

Mock Revision 2021

Eduqas Textiles

Use your knowledge organiser to revise the following topics:

SECTION A

- Environmental issues (carbon footprint, landfill, 6R's)
- Product lifecycle
- SMART materials (Polymorph, thermo-chromic, photochromic, encapsulated)
- Circuit symbols and how electronic components work
- Microprocessors and microcontrollers (advantages and disadvantages)
- Properties of paper and board (Corrugated cardboard – GSM, advantages & disadvantages)
- Properties of ferrous, non-ferrous metals and alloys
- Properties of softwood, hardwoods and manmade woods
- Properties of natural, synthetic, blended and mixed fibres(Wool – properties, Knit construction – properties)
- Technical materials :Rhovyl/Nomex/Kevlar – properties
- Anthropometrics and ergonomics
- Primary and secondary research methods
- Production methods: one-off/unique, batch/small, continuous/mass

Maths –

- percentages
- Circumference
- Velocity ratio/ mechanical advantages/ levers/ fulcrums

Section B: Textiles

- Seam method – overlocking
- Knitted construction – properties
- Transfer printing (heat press) – Equipment, step by step process
- CAM – advantages and disadvantages
- Product life cycle
- Impact of cotton on the environment.
- Cell production- advantages and disadvantages.
- Maths – percentages and multiplication

Ensure you come **FULLY EQUIPPED** to the exam.

2 x Black Pens

Calculator

2 x Pencils

Ruler

Fine liner

Rubber

Mass production
One off production- wedding rings, bespoke furniture

- One product being made
- Manufactured by a skilled craftsman
- Very expensive

Mass production-cars, cookers

- Many similar products are made
- Manufactured by machines
- Affordable prices

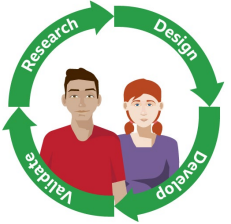
Continuous production- plastic bottles, food cans

- One product made 24/7
- There is a constant demand
- Very high set up costs

Primary research: is any type of research that you collect yourself.
Examples-include surveys, interviews, observations

Secondary Research: is a type of **research** that has already been compiled, gathered, organized and published by others.
Examples- It includes reports and studies by government agencies, trade associations or other businesses in your industry

User-centred design is a different style of designing from iterative design, as it bases the design of a product around the needs of the target market rather than the continual development of iterations. The user is questioned and consulted throughout the development, and evidence is gathered through questionnaires, interviews, testing and observations, and the results are used to improve the product.



The user is put at the end user at the centre of every decision made during the design process and, as a result, the end product is more likely to fit their needs.

CORE AREA

What is a SMART material?

- A ‘smart material’ can be defined as a material whose physical properties change in response to an input e.g. making them simpler or safer to use.
- A smart material reacts to external stimulus / changes in the environment without human intervention.

Designers and manufacturers are utilising SMART materials in a whole range of mass consumer products which often makes them simpler or safer to use.

Smart Materials:

Polymorph is a clever thermoplastic which we can use for prototyping and is especially useful when it comes to modelling ergonomic grips. As it is thermoplastic you can reheat and reuse this material as many times as you wish.

SMART Material	Property
Hydrochromic Ink	Changes colour with water
Thermochromic Pigment/ Paint	Changes colour with heat
Photochromic Material/ Dye	Changes colour with light
SMA - Shape Memory Alloy	Changes shape with heat
Phosphorescent Material	Glow in the dark
QTC – Quantum Tunnelling Composite	Soft Electrical Switch
Polymorph	A thermoplastic used for prototyping which can be reheated and reused

Technical Textiles:

Kevlar is a tightly woven fabric that has great impact resistance. It is used in racing tyres, racing sails, gardening gloves and bulletproof vests.

Rhovyl is an antibacterial material that has antibacterial agents integrated into the fibre itself. This prevents the formation of bacteria and does not wash out. It is used in bedding, children’s clothes, sportswear and underwear, and has many properties:

- thermal insulation and natural fire retardancy
- wicks away moisture
- resistant to mildew, fungi and chemicals

Nomex is a flame-resistant material. As it withstands the intense heat of flames, it is worn by firefighters and Formula 1 racing car drivers for protection

Sustainability:

Resources fall into two categories:

Finite resources-limited supply can't be reproduced

- Oil
- Natural gas
- Coal

Non-finite-in abundant supply or can be replanted/replaced

- Wind
- Tidal
- Solar

The Six Rs of sustainability help designers think about designs and designing in the following way:

RETHINK - our current lifestyles and the way we design and make.

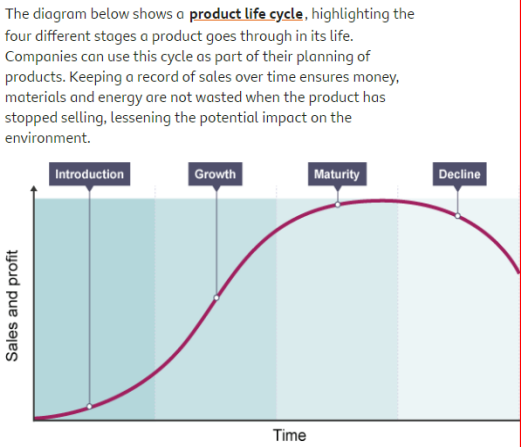
REFUSE - to buy materials and products that are unsustainable.

