

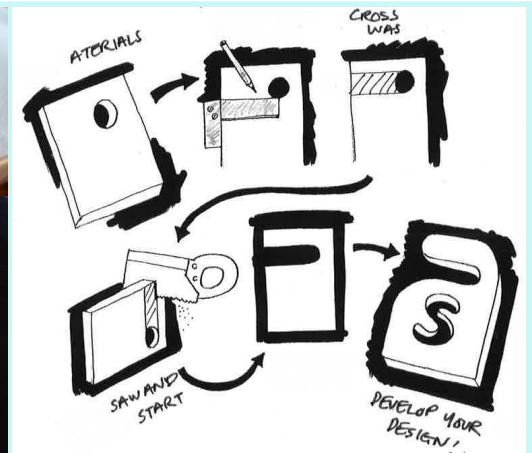
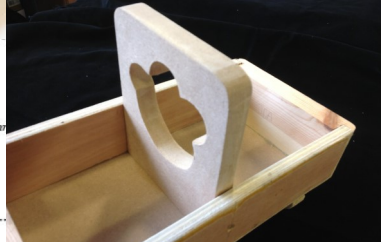
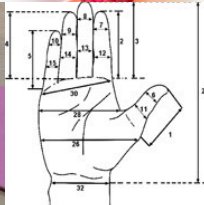
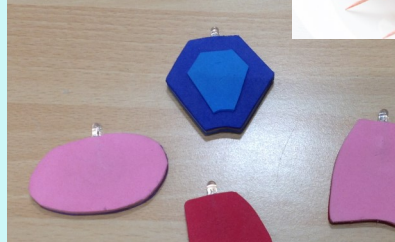
# Year 8 Design & Technology Pathway

## 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 8?

## Design and Technology Pathway:

### Year 8 Resistant Material

	Year 7	Year 8	Year 9
<b>Core Projects</b>	<ul style="list-style-type: none"><li>• Dave the desk tidy</li><li>• Door mouse</li></ul>	<ul style="list-style-type: none"><li>• Electronics</li><li>• The Trox</li></ul>	<ul style="list-style-type: none"><li>• Acoustic dock</li><li>• Metal bottle opener</li></ul>
<b>Additional Projects</b>	<ul style="list-style-type: none"><li>• Avian housing</li></ul>	<ul style="list-style-type: none"><li>• Spatula</li><li>• Money box</li><li>• Metal twist</li></ul>	<ul style="list-style-type: none"><li>• Mirror organiser</li><li>• Acrylic sliding top box</li></ul>

You will be taught these topics, because...

‘Students are able to build on the activities undertaken in the workshop in Year 7 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’.

### Year 8 Catering: “A continuation of practical skills, nutrition and evaluation”

	Year 7	Year 8	Year 9
<b>Core Projects</b>	<ul style="list-style-type: none"><li>• Scones</li><li>• Small cakes</li><li>• Fruit salad</li></ul>	<ul style="list-style-type: none"><li>• Cheese straws</li><li>• Bread and butter pudding</li><li>• Rock cakes</li></ul>	<ul style="list-style-type: none"><li>• American-cookies</li><li>• England– fruit crumble</li><li>• Italy-Pasta bolognaise bake</li></ul>
<b>Additional Projects</b>	<ul style="list-style-type: none"><li>• Pizza</li></ul>	<ul style="list-style-type: none"><li>• Fruit kebabs</li></ul>	<ul style="list-style-type: none"><li>• Spain-Risotto</li></ul>

You will be taught these topics, because...

‘Students are able to build on previous knowledge (Year 7) undertaken in the kitchen environment by using a range of kitchen appliances to prepare cook and serve food to produce healthy, personalised and individual products. Students will be able to learn how to meet the needs of a potential client (brief) and how to evaluate their product’.

## What will you learn on the Design and Technology Pathway?

You will learn about tools and processes in the workshop/catering room, joining, 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!

### Assessment

Within the Design and Technology subject 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.

