

Year 9 Design & Technology Pathway

Knowledge Booklet

This is your copy to **KEEP** for the entire school year

Name:

Class:



What will you have learnt by the end of Year 9?

Design and Technology Pathway:

Consisting of Resistant Materials and Catering

Resistant Materials

- **"Acoustic Dock"**
- **"Candleholder"**

In Resistant Materials, we teach these modules, because...

Students are able to build on the activities undertaken in the workshop in Y8 and Y7 by using a range of tools and processes to realise a directed/ personalised outcome. Students will be able to learn about meeting the needs of a client, designing and planning using data, iterative modelling and realisation skills

Catering

- **"World food, nutrition, costings time plans and briefs"**

In year 9, we teach these modules because...

Pupils need to have the knowledge and skills to design and make food products effectively and as independently as possible. When planning menus they need to understand and use the physical, chemical and nutritional properties of foods to meet a specified need. They need to understand about today's diverse population and demographics that are needed to implement their design, hygienically and effectively. Students will research an individual theme and produce a final outcome for a potential client.

What will you learn in the Design and Technology Pathway?

You will learn about tools/ processes in the workshop/catering room, the dynamics of sound, designing for a client, drawing conventions, healthy eating, health and safety. The work of others- designers and movements, famous chefs

Why?

To give you an opportunity to gain an understanding of 'real life' practical skills. You will be learning through a broad range of practical activities and theoretical elements to enable you to become confident in your D&T lessons

Health and Safety is an important part of the D&T environment, so you must understand safety rules and expectations.

Throughout your time in D&T, you will be encouraged to improve your design skills through practice and demonstration, be creative and have high expectations of yourself

The Subjects

At KS3, students will study both an "Art and Design" pathway and a "Design and Technology" pathway for 1hr per area per week.

Assessment

As all subjects within the Art, Design and Technology Faculty are predominantly practical, assessment and verbal feedback is an essential aspect of most lessons- this may be teacher led, peer or self-assessment.

At the end of each module, each student will be given grades based upon the work they have completed in addition to an Attitude to Learning and Homework grade.

Wider Understanding

Each subject has a Scheme of Work geared towards teaching essential skills, knowledge and understanding with progression towards the KS4 GCSE courses in mind. Please find some resources listed below for wider reading in each subject area- knowledge is power!:

Art

'How to Draw: 53 Step-by-Step Drawing Projects (Beginner Drawing Books)'– Alison Calder

www.tate.org.uk/visit/tate-britain www.pinterest.co.uk www.saatchigallery.com www.youtube.com

Catering

'Hospitality and Catering'- Anita Tull and Alison Palmer

'Exploring Food and Nutrition KS3' - Yvonne Mackey

'Essential Equipment for the Kitchen' - Peter Fiell

www.eatwell.gov.uk www.thinkfast.co.uk www.health4schools.net

www.bbc.co.uk/schools/gcsebitesize/hospitality

Textiles

'Three-Dimensional Embroidery' - Janet Edmonds

'Digital Textile Design' - Melanie Bowles

www.technologystudent.com/ www.design-technology.info/home.htm

www.viviennewestwood.com/en/ www.designmuseum.org/

Graphics

www.ilovetypography.com www.canva.com/ www.kidsthinkdesign.org/graphics/index.html www.bbc.co.uk/schools/gcsebitesize/art

Resistant Materials

'How Things Work' - Conrad Mason

'The Design of Everyday Things' - Don Norman

'Starting Product design Exerciser: Questions and Answers' - Artiom Dashinsky

During Year 9 Design and Technology pathway you will....

Progress by: Understanding the concepts of sound and sustainability (scientific principles and materials-manufactured boards) – Design for a Client - Present a range of appropriate design ideas – Be able to produce a brief and specification -Be able to explain Function Vs Aesthetics and be able to link existing designers/ movements to their work – Use advanced measuring/markings – Show quality design presentation through a range of styles - Produce iterative card models – Show developmental decision making – Understand and use scales of production-Manufacture with a high level of precision – Use a range of surface finishes – Test, Evaluate and develop their work-Be aware of Emerging materials (including Smart) & related tech processes (eg laser and 3D printing)

Develop Literacy skills:

Literacy:

There are a range of extended writing opportunities for each of the projects - both within and outside of the classroom

Oracy:

Students will answer questions in full sentences during discussion work and encouraged to read out loud where appropriate

Keywords:

Designers, Sustainability, Social, Aesthetics, Ergonomics, Anthropometrics, Thermosetting, Thermoforming, Fibres, Fabrics, Upcycle, Life cycle Assessment, Functionality, Iterative Design, Reuse, Recycle, Texture, Ecological, Ethics, Fabricate, Smart materials

Develop Numeracy skills:

- Calculations of sizes
- Use of metric systems
- Scaling drawings
- Determining the amount of materials required
- Graphic presentation of ideas to others
- Analysis of client survey responses
- Measurement and marking out
- Extracting information from technical specifications

Develop Scientific skills:

- Protecting materials from corrosion/ rot
- Selection of appropriate materials
- Use of scientific principles when developing a brief or specification
- Measurement of materials and selection of components
- Classification of materials and their properties (to include Smart materials)
- Knowledge of material properties to be applied when designing and making

Final Endpoints– by the end of the project, you should be able to:

Work to a given context, scenario, personal brief or specification to independently use a wide range of materials and processes to research, design, model, develop (through iterative designing) and realise a product to meet the needs of an identified user/ groups that shows a clear link to an existing designer or movement. Understand the development, use and potential for Smart materials and polymer based materials/ processing and products.