REDUCE - the amount of energy and materials used to manufacture a product.

REUSE - the product for something else so you don't need to throw it away.

REPAIR - the product so you don't need to throw it away.

RECYCLE - finally take the product apart and categorise the parts ready for being converted into another product. This uses a lot of energy



Material

Plastic

Thermoplastic- can be reheated and remoulded

- ABS, strong, can be recycled. Use: children's toys.
- Acrylic, range of different colours. Use-car headlights.
- PET, hygienic. Use- drink bottles
- LDPE, easy to manufacture, good chemical resistance. Use- plastic bags.

Thermosetting plastic-can't be reheated and remoulded

- UF, strong, good heat resistance. Use- electrical plug sockets.
- MF, scratch resistant, good heat resistance. Use- kitchen work tops.

Original source of plastics-oil

Improve plastic-add fillers(reduce material cost),add UV stabilisers(stop changing colour in the sun), add Plasticisers(makes plastic flow quicker when moulding)

Wood

Softwoods-coniferous trees, quick growing, cheap.

- Pine, easy to work with, quite knotty. Use: simple joinery.
- Fir, strong, good resistant against fungal infestation. Use: Building construction

Hardwoods- deciduous trees, slow growing, expensive.

- oak, attractive grain, strong. Use: high class furniture.
- Beech, close grain, hygienic. Use: chopping boards.

Manufactured boards-

- plywood, strong constructed in layers. Use: interior panelling
- Chipboard, ridged board, relatively smooth surface. Use: flooring
- MDF, smooth surface, easy to machine. Use: interior panelling

Original source of woods- trees

Advantages and disadvantages of natural timbers versus manufactured boards:










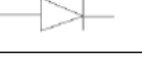



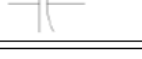

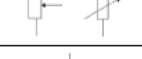









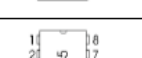

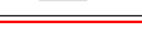
- It is available in large sheets
- It is an environmentally friendly/sustainable material
- It is cost effective (cheap)
- It does not have knots/defects
- It can accept a veneer/'formica' finish

Improve wood- seasoning of wood(reduce moisture, less likely to warp)

Composite materials

A mixture of two or more materials created to enhance the property.

- (GRP) glass reinforced plastic, strong, lightweight, impact resistant. Use: car bodies.

Slide switch		
Micro switch		
Toggle switch		
Battery		
Light Emitting Diode (LED)		
Diode		
Motor		
Electrolytic Capacitor		
Variable Resistor		
Light Dependent Resistor		
Resistor		
Thermistor		
Buzzer		
Speaker		
Integrated Circuit (IC)		

Electronic components:

programmable component: An electronic component that can be programmed to perform different functions.

Microcontroller: An integrated circuit that contains all or most of the individual elements of a central processing unit (CPU)

Microprocessor: An integrated circuit that contains all or most of the individual elements of a central processing unit (CPU).

Resistors restrict or limit the flow of current in a circuit. The ability of a material or component to resist current flow is measured in ohms. There are three main types of resistor:



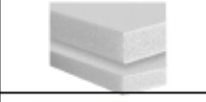
- fixed resistors
- variable resistors
- special resistors, such as thermistors and light-dependent resistors (LDRs)

Papers and boards

Are used for a variety of purposes from writing, drawing, packaging and model making. They are made from cellulose fibres found in wood or grasses which are all renewable.

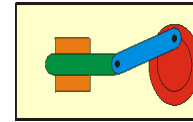
Paper & boards can be plain, textured and can be laminated with other materials like plastic to make them waterproof.

Paper and board is measured in sizes from A0 to A6 and in weight by grams per square metres (gsm). Boards (card or cardboard) are always greater the 200gsm

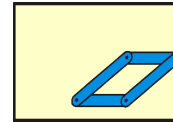
Boards	Example	Properties	Uses
Corrugated card		Strong lightweight material Made from two or more layers and has a fluted middle	Packaging such as pizza boxes, large boxes that are used to protect heavy items
Duplex board		Thin board that often has one side printed. This board can also be coated with wax so it can be used with food and drink	Packaging
Foil lined board		Board covered with one side of aluminum foil making it a good insulator	Packaging such a takeaway and ready meal packaging.
Foam core board		Two pieces of board with a foam core to increase the thickness but as architectural models.	Model making such
Solid white board		High quality cardboard, smooth on both sides which makes it good for printing.	Book covers, cards and packaging.