At the end of the year there will be an 'End of Year' assessment which will be a written test with a set of questions to answer about Design and Technology.

### 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:

#### 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](http://www.eatwell.gov.uk) [www.thinkfast.co.uk](http://www.thinkfast.co.uk) [www.health4schools.net](http://www.health4schools.net)

[www.bbc.co.uk/schools/gcsebitesize/hospitality](http://www.bbc.co.uk/schools/gcsebitesize/hospitality)

#### Resistant Materials

'How Things Work' - Conrad Mason      'The Design of Everyday Things' - Don Norman

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

[www.dornob.com](http://www.dornob.com)      [www.alessi.com](http://www.alessi.com)      [www.designmuseum.org](http://www.designmuseum.org)

[www.technologystudent.com/](http://www.technologystudent.com/)      [www.design-technology.info/home.htm](http://www.design-technology.info/home.htm)

## During Year 8 Design and Technology pathway you will....

**Progress your skills by:** Understanding the concept of Sustainability (materials) - Present design ideas – Be able to explain what is meant by Function Vs Aesthetics – Use advanced measuring/markings – Show quality design presentation - Produce models and test pieces (iteration) – Show developmental decision making – Understand different production techniques - Manufacture with precision – Use a range of surface finishes - Test & Evaluate – Consider Scales of Production

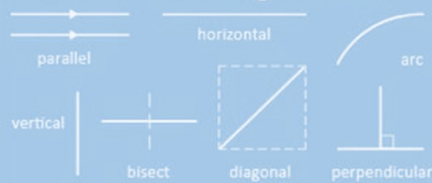
Develop Literacy skills:	Develop Numeracy skills:	Develop Scientific skills:
<p><b>Literacy:</b></p> <p>There are a range of extended writing opportunities for each of the projects -both within and outside of the classroom</p> <p><b>Oracy:</b></p> <p>Students will answer questions in full sentences during discussion work and encouraged to read out loud where appropriate</p> <p><b>Keywords:</b></p> <p>Construct, Annotate, Specification, Promote, Blending, Shaping, Finishing, Design Client, Justify, Modify, Analyse, Specification, Adapt, Input, Process, Output, Weaving, Applique, Embroidery</p>	<ul style="list-style-type: none"> <li>• Calculations of sizes</li> <li>• Scaling drawings</li> <li>• Determining the amount of materials required</li> <li>• Graphic presentation of ideas to others</li> <li>• Use of metric systems</li> <li>• Analysis of client survey responses</li> <li>• Measurement and marking out</li> </ul>	<ul style="list-style-type: none"> <li>• Use of scientific principles when developing a brief or specification</li> <li>• Measurement of materials and selection of components</li> <li>• Classification of materials and their properties</li> <li>• Protecting materials from corrosion</li> <li>• Selection of appropriate materials</li> <li>• Knowledge of material properties to be applied when designing and making- to include textiles</li> <li>• The use of electronics</li> <li>• Sustainability</li> </ul>

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

Confidently use a range of independently collected data and manipulate a range of materials, components, tools and processes to design, develop (via iterative modelling), realise and further develop a range of products for identified target client/ groups

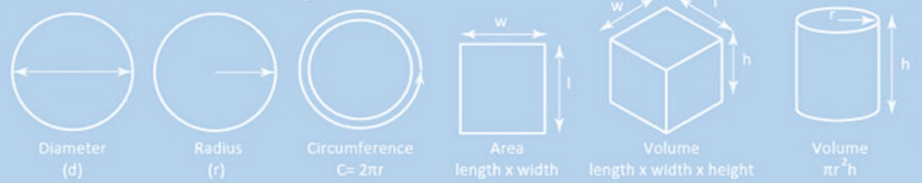
### LINES

What do each of following lines mean



### SHAPES

How to measure different shapes



### ANGLES

Use the right tool to get the right angle



## NUMERACY SUPPORT IN D&T

### MEASURES OF AVERAGES

This help you draw conclusions from data

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

If you place a set of numbers in order, the median number is the middle one.