<h3>LINES</h3> <p>What do each of following lines mean</p> <p>parallel, horizontal, vertical, bisect, diagonal, arc</p>	<h3>SHAPES</h3> <p>How to measure different shapes</p> <p>Diameter (d), Radius (r), Circumference $C = 2\pi r$, Area length x width, Volume length x width x height, Volume $\pi r^2 h$</p>	
<h3>ANGLES</h3> <p>Use the right tool to get the right angle</p> <p>90°, 45°, 30°</p> <p>A try square is used to mark a 90° angle. A mitre square is used to mark a 45° angle. A sliding bevel is used to mark irregular angles.</p>	<h3>NUMERACY SUPPORT IN D&T</h3>	<h3>MEASURES OF AVERAGES</h3> <p>This help you draw conclusions from data</p> <p>The mean is the most common measure of average. To calculate the mean add the numbers together and divide the total by the amount of numbers: Mean = sum of numbers ÷ amount of numbers</p> <p>If you place a set of numbers in order, the median number is the middle one.</p> <p>The mode is the value that occurs most often.</p>
<h3>MEASURING</h3> <p>Measuring in millimetres is more accurate than measuring in centimetres. In the workshop you will frequently use the steel rule.</p> <p>1mm = 0.1cm 10mm = 1cm 50mm = 5cm 57mm = 5.7cm 100mm = 10cm</p> <p>To convert mm to cm ÷ 10 To convert cm to mm x 10</p>		

Personal Machine Training Record

As part of your Design and Technology course, you will be expected to use a range of equipment to help make your work to the highest standard. You will be taught how to use the equipment either individually, or as part of a group and as this happens you will be asked to tick and date the chart, below, to show that you are trained and confident. **Under no circumstances should you use equipment that you have not been trained to use!**

Make sure that you have made yourself aware of the safety signage and information located within your practical area

If you require further instruction on the machinery during your lessons, ask!

Equipment Name	Date	Trained (tick)
Tenon saw		
Chisel		
Scroll Saw (Hegner)		
Sander/ Linisher		
Pillar Drill		
Flame Torch		
Ceramic Chip Hearth		
Strip Heater		
Centre Lathe		
Kitchen knives		
Ovens		
Hobs		
Kitchen utensils		

Year 9 D&T: Acoustic Dock

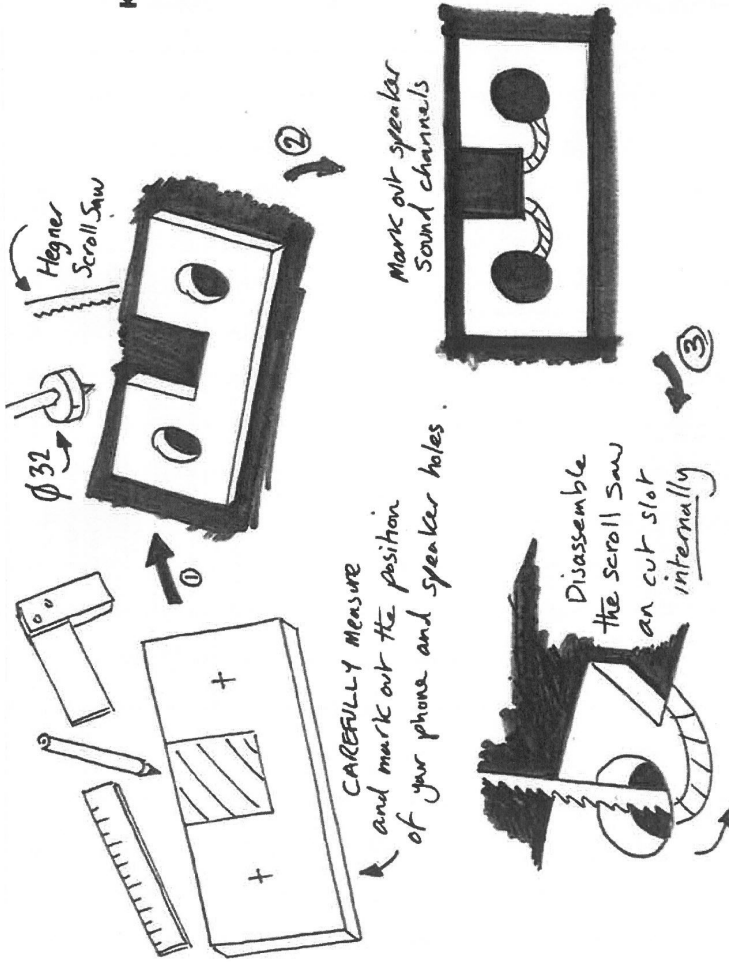
Objective: To create a useful inert acoustic dock using a HUGE range of skills and techniques!

Health and Safety- the basics!

- Always cut away from your body
- Never leave a machine switched on
- Clamp work down firmly
- Wear goggles when using machinery
- Tie long hair back and wear an apron
- Be aware of those around you
- Behave sensibly at all times

Key Skills

- Research and investigation
- Designing and planning
- Prototyping and testing
- Making
- Analysis and evaluating



Manufactured Boards	Manufactured boards are timber sheets which are produced by gluing wood layers or wood fibres together. Manufactured boards often made use of waste wood materials. Manufactured boards have been developed mainly for industrial production as they can be made in very large sheets of consistent quality. Boards are available in many thicknesses
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Key Vocabulary	
Identify	To identify needs , you must both listen and ask the right questions. After identifying needs , always check for additional or related needs . Use your knowledge and experience to identify and present the right solutions to meet your User or Client needs .
Investigate	The action of investigating something or someone; formal or systematic examination or research
Acoustic Design	The branch of physics concerned with the properties of sound. A plan or drawing produced to show the look and function or workings of a product before it is made.
Prototype	A first or preliminary version of a design Idea from which other ideas or versions are developed.
Analyse	Examine (something- eg information, a product; Client feedback) methodically and in detail, typically in order to explain it.
Evaluate	Use feedback or observations to form an idea of the value of something eg 'does it work?'
Make	Create (something) by putting parts together or combining materials and components