Motions and movement:

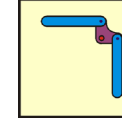
Crank and slider



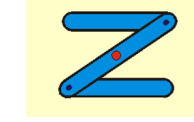
Parallel motion



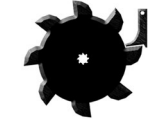
Bell crank




Reverse motion




Ratchet and Pawl




Linear motion- Moves in a straight line in one direction only




Rotary motion- Rotates around a central axis




Reciprocating motion- Moves back and forth or up and down along a straight line



Oscillating motion- Moves back and forth along a curved line



A Load
B Fulcrum
C Effort



Ergonomics

- Making the product easier for the user
- Moulded handles
- Added cushions

Anthropometrics

- Reference to the collection of data
- Measuring the target market
- 5th to 95th percentile
- Standard charts

Enterprise:

An idea is created into a business proposal that has commercial viability as a product.

- Crowd funding- designers or entrepreneurs to raise enough money to manufacture products.
- Patent- remain the property of the person who invented them, which is a legal process so designs/ideas don't get taken.
- Virtual marketing and retail- use websites and social media to promote products, to reach a wider target audience.
- Search engine optimization- company make efforts to boost their website higher in an internet search.
- Cooperatives- owned and run by its members. They can be cost effective way to sell goods around their local community.
- Fair trade- better working conditions and better prices for farmers and working in less developed countries.

Natural fibres from animals

Wool

Used for jumpers, suits and blankets and has the following qualities:

- warm to wear
- absorbent, dries slowly
- breathable, repels rain
- soft or coarse handle

Silk

Used for evening wear and ties and has the following qualities:

- warm to wear
- absorbent
- soft handle
- good lustre and drape

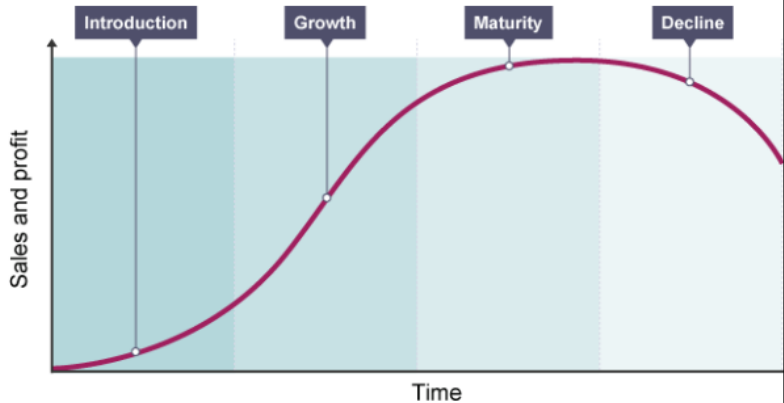
Natural fibres from plants

Cotton

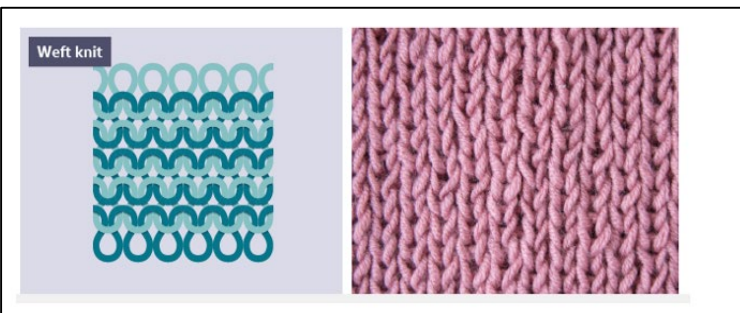
Used for making jeans, T-shirts and towels and has the following qualities:

- cool to wear
- very absorbent, dries slowly
- soft handle
- good drape

The diagram below shows a **product life cycle**, highlighting the four different stages a product goes through in its life. Companies can use this cycle as part of their planning of products. Keeping a record of sales over time ensures money, materials and energy are not wasted when the product has stopped selling, lessening the potential impact on the environment.



Weft Knitted fabric is circular knitted
Made from loops allowing fabric to stretch
The loops trap air to keep warm
Prevents creasing
Comfortable , good fitting
Relatively cheap



Textiles made from plant or animal natural fibres, such as cotton or wool, are **renewable** and easily **biodegradable**. Synthetic textiles are made from oil-based materials, which are **non-renewable** and harder to **degrade** when put into **landfill**.

Fibre:	COTTON	Origin:	NATURAL - PLANT
Properties:			
The fibres are staple fibres. They look like twisted ribbons under a microscope. Cotton is one of the most versatile fibres - almost half of all textile products are made from cotton.			
Used for: all clothing items, soft furnishings, yarns for knitting.			
Fabric names: Calico, Corduroy, Denim, Drill, Poplin, Velvet			
Aesthetics of Fibre		Performance of Fibre	
<ul style="list-style-type: none"> • Strong - fibres are stronger when wet than dry. So items can be washed often • Absorbs moisture easily so is easy to keep clean <ul style="list-style-type: none"> • Conducts heat easily • Damaged by sunlight and mildew • Can be treated with finishes to improve properties • Can be blended and mixed with many other fibres <ul style="list-style-type: none"> • Can be coloured easily • Flammable 		<ul style="list-style-type: none"> • Comfortable to wear because it conducts heat easily and absorbs moisture <ul style="list-style-type: none"> • Soft • Creases easily • Range of effects can be created by using yarns of different thicknesses, and by choosing different weaves or knits to make the fabric • Can be woven or knitted 	

An overlock is a stitch that sews over the edge of cloth for edging or seams, it cuts the edge as it sews



Computer aided manufacture (CAM)

Computers now control much of manufacturing processes, although the textile industry still requires human machinists to sew and assemble garments.

