution means where it is in the world

2. Explain the economic opportunities in a cold environment you have studied (6) - remember economic is linked to making money and jobs. Our cold environment is the tundra in Svalbard

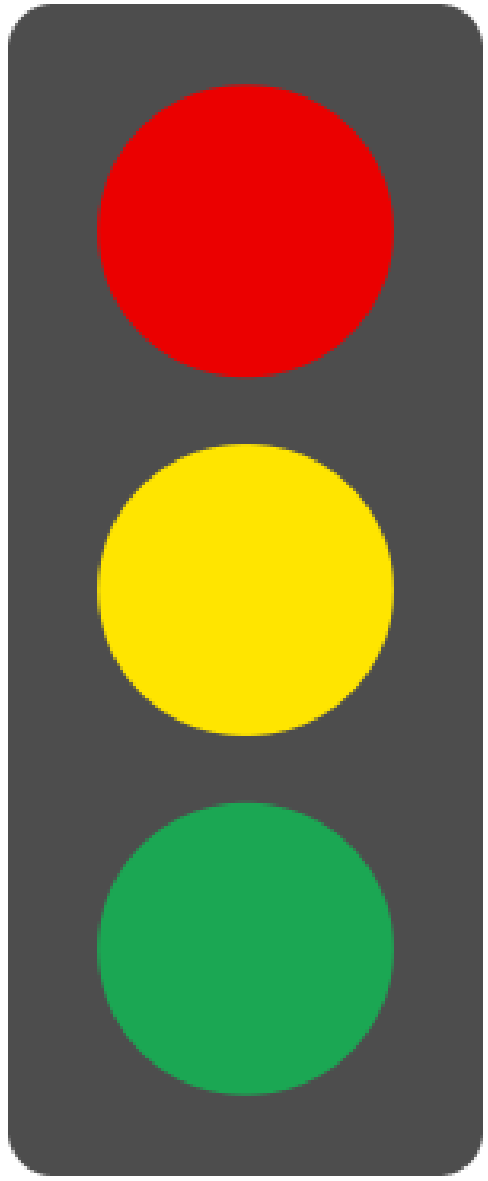
3. Explain how plants and animals have adapted to survive in the extreme climate of the desert (4) – Talk about how the cactus and camel have adapted (changed) to survive in the desert climate

4. To what extent are there more opportunities than challenges in a hot desert you have studied (9) - Weigh up the opportunities and challenges and reach a conclusion on if there are more opportunities or more challenges in the Mojave desert

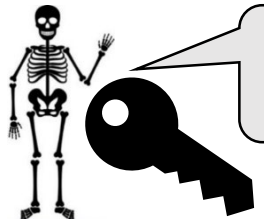
Knowledge	Structure	Speak like a geographer

TOPIC LISTS

Topic	R – A – G
Introducing ecosystems- components in an ecosystems abiotic and biotic	
World biomes- distribution and characteristics	
Taiga forest characteristics and the coniferous tree adaptations	
Threats facing the taiga	
Rainforest characteristics and interdependence	
Rainforest adaptations both fauna and flora	
Protecting the rainforest Borneo- sustainability and conservation	
Tundra characteristics	
Svalbard opportunities and challenges	
Deserts characteristics and adaptions of fauna and flora	
Deserts (Mojave) opportunities and challenges	



Y9 Wonderful Biomes

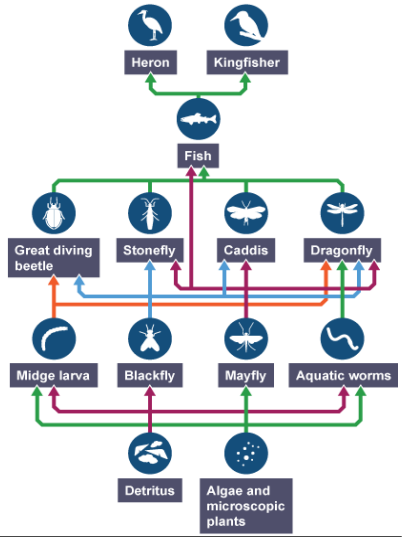


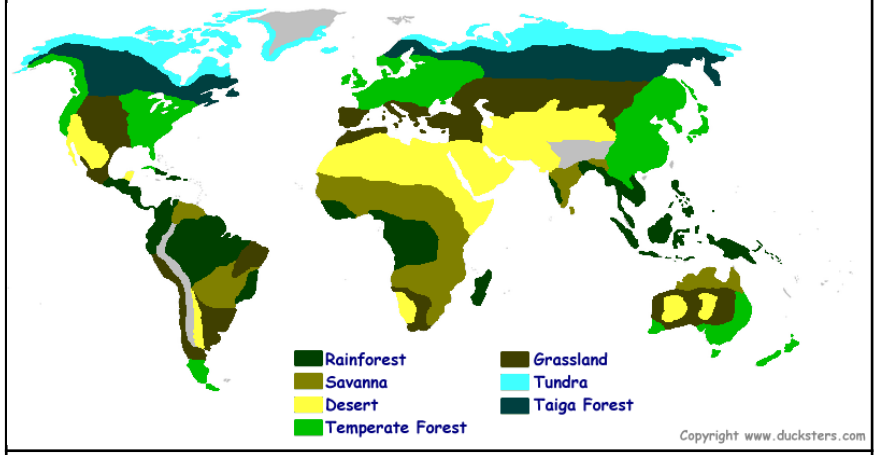
Make sure you know the 'bare bones' (the basics) of this unit.

Keywords:

- **Biome -**
- **Ecosystem -**
- **Climate –**
- **Characteristics –**
- **Fauna -**
- **Flora / Vegetation –**
- **Biodiversity -**
- **Interdependence –**
- **Deforestation –**
- **Soil erosion –**
- **Extreme environment –**
- **Permafrost –**
- **Inaccessibility –**

Small Scale Ecosystem





Types of Global Biomes

Tropical forests -

Savanna -

Desert -

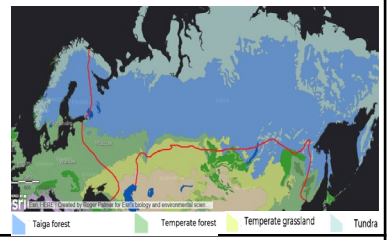
Temperate grasslands -

Temperate deciduous forests -

Taiga Forest

Tundra

Russia – one country, four Biomes

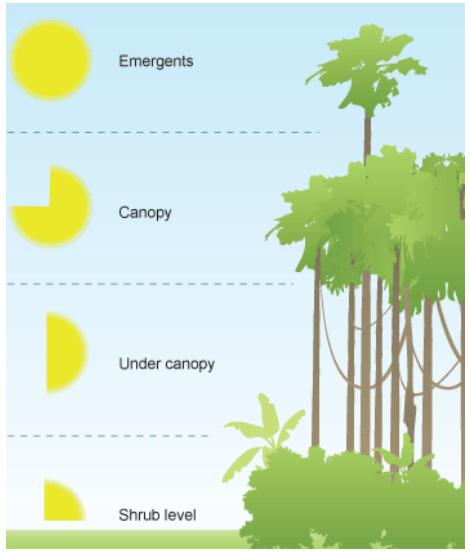


Taiga

Advantages

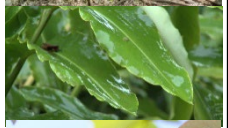
Disadvantages

Tropical Rainforest



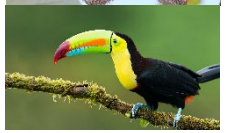
RAINFOREST ADAPTATIONS

Buttress roots -



Drip tips -

Sloth



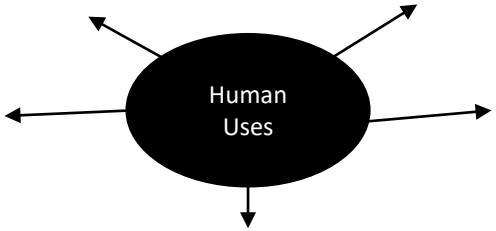
Toucan

Tundra Climate:

Svalbard Opportunities

Svalbard Challenges

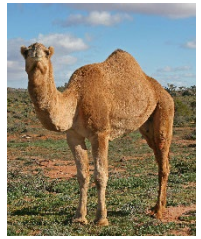
Human Uses / Threats to the Tropical Rainforest



Threats to the Borneo Rainforest

Threat	Positives	Negatives
Agriculture – palm oil production		
Hunting –e.g. pangolins and orangutans		
Mining for coal		

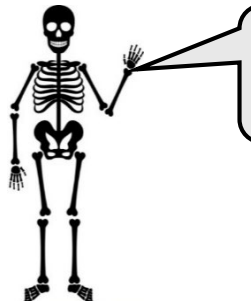
Deserts
Climate:



Mojave Desert Opportunities

Mojave Desert Challenges

Year 9
Resources and Conflict



Make sure you know the 'bare bones' (the basics) of this unit.

Keywords:

1. **Resource** – a material that people need and value E.g. Food, water and energy
2. **Conflict** – difference in opinion / disagreement
3. **Quality of life** - the standard of health, comfort and happiness of an individual
4. **Consumption** - the action of using up a resource
5. **Surplus** – there is a high amount of a resource available
6. **Deficit** – there is not enough of a resource available
7. **Resource Security** - When there is enough resources available for the population to have a health and earnings.
8. **Resource Insecurity** - When there are a lack of resources available for the population to have a health and earnings.
9. **Distribution** – the pattern of how something is spread out
10. **Sustainable** - using natural resources responsibly, so they can support both present and future generations.

Global consumption of resources

For us to survive and be healthy we need food, water and energy. However, access to these resources is not equal which can result in conflict.

Food – people need this to be healthy so we can live or day to day lives and go to school and work

Water - Humans need to drink water to survive. Water is also needed for washing, to dispose of waste, in industry and manufacturing; therefore, it is needed for development too.

Energy - Energy is used in many ways. It heats our homes, is used to manufacture goods, process food and power transport. Energy use varies depending on where people live and how wealthy (rich) they are.

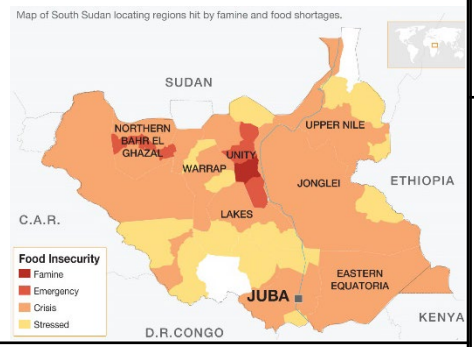
Conflict over food – Famine in South Sudan (a severe shortage of food)

Causes:

- Civil war breaks out in 2013 (killing 400 000 people)
- Fighting interrupts the farming season causing food shortages for 4 million people.
- Drought (lack of rain water)

Impacts:

☹ 1.4 million flee their homes
☹ 2.2 million people forced to flee to neighbouring countries putting further pressure on other countries resources
☹ 1 million refugees in Uganda alone in 2017
☹ 6 million people in need of food aid



Conflict of Technology E.g. Coltan Mining the DR Congo

- Coltan is an important mineral used in electronics. Especially mobile phones, 15 billion mobile phones connected every year meaning a lot of coltan is required!
- 80% of coltan is located in the Democratic Republic of Congo

Impacts

☺ It creates opportunity for jobs in a country where there are few other options
☹ The rainforest has to be cleared to mine under the ground, 8000 gorillas have been killed
☹ Many coltan mines are controlled by rebel soldiers to fund war against the government

Conflict of oil

OPEC founded in 1960 to agree fair oil prices so member countries (not including USA) would be able to develop using oil profits. Countries include Saudi Arabia, Iran, Nigeria and the Democratic Republic of Congo.

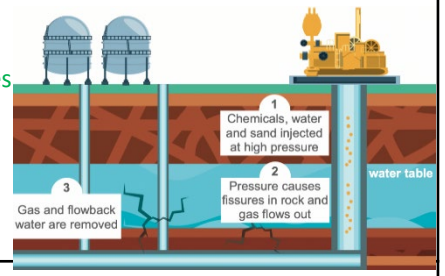
☺ OPEC ensures that there is a steady supply of oil in the global market

☹ It has power in the industry, which allows it to keep prices as high as possible

Fracking in the UK

This is taking gas that is trapped in rocks deep below the surface. They injecting a mixture of sand, water and chemicals into a hole drilled into the to release gas.

☺ Creates job opportunities
☺ Extra energy can be sold to countries
☹ It involves using lots of water which is already in high demand and short supply in parts of the UK
☹ It has caused small movements and shaking in the ground in local areas



Conflict of water E.g. River Nile

160 million depend on the river Nile for their livelihoods across 10 different countries. Within 25 years the population is expected to double – putting severe pressure on the resource. Egypt and Sudan own 100% of the water rights.

Grand Renaissance Dam

Built by Ethiopia to generate 6,000 megawatts of energy to support industrial activities and help provide energy to homes as 65% of the population are not connected to the energy supply. The access energy generated can be sold. However, it will destroy agricultural land and lead to lower levels of water passing further downstream on the River Nile which will restrict the flow to Egypt and Sudan resulting in Conflict.

Resource solutions – Masdar

Masdar City aims to be one of the world's most **sustainable** urban developments powered by **renewable** energy so that it can conserve (protect) natural resources.

- Educating three quarters of the 40,000 residents with 5 hours of sustainability education each year.
- 45 metre wind tower to cool streets
- 87 000 solar panels to produce renewable energy
- Driverless electric vehicles to operate underground
- Cushions of air on the walls reduce need for air conditioning by 55%

DESIGNING AND MAKING

Use this Learning Mate to help you during your NEA and to help you revise and prepare for Section 3 – Designing and Making Principles in your Exam. Take note of any subject specific language used.

1. INVESTIGATION – PRIMARY AND SECONDARY DATA

PRIMARY DATA

Information and Data that are gathered from **Primary Sources** is usually **more specific** to a design task as the investigation can be tailored to the **Design Brief** and/or **Design Specification.**

Primary Sources:

- Interviews - User/Client
- Questionnaires – Target Market
- Focus Groups – Target Market
- Case Studies – Existing Products/Designers
- Product Analysis
- Material Testing
- Observations of Users with Existing Products.
- Important Measurements

SECONDARY DATA

Information and Data gathered from **Secondary Sources** means that the research already exists and was **carried out by someone else.**

Secondary Sources:

- Books
- Magazines
- Websites
- Statistics
- News
- Radio
- Television
- Reviews

MARKET RESEARCH

Gathering **Market Research** is an important exercise in any design process. By conducting Market Research you can find out whether your ideas are **Commercially Viable** and make necessary amendments to your approach to suit the needs of the **User.**

INTERVIEWS AND QUESTIONNAIRES

Asking questions in the form of a **focus group** allows you to gather as much data as needed from a range of people. You may need to conduct a few interviews throughout the design and manufacture of the product. Focus groups are often recorded, **getting the user group to interact with prototypes** or the finished product to gain an insight into how people use products differently.

PRODUCT ANALYSIS

This involves looking at what is already available on the market and critically analysing it to see how it performs **functionally** and **aesthetically** as well as how commercially viable it is. Reviews help pinpoint good and bad points to help steer future designs or developments. Product analysis also gives you an insight into how products are made, which materials are used and how they are finished.

ANTHROPOMETRICS AND ERGONOMICS

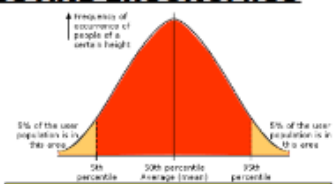
ANTHROPOMETRIC DATA

Anthropometrics is 'The Study of Human Measurements'.

Anthropometric data is used to ensure products and environments are the correct size for the intended users.

Anthropometric Data is split into 3 categories, **The 5th (smallest), 50th (mid) and 95th (largest) percentiles.**

Opposite are examples of where the various percentiles could be used to ensure the maximum amount of people can use the space or product.



5th Percentile – Fire Guard: If the smallest peoples fingers cant fit through neither can the mid or high.
50th Percentile – Public Bench: To ensure it's not too short and not too high for the average person to sit.
95th – Door Frame: If the tallest person can fit through then so can the smallest and mid.

ERGONOMICS

Take a look around your environment now. Everything you can see that is man-made has been designed to fit the end user, from the handle on a coffee mug, to the shape and size of the room you're in. Nothing is accidental.

Ergonomic means that special attention has been given to the design to make sure it is the best possible fit for the user, the environment and the task.

The Dyson Vacuum has been Ergonomically Designed.

- **The handle is designed so the average hand can hold the vacuum firmly and comfortably to minimise the risk of dropping it.**
- The trigger is in the optimum position for your index (main) finger.
- **The weight is distributed near your hand to make it easier to move.**
- The vacuum is cordless which allows you to reach difficult places.
- **The vacuum has an easy clip system to release and empty the bin section.**
- The design is colour coded. Red shows clips/triggers.
- **The vacuum is easily wall mounted for charging.**
- The vacuum is lightweight so it is easy to carry and change direction

DESIGN BRIEF

A **Design Brief** is written by the designer in consultation with a user/client. The Design Brief should outline the **Problem, Need and Design Opportunity**. The document will outline the deliverables and aim of the project including any aesthetics, function, timings and budget.