Outcome

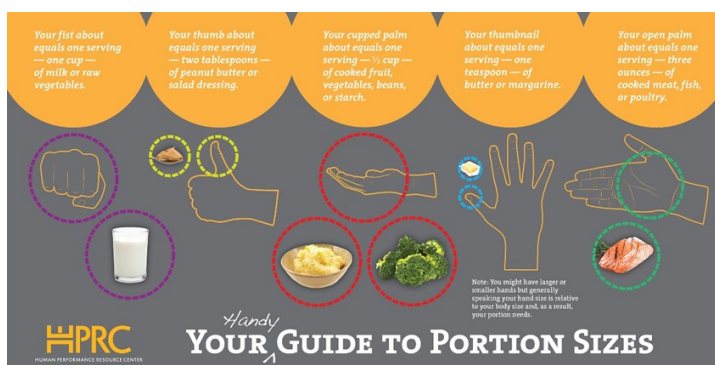
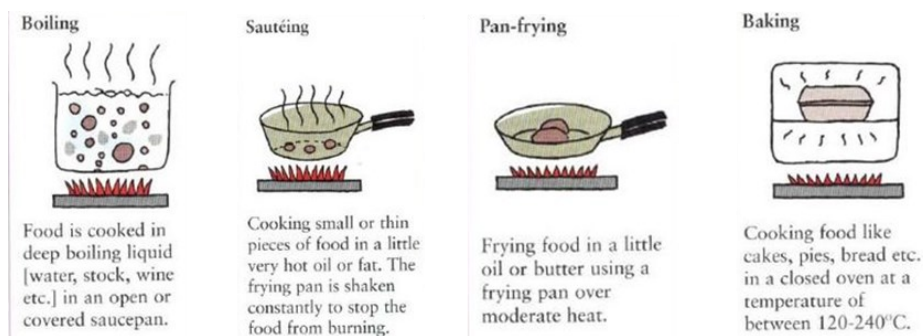
Once your prototype has been finished, **how could it be further developed?**
Could it be more portable, have the speaker ports moved to enhance sound quality or be re designed for a different user group?

Year 9 Catering

Objectives: To investigate world foods, convenience foods and how food can be adapted to suit clients' needs.

Key Skills
Shallow Frying
Saut��ing
Baking
Boiling

Menu
American- Cookies
England- Fruit Crumble
Italy- Pasta Bolognese Bake



Convenience Foods

"Convenience foods make life easier"

Typically a complete meal that has been pre-prepared commercially and so requires minimum further preparation by the consumer.

Health & Safety
Wash hands before you begin
Long hair should be tied back
Remove jewellery
Aprons must be worn
Behave sensibly at all times
Listen to instructions

Key Vocabulary	
Time plans	Schedules of work
Costings	The price of the item per portion with profit
Shopping and equipment lists	What is needed and where is it purchased from?
Evaluations	Review of customer satisfaction and any subsequent changes

Year 9

Design and Technology Pathway

Catering The Environment and the Provenance of Food	
Homework 1	Due Date
<p>Read the text below in readiness for a test on this subject:</p> <p>Why does the UK import food from other countries?</p> <p>Foods that need a different climate to the UK are usually grown in other countries. These include rice, bananas and cocoa (which is used to make chocolate). Some foods are grown elsewhere for other reasons. For example, New Zealand are well-known for producing lamb and they export meat to many other countries.</p> <p>Where does food come from?</p> <p>Different countries produce different types of food, which is often dependent on their climate. For example, Asian countries grow rice, African countries grow cocoa, South American countries produce oil crops, and European countries produce a lot of milk and fish. Of all arable land in the world, around half is farmed.</p> <p>Modern food production allows some, but not all, of the world's population to enjoy a varied diet throughout the year. For example, it is possible to eat strawberries in winter in the UK. This scale of food production can have negative impacts on people, animals and places.</p> <p>Increasing food miles adds to global climate change. This is because fuel is required to move food between countries, which leads to increased carbon emissions</p> <p>Why is global food consumption increasing?</p> <p>Millions of people go hungry each year and may not be able to eat for extended periods.</p> <p>Farmers try to produce more food. Trees are cut-down to make more farmland and more cattle are squeezed into fields. This causes soil erosion and deforestation.</p> <p>When the demand for food exceeds the supply, prices increase. Many of the most vulnerable people cannot afford to eat.</p> <p>Food is a basic human need. Food shortages can lead to conflict.</p>	w/c
Homework 2 Why do we eat certain foods?	Due Date
<p>Read the text below in readiness for a test on this subject</p> <p>Food choices</p> <p>The food we eat is usually because of our own personal choice. We can make our choice because of ethical, religious or medical reasons.</p> <p>Vegans- will not eat any food or product from an animal. They believe that it is wrong to kill any living thing. For example they will not eat eggs, milk, or honey as these foods are all produced from animals.</p> <p>Vegetarians- will not eat the flesh of any animal for the same reasons stated above. However, some they may eat fish, they are called Pescatarians.</p> <p>Coeliac- people cannot eat products made from wheat, such as pasta and bread, as the body cannot digest it.</p> <p>Lactose intolerance- people cannot eat any milk products as the body cannot digest dairy.</p> <p>Low fat diet- people who wish to lose weight will reduce the amount of fat / calories they are consuming</p> <p>Diabetics- need to be careful about the amount of sugar they are consuming. The body cannot control blood sugar levels and produce insulin naturally.</p> <p>Hindus- will not eat beef as the cow is seen as a sacred animal</p> <p>Muslims- will not eat pork as a pig is seen as an unclean animal. Meat has to be Halal (slaughtered in a certain way).</p> <p>Jews- will not eat pork. They will not eat meat and milk at the same time, or cooked together. Meat has to be kosher (cooked to Jewish guidelines).</p>	w/c

Year 9

Design and Technology Pathway

Catering	
Homework 3	Due Date
<p>Read the text below in readiness for a test on this subject</p> <p><u>The Kitchen Brigade</u></p> <ul style="list-style-type: none"> • A group of chefs in a large kitchen is called a Brigade • Every chef has a specific job to do and has a rank position within the kitchen • Each chef has a different name for the type of food they cook • Each area in the kitchen is called a station <p>Executive head chef- this person is in overall charge of the kitchen. Their role is to create menus. They also recruit staff, and ensure all staff are trained in all Health and Safety procedures.</p> <p>Sous chef- this chef is second in charge of the kitchen and is the head chefs deputy. They will do the same roles as the executive chef.</p> <p>Commis chef- this chef is a trainee chef and will learn every station. They will train and their aim is to become a head chef.</p> <p>Chefs de partie- this is a chef that does a specific type of cooking, within an area, such as meat, vegetables, frying, desserts, pantry, sauces etc. They will be a specialist chef in their own right.</p> <p>Kitchen porter- the kitchen porter is very important within the kitchen. They do the washing up, maintain all equipment, check deliveries and put away stock.</p> <p>Expeditor- this person relays messages between the chefs and other areas of a restaurant and hotel.</p>	w/c