Digital and roller printing, **laser cutters**, and **embroidery** machines can now be fully automated and controlled by **computer aided manufacture (CAM)**:

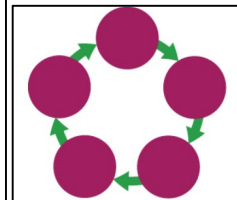
- purchase of machines and set-up costs are high
- output increases rapidly
- economies of scale and a reduction in price to the consumer are produced

Specialist Textiles

Sublimation printing – in school the heat press

Sublimation ink is printed onto coated paper. Once heated, the image is transferred onto fabric.

Cell production involves a number of machinists working together in 'cells'. Each team or 'cell' is responsible for a significant part of a finished garment, or sometimes the whole garment, including **quality control (QC)** checks. Rather than each person carrying out only one very specific task, team members are skilled at a number of tasks, allowing for job rotation. As they are highly skilled, they tend to earn more.



- Cotton is biodegradable
- Cotton uses a lot of water
- Farmer may use pesticides
- Energy is used to process cotton, create fabric and make products
- Consumers use energy to take care of their products.
- Consumers may/may not recycle.

Knowledge Organiser - KS4 Design Technology Maths

Geometry: Angle Fact



Angles around a point add up to 360°

$$a + b + c = 360^\circ$$



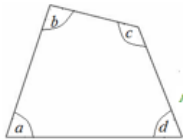
Angles on a straight line add up to 180°

$$e + f = 180^\circ$$



Angles in a triangle add up to 180°

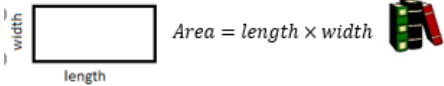
$$w + x + y = 180^\circ$$



Angles in a quadrilateral add up to 360°

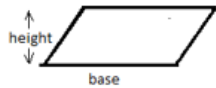
$$a + b + c + d = 360^\circ$$

Area

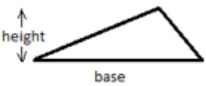


$$\text{Area} = \text{length} \times \text{width}$$

More Geometry:

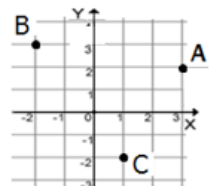


$$\text{Area of parallelogram} = \text{base} \times \text{height}$$



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

Coordinates



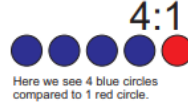
A(3,2)
B(-2,3)
C(1,-2)

RATIOS - EXAMPLES

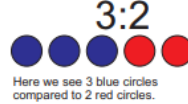
DEFINITION:

A ratio is the mathematical relationship between two or more numbers.

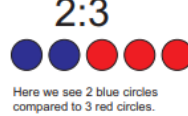
An example of a ratio is:



An example of a ratio is:



An example of a ratio is:



The circle below shows the area of blue in ratio with the area of red. There are 3 areas of red to just 1 area of blue.



RATIOS - EXAMPLES

Part of a recipe to serve two people, requires 4 cups of flour and 1 cup of water.



If the has to be scaled up to serve 10 people, how many cups of flour and water will be required as part of the recipe.

SERVES TWO PEOPLE =

FLOUR	:	WATER
4	:	1

To find the number by which the original ratio numbers are multiplied, divide the new number of people to be served (10) by the old number of people to be served (2).

$$\frac{10 \text{ PEOPLE}}{2 \text{ PEOPLE}} = 5$$

Then, multiply each number of the original ratio by the answer 5, to find the new amount of flour and water.

The new number of cups of flour and water are seen opposite

4x5	:	1x5
FLOUR	:	WATER
20	:	5

How to find a Percentage of a number

Here are the 3 simple steps for finding a percentage of a number:

Step 1

- Convert the percentage to a decimal by dividing it by 100.

Step 2

- Multiply this decimal by the number you are finding the percentage of.

Step 3

- Check your units of measurement.

You should have now found your percentage of a number!

Example 2) Find 17% of 160m.

Step 1)

Convert the percentage to a decimal by dividing by 100.

$$17 \div 100 = 0.17$$

Step 2)

We need to multiply this decimal by our number.

$$0.17 \times 160 = 27.2$$

Step 3)

Check units of measure.