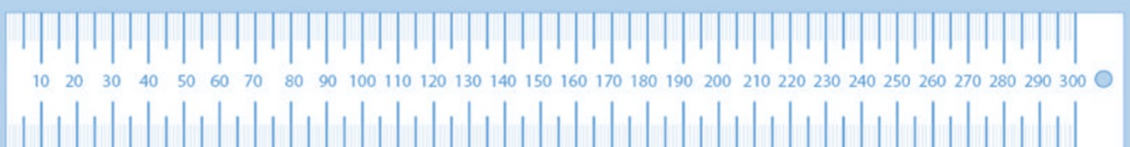
The mode is the value that occurs most often.

### MEASURING

Measuring in millimetres is more accurate than measuring in centimetres. In the workshop you will frequently use the steel rule.

1mm = 0.1cm  
10mm = 1cm  
50mm = 5cm  
57mm = 5.7cm  
100mm = 10cm

To convert mm to cm ÷ 10  
To convert cm to mm x 10



# 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 or approved to use!**

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

Equipment Name	Date	Trained (tick)
Tenon saw		
Chisel		
Scroll Saw		
Belt Sander		
Pillar Drill		
Flame Torch		
Ceramic Chip Hearth		
Strip Heater		
Bobbin Sander		
Kitchen knives		
Ovens		
Hobs		
Kitchen utensils		

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

# Year 8 Electronics

## Inputs, Processes and Outputs

### Input

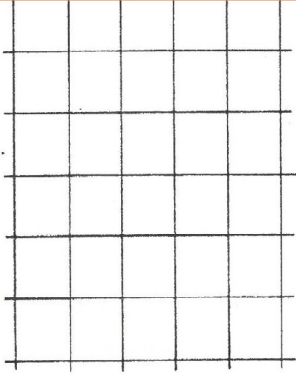
This is the trigger to make the circuit do what ever it is suppose to do. This is normally a switch or a sensor.

### Process

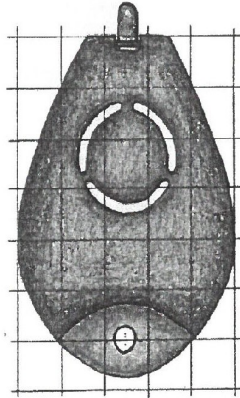
This is the part of the circuit that receives a signal from the input components and then tells the output components what to do. This could be a transistor or an integrated circuit, or even a microcontroller.

### Output

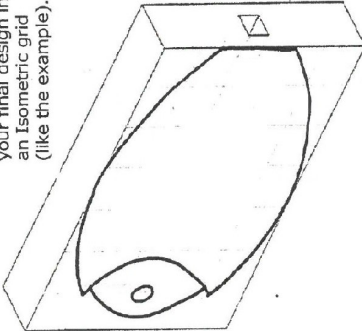
This is the part of the circuit that does the work (visual or auditory) this could be an LED, a motor or a buzzer etc.



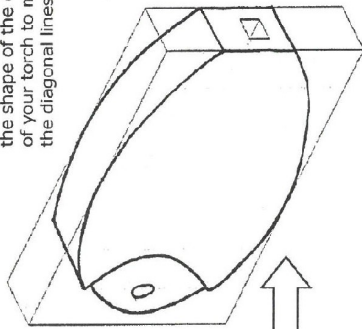
Step 1. Sketch out your final design from an overhead view (like the example) in the gridded area.



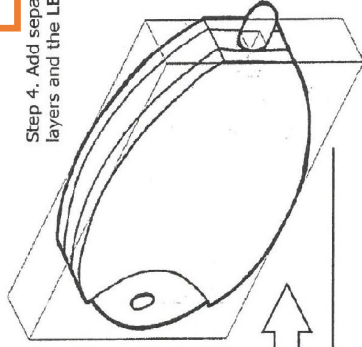
Step 2. Sketch out your final design in an Isometric grid (like the example).