Resistant Materials	
Homework 1 : The 6R's in Design	Due Date
The 6R's in Design: Create an informative, A3 sheet on sustainability in Design and Industry. Staff will explain full details. See sheet in Knowledge Organiser.	w/c
Homework 2 : Designers Research	Due Date
<p>From the list, below, create an interesting, thoughtful and illustrated biography of your chosen person or design company</p> <ul style="list-style-type: none"> • Gerrit Reitveld • Aldo Rossi • Ettore Sottsass • Charles Rennie Macintosh • Marcel Bruer • Braun <p>You will produce a 150 word, edited report which shows a good range of examples of the subjects work and analyse your examples in terms of personal opinion, materials, aesthetics, costs etc. The work should be shown on no more than 1 side of A4 and must be printed if completed on the computer.</p>	w/c
Homework 3 : Types of Metals	Due Date
Types of Metals: Create an informative, A3 sheet on non-ferrous and ferrous metals. Staff will explain full details.	w/c
Homework 4 : Design Movement Research	Due Date
<p>Taking ONE Movement from the list, below. Create an interesting, thoughtful and illustrated report.</p> <ul style="list-style-type: none"> • Memphis • Futurism • Surrealism <p>You will produce a 150 word, edited report showing a good range of examples of the subjects work and analyse your examples in terms of personal opinion– such as materials, aesthetics, costs etc. The work should be shown on no more than 1 side of A4 and must be printed if completed on the computer.</p>	w/c
Homework 5 : SMART MATERIALS	Due Date
On 1 side of A4 paper, create an informative report on the subject of 'Smart Materials'. What are they? Where did they come from? When were they discovered? What are they're benefits? Where are they in use? Give 3 examples of products which use Smart Materials eg iPhone.	w/c
Homework 6 : Manufacturing Process-How to create a wooden baseball bat	Due Date
<p>Create a flowchart or 'step by step' diagram of how a wooden baseball bat is made– from the moment the raw timber is shaped and finished into the final bat product</p> <p>You might want to include sketches and photographs to explain your work– you decide!</p>	w/c

Resistant Materials	
Homework 7: 'Made in Britain: Dr Martens'	Due Date
Watch either video using the links below to investigate how 'Dr Marten' boots are created and produce a report on your findings. 'Made in Britain' Series 1 Episode 1- https://www.itv.com/watch/made-in-britain/2a5692/2a5692a0001 YouTube link-How are boots made? 'Inside the Factory' https://www.youtube.com/watch?v=25hBQCW7ys0 See the sheet provided to help you with completing this task.	w/c
Homework 8: Industrial Processes	Due Date
Research 'metal welding' – how does the process work? To do: Write a 'step by step' to show how welding joins together metals and what are the	w/c
Homework 9: Design Task	Due Date
Research the design company ' <i>Braun</i> ' and sketch design a new radio inspired by the your findings about the company's products. Make sure you annotate your design using ACCESSFM.	w/c
Homework 10: Product Analysis	Due Date
Research the Dyson product - ' <i>Pure Cool TP00</i> ' ventilation fan created by James Dyson. Use the worksheet provided to analyse the product using ACCESSFM.	w/c
Homework 11: Circular Economy Research	Due Date
On A4, create a detailed and informative sheet based on what the concept of the ' <i>Circular Economy</i> ' is. Use a combination of text and images to explain what it is, why it is important, what effect it might have on the planet etc. As a start, consider visiting: https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview	w/c
Homework 12: Sourcing Metals- Reading and Test	Due Date
Read through sheet provided and revise the information on ' <i>Sourcing Metals</i> '. Ready for a test in your next lesson.	w/c
Homework 13: Specialist Techniques and Processes	Due Date
Use the informative sheet on ' <i>Specialist Techniques and Processes</i> ' to complete the table. Add a sketch/drawing to represent the manufacturing process. Add a description which explains the process.	w/c
Homework 14: Flowchart– Use of a vertical belt sander	Due Date
Using the sheet provided, complete the activities on using the vertical belt sander safely.	w/c
Homework 15: Key terms in the Workshop	Due Date
Using the sheet provided, read the keyword and terms, commonly used in the design workshop and explain their meanings- in your own words.	w/c
Homework 16: Forces and Stresses– Reading and Test	Due Date
Using the sheet provided, read through and revise the information on ' <i>Forces and Stresses</i> '. Ready for a test in your next lesson.	w/c
Homework 17: Making Task– Recycle Packaging	Due Date
Make a prototype ' <i>Plant pot</i> ' using packaging that can be recycled such as milk bottle, toilet roll, cereal box etc. Do some research, sketch a design, make your model and take a photo (and bring in the photo to evidence what you have made).	w/c
Homework 18: 3D Sketching	Due Date
Using the sheet provided, practice drawing in one point perspective, follow the steps to complete a drawing of your own street!	w/c

Resistant Materials Homework Checklist

Once finished, tick off the homework you have completed. Remember to keep your work safely stored in your class folder

Homework 1: The 6R's in Design	
Homework 2: Designers Research	
Homework 3: Types of Metals	
Homework 4: Design Movement Research	
Homework 5: The history of <u>SMART AND MODERN MATERIALS</u>	
Homework 6: Manufacturing Process-How to create a wooden baseball bat	
Homework 7: Made in Britain: Dr Martens	
Homework 8: Industrial Processes	
Homework 9: Design task	
Homework 10: Product Analysis	
Homework 11: Circular Economy Research	
Homework 12: Sourcing Metals– reading and test	
Homework 13: Specialist Techniques and Processes	
Homework 14: Flowchart– Use of a vertical belt sander	
Homework 15: Key terms in the workshop	
Homework 16: Forces and Stresses– reading and test	
Homework 17: Making Task– Recycle Packaging	
Homework 18: 3D Sketching	