Answer: 27.2m

Mock Revision 2021

Eduqas Resistant Materials

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Maths –

- percentages
- Circumference
- Velocity ratio/ mechanical advantages/ levers/ fulcrums

SECTION B (Thermoforming & Thermosetting Plastics)

- Injection moulding
- Properties of thermoforming and thermosetting plastics
- Vacuum forming process
- Sustainability issues when using plastics
- Manufacture and distribution of plastic products (globally)

Ensure you come **FULLY EQUIPPED** to the exam.

2 x Black Pens

Calculator

2 x Pencils

Ruler

Fine liner

Rubber

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2 x Black Pens

Calculator

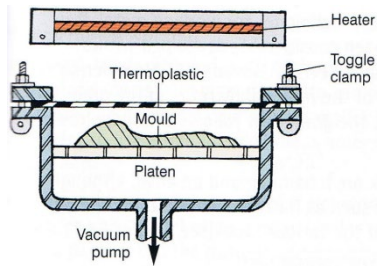
2 x Pencils

Ruler

Fine liner

Rubber

Vacuum forming



Steps:

- Mould are put onto the bed.
- Sheet is placed on top.
- Heat is applied.
- When softened the vacuum is applied over the mould/ if thermoforming an upper mould is also applied
- Vacuum is turned off and mould is released.

Advantages: low cost, smooth shapes with detail.

Disadvantages: simple designs can only be achieved, must be trimmed afterwards..

Plastics:

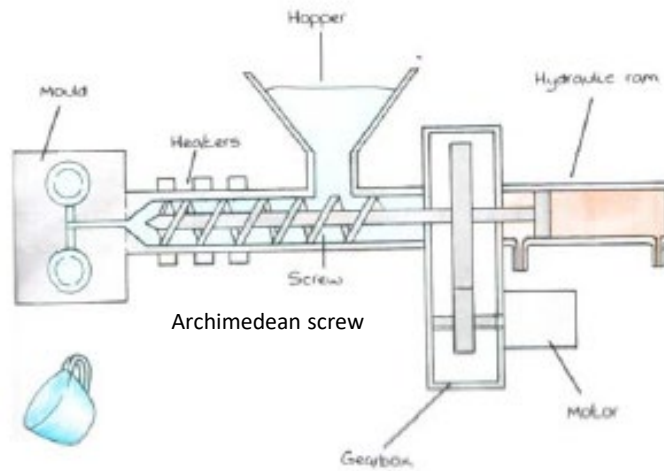
PP:

Advantages: hygienic
Good chemical resistance
Easy to mould

Disadvantages
Difficult to manufacture at high temperatures
Difficult to bond
Tough plastic, poor impact resistance
Suffers from UV gradation
Can catch fire

Specialist RM

Injection moulding



- Screw is rotated moving polymer to the heaters.
- Hydraulic ram forces polymer into mould.
- After a few seconds the mould separates and is finished.

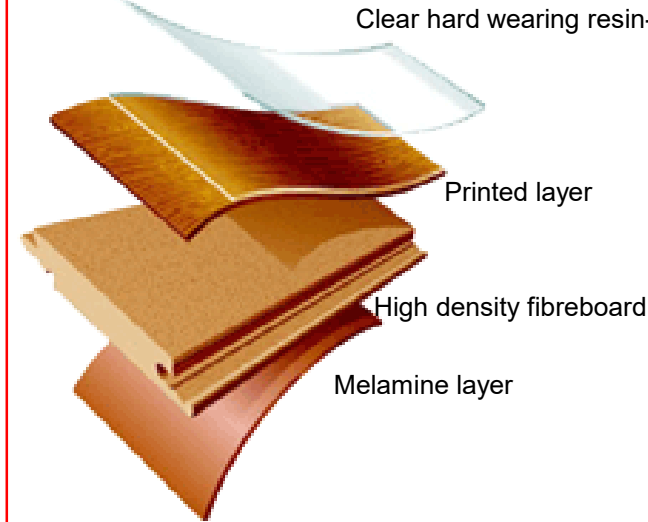
Advantages: complex 3d shapes can be produced, high volumes, metal inserts can be placed in.

Disadvantages: moulds are expensive, initial set up costs are expensive.

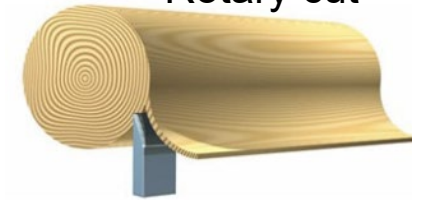
Sustainability issues regarding plastic:

- Plastic is made from a non renewable resource.
- Plastics replace natural materials, including ivory and wood.
- The use of plastic materials in cars and airplanes reduces their weight and therefore increases their fuel efficiency.
- The production of plastic production uses vast quantities of energy.
- The waste of plastics produces CFCs (ChloroFluoroCarbon), which cause destruction of the ozone layer.
- Plastics isn't disposal of correctly.
- Plastic goes to landfills and makes its way into the environment.
- Plastic does not biodegrade quickly which means it remains in the environment for a very long time.
- Plastic trash has made its way to coastal ecosystems and the ocean, presenting a danger to marine and birdlife.