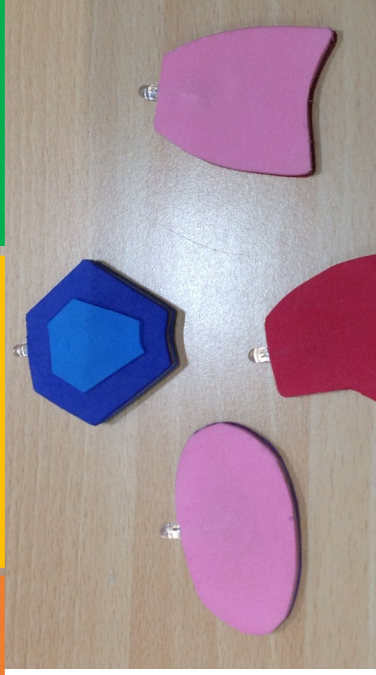
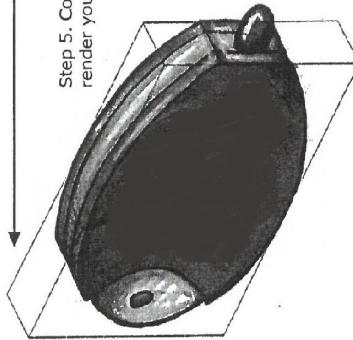
Step 3. Add diagonal lines parallel to the corners of the box. Copy the shape of the outside of your torch to meet the diagonal lines.



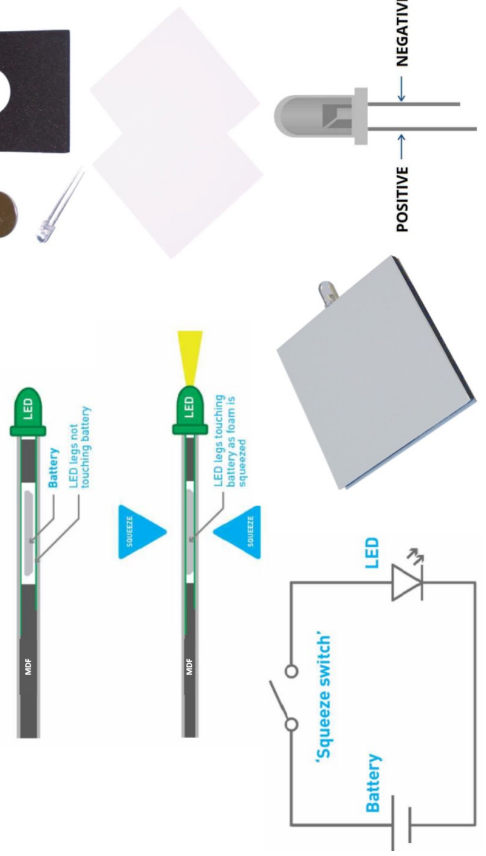
Step 4. Add separate layers and the LED.



Step 5. Colour render your design.