Homework 1: The 6R's in Design

6R's FOR ONE PRODUCT

Pick out one product from your recycling tub and try to apply as many of the 6r's as you can to it. Create an informative, A3 sheet on sustainability in Design and Industry

Example: **baked bean tins**

- **RECYCLE-** cans are made of steel and have an inner layer of tin or plastic. For recycling all metal is, sorted using magnets, shredded and melted, purified using electrolysis and then poured into moulds and cooled. There are many benefits associated with scrap metal recycling. Conserving our natural resources from being mined, reducing greenhouse gasses and water pollution by recycling, reduce landfill dumping of metal that could have been recycled, with the most important benefit is the substantial energy saving that is made from recycling scrap metal compared to manufacturing from raw materials on the environment and our economy. Making steel from recycled cans uses 75% less energy than when producing steel from raw materials. Recycled steel can be used to make steel girders for the construction industry.
- **REUSE-** tin cans can be used for many different things, for example plant pots, pen holders and storage. When re-using you have to be careful that the edges are not sharp.
- **REDUCE-** reduce the amount of cans made by buying food in bulk. This would save raw materials as well as energy and is therefore preferable to recycle and reusing.
- **REFUSE-** to buy tinned food all together. Make your own baked beans in bulk and freeze in re-usable tubs.
- **RETHINK-** how could energy and resources be saved?

Could the concept of supermarkets and food shopping be re-considered? How about buying food from farmers markets and making your own from locally sourced, seasonal foods. This would save on a lot of unnecessary packaging, food miles and waste.



Homework 7: 'Made in Britain: Dr Martens'

Watch either video using the links below to investigate how '**Dr Marten boots**' are created.

Made in Britain Series 1 Episode 1-

<https://www.itv.com/watch/made-in-britain/2a5692/2a5692a0001>

YouTube link-How are boots made? Inside the Factory

<https://www.youtube.com/watch?v=25hBQCW7ys0>

Create a summary report which explains the following:

- What materials do they use to make the boots?
- Draw and label the different parts of the boots
- What has been made by hand and what has been made by automation?





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.

ACCESS FM - Helpsheet

A is for **Aesthetics**

C is for **Cost**

C is for **Customer**

E is for **Environment**

S is for **Size**

S is for **Safety**

F is for **Function**

M is for **Material**



Aesthetics means **what does the product look like?**

What is the: Colour? Shape? Texture? Pattern? Appearance? Feel? Weight? Style?



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?



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?



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



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?



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?



Function means **how does the product work?**

What is the product's job and role? What is it needed for? How well does it work? How could it be improved? Why is it used this way?



Material means **what is the product made out of?**

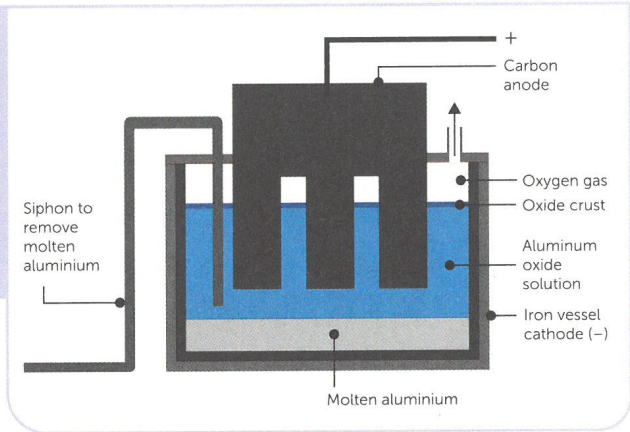
What materials is the product made from? Why were these materials used? Would a different material be better? How was the product made? What manufacturing techniques were used?

SOURCES AND ORIGINS

Metal ores are found in the earth's crust and are obtained by mining. Metals are extracted or separated from the ore and refined ready for use. Metals are extracted by different methods:

Electrolysis

Aluminium is extracted from **bauxite**. The bauxite is purified to produce aluminium oxide. This is converted to aluminium by electrolysis; a process that passes an electrical current through melted aluminium oxide. The pure molten aluminium is separated and collected.



Liquation

Liquation is used with metals with a low melting point, such as tin and lead, to separate the metal from an ore or an alloy. The impure metal is heated inside a sloped container. Once it has melted, the liquid metal runs off leaving behind any impurities.

Distillation

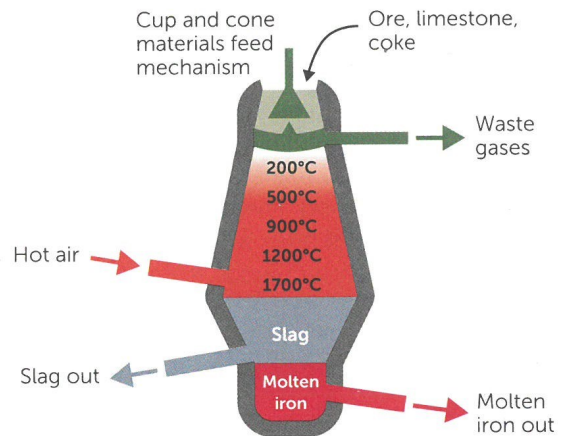
Metals such as mercury and zinc have a low boiling point and can be distilled to remove impurities. When mercury is heated, it will vaporise leaving behind the impurities. The vapour is collected and condensed to produce pure mercury.

Refining metals

Refining purifies an impure metal. Different processes are used according to the type of metal, such as fire refining or chemical refining. Electrolysis is also used to separate copper from any impurities.

Blast furnace

Metals are separated from the waste material by heating in a blast furnace. Iron is extracted from iron ore by heating it to around 1700°C until it becomes liquid. The liquid descends through the furnace and separates from the waste ore or slag.