Set out your Design Brief in 3 sections:

- **Project Name**
- **Problem/Context**
- **Task and Time-frame**

What is the aim of the Design Task?

DESIGN SPECIFICATION

A **Design Specification** is a list of criteria that your Designs and Final Product must meet in order to be successful.

Your Design Specification points should be carefully thought out and **justified**. This means that you should have research or requirements that back up each Specification Point. Here are a few possible focus areas:

- **User requirements**
- **Aesthetic requirements**
- **Functional requirements**
- **Environment requirements (where the product will be used)**
- **Size requirements**
- **Material requirements**
- **Cost requirements**
- **Safety requirements**
- **Sustainability/Environmental requirements (Environmental Impact)**
- **Ethical requirements**

You will constantly **evaluate your Designs, Models and Final Product against your Design Specification** since this is essentially the **'Success Criteria'** for your whole project.

DESIGNING AND MAKING PRINCIPLES

2. DESIGN STRATEGIES

USER CENTRED DESIGN

User-Centred Design focuses specifically on the wants and needs of the end user. The Client and/or User are consulted at every stage of the design process to gather feedback on how they think the design is progressing. The designer is then able to make modifications going forward to ensure the product's sales are maximised when it is released.

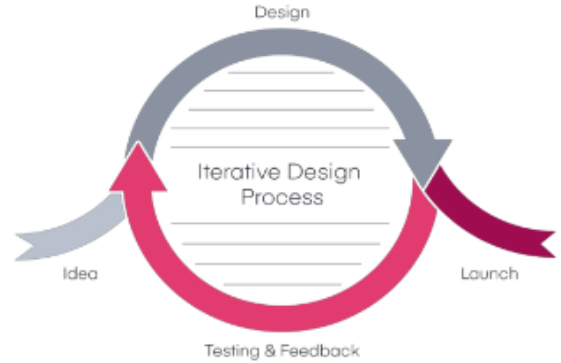
GCSE projects should be User-Centred as the prototype is designed for a specific client or user group. Ensuring the user is consulted throughout the process helps make the final design one that will satisfy the user and be fit for purpose.

COLLABORATION

Working with others is a good way to get ideas flowing. By working in, a 'design team' you can maximise initial ideas. Designers can feed off the ideas of colleagues and inspire others around them.

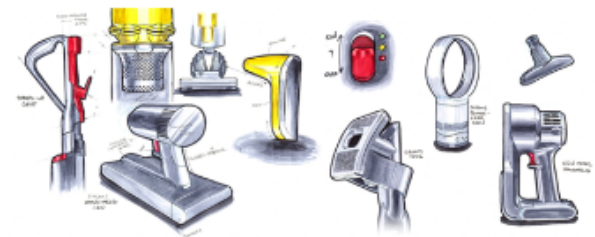
ITERATIVE DESIGN

Iterative Design involves constant refining and development of ideas as new information is gathered. Designing, Prototyping, Testing, Research, Investigations, Analysing and Evaluating are all parts of the Iterative Process and either of these can happen at any stage of the process in order to progress.



SKETCHING

Sketching allows a designer to **get ideas down quickly.** Getting ideas down quickly is important – there is always time later to tidy up and refine them. Sketching should allow you to communicate your idea to others through both drawing, rendering and annotating. Colour can be added to show important features.



MODELLING

Modelling is a great way to **test ideas in 3D** to see if they have any potential. Modelling should be carried out using **cheap and easy to work materials** such as cardboard, clay, straws and other craft-like products. Modelling can also be carried out using CAD. CAD models can be easily rendered to make them look look realistic and also easily modified once feedback has been obtained.

TESTING

Testing involves a range of checks to see if the design/model is suitable to take forward.

Non-destructive Testing: Tests that are carried out until it starts to show signs of failure/breaking. Testing limits.

Destructive Testing: How does the product cope under extreme conditions? This can help the designer select suitable materials to cope under extreme stresses.

Market Testing: The product is given to a user group to see how it performs in use. Feedback is given to help take the design forward.

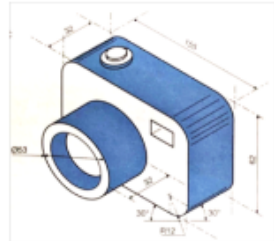
DESIGNING AND MAKING

3. COMMUNICATING DESIGN IDEAS

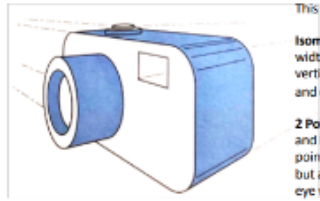
DRAWING TECHNIQUES

CABINET OBLIQUE

ISOMETRIC PROJECTION



TWO POINT PERSPECTIVE



Cabinet Oblique: Design is drawn from the front in 2D. 45° lines are drawn to show the depth of the product. This is the quickest and easiest 3D drawing technique.

Isometric Projection: Uses 30° lines (parallel) to show the width and depth of a product. The height is drawn with vertical lines. Much more detailed than Cabinet Oblique and can be a quick drawing technique if practiced.

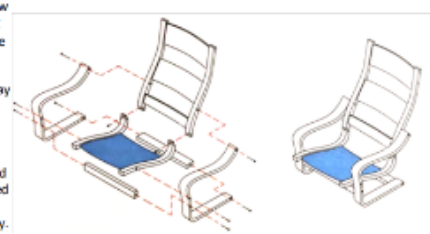
2 Point Perspective: Uses Vanishing Points. The Width and Depth are drawn towards the vanishing points. 2 point perspective is the most time consuming technique but also the most accurate as it emulates how the human eye would view a product.

EXPLODED DRAWINGS

Exploded Drawings: Used to show how a product or components fit together. The paths represent the way the product is assembled.

Exploded drawings are a good way to show components that are usually hidden using standard drawing methods.

Exploded drawings are often used in instruction packs for flat packed products to help the customer assemble the product more easily.

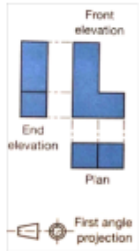


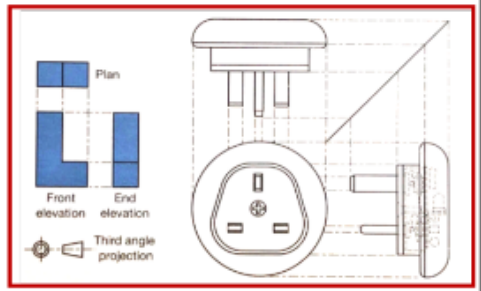
WORKING DRAWINGS

In order for products to be manufactured, a **Working Drawing** is usually produced to communicate the full idea from the most important angles. This usually includes Front, Side and Plan viewpoints. Working Drawings also show **Sectional Views** which allows you to see inside the component if parts are hidden.

The most common types of working drawing are **First Angle Orthographic Projection and Third Angle Orthographic Project.** They use the same format however, the layout of views is slightly different between them.

We most commonly use Third Angle Orthographic Projection in GCSE Design and Technology. A Third Angle drawing of a British plug is shown below in the red box.





4. QUALITY CONTROL AND TOLERANCES

QUALITY CONTROL

In manufacturing, **quality control is a process that ensures customers receive products free from defects and meet their needs.** When done the wrong way, it can put consumers at risk. For example, the recent defect found in Takata airbags resulted in the biggest automotive recall in history. The recall includes almost 69 million airbag inflators and may cost billions of pounds.

Major recalls like these can be prevented through effective quality control in manufacturing. Customers expect and demand high-quality products. When customers receive quality products you will:

- **Increase customer loyalty**
- Gain repeat business
- **Gain new customers from referrals/reviews**
- Maintain or improve your position in the market
- **Improve safety**
- Contribute to overall positive branding of your product

Manufacturers with quality control procedures in place are far less likely to face product recalls or place customers at risk from poorly made products.

TOLERANCES

Tolerance is the amount of 'error' that is allowed for a specific component. It is often thought of as a **measurement that is Plus or Minus (±)** a specific distance e.g. ±1mm. In this specific instance, the component would be allowed to be either 1mm longer or shorter than the required measurement. **It can also refer to measurements such as weight, sound, temperature, strength etc..**

During a making activity it may not be possible to achieve 100% accuracy. Therefore an appropriate degree of tolerance needs to be considered so that the product can be manufactured but also perform it's intended function. Tolerances can vary from a fraction of a millimetre to a few millimetres.

In industry generally, the narrower the level of tolerance required, the more an item will cost to produce. It is simply more time consuming and therefore more expensive to make due to the intense Quality Control in place. However, well-made products tend to work more effectively and last longer, so may in the end be better value for money.

A component being manufactured to 38mm (±1mm) could be anywhere between 37-39mm to be within tolerance.

QUALITY SYMBOLS

Many products sold in the UK and in Europe have to meet strict standards. If a manufacturer believes their product meets certain quality and safety standards they might be able to display the following logo's on their product to make it more appealing to consumers and increase their sales.

BRITISH STANDARDS KITEMARK

When you see a product with a Kitemark this means that the British Standards Institution has independently tested it, has confirmed that the product conforms to the relevant British Standard, and has issued a BSI license to the company to use the Kitemark. The manufacturer pays for this service and their product is tested, and the manufacturing process is assessed, at regular intervals.

EUROPEAN STANDARDS

The European Standards symbol (*Conformité Européenne*, meaning European Conformity). Companies are allowed to display this symbol on products if they feel that the product meets certain standards of quality and safety set out by the EU. The product is not independently tested, therefore, it is the responsibility of the company to ensure that the product meets the standards before displaying the symbol.

THE LION MARK

The Lion Mark was developed in 1988 by the British Toy & Hobby Association as a symbol of toy safety and quality for the consumer.

For a toy to display the Lion Mark, the supplier has signed a strict Code of Practice which, as well as covering toy safety matters, demands the highest standards of ethics. This symbol is of great importance to parents who can make decisions based on whether a toy has gone through strict safety control measures before giving it to their child to play with.

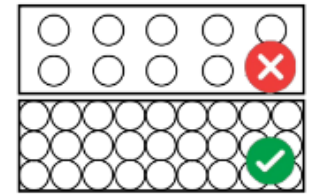
5. MATERIAL MANAGEMENT AND MARKING OUT

PLANNING

MARKING OUT

The key to material management is **calculating how much material is required for a job** whilst **minimising the amount of waste** material produced. The general rule is that you **mark from the edge of a piece of material, not somewhere in the middle.** This means that the remaining material is as large as possible.

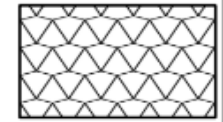
Clustering your marking out close together and arranging pieces to maximise the use of material is essential for cost cutting and saving material waste.



TESSELLATION

Cutting cost and reducing waste a key priorities for manufacturers. The **nesting of similar shapes** means that they can be cut from a piece of material whilst minimising waste.

The process of **interlocking shapes is known as tessellation**. Clever layout planning can make use of waste areas in a sheet material.

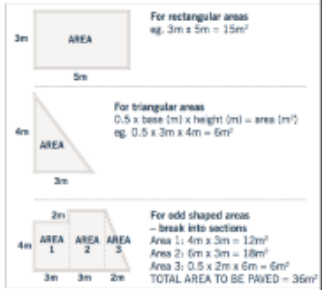


MATERIAL REQUIREMENTS

One of the most important considerations before marking out is to gather the correct amount of material required for the manufacturing process. You must work out the total area needed to manufacture the component or product therefore, knowing the size of each piece needed is extremely important.

The basic area calculation for the size of a rectangular shape is LxW (Length x Width). The area of an A4 piece of paper would be calculated as follows: **L297mm x W210mm = 62,370mm²**

Knowing the overall size of the material being used, you can calculate the cost of the material for the parts required plus how much waste will be left over. The waste would still count towards the total cost of manufacturing unless it could be used elsewhere.



6. PRODUCTION AIDS

MAKING MULTIPLE PRODUCTS

When making multiple products it is important that all products look and function in the same way. The quality of each product should be the same in order to prevent different users having different experiences. The following production aids are commonly used to ensure the quality and accuracy of each part.

TEMPLATE

A template is something that can be traced or printed multiple times to ensure each time a part is marked out, it is identical to the last.

Templates for nets are usually produced to ensure the final product can be assembled accurately.

JIG

Jigs are produced to assist in cutting, drilling or routing each component in the exact same place each time without the need for marking out. See cutting jig opposite.

MOULD

A mould is a cavity that molten metals and plastics are poured into. The material will take the exact same shape each time.

DIE

A die is used whilst cutting or extruding a piece of material. The die is a set of blades that ensure the material is cut/extruded into the same shape each time.

PAPERS AND BOARDS

1. SELECTING MATERIALS AND COMPONENTS

INTRODUCTION

Papers and Boards are commonly made from **cellulose fibres** found in wood pulp and produced in a **Paper Mill**. Other varieties of Papers and Boards come from sources such as cotton, which produces extremely high quality paper which lasts hundreds of years. Paper is weighed in **grams per square meter (GSM)**. Anything over 200 GSM is generally considered to be board.

PAPERS

Paper is something we use on a daily basis. It is a particularly useful medium for designers as it can be drawn on, written on and can be folded to make small scale models. Paper is made in a Paper Mill from cellulose fibres most commonly from wood pulp. Paper can be made from both **deciduous** and **coniferous trees** however, the latter is preferred as it is **fast growing** and more **sustainable**. Spruce and Fir trees are the most common source of the wood pulp used for papers.

TISSUE PAPER

Properties: Lightweight, Soft, Absorbent, 10-35 GSM.
Common Uses: Packaging for gifts, arts and crafts and toilet/kitchen roll.

NEWSPRINT PAPER

Properties: Off white colour, lightweight, low cost, unfinished, mainly made from recycled paper, 45-55 GSM.
Common Uses: Newspapers and low cost leaflets.

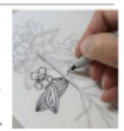
LAYOUT PAPER

Properties: Semi-translucent, Some inks smear, Good for pencil work, 40-60 GSM.
Common Uses: Sketch and design work, tracing images.

BLEED PROOF PAPER

Properties: Coated to stop markers bleeding through page, 70 GSM.
Common Uses: Design pages when markers are being applied.

TRACING PAPER



Properties: Translucent, works well with pencil, 40-120 GSM.
Common Uses: Tracing images. Best when used with a light box. Good for developing ideas.

PHOTOCOPY PAPER

Properties: Lightweight, Low cost, good for inkjet and laser printing, 70-150 GSM.
Common Uses: Household and office based printing.

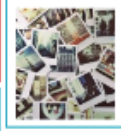
CARTRIDGE PAPER

Properties: Opaque, fairly thick, 120-150 GSM.
Common Uses: Pencil and Pen drawings, watercolour painting.

SUGAR PAPER

Properties: Range of colours, takes ink well, 80-150 GSM
Common Uses: Display work, contrast drawings.

PHOTO PAPER



Properties: High quality, bright images, gloss/satin/matt finishes, 120-260 GSM
Common Uses: Photographs, albums, cards.

BOARDS

Any paper based material weighing over 200 GSM is considered to be a board. Board is also measured by it's thickness. The measurement used is microns. **1 micron = 1/1000th of a millimetre.** A board that is 500 microns thick measures 0.5mm. Board is generally **more rigid and durable** than paper and is more suitable for items such as packaging, food containers and presentations.

CARTON BOARD

Properties: Thick, can be coated/foil lined for food, easy to print on, 200-500 GSM.
Common Uses: Food and drink, POS, Packaging.

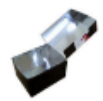
DUPLEX BOARD

Properties: Cheaper than standard card, lightweight, stiff, easily coated, 200-500 GSM.
Common Uses: Packaging, food and drinks.

CARD

Properties: Stiff, easily cut and creased, 200-500 GSM
Common Uses: Greetings cards, packaging, advertising.

FOIL LINED BOARD



Properties: Stiff, good heat insulator, water and oil resistant, 200-400 GSM.
Common Uses: Takeaway containers. Foil helps to keep food hotter for longer.

MOUNT BOARD

Properties: Thick, rigid, excellent finish, cuts well, 400 700 GSM.
Common Uses: Frame borders, mounting images.

FOAM BOARD

Properties: Lightweight, rigid, cracks and folds under pressure, 3-10mm thick.
Common Uses: Modelling, prototyping, mounting images.

CORRUGATED CARDBOARD

Properties: Strong, Lightweight, rigid in 1 direction, good insulator, easy to print on, 3-10mm thick.
Common Uses: Heavy duty packaging, storage boxes, takeaway pizza boxes.

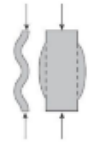
2. FORCES AND STRESSES ON PAPER AND BOARD PRODUCTS

The products below are made from various Papers and Boards. In their everyday use, these products are regularly having forces applied to them. These forces affect the way the product operates and its overall function and safety. Designers and manufacturers need to ensure that the materials they select for their products are able to withstand the forces and stresses the product will be subjected to. If they get this wrong it could have serious consequences.

TYPES OF FORCES AND STRESSES

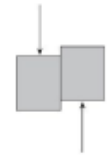
Tension forces are **pulling** forces that cause an object to be stretched or pulled apart.

Compression forces are **pushing** forces that squeeze an object. Imagine a 'crushing' motion.