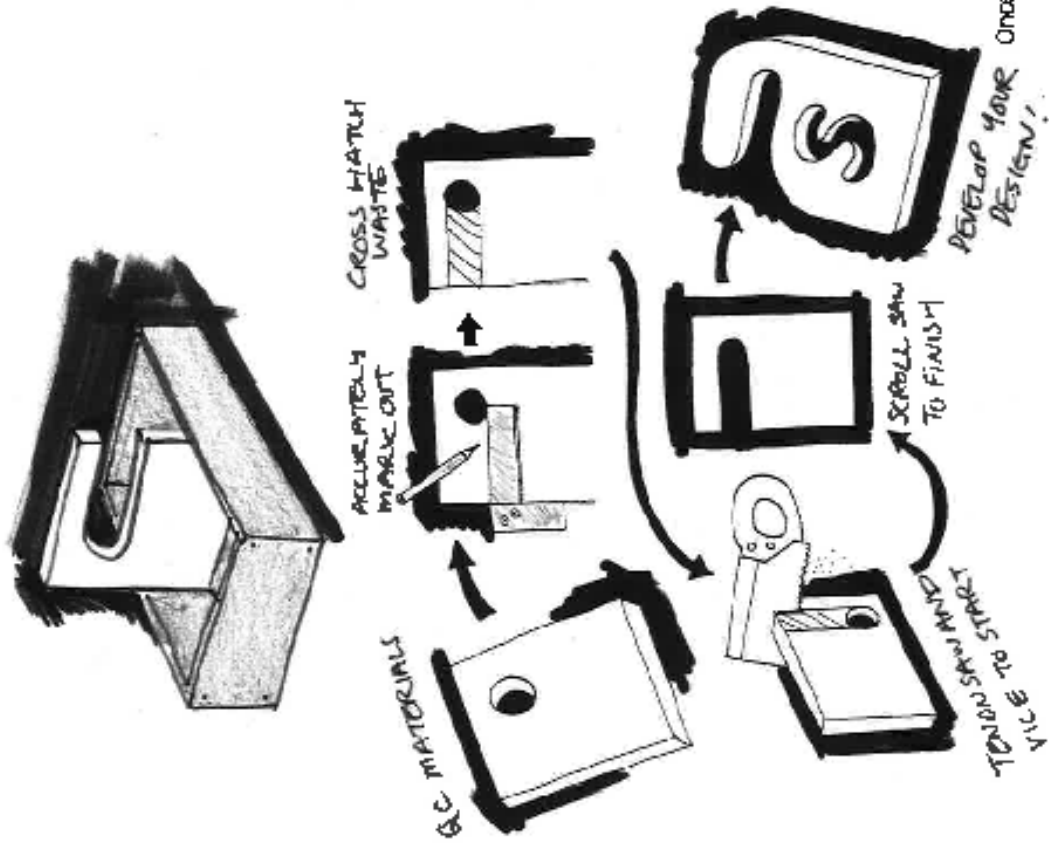
## How the Squeeze Torch Works



Using the Isometric box you should bring together all of the techniques that you have learnt to produce an Isometric, colour rendered, final design solution.

# Year 8 D&T: Portable Storage

Objective: to create an efficient, user friendly and comfortable handle for your 'Trox' base.



### Health and Safety- the basics!

- Always cut away from your body
- Clamp work down firmly
- Wear eye protection when using machinery
- Tie long hair back and wear an apron
- Be aware of Unlisc around you
- Behave sensibly at all times

### Key Skills

- Accurate marking out
- Washing
- Finishing
- Joining

<b>MDF</b>	Medium Density Fibreboard. A type of factory made, wood based material. Environmentally friendly, has good strength properties and is easy to shape and join.
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### Key Vocabulary

<b>Scroll Saw</b>	An electric saw used to cut curves and intricate shapes into wood and plastics.
<b>Tolerance</b>	An acceptable variation in dimension. This is how much larger or smaller a size can be eg 1 or 2mm
<b>Tennon Saw</b>	A hand held saw used for accurate line cutting.
<b>Bobbin Sander</b>	An electric sander used for shaping internal or concave curves and lines.
<b>Ergonomic</b>	Something that has been designed to allow people to work efficiently by making it comfortable and user friendly
<b>Linisher</b>	A flat faced sander used for a variety of materials and tasks (not metal)
<b>Try Square</b>	Used for the accurate marking out of right angled and parallel lines
<b>Bench Vico</b>	A holding device.

### Final outcome- next steps...?

Once the basic handle has been made and developed, how could you produce your own design using different materials, sizes, shapes etc?