Lamination

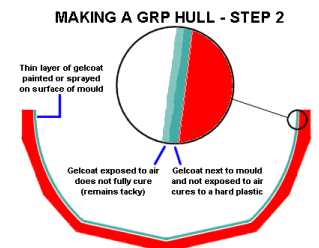
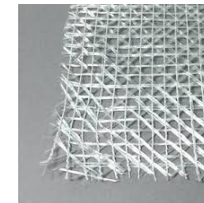


Rotary cut



The lay-up process is used to make 3D products from fibre based composites such as GRP or CFRP

- Mould is prepared for the shape of the product, made from manufactured boards
- The mould is coated with a release agent such as wax or PVA
- A top layer of gel coat is applied. Coating of polyester resin mixed with a pigment. Additives can be added here to prevent degradation.
- Fibreglass matting is cut down to size and layer over the former. Polyester resin is brushed onto the matting with a roller to create an even surface and remove any air bubbles this is called stippling. Matting can come in different stock forms.
- Step 3 is repeated until the desired thickness is achieved and fine matting is used on the top layers.
- A vacuum bag can be used for GRP before it sets.
- GRP is allowed time to set



Manufactured in different parts of the work:

- Various parts of the world will increase employment in the area
- Cheap labour and parts, allowing them to either drive down the price of their product or make more profit
- Regional governments will benefit from increased employment and the customer will benefit from cheaper products
- Manufacturing in this way would increase competitiveness in the market place

Mass production
One off production- wedding rings, bespoke furniture

- One product being made
- Manufactured by a skilled craftsperson
- Very expensive

Mass production-cars, cookers

- Many similar products are made
- Manufactured by machines
- Affordable prices

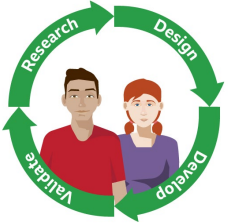
Continuous production- plastic bottles, food cans

- One product made 24/7
- There is a constant demand
- Very high set up costs

Primary research: is any type of research that you collect yourself.
Examples-include surveys, interviews, observations

Secondary Research: is a type of **research** that has already been compiled, gathered, organized and published by others.
Examples- It includes reports and studies by government agencies, trade associations or other businesses in your industry

User-centred design is a different style of designing from iterative design, as it bases the design of a product around the needs of the target market rather than the continual development of iterations. The user is questioned and consulted throughout the development, and evidence is gathered through questionnaires, interviews, testing and observations, and the results are used to improve the product.



The user is put at the end user at the centre of every decision made during the design process and, as a result, the end product is more likely to fit their needs.

CORE AREA

What is a SMART material?

- A ‘smart material’ can be defined as a material whose physical properties change in response to an input e.g. making them simpler or safer to use.
- A smart material reacts to external stimulus / changes in the environment without human intervention.

Designers and manufacturers are utilising SMART materials in a whole range of mass consumer products which often makes them simpler or safer to use.

Smart Materials:
Polymorph is a clever thermoplastic which we can use for prototyping and is especially useful when it comes to modelling ergonomic grips. As it is thermoplastic you can reheat and reuse this material as many times as you wish.

SMART Material	Property
Hydrochromic Ink	Changes colour with water
Thermochromic Pigment/ Paint	Changes colour with heat
Photochromic Material/ Dye	Changes colour with light
SMA - Shape Memory Alloy	Changes shape with heat
Phosphorescent Material	Glow in the dark
QTC – Quantum Tunnelling Composite	Soft Electrical Switch
Polymorph	A thermoplastic used for prototyping which can be reheated and reused

Technical Textiles:
Kevlar is a tightly woven fabric that has great impact resistance. It is used in racing tyres, racing sails, gardening gloves and bulletproof vests.

Rhovyl is an antibacterial material that has antibacterial agents integrated into the fibre itself. This prevents the formation of bacteria and does not wash out. It is used in bedding, children’s clothes, sportswear and underwear, and has many properties:

- thermal insulation and natural fire retardancy
- wicks away moisture
- resistant to mildew, fungi and chemicals

Nomex is a flame-resistant material. As it withstands the intense heat of flames, it is worn by firefighters and Formula 1 racing car drivers for protection

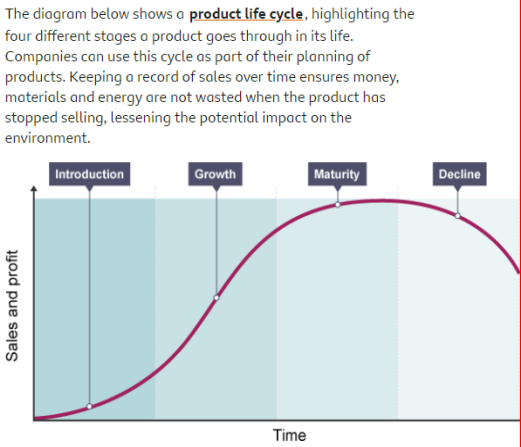
Sustainability:
Resources fall into two categories:
Finite resources-limited supply can't be reproduced