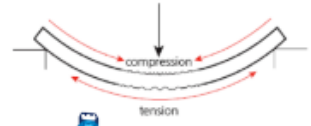


Bending forces act at an angle to an object and make it bend.

Shearing forces act **across** a material by creating a shearing action. Scissors are a good example.



When an object **bends** it is under **compression** and **tension** at the same time. See below...



Torsion forces are twisting forces that are applied to an object.

SPECIALIST TECHNICAL PRINCIPLES

4. SOURCES AND ORIGINS OF PAPERS AND BOARDS

SOURCES

Papers and Boards are usually made from **wood pulp**. **Hardwoods** and **Softwoods** can be used in paper production however, softwoods are preferred as they **grow quicker** making them **more sustainable**. The UK uses 12m Tonnes of paper every year. It takes roughly 25 trees to produce 1 tonne of paper putting huge a huge strain on our forests.

Paper can also be produced from other fibrous sources such as bamboo, sugar cane and straw, although wood generally gets the best results. Recycled papers and boards can also be used to produce new paper and board materials. **By using recycled paper and boards we save 40-70% of energy during production.**


Softwood Trees


Sugar Cane

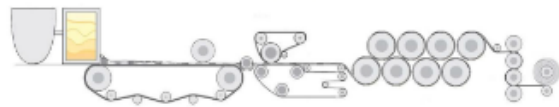

Straw

Bamboo


Recycled Pulp

HOW IS PAPER MADE?

99.5% Water ——— 0.5% Water



1. Cellulose Fibres are mixed with water to create a pulp
2. Fibrous liquid is bleached or coloured
3. Water is drained through a mesh screen
4. Felt fabrics are used to press out water
5. Heated rollers evaporate remaining water
6. Finished paper is prepared in sheets or rolls

3. ECOLOGICAL AND SOCIAL FOOTPRINT

DISPOSABLE PACKAGING

WHY IS PACKAGING USED?

Transport
The box itself is shaped so that when it is transported the boxes can be stacked along side and on top of each other. This means more can be transported at once.

Inform
The box displays important information such as nutritional information, Best Before dates and basic information such as 'what the product is' so people know exactly what they're buying.

Protect
The egg box has 6 pouches that keep the eggs still so to prevent them from cracking when the box is moved.

The card used is very soft in order to reduce shock if the box is knocked against something.

Display
The label on top helps promote the product in the shop. The label displays the brand, a picture of the item and makes the product seem fresh.

None of this could be printed on the egg itself.

Contain
The box has 6 separate sections, one for each egg. When the lid is closed the eggs are completely contained so they cannot move.

Preserve
The egg itself has a protective shell. That shell helps keep the egg fresh and stops any bacteria from touching the inner egg white and yolk.

TETRA PAK – PAST, PRESENT AND FUTURE

Deep Reading

In 2016, the UK produced 11.4 million tonnes of packaging waste, of which 7.3 million tonnes (61%) was recovered or recycled, according to the Department for Environment, Food and Rural Affairs.

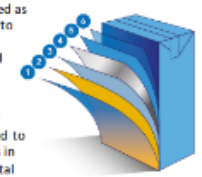
Most packaging is either plastic or card based. Plastics take an extremely long time to biodegrade and mainly come from non-renewable resources, whereas most card based materials are renewable, fully biodegradable and recyclable. The main issue with card is that it absorbs moisture if left untreated. Card can be processed to make it waterproof however this comes at a cost as it makes it harder to recycle and slower to biodegrade.

In the early 2000's, Tetra Pak came under huge scrutiny from the Recycling Association. It was named as one of the most difficult products to recycle due to the design of their packaging. The company produced layered packaging which was extremely difficult to separate.

In 2011, Tetra Pak reviewed their environmental policies and decided to change the design of their cartons in order to reduce their environmental impact. Since then, Tetra Pak has created a layered carton which is easy to separate for recycling.

Tetra Pak®

Fully Recyclable Carton



1	Polyethylene - protects against outside moisture
2	Paper - for stability and strength
3	Polyethylene - adhesion layer
4	Aluminium foil - oxygen, flavour and light barrier
5	Polyethylene - adhesion layer
6	Polyethylene - seals in the liquid

Find out more at: http://www.tetrapakrecycling.co.uk/faqs.asp

74% of the carton is made from paper which is used for strength and stability, helping the product keep it's shape. Paper is also renewable which reduces the impact of each carton. Tetra Pak works in partnership with the FSC to ensure all of their paper materials are sustainably sourced.

22% is made from polyethylene which is used for adhesion (sticking the layers together) and protecting the paper layer from moisture. It also help to contain any liquids inside the carton.

4% is the foil layer which is used to help keep the produce as fresh as possible, making products last longer. This reduces food waste and allows products to be stored at room temperature which reduces CO2 emissions caused by refrigerators.

Bio-Based Carton

All bottle lids are made from bio-polymers which makes them renewable and biodegradable in landfill.

Tetra Pak does not use biodegradable plastic in some of its packages because the materials need to withstand light, oxygen and water for long periods of time to preserve the product and prevent spoilage. However, in 2015 the company launched it's first ever fully bio-based carton for Swedish milk company Valio. Due to the short life of milk, using bio-polymers does not affect the product and helps to limit the environmental impact of this extremely disposable form of packaging. For this particular carton, the polymer layers were made from the starches in sugar cane which is renewable and decomposes quickly once in landfill.

Tetra Pak's ultimate goal is to design a fully renewable carton package for all of the products they cater for.

PAPERS AND BOARDS

5. USING AND WORKING WITH PAPERS AND BOARDS

MARKING OUT AND CUTTING EQUIPMENT

Equipment	Image	Description	Equipment	Image	Description
Steel Rule		Used for measuring and drawing lines.	Paper Shears		Used for cutting paper and boards.
Safety Rule		Helps to safely cut when using a knife/scalpel.	Creasing Tool		Used to create a crease in thicker boards.
Craft Knife		Cutting and scoring various paper and board.	Cutting Mat		Anti-slip to help when cutting. Protects surfaces.
Scalpel		Fine cutting and scoring. Various blades for tasks.	Rotary Cutter		Used to cut paper and boards to correct size.
Rotary Cutting Wheel		Cuts curved lines through paper and card.	Creasing Machine		Used to make creased lines to enable folding.

COMMON FASTENERS

Split Pin · Bulldog Clip · Binder Clip · Rachet Rivet · Staples · Paper Clip

COMMON SEALING METHODS

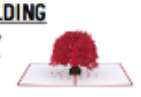
Self-Adhesive or Gummed · Easy Open Tear Strip · Tamper-Proof Stickers

COMMON BINDING METHODS

Perfect Binding · Hard Back Binding · Coil/Spiral/ Wire Binding

CREASING AND FOLDING

A **crease** is a permanent line that is created when papers and boards are **folded**. We can use creases and folds to **create complex 3D shapes from the 2D materials** using nets. Folding and creasing can also be used to add creative elements to products such as pop-up cards.



*Corrugated card has a folded layer in the centre to make it **stronger and tougher.***

ADHESIVES

Glue Stick Paper/Card · **PVA** Papers/Timber · **Spray Glue** Papers/Boards

Super Glue All Materials · **Double Sided** Papers/Boards · **Glue Gun** Papers/Timber

6. STOCK FORMS AND SIZES

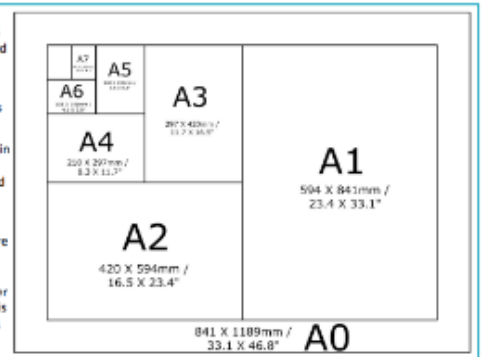
SIZES AND FORMS

Paper is commonly produced in Rolls or Sheets.

Rolls are used in industrial settings for **continuous runs and high volume printing.**

Sheets are commonly used in **work places, schools and homes.** Sheets are also used for producing consumer goods.

International paper sizes are shown opposite. The dimensions of the paper halves each time the number increases. For example, A1 is half the size of A0 and A4 is twice the size of A5.



7. SCALES OF PRODUCTION

ONE OFF PRODUCTION

In one-off production a **single product** is designed and made to a client's specification. **Labour and material costs are high**, and a high level of design and manufacturing skills are needed. Pieces of art are often one-off's.

BATCH PRODUCTION

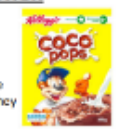
In batch production **set quantities** of a product are made to order. Materials are cost-effective and manufacturing **costs are lower.** Items that have **a tendency to change quickly** are usually Batch produced.

MASS PRODUCTION

Mass production is the industrial scale manufacture of **large quantities** of products, usually on **a production line.** Standardised production methods mean it is suitable for products that are not redesigned very often.

CONTINUOUS PRODUCTION

Continuous production is the manufacture of an item **24/7 – 365.** The system is usually completely **automated using a production line.** Due to the scale on which the items are made, they are **extremely cost effective.**



8. SPECIALIST TECHNIQUES AND PROCESSES

COMMERCIAL PRINTING PROCESSES

OFFSET LITHOGRAPHY

Considered the most cost-effective and **time-efficient publication printing process**, offset printing is fit for printing on paper, plastic or even the thicker cardboard. This technique is used for printing newspapers, books, and magazines.

In the offset publication printing process, your print goes through three major processes; **Plate making, Wetting,** and then **Inking.**

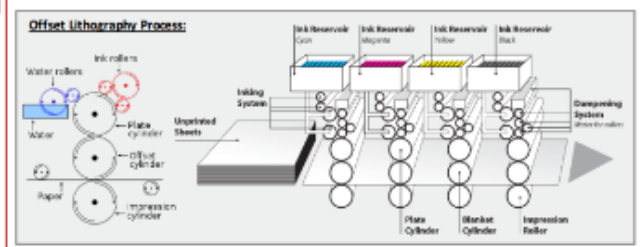
The ink sticks to the areas with images and characters while the water repels them and thus imprints to the blank spaces. This phase of the procedure is very precise. There is not a drop of ink that sticks outside of the colored areas.

The process prints one colour at a time; **Cyan, Magenta, Yellow and Black.**

Offset Lithography is used for high volume print runs. It is an extremely common process when printing newspapers and magazines.

Cyan, Magenta, Yellow and Black can be used to create any printable colour/tone. These primary colours are mixed to create other colours during the print run.

Offset Lithography Process:



DIGITAL PRINTING

The **most favored publication printing process**, digital printing also has its share of **time-efficiency**. It is a very quick computer to printer procedure **without the need of plates.** It also boasts of the **high quality images** it produces which make it ideal for glossy magazines.

Editing is easy with the use of a computer. Computers used for editing are usually expensive and ensure that the shade of colour that registers on the screen will be the exact same kind of colour once out of the printer.

Digital Printing uses the same **CMYK** colour system as Offset Lithography.

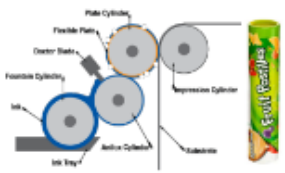
SCREEN PRINTING

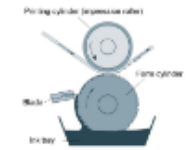
Screen printing is commonly used for art prints and **small batches of specialist prints** such as greetings cards.

The screen is made from a fine mesh material fixed to a wooden frame. A stencil is placed under the screen and ink forced through the stencil onto the material below.

FLEXOGRAPHY

Flexo printing can be described as a revised version of letterpress. **Flexography** is more versatile owing to its use of photo-etched plates which bring the ink right onto the page with colored images and characters. If letterpress is almost on its way out of the publication printing process, flexography is the exact opposite. Flexography can be used to print on various surfaces including **boards and plastics. Commonly used in packaging.**



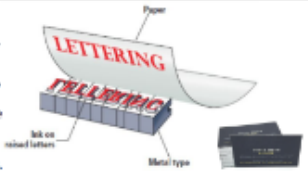


GRAVURE

High cost and capable of high quality prints like digital printing but this technique uses plates. This gravure printing process involves the direct contact between the photo-etched plates and the paper. This technique allows for the production of brilliant photograph-like prints. Commonly used for **high end magazines and up-market packaging.**

LETTERPRESS

Used to be the most popular printing process however these days **letterpress** is starting to die out. Letterpress printing is widely used for **printing tickets, business cards and stamped invitation letters.** Declining fast in popularity and use, it is far behind the other processes in terms of technological advancement; however, the letterpress technique can still be used for printing books, posters and magazines.



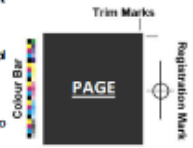
QUALITY CONTROL

Registration Marks:
The little circle with a cross through it is printed using every colour of the CMYK printing process. If they're being **printed accurately, they should overlap precisely** so the mark looks entirely black. Therefore if any of the colours are slightly offset then they'll be visible (see right).

GOOD · BAD

Trim Marks:
These are small lines which **show exactly where the finished page will be cut** during the finishing process.

Colour Bars:
Colour bars are printed outside the trim area and are used for **quality control** purposes by the printer. Squares of colour are printed on the area of the page to be trimmed off, which the printing press operator uses to check colour density and consistency is maintained. This checking process is automated by some printers, with digital scanners tracking the colour bars to ensure quality and consistency is maintained.

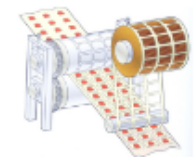


INDUSTRIAL CUTTING

DIE CUTTING

Die cutting is used to cut multiple, identical shapes, very quickly. A shaped blade called a die is used to cut the paper based material. The material to be cut is placed under the die and the die is lowered. For creasing, blunt blades are used and therefore does not cut through the material but creases it instead.

This process is commonly used when manufacturing nets for packaging. It allows the complex shapes to be cut in high volumes.



9. SURFACE TREATMENTS AND FINISHES

Name	Image	Description	Name	Image	Description
UV Varnish		Used for shiny finish and protective layer.	Laminating		Polymer film which protects from damage and moisture.
Foil Application		Used to create a luxurious metallic effect.	Embossing		Raises the profile of the surface by compressing to improve aesthetics.

ACCESS FM - Helpsheet

We use **ACCESS FM** to help us write a **specification** - a list of requirements for a design - and to help us **analyse and describe** an already existing product.

A is for **Aesthetics**

Aesthetics means **what does the product look like?**
What is the: Colour? Shape? Texture? Pattern? Appearance? Feel? Weight? Style?

C is for **Cost**

Cost means **how much does the product cost to buy?**
How much does it: Cost to buy? Cost to make?
How much do the different materials cost? Is it good value?

C is for **Customer**

Customer means **who will buy or use your product?**
Who will buy your product? Who will use your product?
What is their: Age? Gender?
What are their: Likes? Dislikes? Needs? Preferences?

E is for **Environment**

Environment means **will the product affect the environment?**
Is the product: Recyclable? Reuseable? Repairable? Sustainable? Environmentally friendly? Bad for the environment?
6R's of Design: Recycle / Reuse / Repair / Rethink / Reduce / Refuse

S is for **Size**

Size means **how big or small is the product?**
What is the size of the product in millimeters (mm)? Is this the same size as similar products? Is it comfortable to use? Does it fit? Would it be improved if it was bigger or smaller?

S is for **Safety**

Safety means **how safe is the product when it is used?**
Will it be safe for the customer to use? Could they hurt themselves? What's the correct and safest way to use the product? What are the risks?

F is for **Function**

Function means **how does the product work?**
What is the products job and role? What is it needed for? How well does it work? How could it be improved? Why is it used this way?

M is for **Material**

Material means **what is the product made out of?**
What materials is the product made from? Why were these materials used? Would a different material be better? How was the product made? What manufacturing techniques were used?

Dancing through the Decades

Links

https://www.ted.com/talks/camille_a_brown_a_visual_history_of_social_dance_in_25_moves

http://history-is-made-at-night.blogspot.com/2013/06/saturday-night-dancing-in-1950s-london.html

Vocabulary

accumulation:	A choreographic device or structure where new movements are added to existing movements in a successive manner, for example, A, AB, ABC, ABCD.
canon:	A passage, movement sequence or piece of music in which the parts are done in succession, overlapping one another. E.g. sequential canon. 1234 - 1234 - - 1234 - - - 1234
dance phrase:	Part of a larger dance idea. It is composed of a series of connecting movements; similar to a sentence in the written form. It contains a beginning, a middle, an end and a high point.
dance sequence:	Order in which a series of phrased movements and shape occurs.
dynamics:	Energy of movement expressed in varying intensities, accent and quality.
facing:	Where a dancer faces when performing each action, e.g. downstage, out to the audience, towards another dancer or body part.
formation:	A group formation is the pattern or shape that dancers make as a group, e.g. a circle, triangle, lines.
gesture:	Movement of a body part or combination of parts, with emphasis on its expressive characteristics, including movements of the body not supporting weight.
improvisation:	Movement created spontaneously; can be freeform or highly structured environments, always including an element of chance.
isolated movement:	Movement executed with one body part or a small part of the body. Examples include rolling the head, shrugging the shoulders and rotating the pelvis.
mirroring:	Reflecting the movements of another person as if they are a mirror image (facing each other).
unison:	Identical dance movement that takes place at the same time in a group.