# Year 8 Catering

Objectives: To learn the basics of healthy eating, to understand what Michelin stars are and to investigate the work of famous chefs

Key Skills
Rubbing in method
Crumbling
Knife holds
-ayering food
Using an oven
Grating
Frying

Menu
Mi
Ch
Str
Fruit
down
Bread and Butter
Pudding
Rock Cakes



KNIFE SKILL  
SAFE SKILL  
EFFECTIVE SKILL

Key Vocabulary	What does it smell like?
Aroma	How does it feel?
Texture	What does it look like?
Appearance	What is the cost with profit?
Cost	What does it taste like?
Taste	Is the dish healthy?
Nutritional value	Is the dish as per the specification?
Fit for purpose	

HEALTH & SAFETY
Wash hands before you begin
Nothing should be tied back
Aprons must be worn
Behave sensibly at all times
Listen to instructions






BRILLIANT LEARNING WITH A CHERRY ON TOP!  
IN READINESS FOR NEXT YEAR (AND BEYOND!) YOU WILL LEARN: HYGIENE, NUTRITION, HEAT, PRESENTATION, HEALTHY LIVING, TIMINGS AND LOTS MORE!



# Homework in Design and Technology

You will be set homework tasks in each subject area/pathway equivalent to two tasks per term. For each homework task, a traffic light system is used to indicate the level of difficulty as follows:

-  -An outstanding piece of homework that is carefully completed with elements of personalisation. Presentation is exemplary
-  -A well-presented piece of work which meets all of the requirements of the task
-  -A basic piece of work that meets some of the requirements of the task. Some attempt has been made to present this well

<b>Catering</b>	
<b>Homework 1</b>	<b>Due Date</b>
<p>Read the text below in readiness for a test on this subject</p> <p><b><u>Healthy Eating</u></b></p> <p>Healthy eating is needed to give good health, a failure to do so can lead to diabetes, high cholesterol, obesity and heart attacks. A balanced diet will provide the right amount of nutrients that a body needs.</p> <p>A balanced diet is based on the Eatwell guide, which is divided into 5 groups.</p> <ul style="list-style-type: none"> <li>• Fruit and vegetables- needed for dietary fibre</li> <li>• Carbohydrates- needed for slow releasing energy</li> <li>• Proteins- for growth and repair</li> <li>• Dairy- for calcium, strong teeth and bones</li> <li>• Fats- for warmth and protection of organs</li> </ul> <p>You should try and eat from all of these groups every day. No food is banned but areas such as fat should try to be eaten in moderation. You should eat breakfast everyday as this gets your body ready for the day ahead, it helps you stay alert and gives you energy.</p> <p>You need to have between 6-8 glasses of water per day to keep you hydrated. A lack of water can lead to dehydration, which then gives you a headache, makes you confused, and heart rate and blood pressure increase. Water will control your body temperature and keep it at 37' C, keeps your skin moist and healthy and helps to remove waste from the body as well as keeping your joints lubricated.</p>	<p>w/c</p>

<b>Catering</b>	
<b>Homework 2</b>	<b>Due Date</b>
<p>Read the text below in readiness for a test on this subject</p> <p><b><u>George Auguste Escoffier</u></b></p> <p>George Auguste Escoffier was a French chef and author. He was born on 28th October 1846 in France, and died on 12th February 1935 at the age of 88. He was famously known as being the foremost leader of having a well organised, hygienic kitchen, that was disciplined and where the staff worked in silence.</p> <p>He worked at 'The Ritz' and 'Savoy' hotels in London, where he wrote many cookery books. He created many famous dishes such as 'Peach Melba', 'Melba toast', and the famous ice-cream bombs</p>	w/c
<b>Homework 3</b>	<b>Due Date</b>
<p>Read the text below in readiness for a test on this subject</p> <p><b><u>How the environment is affected by the Hospitality and Catering industry</u></b></p> <p>The catering industry affects the environment in several ways. Food production contributes to climate change. This happens because of the way food is cooked, delivered, produced and stored. Food 'provenance' means where the food comes from and how many miles it has to travel before it reaches the kitchen. This is also known as the 'carbon footprint'. This is because of the CO2 gas that is released into the atmosphere by the industry, when being transported and being produced and cooked. Food being transported is known as 'air miles'. To lower the air miles, a caterer can try and buy locally grown produce (this also helps local farmers). They can also grow their own food and try and use foods that are in season e.g. using strawberries in the summer months.</p> <p>Food packaging has a huge impact on the environment. 13 billion plastic water bottles are used every year, with only 3 billion being recycled. Many disposable packaging products end up in the sea which harms wildlife. Caterers do try and recycle as much as possible but many aren't biodegradable, unfortunately the majority of food packaging uses fossil fuels in their manufacture.</p> <p>When cooking food you should only use the oven and hob when ready, put lids on saucepans to keep in the heat. Hot food shouldn't be put into a fridge and fridge doors should be kept shut to keep them cold inside.</p>	w/c