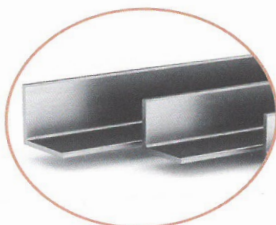
Standard dimensions

Dimensions are given in mm.

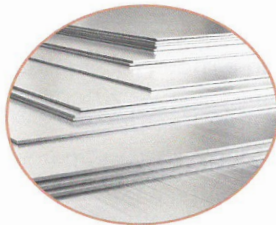
Standard dimensions for **sheet** and **flat bar** are given as length x width x thickness.

Box sections and shaped profiles – profile shape plus the length.

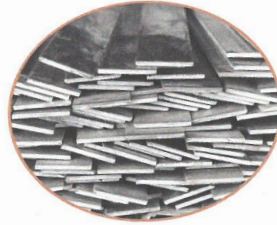
Rod – diameter x length. **Tube** – diameter x length plus the thickness of the wall or the gauge.



Angle



Sheet



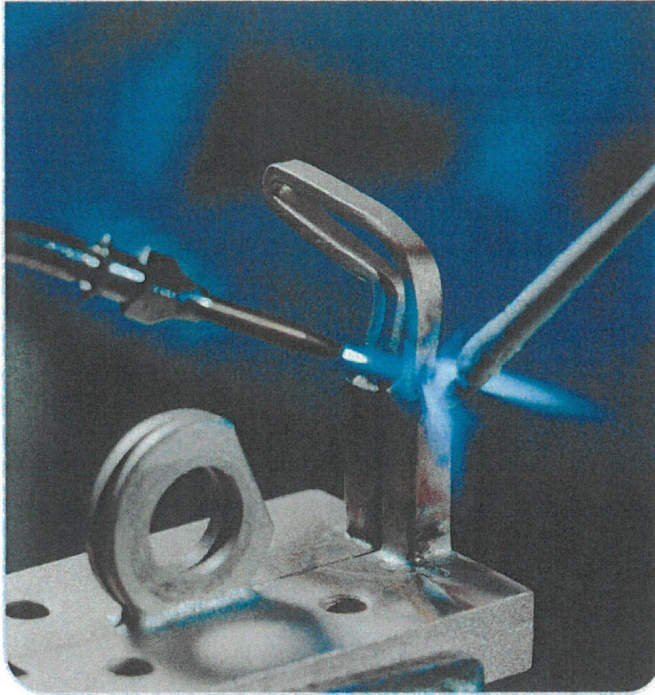
Bar



Strip

SPECIALIST TECHNIQUES AND PROCESSES

Metals can be joined together using brazing, soldering and welding.



Brazing

Brazing uses a molten filler, such as brass spelter, to join two surfaces of metals together.

- Enables two different metals to be joined.
- It is a high-temperature process, but a lower temperature than welding for the same base metals.
- The work piece does not melt, just the molten filler, which solidifies when cool.
- Provides a strong joint.

Soldering

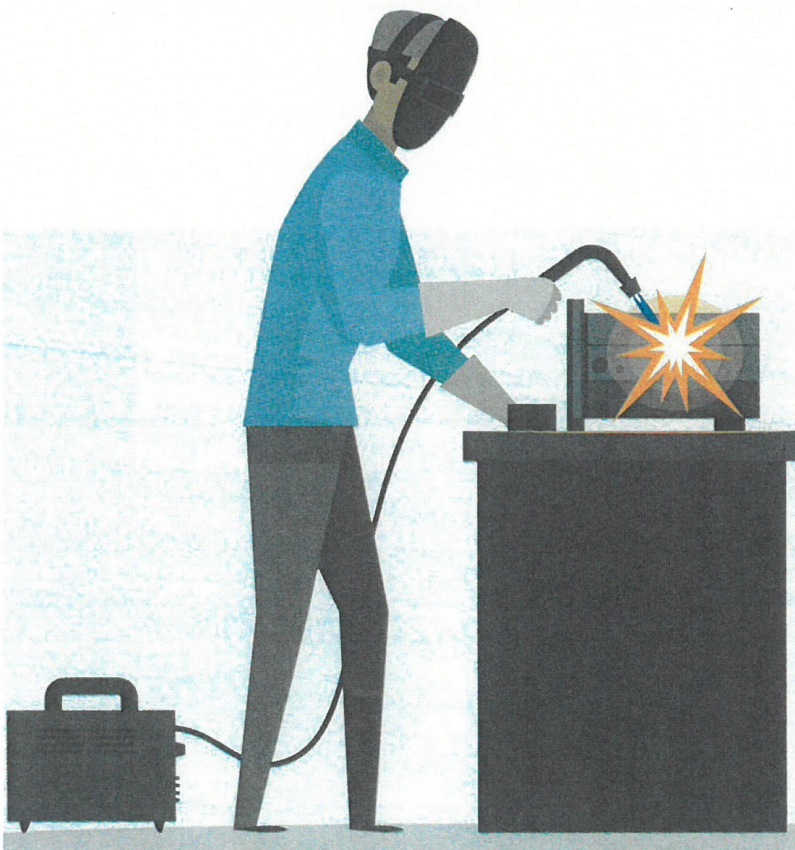
Metals are joined with a metal filler known as solder. Solder has a lower melting point than the adjoining metals. Soft soldering is commonly used in manufacturing electrical circuits and plumbing with copper components. Flux is used to help the solder flow and keep the join clean. Hard soldering is used for joining precious metals.

Welding

Welding fuses together metals at a very high temperature.

- The high heat melts the base materials.
- A metal filler (welding rod of the same or similar base metal) is melted to fill the joint.
- As they cool the parts fuse together, creating a very strong join.

Spot welding is a quick process often used to join thin sheets of metal. Automated machines can spot weld to increase speed of production. The weld is not suitable for all purposes as it is small and less strong.