Historical Context and Information

What is Social Dance?

Social dances are generally intended for participation, which means doing, rather than watching a performance. They are the dances you join in with when you are socialising for entertainment. In the 20th century, these also include ballroom dances, tea dances and line dances, as well as anything you would do down at the disco.

Social dances are not created by any one person but evolve gradually. They are a form of self-expression, as well as a way to build a sense of community.

Social Dance in the 1950s

After the Second World War, many styles of social dance were created by teens in dancehalls and nightclubs. The styles of dance were based on earlier swing dance styles, but with regional differences. People became enthusiastic dancers with the rise of television music and dance shows, especially in America, and the emergence of Rock and Roll music. The television show American Bandstand, hosted by Dick Clarke was a major influence on teen dancers of the time (see a clip here: https://youtu.be/xdSGjmhtaL0). Ballroom dance styles evolved during this decade, with the Jive becoming more popular, the Mambo, the Cha Cha and the Meringue developing into the styles we still use today.

Social Dance in the 1960s

The 1960s had a tendency to develop 'fads'; fashions that rose to popularity quite quickly due to the rise of the television. Young people would see movement or dance being performed to a particular track of music and hence was born 'the next new thing'. These dance styles, such as the Twist and The Madison, which was danced to Ray Bryant's 'Madison Time,' were 'here today and gone tomorrow'.

Bob Fosse, an American dancer, actor, film director, screenwriter and choreographer, choreographed his first musical, The Pajama Game in 1954, following it with three decades of Broadway and motion picture successes including Sweet Charity, Cabaret and All That Jazz.

His distinct style, characterized by use of the pelvis, rounded shoulders, and arm and hand isolations, is considered a classic theatrical jazz form. These movements included the use of turned-in knee, sideways shuffling, rolled shoulders, and jazz hands. With Fred Astaire as an influence, he used props such as bowler hats, canes and chairs and choreographed the musical dance numbers in films such as 'Sweet Charity'. It is these types of movements that we now also associate with 1960's social dance thanks to films like 'Austin Powers' that parody Fosse's style.

Social Dance in the 1970s

Music had moved on and fads were still strong with fashion becoming more of a form of self-expression and political expression. The '70s were a period of major political and cultural shift, with dance and music defining this decade's youth culture. Dancing became even more important to this new generation of club-goers as more discotheques began to spring up in towns and cities. Known for loud polyester clothing, platform shoes and, of course, disco music, this era of free love and flower power helped fuel some of the wildest dance crazes ever.

In 1975, singer Van McCoy got everyone on the dance floor to "Do The Hustle" this dance as a mixture of Swing and Latin, performed to a '70s disco beat. Other dance styles included The Bump where partners stepped or swayed to the music and came together to bump hips, the YMCA by The Village People, in 1978 where the dancers simply move their arms to form the letters Y, M, C, and A and the The Funky Chicken where dancers imitated the jerky movements of a chicken.

Social Dance in the 1980s

The '80s brought us all kinds of cool stuff, like MTV, big hair, Pac Man and great music on the radio and in the clubs, as well as not-so-cool things, like shoulder pads, t-shirts with suit jackets, batwing jumpers, bubble perms and canary yellow highlights. Some of the biggest dances from the 80's included the Robot, Moon Walking, The Running Man, The MC Hammer Dance, The Macarena, The Sprinkler, Kriss Kross Jump Dance and The Worm.

The '80s also saw the creation of Break Dance, which is a style of acrobatic street dance, often also called breaking, b-boying or b-girling. Part of Hip Hop culture, it can often be performed to rap music in the streets. Originating in the late 1970s, Break Dance really came into its own in 1980s with the development of a series of underpinning steps, including the Toprock, the Downrock and other virtuosic power moves like head spins, tumbling and freezes. This dance craze was performed in urban environments, often on lino cut offs, accompanied by a large music box and a sense of competition.

Ask a child of the 1980s the time. The answer: Hammer Time.

Democracy – Y9 – P4L

Democracy
Direct - Where the people decide on the policy directly, for example through a vote or referendum (yes/no) on each issue.
Representative - When the citizens of a country elect representatives to make decisions on their behalf.

The Duties of the Government
- To protect citizens and keep them safe.
- To look after the welfare of citizens.
- To watch over the employment of citizens.
- To look after the environment.
- To run the economy.

The Prime Minister
- Leads government and directs government policy.
- Chooses Cabinet Ministers and chairs the Cabinet.
- Is the head of the armed forces.
- Appoints senior judges and archbishops in the Church of England.
- Represents the nation in international affairs.

The Cabinet
- The PM chooses a group of MPs to help run the country.
- This group is called the Cabinet.
- The Cabinet are the most important MPs.
- They get put in charge of the big departments like education, health etc.
- The Cabinet works with the PM to decide the governments major

Democratic Countries like UK have
- Respect for human rights which are outlined in Humans Right Act 1998.
- Free press where citizens are given information to hold leader accountable.
- Political rights like the right to vote and the right to peacefully protest to bring about changes on social issues.
- Fair, regular, and open elections. The right of citizens to seek election to political office.
- Rules of law – prevents abuse of state power and requires law be followed by all.
- Freedom of speech, conscience, religion, and belief.

Non-Democratic Countries have
- One party states with no choice for voters.
- No voting or absence of free elections. Electoral malpractice and voter intimidation.
- Denial of the due process of law
- Censorship of the media and resources in education to limit knowledge and understanding.
- Actions of military or police to control, spy on and intimidate citizens into obedience.

Parliament

1. House of Commons - All of the MPs elected by UK citizens in the general election. Each represents their own constituency.
2. House of Lords - All of the Peers. They are unelected. They are nominated experts in their fields. The Prime Minister has a large say in who becomes a Peer.
3. The Monarch - The King or Queen at the time. They have less power now but still have the final sign-off on laws and on Peerages.

- In the House of Commons MPs: make laws, examine the work of the Government by asking questions and having debates, keep a check on government spending, represent their constituencies and the interests of their people.
- In the House of Lords they: check on the House of Commons and make sure laws are not rushed, criticise the government if it thinks that it has become to powerful, hold debates on important issues.

Local Council/Government
- Councils are responsible for many of the services in your local area.
- These services make a big difference to the quality of people's everyday lives.
- Services provided: waste collection and disposal, recycling and waste management, local planning functions, grounds maintenance, street cleaning, public conveniences etc.

Voting
- Every 5 years the country is asked to choose 1 person to represent them in the UK parliament.
- Those people who would like to be elected will campaign in your local area to try and get your vote. The candidates in each constituency will be attached to a political party.
- All of the political parties in the UK have a leader. Those people will then campaign to encourage people to vote for their party allowing them to become Prime Minister.
- They will travel around the country meeting people and discussing their policies.
- People who are over the age of 18 will then be asked to go to the polling station to vote for their favourite.
- The party with the majority of the votes wins.

Who can vote? Anyone over the age of 18 who is registered with the local council.

Who cannot vote? Under 18 , members of the House of Lords, in prison, anyone found guilty of breaking election law in the last five years

Why do people vote?
Gives you the power to create change, people have fought for you to have the right to vote, their vote will make a difference

Why people don't vote
They think politics is boring, some people are too young to vote, they are too busy

How can voting be encouraged?
Electronic voting, making voting compulsory, target young people

Should the age of voting be lowered to 16?
Yes – they deserve to have a say, it would get younger people interested in politics, increase turnout
No – immature choices, they have not learned enough through education and experience, it could create calls for it to be lowered again – where do we draw the line?

Pressure Groups
- An organised group of people who seek to influence and change government policy or legislation (law).
- These groups of people have very strong opinions on a particular issue and often will try to influence what happens in government by putting pressure on MPs and people who make decisions.
- They are sometimes referred to as 'lobby groups' or 'interest groups'.
- Methods used: Campaigning, petitions, lobbying, writing or meeting an MP, marching etc

Political parties
- The ideas of a political party are written down in a document called a manifesto.
- The party manifesto provides the basis for action should a party win an election.
- There are several different parties in the UK each with different ideas and policies.
- The largest parties include the Conservative Party, the Labour Party, the Liberal Democrat Party, the United Kingdom Independence Party (UKIP) and in Scotland, the Scottish National Party.
- There are other smaller parties such as the Green Party and Plaid Cymru, the Welsh nationalist party. Northern Ireland has a number of other, different parties.

Key Words

Constituency - The UK is currently divided into 650 parliamentary constituencies, each of which is represented by one MP in the House of Commons.

Democracy – 'ruled by the people' a system of government who have been elected by the people, thought of as allowing freedom of speech, religion and political opinion

General Election - When the citizens of a country vote to elect a new government. A general election in the UK usually happens once every 5 years.

Government – The individuals who have been elected to run the state, led by the Prime Minister (PM) in the UK.

Lobbying - A person or group of people meeting or taking action (eg writing letters, demonstrating, petitioning) to try to persuade a politician to take up their cause.

Local Government - A system of government that operates at a local level providing services to its community.

MP – Member of Parliament

Parliament - The institution of Government in the UK. It comprises of three parts: the House of Commons, the House of Lords and the monarch.

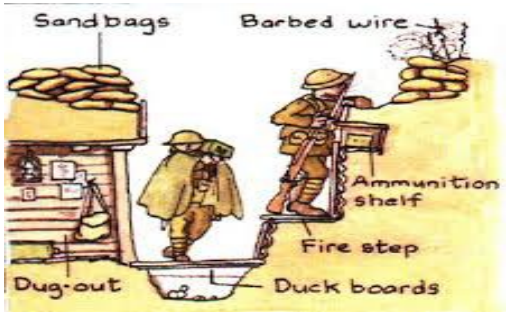
Political Party– a group of people with similar political goals and opinions. Examples: Labour Party, Conservative Party, Liberal democrats

Pressure group - An organised group of people who take action together to try to bring about change regarding a specific issue.

Year 9: The First World War

Key words	Definitions
Militarism	The belief that a country should maintain a strong military capability and be prepared to use it.
Alliances	A friendship formed for mutual benefit, especially between countries
Imperialism	Building an empire
Nationalism	An extreme form of patriotism marked by a feeling of superiority over other countries.
Conscription	Compulsory enrolment into the armed forces (Britain, 1916).
Stalemate	When neither side can make any progress; deadlock
Armistice	Ceasefire; an agreement made to stop fighting. (November 11th 1918)
No Man's Land	Unoccupied ground between opposing trenches.
Propaganda	Used to influence or persuade an audience.

Causes	
Militarism	Kaiser Wilhelm, wanted to build a navy that was bigger and stronger than Britain's. This started a naval and arms race and increased the tensions between the two nations.
Alliances	Germany wanted to rival Britain and France and have an empire of its own. Kaiser Wilhelm called this policy **Weltpolitik**. E.g. 1905 crisis in Morocco when Germany attempted to undermine French control of the country.
Imperialism	A country knew that to start a war would invite a response from an entire alliance. However, if this deterrent did not work, it also ran the risk of dragging all the countries into a war, even if they were not directly involved in the initial events.
Nationalism	Some felt that their country was superior to their opponents, others that it was their responsibility to protect the national interests.
Assassination	28 June 1914: Archduke Franz Ferdinand was killed by Gavrilo Princip, a member of the Black Hand Gang. Austria-Hungary decided to issue an ultimatum and threats to Serbia. Crucially Germany agreed to support Austria-Hungary in this move. On 28th July Austria-Hungary invaded Serbia.



Life in the trenches:
The trenches were dirty, smelly and riddled with disease. Cholera & trench foot were common. Trench fever was spread by body lice. There were millions of rats. Many men suffered from shell shock. Trench life included long periods of boredom mixed with moments of terror. Gas attacks could kill soldiers or cause temporary blindness.

USA's entry:
In early 1917 British codebreakers intercepted a telegram (Zimmerman telegram) that detailed Germany's plan to resume unrestricted submarine warfare. This led to the USA joining the war.

Germany's defeat:
Germany was in a weak position: a British naval blockade led to food shortages, wages were falling and the mark lost its value.
In September 1918 the heads of the German army, Generals Hindenburg and Ludendorff, told the Kaiser that Germany should ask the Allies for an armistice .

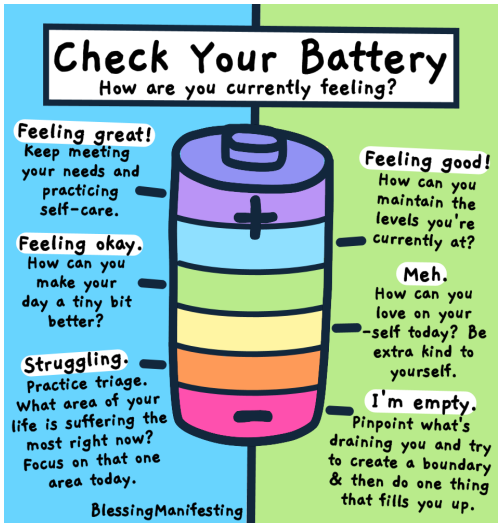
1914	1915	1916	1917	1918
Britain declares war on Germany 1st Battle of Ypres	2nd Battle of Ypres	Battle of the Somme	Battle of Arras 3rd Battle of Ypres Battle of Cambrai	11th November Armistice signed

Mental Wellbeing and health prevention – Y9 – P4L

What is mental wellbeing?

- We might use it to talk about how we feel, how well we're coping with daily life or what feels possible at the moment.
- Good mental wellbeing doesn't mean you're always happy or unaffected by your experiences. - But poor mental wellbeing can make it more difficult to cope with daily life.

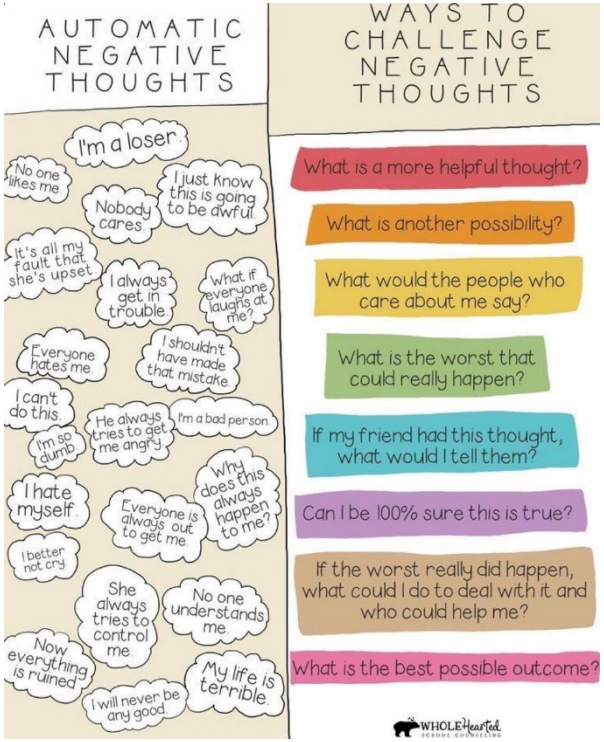
- **Resilience** is the process of adapting when you are faced with trauma, stress or any kind of adversity or emotional suffering.
- Someone who is resilient faces tough life situations head-on, experiencing the difficult times and emotions.

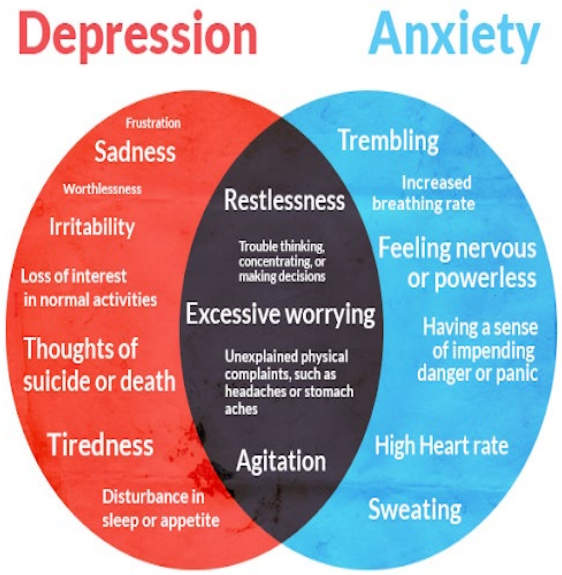


Mindfulness involves noticing what's happening in the present moment. You might be aware of your mind, body or surroundings. Mindfulness aims to help you to feel calmer and less stressed.

SUPPORT

Young Minds www.youngminds.org.uk
Childline - www.childline.org.uk
Samaritans - www.samaritans.org





Is mental health as important as physical health?

- Mental and physical health are equally important.
- The presence of physical conditions can increase the risk for mental illness. For example, if you have a chronic illness you may not be able to leave the house.
- Mental health problems can cause your physical health to deteriorate. For example: if you have chronic anxiety and depression, you may have trouble sleeping, thus, putting your physical health at risk.

Responsible Choices

Vaccines - have saved millions of lives as they protect people against harmful diseases.

Blood donation – Blood or the components of blood are used to treat patients with medical conditions, such as anaemia, cancer and blood disorders, as well as those having surgery.

Organ Donation - when you decide to give an organ to save or transform the life of someone else.