- Oil
- Natural gas
- Coal

Non-finite-in abundant supply or can be replanted/replaced

- Wind
- Tidal
- Solar

The Six Rs of sustainability help designers think about designs and designing in the following way:
RETHINK - our current lifestyles and the way we design and make.
REFUSE - to buy materials and products that are unsustainable.
REDUCE - the amount of energy and materials used to manufacture a product.
REUSE - the product for something else so you don't need to throw it away.
REPAIR - the product so you don't need to throw it away.
RECYCLE - finally take the product apart and categorise the parts ready for being converted into another product. This uses a lot of energy



Material
Plastic
Thermoplastic- can be reheated and remoulded

- ABS, strong, can be recycled. Use: children's toys.
- Acrylic, range of different colours. Use-car headlights.
- PET, hygienic. Use- drink bottles
- LDPE, easy to manufacture, good chemical resistance. Use- plastic bags.

Thermosetting plastic-can't be reheated and remoulded

- UF, strong, good heat resistance. Use- electrical plug sockets.
- MF, scratch resistant, good heat resistance. Use- kitchen work tops.

Original source of plastics-oil
Improve plastic-add fillers(reduce material cost),add UV stabilisers(stop changing colour in the sun), add Plasticisers(makes plastic flow quicker when moulding)

Wood
Softwoods-coniferous trees, quick growing, cheap.

- Pine, easy to work with, quite knotty. Use: simple joinery.
- Fir, strong, good resistant against fungal infestation. Use: Building construction

Hardwoods- deciduous trees, slow growing, expensive.

- oak, attractive grain, strong. Use: high class furniture.
- Beech, close grain, hygienic. Use: chopping boards.

Manufactured boards-

- plywood, strong constructed in layers. Use: interior panelling
- Chipboard, ridged board, relatively smooth surface. Use: flooring
- MDF, smooth surface, easy to machine. Use: interior panelling










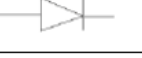



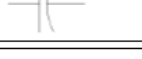

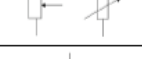









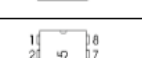

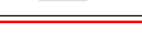
Original source of woods- trees
Advantages and disadvantages of natural timbers versus manufactured boards:

- It is available in large sheets
- It is an environmentally friendly/sustainable material
- It is cost effective (cheap)
- It does not have knots/defects
- It can accept a veneer/'formica' finish

Improve wood- seasoning of wood(reduce moisture, less likely to warp)

Composite materials
A mixture of two or more materials created to enhance the property.

- (GRP) glass reinforced plastic, strong, lightweight, impact resistant. Use: car bodies.

Slide switch		
Micro switch		
Toggle switch		
Battery		
Light Emitting Diode (LED)		
Diode		
Motor		
Electrolytic Capacitor		
Variable Resistor		
Light Dependent Resistor		
Resistor		
Thermistor		
Buzzer		
Speaker		
Integrated Circuit (IC)		

Electronic components:

programmable component: An electronic component that can be programmed to perform different functions.

Microcontroller: An integrated circuit that contains all or most of the individual elements of a central processing unit (CPU)

Microprocessor: An integrated circuit that contains all or most of the individual elements of a central processing unit (CPU).

Resistors restrict or limit the flow of current in a circuit. The ability of a material or component to resist current flow is measured in ohms. There are three main types of resistor:





- fixed resistors
- variable resistors
- special resistors, such as thermistors and light-dependent resistors (LDRs)

Papers and boards

Are used for a variety of purposes from writing, drawing, packaging and model making. They are made from cellulose fibres found in wood or grasses which are all renewable.

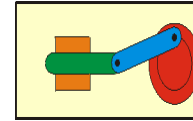
Paper & boards can be plain, textured and can be laminated with other materials like plastic to make them waterproof.

Paper and board is measured in sizes from A0 to A6 and in weight by grams per square metres (gsm). Boards (card or cardboard) are always greater the 200gsm

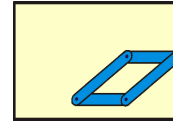
Boards	Example	Properties	Uses
Corrugated card		Strong lightweight material Made from two or more layers and has a fluted middle	Packaging such as pizza boxes, large boxes that are used to protect heavy items
Duplex board		Thin board that often has one side printed. This board can also be coated with wax so it can be used with food and drink	Packaging
Foil lined board		Board covered with one side of aluminum foil making it a good insulator	Packaging such a takeaway and ready meal packaging.
Foam core board		Two pieces of board with a foam core to increase the thickness but as architectural models.	Model making such
Solid white board		High quality cardboard, smooth on both sides which makes it good for printing.	Book covers, cards and packaging.