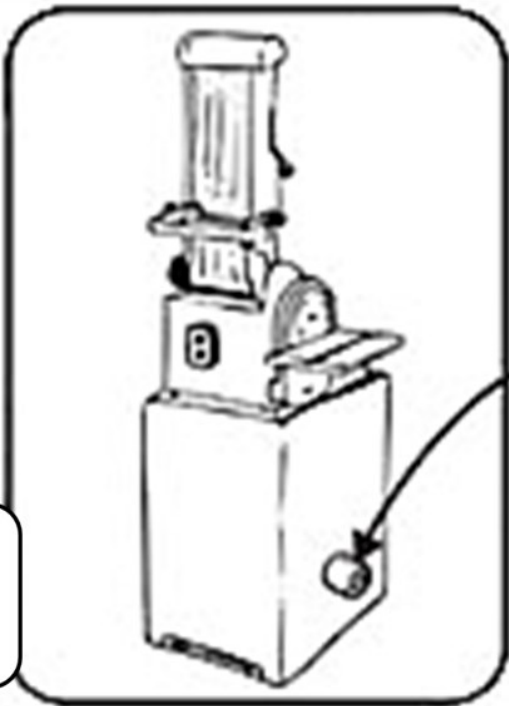


Homework 13: Specialist Techniques and Processes

Use the informative sheet on '*Specialist Techniques and Processes*' to complete the table below

Process	Sketch/Drawing	Description
Brazing		
Soldering		
Welding		

Vertical Belt Sander
Operation and Safety



Top G_____

A_____

T_____

S_____/Stop
Speed Buttons

K_____S_____

How much space should
be left around a person
using the belt sander?

0.5M

1M

1.5M

A_____ Belt

R_____ Disc

Dust E_____

Hold work f_____

against the table

Ensure a s_____ gap





between the table and

the belt

Table Abrasive Stop Guard Start Firmly Rotary Small Extractor Kick Adjustable

Flowchart

A flowchart is a type of diagram that
represents a workflow or process.

Symbol	Name
	Start/end
	Arrows
	Process
	Decision

Homework 15: Key terms in the Workshop

Keyword/Term	Meaning
Alloy	
Anthropometrics	
Carbon Footprint	
Corrosion	
Ergonomic	
Ferrous Metal	
Finite Resource	
Lean Manufacturing	
Market Pull	
Non-ferrous Metal	
Planned Obsolescence	
Prototype	
Quality Control	
Smart Material	
Technology Push	
Tolerance	
Yarn	

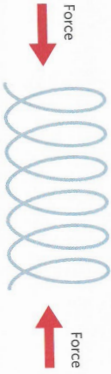
FORCES AND STRESSES

Materials and objects

All materials, structures and products must withstand stress as certain forces are applied to them when in use. The ability to withstand stress is what allows them to perform their functions successfully.

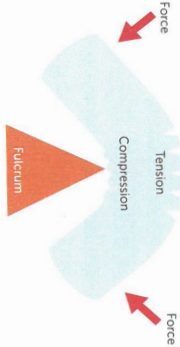
Compression

Compression occurs when a pushing force is applied to either end of a material



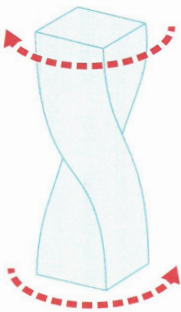
Bending

Bending is both tension and compression forces; tension on one side with compression on the other.



Torsion

Torsion forces occur when a material is twisted.



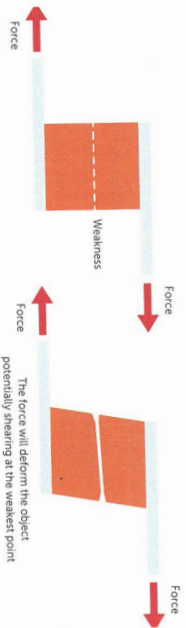
Tension

Tension occurs when a pulling force is applied to either end of a material.



Shear

Shear force acts on an object in a direction perpendicular to its length



ENHANCING MATERIALS

Materials can be enhanced to resist or work with a variety of forces and stresses. This can improve functionality. They may be:

- **Reinforced** – strengthened by the addition of other materials.
- **Strengthened** – made stronger or more rigid to resist certain forces.
- Made more **flexible**

Bending

Adding curves, arches and tubes can add considerable strength to products, using a minimum amount of material.



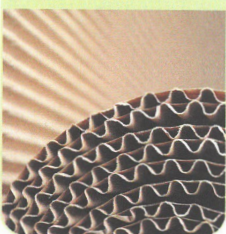
Webbing

A strong fabric made from high-strength material, it is usually woven into flat strips and used for items under high tension.



Folding

This can add strength, but also flexibility by enabling a material to bend easily.



Fabric interfacing

Used in textiles, this adds an additional layer to give structure, shape and support.