Donating stem cells - replaces damaged blood cells with healthy ones. It can be used to treat conditions affecting the blood cells, such as leukaemia.

Is it ever right to have a child in order to save another?

AGREE	DISAGREE
It can save a life	The saviour sibling cannot give its consent
It's not a 'designer baby', as you are not choosing anything about what the new baby will be like, only that it is free from the inherited disorder and is a donor match	You are using the new baby as a means to an end, not valuing it in itself
It's the loving thing to do for the existing sick child	The procedures can be painful and even life-threatening
There may be no other choice	Doctors are putting the donor sibling at risk, with no possible benefit to them - this goes against the Hippocratic Oath ("abstain from doing harm")
It's good for the saviour sibling, as they are able to save someone's life. What a great start to their own life	You are creating a 'designer baby'
In most cases, no harm comes to the sibling - they simply take stem cells from the umbilical cord	The saviour sibling will always feel less loved

KEY WORDS:

AED: automated external defibrillator, is used to help those experiencing sudden cardiac arrest

Anxiety: is what we feel when we are worried, tense or afraid – particularly about things that are about to happen, or which we think could happen in the future

CPR: stands for cardiopulmonary resuscitation. It is an emergency lifesaving procedure that is done when someone's breathing or heartbeat has stopped

Depression: is a low mood that lasts for a long time, and affects your everyday life

First Aid: help given to a sick or injured person until full medical treatment is available

Panic attacks: are a type of fear response. They're an exaggeration of your body's normal response to danger, stress or excitement

Resilience: being able to cope with difficult life events and bounce back afterwards

Stress: is how we react when we feel under pressure or threatened. It usually happens when we are in a situation that we don't feel we can manage or control

Cancer Awareness

Breast cancers: https://coppafeel.org
Cervical cancer: https://www.jostrust.org.uk
Cervical screens (smear tests): https://www.cancerresearchuk.org/about-cancer/cervical-cancer/getting-diagnosed/screening/about
Testicular cancer: https://www.teenagecancertrust.org/information-about-cancer/testicular-cancer
Skin cancer: https://www.teenagecancertrust.org/information-about-cancer/skin-cancer

Year 9 Sentence Builder
Family relationships

À mon avis [in my opinion] Je pense que [I think that] Je trouve que [I find that] Je crois que [I believe that] Je dois admettre que [I must admit that] Je dirais que [I would say that]	je m'entends bien avec [I get on well with] j'adore [I love] je préfère [I prefer] j'aime [I like]	mon père [my dad] mon frère [my brother] mon grand-père [my grandad] mon beau-père [my step-dad] mon demi-frere [my half-brother] mon oncle [my uncle]	car [because] comme [as] mais [but] cependant [however] pourtant [however] toutefois [however]	il est [he is] il n'est pas [he is not]	très [very] vraiment [really] extrêmement [extrememly] plutôt [rather] absolument [absolutely] un peu [a bit] assez [quite] trop [too] si [so] tout à fait [totally] incroyablement [incredibly]	intelligent [intelligent] gentil [kind] généreux [generous] agréable [pleasant, nice] ennuyeux [boring] nul [rubbish] désagréable [unpleasant]
	je ne m'entends pas bien avec [I don't get on well with] je me dispute avec [I argue with] je me fâche de [I fall out with] je déteste [I hate] je n'aime pas [I don't like]	ma mère [my mam] ma sœur [my sister] ma grand-mère [my grandma] ma belle-mere [my step-mam] ma demi-sœur [my half-sister] ma tante [my auntie]		elle est [she is] elle n'est pas [she is not]		intelligente [intelligent] gentille [kind] généreuse [generous] agréable [pleasant, nice] ennuyeuse [boring] nulle [rubbish] désagréable [unpleasant]

Year 9 Sentence Builder
Describing people

Mon acteur préféré [My favourite actor] Mon footballeur préféré [My favourite footballer] Mon joueur préféré [My favourite player] Mon musicien préféré [My favourite musician] Mon écrivain préféré [My favourite writer] Mon artiste préféré [My favourite artist] Mon influenceur préféré [My favourite influencer]	s'appelle [is called]	**NAME**	et il a [and he has]	les yeux verts [green eyes] les yeux bleus [blue eyes] les yeux marron [brown eyes] les cheveux blonds [blond hair] les cheveux noirs [black hair] les cheveux roux [red hair] les cheveux bruns [brown hair] les cheveux longs [long hair] les cheveux mi-longs [mid-length hair] les cheveux courts [short hair] les cheveux bouclés [curly hair] les cheveux raides [straight hair]	et en plus [and additionally] et aussi [and also]	il est [he is]	grand [big/tall] petit [small] mince [slim, thin] de taille moyenne [average size/height]
			et elle a [and she has]			elle est [she is]	grande [big/tall] petite [small] mince [slim, thin] de taille moyenne [average size/height]

Year 9 Sentence Builder
Describing a past visit to a city: Paris

L'an dernier
[Last year]

Il y a un an
[One year ago]

Il y a deux ans
[Two years ago]

Récemment
[Recently]

j'ai visité Paris
[I visited Paris]

nous avons visité Paris
[we visited Paris]

j'ai fait un voyage à Paris
[I made a trip to Paris]

je suis allé à Paris
[I went to Paris]

nous sommes allés à Paris
[we went to Paris]

où
[where]

j'ai admiré les églises et les cathédrales
[I admired the churches and the cathedrals]

j'ai visité les galeries / les musées
[I visited galleries / museums]

j'ai acheté une baguette dans une boulangerie
[I bought a baguette in a bakery]

j'ai mangé des croissants tous les jours
[I ate croissants every day]

j'ai marché beaucoup
[I walked a lot]

j'ai loué un vélo
[I hired a bike]

j'ai fait les magasins
[i did some shopping]

j'ai fait un tour en segway
[I did a segway tour]

j'ai pris le métro / le bus
[I took the metro / the bus]

j'ai vu les monuments historiques
[I saw the historic monuments]

je suis resté dans un hôtel de luxe
[I stayed in a luxury hotel]

je suis monté sur la Tour Eiffel
[I went up the eiffel Tower]

qui était
[which was]

et c'était
[and it was]

mais ce n'était pas
[but it wasn't]

bon [good]

mauvais [bad]

beau [beautiful]

animé [lively]

fatigant [tiring]

délicieux [delicious]

agréable [nice, pleasant]

cher [expensive]

touristique [touristy]

ennuyeux [boring]

sale [dirty]

une perte de temps
[a wast eof time]

une perte d'argent
[a waste of money]

le meilleur
[the best]

le pire
[the worst]

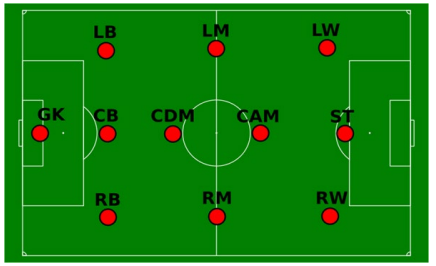
Y9 Subject Knowledge Organiser

Football – Rules, Player Positions, Pitch Dimensions & Skills

Rules

- ❑ A senior football match consists of two 45-minute halves and must have a 15-minute break in the middle.
- ❑ A team can start with a maximum of 11 players, of which one is the designated goalkeeper.
- ❑ To continue a match, a team must have a minimum of 7 players on the field.
- ❑ A team is able to make substitutions at any time of the match and are able to make a maximum of three changes.
- ❑ A competitive game must be officiated by a referee and two assistant referees, also known as linesmen.
- ❑ The whole ball must cross the goal line for it to constitute a goal.
- ❑ A referee may award a foul if they believe an unfair act is committed by a player. A foul contravenes the laws of the game and can be given for a range of offences (for example, kicking the player, pushing, handball etc).
- ❑ Fouls are punished by the award of a free kick (direct or indirect, depending on the offence) or penalty kick to the opposing team if it is committed in the penalty box.
- ❑ In cases of foul play, a referee can penalise players with either a yellow or red card. A yellow card gives a player a warning about their conduct and a red card requires them to leave the pitch.
- ❑ In the event that a player receives two yellow cards, the referee will automatically show a red card.
- ❑ A throw-in is awarded to a team if the opposition kicks the ball over the side-lines.
- ❑ A corner kick is awarded to a team if the opposition kicks the ball over the goal line and either side of the goal posts.
- ❑ A player is deemed offside if they are in front of the last defender when a teammate passes the ball through to them.

Player Positions



Pitch Dimensions

Throw-in

The throw-in is the legal way to restart the game if the ball has gone out of play from either of the side-lines.

- ❑ Hold the ball with both hands and ensure that the thumbs are behind the ball and fingers are spread.
- ❑ Hold the ball behind the head with relaxed arms and elbows bent.
- ❑ Keep your feet shoulder-width apart.
- ❑ Face your target.
- ❑ Lean back with both feet in contact with the ground.
- ❑ Slightly bend your knees and arch your head, neck, shoulders and trunk.
- ❑ When ready, propel yourself forward and release the ball just as it passes your head.
- ❑ Once the ball is released, bring your strongest leg forward and out in front of you for balance.

Control

Good control of the football is an essential skill to maintain possession of the ball from the opposition and, if done accurately, gives the player more time to make the correct next decision.

- ❑ Keep your eye on the ball at all times.
- ❑ On contact with the ball, withdraw the foot slightly to take the momentum out of the ball (this is known as "cushioning").
- ❑ Aim to contact the middle of the ball to ensure that it stays close to the ground and does not bounce up.
- ❑ Once under control, move the ball out of your feet to allow the next decision to be made.

Block tackle

The block tackle is an essential skill for winning the ball back in football. It is mainly used when confronting an opponent head on and it is important to complete it with good timing and technique to prevent injury or fouls.

- ❑ Close down your opponent quickly but do not rush uncontrolled at them.
- ❑ Try to reduce any space around you and monitor for passing options.
- ❑ Stay on the balls of your feet, arms slightly out to jockey your opponent.
- ❑ Keep your eye on the ball and wait for a clear view of the ball.
- ❑ When you can see most of the ball, transfer your weight from your back to front foot and move the inside of your foot towards the ball.
- ❑ Maintain a strong body position.

Long pass

A long pass is an attacking skill that allows players to switch the direction of the attack very quickly to create space, find a teammate or to catch out the opposition.

- ❑ Move parallel to the ball and place your non-kicking foot to the side of the ball.
- ❑ Keep your eye on the ball until you have it under your control.
- ❑ Look up to see where is the best place to pass the ball.
- ❑ On selection of your pass, maintain a strong body position.
- ❑ Explosively bring your kicking foot through and strike the ball with laces of your football boot.
- ❑ Aim to hit the middle of the ball to ensure it stays close to the ground or the lower half of the ball if you want to lift it over opposition players.
- ❑ Keep looking at your target.
- ❑ Follow your kicking leg through towards the intended target and your body over the ball.
- ❑ The speed of the kicking leg will direct how hard you kick the ball.

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Y9 Subject Knowledge Organiser
Rugby – Laws, Player Positions & Skills

Laws

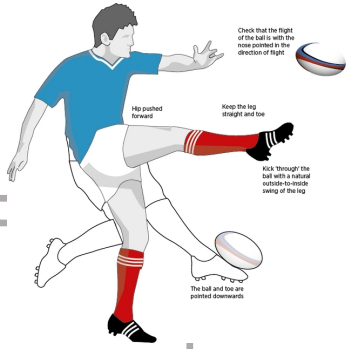
- ❑ The rugby game is broken down into two 40-minute halves with a 10-minute rest period in between.
- ❑ The time during a game can be stopped for an incident. Therefore, the game stops on exactly 80 minutes.
- ❑ The game must have one referee and two touch judges.
- ❑ The game is stopped if a player is fouled and there is no subsequent advantage. Unlike most sports, a referee can wait to see how an incident unfolds before deciding whether the attacking had an advantage.
- ❑ A tackle cannot be made above the nipple line or by tripping a player with your feet.
- ❑ A lineout is called if the ball travels past the side-line.
- ❑ A lineout consists of up to seven players and players can be lifted in order to catch the ball.
- ❑ At a lineout, both teams can compete to win the ball.
- ❑ To successfully covert a kick, the ball must travel the top section of the goal.
- ❑ If a ball, when kicked, hits the post and bounces in field, then play can continue.
- ❑ In order to stay onside in rugby, the attacking players must remain behind the ball of the player passing to them.
- ❑ A referee may award a foul if they believe an unfair act is committed by a player. A foul contravenes the laws of the game and can be for a range of offences (kicking the player, offside, dropping the ball).
- ❑ In cases of foul play, a referee can award players with either a yellow or red card. A yellow card provides a player with a warning about their conduct (sin binned for 10 minutes) and a red card requires them to leave the pitch immediately.

Tackle

- ❑ The tackle is an essential skill for winning the ball back in rugby or stopping an attacking player. It is very important to complete it with good timing and technique to prevent injury or accidents.
- ❑ Position your body to the opponent's right-hand side (safe side).
- ❑ Position your left foot forward into a slight opposition.
- ❑ Make contact by putting your right shoulder into the opponent's mid-right thigh.
- ❑ Make sure your head is on the other side of the ball carrier so their body is between your shoulder and head.
- ❑ Bring your arms up and wrap them around the ball carrier, just above their knees (do not lock your hands together).
- ❑ Squeeze your arms and pull the ball carrier into your body.
- ❑ As you squeeze, push your shoulder into the ball carrier, as though you are trying to push him away with your head.
- ❑ Continue pushing until both you and the ball carrier fall to the ground.
- ❑ Keep your head as close as you can to their thigh throughout.

Grubber Kick

- ❑ The grubber kick is a simple low kick that aims to move the ball past defences for attacking players to try and retrieve. It is very good at breaking defensive positions and forces defenders to turn around and chase.
- ❑ Stand in opposition on the balls of your feet, with the non-kicking foot in front.
- ❑ Lean forward so the head and chest should be comfortably over the ball.
- ❑ Hold the ball vertically at waist height, with hands either side of the ball.
- ❑ Extend arms fully so the ball is half a metre out in front.
- ❑ Drop the ball and point toes towards the ground.
- ❑ Keep the knee bent and over the ball.
- ❑ Strike the upper half of the ball with the laces, just before it bounces.
- ❑ Extend the leg through so it is straight, with toes pointing at the target.



Player Positions

Spin pass

- ❑ A spin pass enables a team to quickly pass a ball and help maintain possession.
- ❑ Stand on balls of feet in opposition (left foot forward), knees slightly bent with body facing forward.
- ❑ Hold the ball out in front of you with extended arms.
- ❑ Put the right hand on the bottom half of the right hand side of the ball.
- ❑ Point the thumb up along the seam of the ball and spread the fingers around the side of the ball.
- ❑ Put the left hand on the top half of the left hand side of the ball.
- ❑ Point the thumb up along the seam of the ball and spread the fingers around the side of the ball.
- ❑ Bring the ball in towards your waist and flex your elbows at a 90° angle.
- ❑ Rotate your shoulders round until your left shoulder is pointing forward.
- ❑ Draw the ball back across to the right hip, keeping your elbows slightly bent.
- ❑ Sweep the ball across your body, keeping the elbows close to your body and shift your weight from your back leg to your front foot.
- ❑ Release the ball when arms are nearly fully extended with a flick of the wrists and fingers.
- ❑ Follow through with your fingers pointing to the target.

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Y9 Subject Knowledge Organiser

Netball – Rules, Officials, Scoring, Player Positions

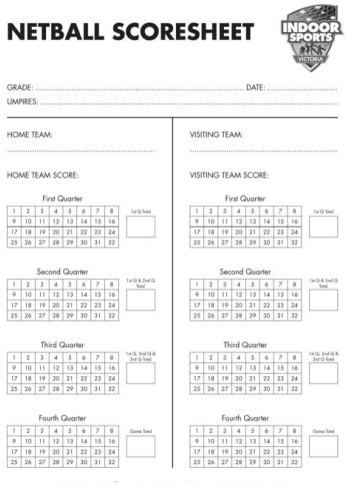
Rules

- ❑ Players are not allowed to travel with the ball.
- ❑ A team can have up to 12 players but only seven are allowed to play on court.
- ❑ Defending players are unable to snatch or hit the ball out of another player's hands.
- ❑ A defending player is only allowed to stand beside the player with the ball until it has left their hands.
- ❑ A defending player must stand three feet away from the person with the ball.
- ❑ An attacking player is unable to hold the ball for more than three seconds.
- ❑ Players must remain within their designated zones.
- ❑ The team retaining possession after the ball goes out of play have three seconds at the side-line to get the ball back into play.

Officials

During a competitive game of netball there are two umpires and up to two scorekeepers and timekeepers officiating.

A scoresheet is completed for each quarter as shown. This also determines which teams centre pass it is.



Player Positions

GS	Goal shooter	GA	Goal attack	WA	Wing attack
C	Centre	WD	Wing defence	GD	Goal defence
GK	Goal keeper				

Scoring

In a game of netball there are two clear ways to score points:

1.In open play, if a shot is successfully scored from inside the goal circle, the team gains one point.

2.If the team is awarded an obstruction or contact penalty then they will receive a penalty shot at the net. A successful shot will be awarded with one point.