Motions and movement:

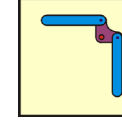
Crank and slider



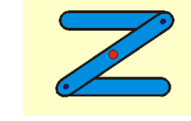
Parallel motion



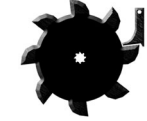
Bell crank




Reverse motion




Ratchet and Pawl




Linear motion- Moves in a straight line in one direction only




Rotary motion- Rotates around a central axis




Reciprocating motion- Moves back and forth or up and down along a straight line



Oscillating motion- Moves back and forth along a curved line



A Load
B Fulcrum
C Effort



Ergonomics

- Making the product easier for the user
- Moulded handles
- Added cushions

Anthropometrics

- Reference to the collection of data
- Measuring the target market
- 5th to 95th percentile
- Standard charts

Enterprise:

An idea is created into a business proposal that has commercial viability as a product.

- Crowd funding- designers or entrepreneurs to raise enough money to manufacture products.
- Patent- remain the property of the person who invented them, which is a legal process so designs/ideas don't get taken.
- Virtual marketing and retail- use websites and social media to promote products, to reach a wider target audience.
- Search engine optimization- company make efforts to boost their website higher in an internet search.
- Cooperatives- owned and run by its members. They can be cost effective way to sell goods around their local community.
- Fair trade- better working conditions and better prices for farmers and working in less developed countries.

Natural fibres from animals

Wool

Used for jumpers, suits and blankets and has the following qualities:

- warm to wear
- absorbent, dries slowly
- breathable, repels rain
- soft or coarse handle

Silk

Used for evening wear and ties and has the following qualities:

- warm to wear
- absorbent
- soft handle
- good lustre and drape

Natural fibres from plants

Cotton

Used for making jeans, T-shirts and towels and has the following qualities:

- cool to wear
- very absorbent, dries slowly
- soft handle
- good drape

Knowledge Organiser - KS4 Design Technology Maths

Geometry: Angle Fact



Angles around a point add up to 360°

$$a + b + c = 360^\circ$$



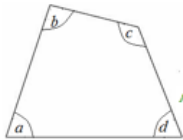
Angles on a straight line add up to 180°

$$e + f = 180^\circ$$



Angles in a triangle add up to 180°

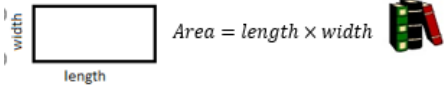
$$w + x + y = 180^\circ$$



Angles in a quadrilateral add up to 360°

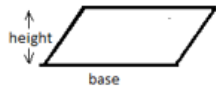
$$a + b + c + d = 360^\circ$$

Area

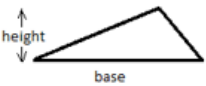


$$\text{Area} = \text{length} \times \text{width}$$

More Geometry:

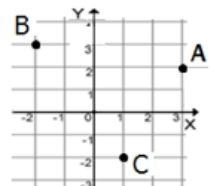


$$\text{Area of parallelogram} = \text{base} \times \text{height}$$



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

Coordinates



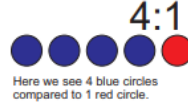
A(3, 2)
B(-2, 3)
C(1, -2)

RATIOS - EXAMPLES

DEFINITION:

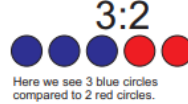
A ratio is the mathematical relationship between two or more numbers.

An example of a ratio is:



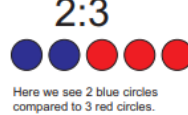
Here we see 4 blue circles compared to 1 red circle.

An example of a ratio is:



Here we see 3 blue circles compared to 2 red circles.

An example of a ratio is:



Here we see 2 blue circles compared to 3 red circles.

The circle below shows the area of blue in ratio with the area of red. There are 3 areas of red to just 1 area of blue.



RATIOS - EXAMPLES

Part of a recipe to serve two people, requires 4 cups of flour and 1 cup of water.



If the has to be scaled up to serve 10 people, how many cups of flour and water will be required as part of the recipe.

SERVES TWO PEOPLE =

FLOUR	:	WATER
4	:	1

To find the number by which the original ratio numbers are multiplied, divide the new number of people to be served (10) by the old number of people to be served (2).

$$\frac{10 \text{ PEOPLE}}{2 \text{ PEOPLE}} = 5$$

Then, multiply each number of the original ratio by the answer 5, to find the new amount of flour and water.

The new number of cups of flour and water are seen opposite

4x5	:	1x5
FLOUR	:	WATER
20	:	5

How to find a Percentage of a number

Here are the 3 simple steps for finding a percentage of a number:

Step 1

- Convert the percentage to a decimal by dividing it by 100.

Step 2

- Multiply this decimal by the number you are finding the percentage of.

Step 3

- Check your units of measurement.

You should have now found your percentage of a number!

Example 2) Find 17% of 160m.

Step 1)

Convert the percentage to a decimal by dividing by 100.

$$17 \div 100 = 0.17$$

Step 2)

We need to multiply this decimal by our number.

$$0.17 \times 160 = 27.2$$

Step 3)

Check units of measure.

Answer: 27.2m