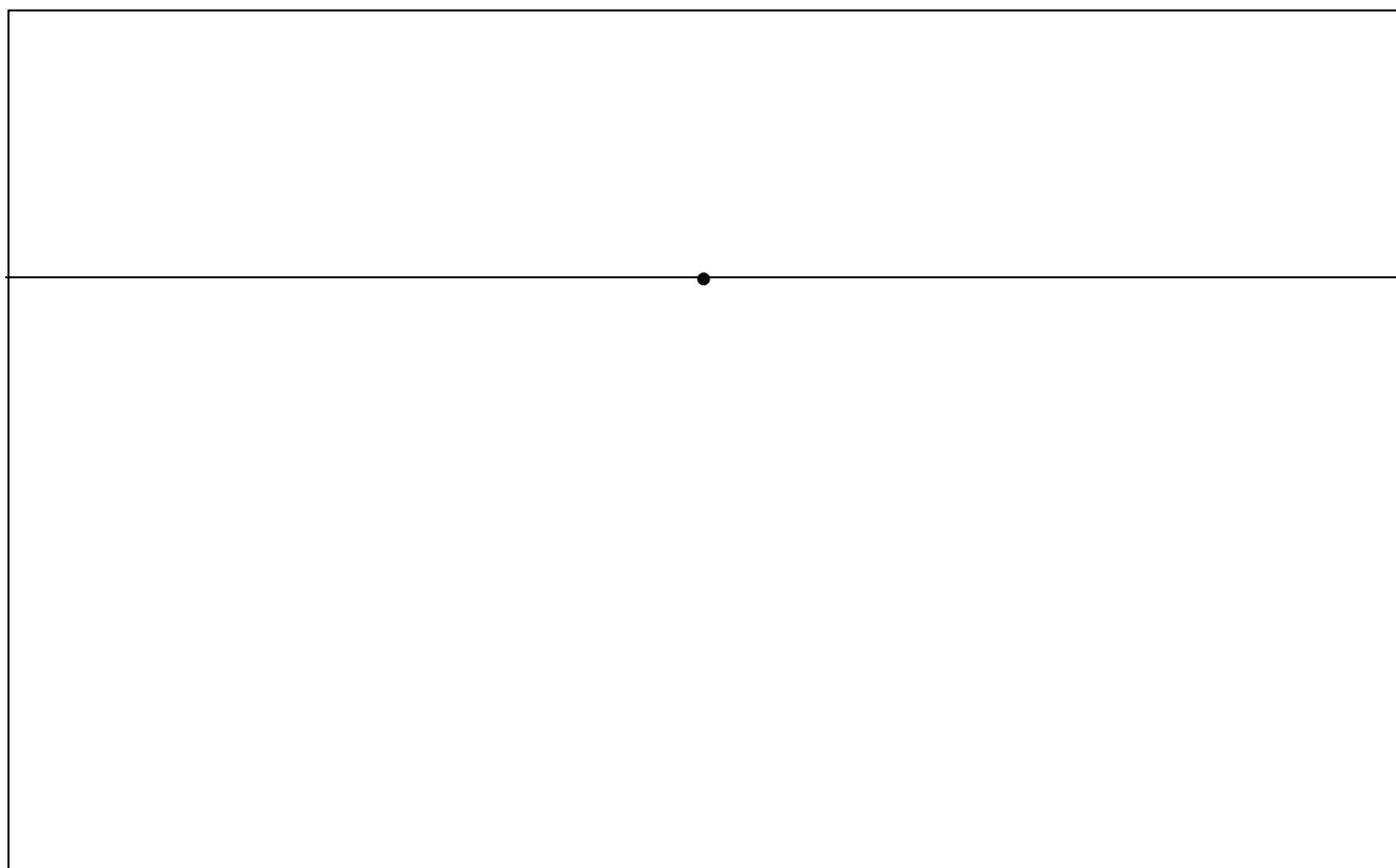
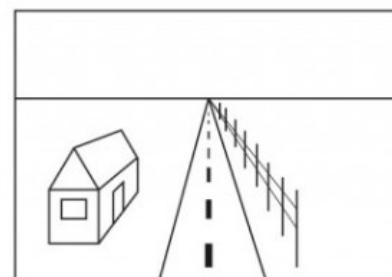
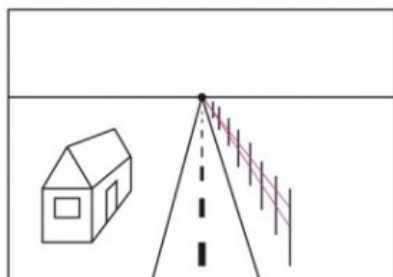
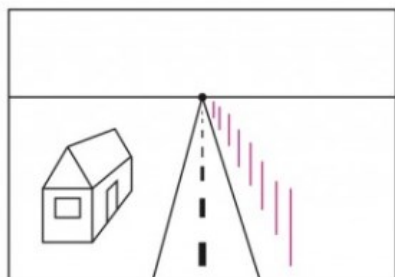
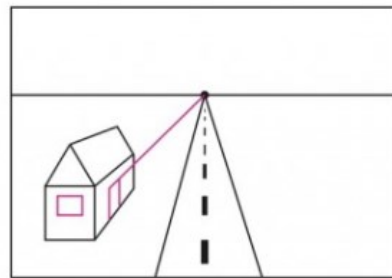
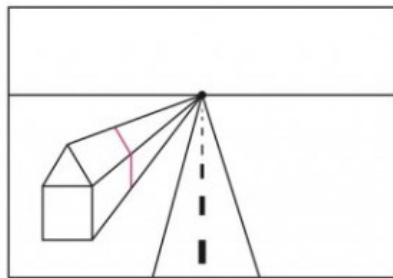
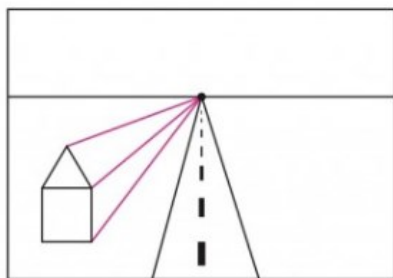
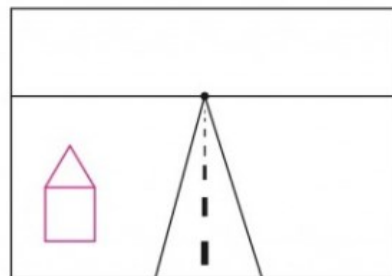
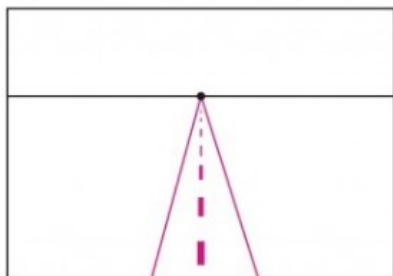
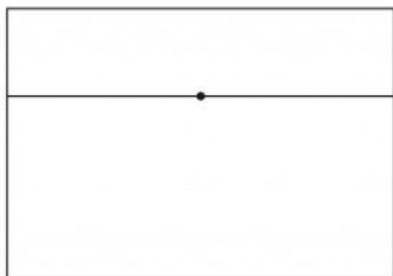
Lamination

By bonding two or more materials together, a product's strength and stability are improved. It can also add to the aesthetics by giving a new finish.



Homework 18: 3D Sketching

Use the space, below, to practice drawing in one point perspective. Follow the steps to complete a drawing of your street.



Notes