Netball Shooting

1. Stand in a balanced position facing the goal
2. Ball held high above head (away from defenders arms)
3. Ball sits on one hand (fingers) with other hand supporting
4. Bend your knees and elbows keeping your hands high and focus on the goal. Keep your shoulder still
5. Extend knees and elbows and flick the ball off your fingers - push the ball high to allow it to fall into the net
6. End the shot with arms high and hands following the ball

Team Information

Goal Shooter (GS)-To score goals and to work in and around the circle with the GA.

Goal Attack (GA)-To feed and work with GS and to score goals.

Wing Attack (WA)-To feed the circle players giving them shooting opportunities.

Centre (C) - To take the centre pass and to link the defence and the attack.

Wing Defence (WD)-To look for interceptions and prevent the WA from feeding the ball to the GS and GA.

Goal Defence (GD)-To win the ball and stop the GA from scoring.

Goal Keeper (GK)-To work with the GD and to prevent the GA/GS from scoring.

Key Vocabulary

Passing- sending the ball
Receiving- catching the ball
Footwork- how you land when in control of the ball (see footwork rule)
Dodging- a way to change direction quickly
Defending- preventing the other team from gaining possession of the ball and scoring
Attacking- making an attempt to score
Marking- a way to prevent your opponent from receiving or passing the ball or shooting
Shoot- attempt to score a goal
Offside- Moving into an area where you're not permitted (see offside rule)
Interception- preventing a pass between players
Throw in- a free pass taken off court
Centre Pass- taken to start or restart the game
Free Pass- awarded when there is an infringement of the rules by a player
Penalty Pass- as above, when two players are involved
Goal Third & Centre Third- areas of the court

Y9 Subject Knowledge Organiser

Basketball – Rules, Scoring, Officials, Court Dimensions & Player Positions

Rules

- ❑ A basketball team can have a maximum of five players on the court.
- ❑ Player substitutions can be made at any time and there is no restriction on the number of substitutions made.
- ❑ A ball can travel through dribbling or passing.
- ❑ A player is no longer able to dribble with the ball once the player puts two hands on the ball. At this point, a player must either pass or shoot.
- ❑ If a team wins possession back in their own half, they have ten seconds to get it into their opponent's end or a foul will be called.
- ❑ An attacking team has 24 seconds from gaining possession of the ball to shoot
- ❑ After the shot is taken, the clock is restarted for another 24 seconds.
- ❑ After a team scores a basket, the ball is returned back to the opposition to start again.
- ❑ All fouls that are committed throughout a game are to be accumulated and when a certain number is reached, the umpire will award a free throw.
- ❑ Depending on where a technical foul is committed, the umpire may award a number of free throws a player will receive.
- ❑ Violations can be awarded by the officials in basketball for player handling errors. These include travelling, double dribble, goal-tending and back court violation.

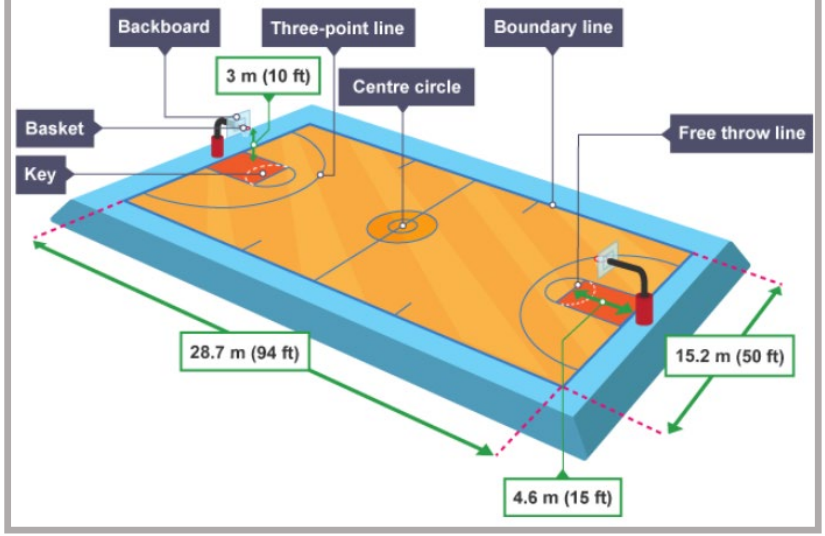
Scoring

In a game of basketball there are three clear ways to score points. If a shot is successfully scored from outside of the three-point line, three points are awarded. If a shot is successfully scored from inside of the three-point line, two points are awarded. If a team is awarded a technical foul then they will receive between one and three free shots. Each shot scored will be awarded with one point.

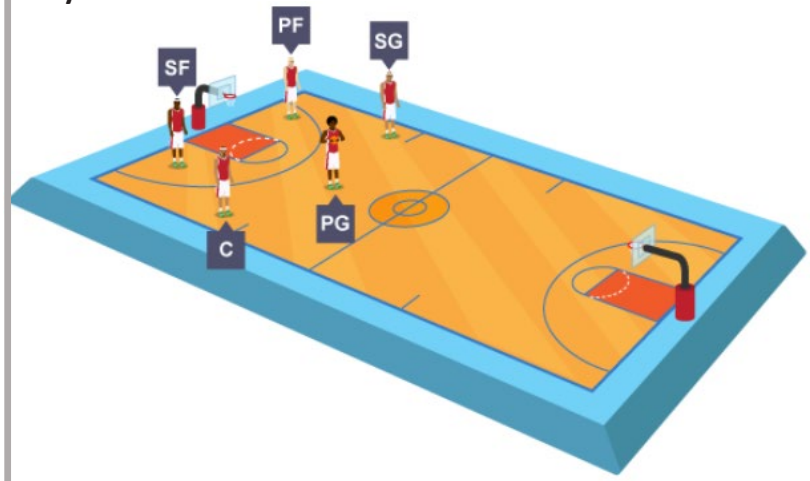
Officials

During a competitive game of basketball there are two referees, a scorekeeper, timekeeper and a shot clock operator. To ensure that everybody is aware of a decision made, the referees perform a series of hand and arm signals.

Court Dimensions



Player Positions



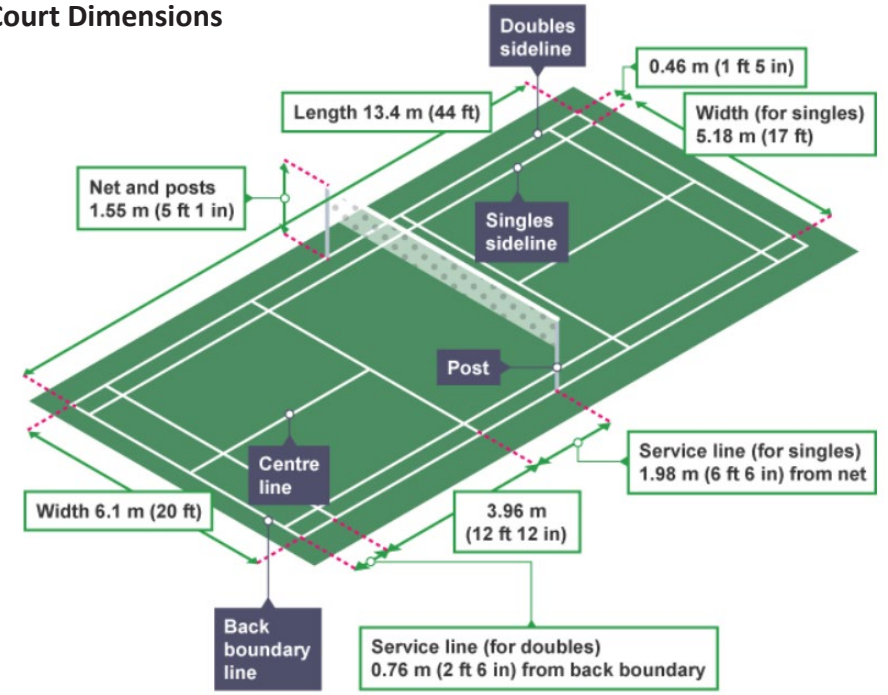
SF Small forward
PF Power forward
SG Shooting guard
C Centre
PG Point guard

Y9 Subject Knowledge Organiser
Badminton – Rules, Scoring & Officials

Rules

- ❑ A match consists of the best of three games of 21 points.
- ❑ The player/pair winning a rally adds a point to its score.
- ❑ At 20-all, the player/pair which first gains a 2-point lead wins that game.
- ❑ At 29-all, the side scoring the 30th point wins that game.
- ❑ The player/pair winning a game serves first in the next game.
- ❑ A badminton match can be played by two opposing players (singles) or four opposing players (doubles).
- ❑ A competitive match must be played indoors utilising the official court dimensions.
- ❑ A point is scored when the shuttlecock lands inside the opponent's court or if a returned shuttlecock hits the net or lands outside of the court the player will lose the point.
- ❑ At the start of the rally, the server and receiver stand in diagonally opposite service courts.
- ❑ A legal serve must be hit diagonally over the net and across the court.
- ❑ A badminton serve must be hit underarm and below the server's waist height with the racquet shaft pointing downwards, the shuttlecock is not allowed to bounce. After a point is won, the players will move to the opposite serving stations for the next point.
- ❑ The rules do not allow second serves.
- ❑ During a point a player can return the shuttlecock from inside and outside of the court.
- ❑ A player is not able to touch the net with any part of their body or racket.
- ❑ A player must not deliberately distract their opponent.
- ❑ A player is not able to hit the shuttlecock twice.
- ❑ A 'let' may be called by the referee if an unforeseen or accidental issue arises.
- ❑ A game must include two rest periods. These are a 90-second rest after the first game and a 5-minute rest after the second game.

Court Dimensions

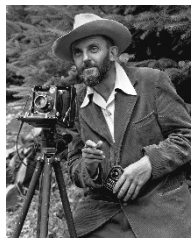


Scoring

In recent years, badminton has changed how players can score a point. In 2006, the rules were changed to a rally point system and this now allows both players to score a point during a rally, regardless of who served.

In competitive adult matches, all games are played to a best of three games. To win a game, a player must reach 21 points. However, if the game is tied at 20-20 (or 20-all) then you are required to win by two clear points. Unlike most sports, however, if the score becomes 29-29 (or 29-all), the player or team to score the 30th point will win the game.

Y9 ART: Layers

Key Figures	
Ansel Adams 	Ansel Easton Adams was an American landscape photographer and environmentalist known for his black-and-white images of the American West. He helped found Group f/64, an association of photographers advocating "pure" photography which favoured sharp focus and the use of the full tonal range of a photograph.
Dan Mountford 	Dan Mountford was born and raised in Milton Keynes but currently lives and works in Brighton. He studied Graphic Design at the University of Brighton. He is a freelance graphic designer and photographer. He works with a wide variety of disciplines like photography, illustrations, editorials and motion design.
Double Exposure 	Double exposure is a technique that combines two different exposures or images that are layered on top of each other. The image overlaid is less than full opacity so a bit of both images can be seen producing an almost ghost-like image.
Digital Art 	Art created using digital methods – a computer, tablet or even an app. Adobe Creative Suite has software able to create digital art.

Key Terms	
Architecture	The art and technique of designing and building.
Background	The part of a picture, scene, or design that forms a setting for the main figures or objects, or appears furthest from the viewer.
Blending	The technique of gently intermingling two or more colors or values to create a gradual transition or to soften lines.
Colour	What the eye sees when light is separated.
Colour symbolism	The use of colour as a symbol that represents a meaning or feeling. This can be different in various cultures or time periods.
Composition	Composition is the way in which different elements of an artwork are combined or arranged.
Decorative	Additions to make something look more attractive; ornamental.
Digital	Digital art refers to any artistic work or practice that uses digital technology as part of the creative or presentation process.
Double Exposure	Double exposure is a technique that combines two different exposures or images that are layered on top of each other. The image overlaid is less than full opacity so a bit of both images can be seen producing an almost ghost-like image.
Foreground	The part of a view that is nearest to the observer, especially in a picture or photograph.
Form	An element in art where an object appears to have three-dimensions.
Landscape	Landscape art, is the depiction of natural scenery such as mountains, valleys, trees, rivers, and forests.
Layer	Layering in art is the process of applying various materials or colours on top of one another.
Line	A line is a mark made in art. A line has a width and a length. A line can be straight, curved, continuous, dashed or broken.
Proportion	Proportion is a principle of art that describes the size, location or amount of one element to another (or to the whole) in a work.
Symbol	A thing that represents or stands for something else.
Tone	Light to dark shade used to create form in an artwork.
Transparency	The quality of being able to see through (or partially see through) one or more layers in an artwork.

Timeline

Knowledge Links: Computer Science, Geography, History

SMSC: Creative Thinkers

1902 — Ansel Adams is born

1922 — Ansel Adams first published some of his photographs in the Sierra club bulletin

1984 — Ansel Adams dies

1991 — Dan Mountford is born

2014 — Dan Mountford's work goes viral on Tumblr

1. Trust lead for Technology
2. Teaching and learning lead
3. Assessment policy and implementation
4. Oversight of School Cloud and parents' evening
5. iPad development
6. Performance management
7. QA as per monitoring cycle

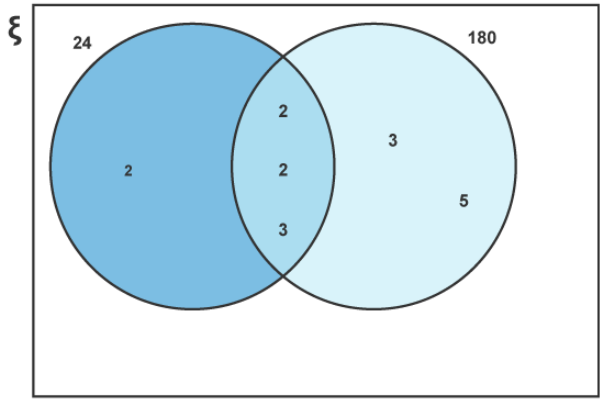
Year 9 Foundation Topic 1 Calculations Student Knowledge Organiser

Key words and definitions

A **factor** is a number that divides into another number exactly and without leaving a remainder.
A **prime number** has only two factors - the number itself and 1.
1 is not a prime number
A **Multiple** is the result of multiplying a number by an integer. The times tables of a number.

HCF & LCM from Venn diagrams

Put each prime factor in the correct place in the Venn diagram. Any common factors should be placed in the intersection of the two circles.



The highest common factor is found by **multiplying together the numbers in the intersection** of the two circles.

HCF = $2 \times 2 \times 3 = 12$

The LCM is found by **multiplying together the numbers from all three sections** of the circles.

LCM = $2 \times 2 \times 2 \times 3 \times 3 \times 5 = 360$

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Rounding to Significant Figures

Examples
Round 53,879 to 1 significant figure, then 2 significant figures.
5|**3**879 to 1 significant figure is 50,000
53|**8**79 to 2 significant figures is 54,000
Notice that the number of significant figures in the question is the maximum number of non-zero digits in your answer.
Round 0.005089 to 1 significant figure, then 2 significant figures.
0.005|**0**89 to 1 significant figure is 0.005
0.0050|**8**9 to 2 significant figures is 0.0051

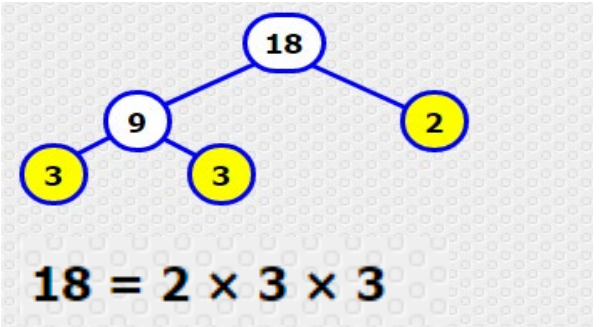
Highest Common Factor (HCF) and Lowest Common Multiple (LCM)

HCF Example
Consider the numbers 12 and 15:
The factors of 12 are : **1, 2, 3, 4, 6, 12**.
The factors of 15 are : **1, 3, 5, 15**.
1 and **3** are the only **common factors** (numbers which are factors of <u>both</u> 12 and 15).
Therefore, the **highest common factor** of 12 and 15 is **3**.

LCM Example
Consider the numbers 12 and 15 again:
The multiples of 12 are : **12, 24, 36, 48, 60, 72, 84, ...**
The multiples of 15 are : **15, 30, 45, 60, 75, 90, ...**
60 is a **common multiple** (a multiple of <u>both</u> 12 and 15), and there are no lower common multiples.
Therefore, the **lowest common multiple** of 12 and 15 is **60**.

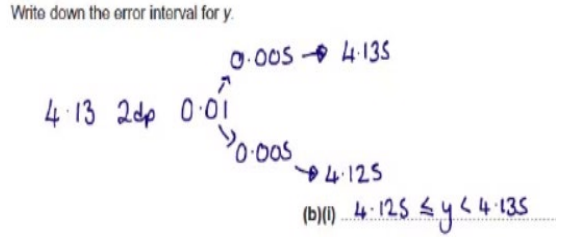
Product of Prime Factors

Finding out which prime numbers multiply together to make the original number. Use a prime factor tree. Also known as 'prime factorisation'.



Error Intervals

An error interval is the range of values that a number could have taken before being rounded or truncated. Error intervals are usually written as a range using inequalities, with a lower bound and an upper bound.



Sparx Maths Links

Error Intervals: U657 & U587
Rounding to Significant Figures: U731 & U965
HCF: U529
LCM: U751
Product of Prime Factors: U739

Year 9 Foundation Topic 2 Indices and Standard Form Student Knowledge Organiser

Key words and definitions

Index number - number that is multiplied by itself one or more times is raised to a power. The power is the index number. The plural is indices.

Power - A number that is multiplied by itself one or more times is raised to a power

Standard Form – Writing large and small numbers as a number between 1 and 10 multiplied by a power of 10

Square Root – square root of a number is a value that, when multiplied by itself, gives the number

Powers/Indices

2^4 is a short way of writing $2 \times 2 \times 2 \times 2$.

Index laws

1. $a^m a^n = a^{m+n}$
2. $\frac{a^m}{a^n} = a^{m-n}$ e.g. $b^5 \times b^3 = b^{5+3} = b^8$
3. $(a^m)^n = a^{mn}$
4. $(ab)^m = a^m b^m$
5. $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$ e.g. $(a^2)^5 = a^{2\times5} = a^{10}$
6. $a^0 = 1$
7. $a^{-n} = \frac{1}{a^n}$

Standard Form

Standard form, or standard index form, is a system of writing numbers which can be very large or very small numbers. It is based on using powers of 10.

Convert to

50,000 can be written as: $5 \times 10,000$

$10,000 = 10 \times 10 \times 10 \times 10 = 10^4$

So, $50,000 = 5 \times 10^4$

0.0005 can be written as 5×0.0001.

$0.0001 = 10^{-4}$

So, $0.0005 = 5 \times 10^{-4}$.

Convert from

1.34×10^3 is 1,340, since $1.34 \times 10 \times 10 \times 10 = 1,340$.

4.78×10^{-3} is 0.00478, as $4.78 \times 0.001 = 0.00478$.

BIDMAS

Mathematical operations must be carried out in the correct order. BIDMAS is a way of remembering this order.

B – Brackets
I – Indices/Powers
D – Division
M- Multiplication
A – Addition
S- Subtraction

e.g $2^2 \times 5 - 6 \div 3$.

1.There are no brackets (B), so calculate the indices first (I), giving

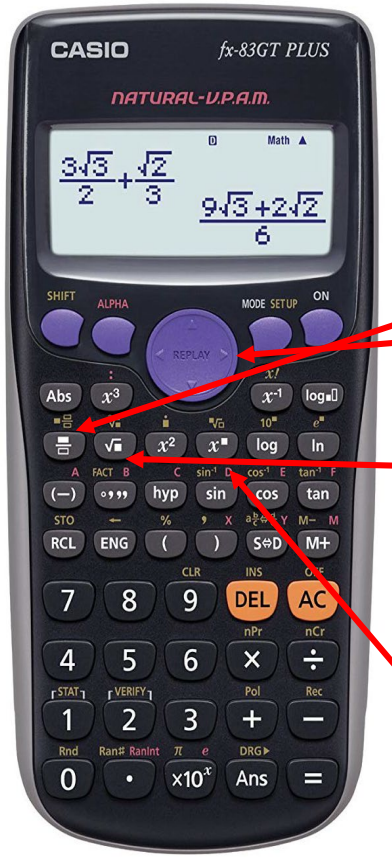
$4 \times 5 - 6 \div 3$

2.Do any divisions or multiplications (DM), working left to right:

$4 \times 5 = 20$ and $6 \div 3 = 2$

3. And, finally, do any additions or subtractions (AS): $20 - 2$ gives 18

Calculator Methods



Calculate

$$\frac{\sqrt{678} - 1.42^2}{3^4 \times 1.57}$$

1. Press fraction button (use arrow keys to move around the fraction)
2. Press square root button and fill in 678, use arrow key to go out of the square root
3. Subtract 1.42^2
4. Move down the fraction and press the indices button and use the arrow keys to fill in the numbers and multiply by 1.57

Sparx Maths Links

Powers and roots – U851, U235, U694 and U985

Standard Form – U330, U534, U264 and U290

Order of calculation - U976

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Year 9 Foundation Topic 3 Expressions Student Knowledge Organiser

Key words and definitions

Substitution: putting numbers where the letters are
Simplify: make an algebraic expression easily understandable and solvable
Expand: multiply to remove the ( )
Factorise: putting an expression back into brackets.

Substitution

$2b^2c = 2 \times b^2 \times c$

(substituting $b = 4$ $c = 3$)

This gives: $2b^2c = 2 \times b^2 \times c = 2 \times 4^2 \times 3$

$2 \times 16 \times 3 = 96$

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Simplify

Simplify $b + b + b + b$.

Adding the four like terms together gives $4b$.

Simplify $5m + 3m - 2m$. = 8m-2m = 6m

Expand (Single Brackets)

To remove brackets, multiply the term on the outside of the bracket with each term inside the brackets.

Expand and simplify:

$3(x + y) + 2(x + y)$ $= 3x + 3y + 2x + 2y$

$= 5x + 5y$

Simplify (with multiplication and division)

Simplify $b \times b \times b$.

$b \times b \times b = b^3$.

Simplify $16e^2 \div 2e$.

$16 \div 2 = 8$ and $e^2 \div e = e$

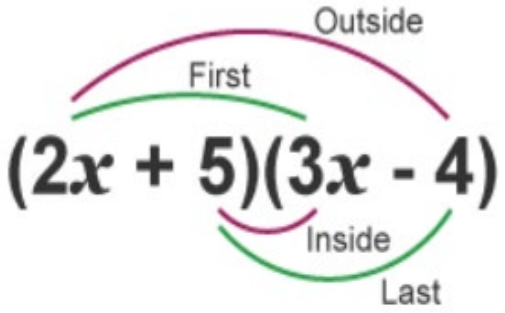
$16e^2 \div 2e$ simplified is $8e$.

When you divide powers you subtract them (shown below):

$\frac{a^5}{a^2} = a^{5-2} = a^3$

Expand (Double Brackets)

Expand and Simplify $(2x + 5)(3x - 4)$



$(2x + 5)(3x - 4)$

$= (2x \times 3x) + (2x \times -4) + (5 \times 3x) + (5 \times -4)$

$= 6x^2 - 8x + 15x - 20$

$= 6x^2 + 7x - 20$

Sparx Maths Links

Substitution: U585

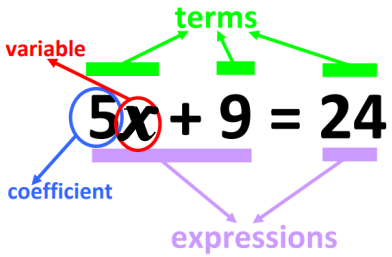
Expansion: U179 & U768

Simplify: U105

Year 9 Foundation Topic 4 Equations Student Knowledge Organiser

Key words and definitions

Variable – A symbol for an unknown value. Usually a letter, such as a, x or y
Constant – A number on its own
Coefficient – A number that is multiplied by a variable
e.g. 8y -> 8 is the coefficient and y is the variable
Term – Either a single number, a variable, or number and/or variables multiplied together
Expression – A term or a combination of terms
Equation – A mathematical sentence starting that two expressions are equal



Solving Linear Equations

Solve the equation $4y + 5 = -3$.

$4y + 5 = -3$

Subtract 5 from each side:

$4y + 5 - 5 = -3 - 5$

Simplify:

$4y = -8$

Get y by itself by dividing both sides by 4:

$4y \div 4 = -8 \div 4$

$y = -2$

Solve the equation $5(2c - 3) = 19$.

Expand the bracket:

$5 \times 2c - 5 \times 3 = 19$

$10c - 15 = 19$

Isolate $10c$ by adding 15 to each side:

$10c - 15 + 15 = 19 + 15$

$10c = 34$

Isolate c by dividing by 10:

$10c \div 10 = 34 \div 10$

$c = \frac{34}{10} = \frac{17}{5}$ or 3.4

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Rearranging Formulae

The **subject** of a formula is the variable that is being worked out. It can be recognised as the letter on its own on one side of the equals sign.

For example, in the formula for the area of a rectangle $A = bh$ (***area = base × height***), the subject of the formula is A.

Rearrange the formula $v = u + at$ to make t the subject of the formula.

$$\begin{array}{rcl} v & = & u + at \\ -u & & -u \\ v - u & = & at \\ \div a & & \div a \end{array}$$

$$\frac{v - u}{a} = t$$

The letter t is now isolated, so t is now the subject of the formula.

Inequalities

$>$	Greater Than	$<$	Less Than
$\geq$	Greater Than or Equal To	$\leq$	Less Than or Equal To

Writing inequalities on a number line :

- Place dot on the numbers given in the inequality
- Colour in dot if your sign is a greater/less than or equal to
- Draw the line to satisfy the inequality

e.g.

$x < 2$

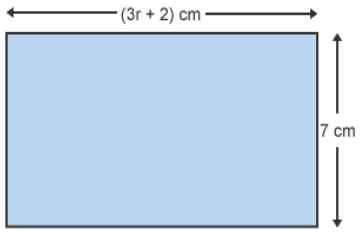
$-5 \leq x < 4$

The process to solve inequalities is the same as the process to solve equations.

$$\begin{array}{rcl} 3m + 2 & > & -4 \\ -2 & & -2 \\ 3m & > & -6 \\ \div 3 & & \div 3 \\ m & > & -2 \end{array}$$

Forming and Solving Equations

The area of this rectangle is 56 cm^2. Find the value of r.



Area of a rectangle = base × height. This means $3r + 2$ will all be multiplied by 7. To show this in algebra, use a bracket for $3r + 2$ to show that both terms are being multiplied by 7.

7 multiplied by $(3r + 2)$ can be written as $7(3r + 2)$ as multiplication signs are not used in algebra.

Area = base × height

Area = $7(3r + 2)$

The area of the rectangle has been given in the question as 56 cm^2:

$56 = 7(3r + 2)$

Expand the bracket:

$56 = 7 \times 3r + 7 \times 2$

$56 = 21r + 14$

Isolate $21r$ by subtracting 14 from both sides:

$56 - 14 = 21r + 14 - 14$

$42 = 21r$

Isolate r by dividing both sides by 21:

$42 \div 21 = 21r \div 21$

$2 = r$

Sparx Maths Links

Solving equations U755, U325, U505, U870

Forming and solving equations: U599

Rearranging Formulae: U585 & U144

Simultaneous Equations: U760, U757 & U137

Year 9 Foundation Topic 5 Charts and averages Student Knowledge Organiser

Key words and definitions

Frequency – How many times a value occurs

Cumulative Frequency – Frequency added together

Ascending – Going up from smallest to biggest

Median – Middle value in an ascending list of data

Mode/Modal value – most common value in the data

Mean - The total of the numbers divided by how many numbers there are.

Range – Biggest number – smallest number

Sum - addition of values

Averages from lists

7 babies weigh the following amounts:
2.5 kg, 3.1 kg, 3.4 kg, 3.5 kg, 3.5 kg, 4 kg, 4.1 kg

- $mean = \frac{2.5+3.1+3.4+3.5+3.5+4+4.1}{7} = \frac{24.1}{7} = 3.44$ (2 dp)
- 2.5 kg, 3.1 kg, 3.4 kg, **3.5 kg**, 3.5 kg, 4 kg, 4.1 kg
  The median weight of these babies is 3.5 kg.
- 2.5 kg, 3.1 kg, 3.4 kg, **3.5 kg**, **3.5 kg**, 4 kg, 4.1 kg
  The modal weight is 3.5 kg.

Hegarty Maths Links

Pie charts - 427, 428, 429

Averages – 413, 419, 417,418, 416, 415, 404, 409, 406

Scatter Graphs – 453, 454

Averages from table

	Number of Goals	Frequency	Cumulative Frequency
	0	2	2
	1	3	5
	2	5	10
	3	1	11
Total		11	

Mode = category with biggest frequency = **2 goals**

Median = value in the $\frac{Total+1}{2}$ position = 6th position = **2 goals**

Mean = $\frac{Sum\ of\ frequency \times number\ of\ goals}{Total}$ = $\frac{0\times2+1\times3+2\times5+3\times1}{11}$

= $\frac{16}{11}$ = **1.5 goals** (1.d.p)

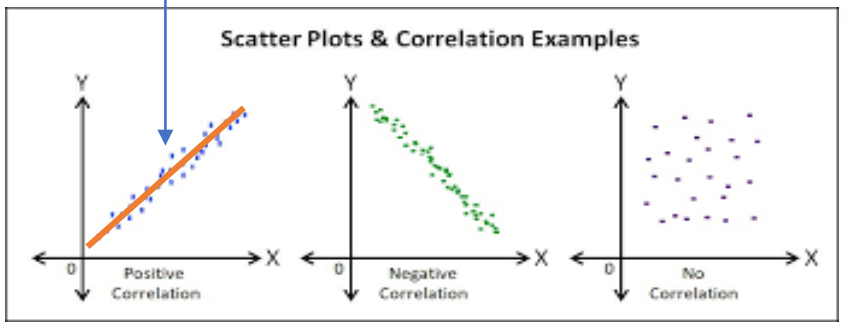
For grouped data,

$0 \le m < 4$	12

use the middle value when multiplying the data by the frequency when calculating the mean.

Scatter Graphs

Use a line of best fit to show correlation and to estimate values using the scatter graph



Reverse mean

The mean height jumped by a high jumper after 10 jumps is 1.81m. He jumps another jump at 1.73m, what is his new mean height?

1.81 x 10 = 18.1m = Sum of all 10 jumps

Mean of 11 jumps = $\frac{Sum\ of\ 11\ jumps}{Total\ no.of\ jumps}$

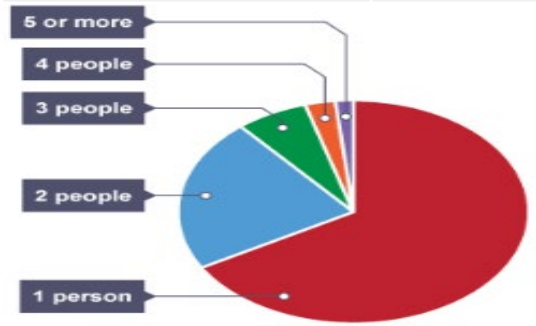
= $\frac{18.1+1.73}{11}$ = 1.80m (2.d.p)

Pie Charts

To draw a pie chart, find the proportion of 360° :

1 item/frequency = $\frac{360°}{Total\ Frequnecy}$ = $\frac{360°}{180}$ = 2°

People travelling in a vehicle	Frequency	Calculation	Angle
1 person	120	2 × 120	240°
2 people	40	2 × 40	80°
3 people	13	2 × 13	24°
4 people	5	2 × 5	10°
5 or more people	2	2 × 2	4°
Total	**180**		



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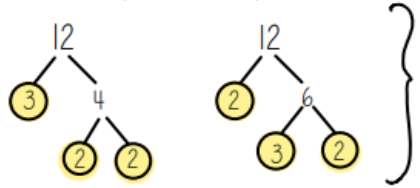
Year 9 Higher Topic 1 Factors and Multiples Student Knowledge Organiser

Key words and definitions

Factor: a number that divides into another number exactly and without leaving a remainder.
Prime number: A prime number has only two factors - the number itself and 1. 1 is not a prime number
Multiple: This is the result of multiplying a number by an integer. The times tables of a number.
Product: the result when terms are multiplied together
Error Interval: the range of values a number could have taken before being rounded or truncated

Product of Prime Factors

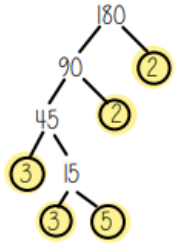
Example 1
Write 12 as a product of it's prime factors



Both of these trees represent the same decomposition

$12 = 2 \times 2 \times 3$
$= 2^2 \times 3$

Example 2
Write 180 as a product of it's prime factors



$180 = 2 \times 2 \times 5 \times 3 \times 3$
$= 2^2 \times 3^2 \times 5$

Always try to write your final answer in ascending order using index notation!

Using prime factor decomposition
If we know that 12 written as a product of it's prime factors, how does that help us to write 36 as a product of it's prime factors?

We know $12 \times 3 = 36$ therefore we can multiply our answer by three and
$36 = 2 \times 2 \times 3 \times 3$
$= 2^2 \times 3^2$

What about 120?
Well 120 is 10 x 12 so we can say
$120 = 2 \times 2 \times 3 \times 10$
$= 2^3 \times 3 \times 5$

Remember $10 = 2 \times 5$

Lowest Common Multiple

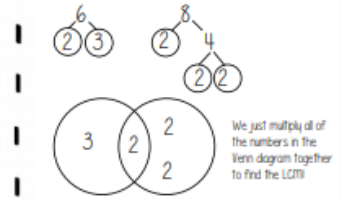
Example 1
What is the LCM of 6 and 8?

6 - 6, 12, 18, 24, 30
8 - 8, 16, 24, 32, 40

The first time their multiples match is 24 therefore

the LCM of 6 and 8 is 24

Example 2
What is the LCM of 6 and 8?



We just multiply all of the numbers in the Venn diagram together to find the LCM!

LCM of 6 and 8 = $3 \times 2 \times 2 \times 2$
$= 24$

Highest Common Factor

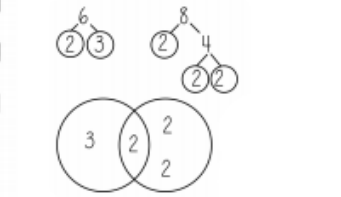
Example 1
What is the HCF of 6 and 8?

6 - 1, 2, 3, 6
8 - 1, 2, 4, 8

The biggest number which is a factor of both 6 and 8 is 2, therefore

the HCF of 6 and 8 is 2

Example 2
What is the HCF of 6 and 8?



As we are looking for the highest common factor we are looking for the factors which the two numbers share. These can be found in the overlap in the Venn diagram!

HCF of 6 and 8 = 2

SPARX Maths Links

Product of Prime Factors: U739
HCF: U529 and LCM: U751
HCF and LCM using prime factor decomposition: U250
Rounding to Significant Figures: U731, U965
Error Intervals: U657
Calculations with bounds: U587

Rounding – Decimal Places

2.46192 (to 2dp) - Is this closer to 246 or 247

246 ← 2.46192 → 247

This shows the number is closer to 2.46

Rounding – 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

We count significant figures from the first non-zero digit

Error Intervals

An error interval is a way of representing the upper and lower bounds of a value as an **inequality**.

Eg: w has been rounded to 6.4cm correct to one decimal place. Lower Bound = **6.35** Upper Bound = **6.45**

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

Calculations with Bounds

A = 30 to nearest whole number **LB = 29.5** **UB = 30.5**
B = 11.5 to 1 decimal place **LB = 11.45** **UB = 11.55**
C = 300 to 1 significant figure **LB = 250** **UB = 350**

Calculate the **maximum** value of **A + B**
UB of A + UB of B = 30.5 + 11.55 = 42.05

Calculate the **minimum** value of **A x C**
LB of A x LB of B = 29.5 x 250 = 7375

Calculate the **maximum** value of **C ÷ B**
UB of C ÷ LB of B = 350 ÷ 11.45 = 30.57 (2dp)

Year 9 Higher Topic 2 Indices and standard form Student Knowledge Organiser

Key words and definitions

Base – The number that gets multiplied by a power
Index number - number that is multiplied by itself one or more times is raised to a power. The power is the index number. The plural is indices.
Standard Form – A system used to write both large and small numbers as a number between 1 and 10 multiplied by a power of 10
Integer – A whole number
Reciprocal – The reciprocal of a number is 1 divided by the number. A number multiplied by its reciprocal will always give an answer of 1.

Index Laws

Rule	
$a^m \times a^n = a^{m+n}$	$2^5 \times 2^3 = 2^8$
$a^m \div a^n = a^{m-n}$	$5^7 \div 5^3 = 5^4$
$(a^m)^n = a^{m \times n}$	$(10^3)^7 = 10^{21}$
$a^1 = a$	$17^1 = 17$
$a^0 = 1$	$34^0 = 1$

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Negative Indices

Rule

$a^{-m} = \frac{1}{a^m}$ a^{-m} is the reciprocal of a^m

Examples

$9^{-2} = \frac{1}{9^2} = \frac{1}{81}$

$\left(\frac{1}{3}\right)^{-3} = \left(\frac{3}{1}\right)^{3} = 27$

Fractional Indices

$a^{\frac{1}{m}} = \sqrt[m]{a}$ $a^{\frac{n}{m}} = \left(\sqrt[m]{a}\right)^n$

$25^{\frac{1}{2}} = \sqrt{25} = 5$ $25^{\frac{3}{2}} = \left(\sqrt{25}\right)^3 = 5^3 = 125$

$8^{\frac{1}{3}} = \sqrt[3]{8} = 2$ $(8x^2)^{\frac{1}{2}} = \sqrt{8x^2} = 9x$

Negative Fractional Indices

$8^{-\frac{1}{3}} = \frac{1}{8^{\frac{1}{3}}} = \frac{1}{2}$ (Remember this means the cube root of 8)

$25^{-\frac{3}{2}} = \frac{1}{25^{\frac{3}{2}}} = \frac{1}{5^3} = \frac{1}{125}$

Think about what the negative in the power does first.

Standard Form Conversions

Numbers in standard form should always be written in the following format:

$A \times 10^n$ (This power is always an integer; A is 1 or greater, but less than 10)

Write 32 000 000 in standard form:

$32\,000\,000$
$= 3.2 \times 10\,000\,000$
$= 3.2 \times 10^7$

Write 8.35×10^{-3} as an ordinary number:

8.35×10^{-3}
$= 8.35 \times 0.001$
$= 0.008\,35$

Standard Form Calculations

Add and Subtract

$6 \times 10^5 + 8 \times 10^5$
$= (6 + 8) \times 10^5$
$= 14 \times 10^5$
$= 1.4 \times 10^1 \times 10^5$
$= 1.4 \times 10^5$

The powers **must** be the same before we add or subtract

Be careful! This is **not** standard form!

Multiply and Divide

$\frac{1.5 \times 10^5}{0.3 \times 10^3}$

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

$(1.5 \times 10^5) \div (0.3 \times 10^3)$
$1.5 \div 0.3 \times 10^5 \div 10^3$
$= 5 \times 10^2$

SPARX Maths Links

Index Laws: U235, U662
Negative Indices: M150
Standard Form : U330, U534
Calculating in standard form: U264, U290
Fractional indices: U985, U772

Year 9 Higher Topic 3 Expressions Student Knowledge Organiser

Key words and definitions

Simplify – reduce an algebraic expression to its simplest terms

Expand – Multiply to remove the brackets from an expression

Factorise – Put brackets into an expression by identifying the common factors of the terms in the expression

Quadratic – An equation of expression where the unknown is raised to the power of 2 (it is squared)

Expanding and simplifying single brackets

Expand $-3(2x + 4)$.

Solution

Multiply the **first term.** $-3(2x + 4)$ Multiply the **second term.**

$= -6x - 12$

Expand and simplify $x(x + 4) - 3(x - 2)$

$x(x + 4) - 3(x - 2)$

Expand as single brackets.

$= x^2 + 4x - 3x + 6$

$= x^2 + x + 6$

Simplify by collecting like terms

Factorising Single Brackets

Factorise $2ab + 4b$.

Find the **HCF** of the **variables.** $2ab + 4b$

$= 2b(a + 2)$

HCF $= 2$

HCF $= b$

Divide each term by the **HCF**s and **close the bracket.**

Only **'open the brackets'** once **all HCFs are found.**

Expanding Double Brackets

Outer, First, Inner, Last

$(x + 3)(x + 4)$

First
Outer
Inner
Last

$= x^2 + 4x + 3x + 12$

$= x^2 + 7x + 12$

Expand Triple Brackets

Expand and simplify $(x + 1)(x + 2)(x + 3)$

Expand the first **two brackets only.**

$(x + 1)(x + 2)(x + 3)$

$= x^2 + 2x + x + 2$

$= x^2 + 3x + 2$

Expand the **result with the next bracket.**

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

$= x^3 + 3x^2 + 3x^2 + 9x + 2x + 6$

$= x^3 + 6x^2 + 11x + 6$

SPARX Maths Links

Expand Single Brackets: U179
Factorise Single Brackets: U365
Expand Double Brackets: U768
Expand Triple Brackets: U606
Factorise Quadratics: U178
Factorise harder quadratics: U858
Difference of two squares: U963

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Factorise Quadratics

Factorise $x^2 + 9x + 18$

$x^2 + 9x + 18$

$= (x + 6)(x + 3)$

Write a **list** of **factor pairs** of the **constant term.**

Factors of 18
1, 18
2, 9
3, 6

Choose the pair that **sum to "+9".** These numbers go in the brackets

Factorising more challenging Quadratics

Factorise $5x^2 + 2x - 3$

Multiply the **coefficient of x^2** by the **constant term** & write a **list** of **factor pairs.**

Choose the pair that can be **used to make "+2".**

Set up the **double brackets using** the **coefficient of x^2.**

$5x^2 + 2x - 3$

$\Rightarrow (5x + 5)(5x - 3)$

5

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

$5 \times (-3) = -15$

Factors of 15
1, 15
3, 5

$5x \times 5x = 25x^2$ so we need to **divide** the **brackets by their HCFs to get our final answer**

The difference of two squares

$a^2 - b^2 = (a + b)(a - b)$

Factorise $x^2 - 16$

$= x^2 - 4^2$ $16 = 4^2$

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

Factorise $4x^2 - 81y^2$

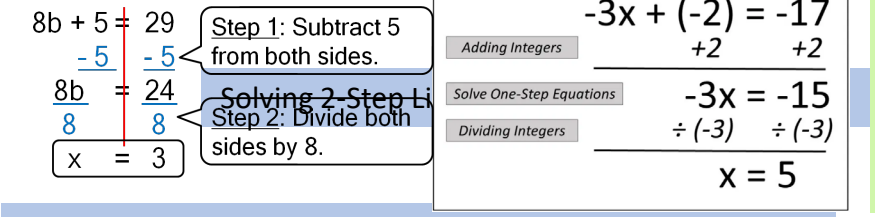
$= (2x)^2 - (9y)^2$

$= (2x + 9y)(2x - 9y)$

Year 9 Higher Topic 4 Equations Student Knowledge Organiser

Key words and definitions

Equation: An equation says that two things are equal
Expression: Is a set of terms combined using the operations
Variable: A symbol (usually a letter) standing in for an unknown value
Linear: Linear functions are those whose graph is a straight line
Subject: The variable that is being worked out
Inequality: Compares two values, showing if one is less than, greater than, or simply not equal to another value
Integer: Whole number



Solving Equations using Cross-Multiplication

Ex1 Solve, $\frac{3x-1}{x+2} = 2$

Solution

$\times (x+2)$ $\quad$ $\times (x+2)$

$3x - 1 = 2(x+2)$ Expand

$3x - 1 = 2x$

$-2x \quad -2x$

$x - 1 = 4$

$+1 \quad +1$

$x = 5$

Multiply to remove the denominator.

Ex3 Solve, $\frac{4x+2}{2x-3} = 10$

Solution

$\times (2x-3)$ $\quad$ $\times (2x-3)$

$4x + 2 = 10(2x-3)$ Expand

$4x + 2 = 20x$

$-4x \quad -4x$

$2 = 16x - 30$

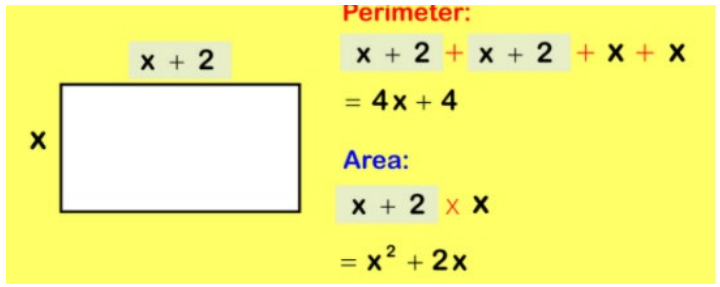
$+30 \quad +30$

$\frac{32}{16} = \frac{16x}{16}$

$2 = x$

Multiply to remove the denominator.

Forming Equations



The sum of (x + 2), (x + 3) and (x + 4) is 21.
Work out x.

$x+2+x+3+x+4=21$

$3x+9=21$

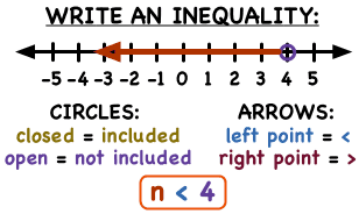
$3x=12$

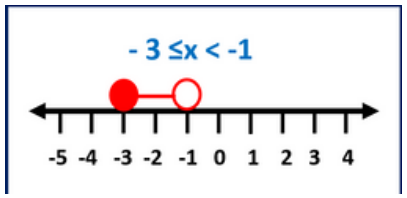
$x=4$

Inequalities

Greater than	$>$	Greater than or equal to	$\geq$
Less than	$<$	Less than or equal to	$\leq$
Not equal to	$\neq$		

Inequalities on a Number Line





Solving Inequalities

Solving Two-Step Inequalities

1. Add or subtract to isolate the variable term.
2. Multiply or divide to solve for the variable. If multiply or divide by a negative number then reverse the inequality symbol.

Example:

$-3x+5 \leq -16$

$-5 \quad -5$ Subtract

$-3x \leq -21$

$\frac{-3x}{-3} \geq \frac{-21}{-3}$ Divide by -3, reverse inequality

$x \geq 7$

Changing the Subject of the Formula

Make 'x' the subject of this formula $y = 3x + 5$

$y = 3x + 5$ (-5) (Subtract 5 from both sides)

$y - 5 = 3x$ $(\div 3)$ (Divide both sides by 3)

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

Make c the subject

$A = 3b + 3c$

$A - 3b = 3c$

$\frac{A-3b}{3} = \frac{3c}{3}$

$\frac{A-3b}{3} = \frac{3c}{3}$

$\frac{A-3b}{3} = c$

Expand

Subtract 3b

Divide by 3

Cancel out on the RHS

SPARX Maths Links

Solving Linear Equations: U325, U870, U505
Forming Equations: U599
Inequalities on a Number Line: U509
Solving Inequalities: U759, U738, U145
Forming inequalities: U337
Changing the Subject of the Formula: U556

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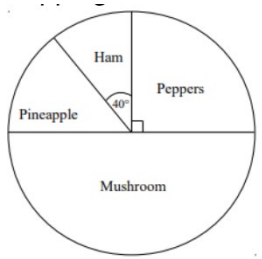
Year 9 Higher Topic 5 Charts and averages Student Knowledge Organiser

Key words and definitions

Qualitative Data: Data which is non numeric
Quantitative Data: Data which is numeric
Discrete Data:
Continuous Data:
Mean: A type of average where all the data is added and divided by the amount of data
Mode: An average which is the most popular piece of data
Median: An average found when all data is put in order and middle value selected.
Range: Difference between the largest value and the smallest value

Pie Chart.

When drawing a pie chart, divide 360 by the total frequency. This will give you how many degrees are required for each part of the data. For example, in a survey of 40 people, if you do 360 divided by 40, it would mean each person would be represented by 9 degrees



Averages

Mean - Add up the values and divide by how many values there are.
Median - The middle value. Put the data in order and find the middle one
Mode - Most frequent/common.
Range - The difference between the highest and lowest vales

The mean of 3, 4, 7, 6, 0, 4, 6 is $\frac{3+4+7+6+0+4+6}{7} = 5$

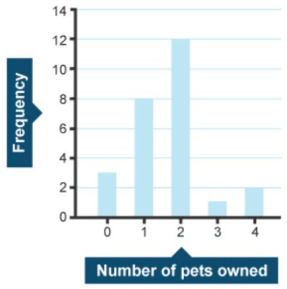
Find the median of:
4, 5, 2, 3, 6, 7,6
Ordered: 2, 3, 4, **5**, 6, 6, 7
Median = 5

Find the mode:
4, 5, 2, 3, 6, 4, 7, 8, 4
Mode = 4

Find the range:
3, 31, 26, 102, 37, 97
Range = 102-3 = 99

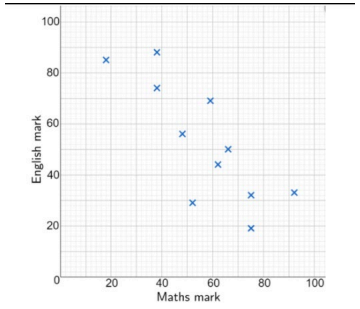
Bar Chart.

Represents data as vertical blocks. Each bar should be the same width. There should be gaps between each bar. Label each axis

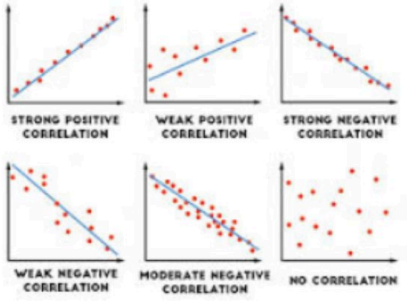


Scatter Graphs.

A scatter graph is used to plot data measured in two ways. Each point plotted is a single piece of data with two measurements.
Eg, each point on the following is for a single pupil, with their Maths and English scores from a test



When the points plotted on a scatter graph are all very close together, we say there is a strong **correlation** between the two things being measured. This might mean the two things are connected



Averages From Tables

You can use frequency tables to work out the Mead, Median, Mode and Range of a set of Data.

Pets	Frequency
0	12
1	7
2	11

Mode – The mode is the value with the highest frequency – 0
Median - Divide the total frequency by 2 to work out the middle value.
12+7+11=30, 30÷2=15
The first 12 values are 0. The next 7 values (so the 8th, 9th, 10th…) are 1.
So the median is the 15th value, which is 1.
Mean - Total = 0x12 + 1x7 + 2x11 =29
Total Frequency = 30
Mean= 29 ÷ 30 = 0.96666…

Sparx Maths Links

Types of data: U322
Collecting and recording data: U120
Bar charts: U363, U557
Pie charts: U508, U172
Scatter graphs: U199, U277, U128
Calculating averages: U526, U456, U260, U291, U717
Averages from frequency tables: U569, U877

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