## Catering

### Homework 4

Due Date

Read the text below in readiness for a test on this subject

w/c

#### Different coloured chopping boards

Chefs use different coloured chopping boards in a kitchen to prevent bacteria growth and cross contamination. Cross contamination occurs when germs move from one place to another. An example of this would be cutting raw meat on a chopping board and then using the same board and knife to prepare cooked meat. Bacteria also cross over when hands aren't washed between different cooking procedures.

- Red- Raw meats
- Yellow- Cooked meats
- Green – Fruit and salad
- Blue – Fish
- Brown- Vegetables

### Homework 5

Due Date

#### Dress codes in the kitchen

w/c

For this homework task you need to research the following and explain in detail all the required areas:

- Research the dress code of a chef. Explain in detail what they need to wear and why?
- Explain why traditionally chefs wore tall hats
- What hygiene rules should be followed for wearing a chef's uniform?

### Homework 6

Due Date

#### Organoleptic foods

For this homework task you need to research and create a mind map on organoleptic foods. Points to consider:

- The senses and food
- How do smell and taste work together?
- How could a blind person enjoy their food?

## Resistant Materials

### Homework 1: Health and Safety investigation

Due Date

Investigate rules and procedures for different job profiles in the design industry. Pages 14 and 15.

w/c

### Homework 2: Designers Research

Due Date

Create an interesting, thoughtful and illustrated biography of your chosen person or design company.

w/c

- Alexander McQueen
- Aldo Rossi
- Ettore Sottsass
- Phillippe Starck
- Alessi
- Braun

You will produce a 150 word, edited biography, show 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.

### Homework 3: Types of Plastics

Due Date

Create an informative, A4 sheet on thermoplastics and thermosetting plastics. List properties, uses and differences between the different types of plastics.

w/c

### Homework 4: The history of CLOCKS

Due Date

On 1 side of A4 paper, create an informative report on the subject of clocks- How do they work? Where did they originate? How are they made? Etc etc -So many questions!

w/c

### Homework 5: Design Movement Research

Due Date

Selected from the list, below, create an interesting, thoughtful and illustrated report of your chosen design movement.

w/c

- Art Nouveau
- Bauhaus
- Modernism

You will produce a 150 word, edited report and show a good range of examples of the subjects work. 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.

### Homework 6: What is the difference between Hardwood and Softwood?

Due Date

Read the text about the difference between hardwood and softwood and complete the set of questions. Pages 17 and 18 of the knowledge organiser.

## Resistant Materials

### Homework 7: Product Analysis

Due Date

Research the Alessi- 'Alessandro' Corkscrew created by Alessandro Mendini. Use the worksheet provided page 19 to analyse the product using ACCESSFM.

w/c

### Homework 8: What is Neoprene fabric?

Due Date

Read through and revise the information on page 20 to 21 on what is neoprene fabric. Complete the set of questions.

w/c

### Homework 9: Life cycle Assessment-Reading and Test

Due Date

Read through and revise the information on page 22 on 'Sustainability and the Life Cycle Assessment' for products. Be ready for a test in you next lesson.

w/c

### Homework 10: Manufacturing Process-How is a fizzy drink plastic bottle and cap made?

Due Date

Create a flowchart or step by step diagram of how a plastic bottle is made- from the moment the raw plastic is made to the process of moulding it into a bottle shape.

w/c

You might want to include sketches and photographs to explain your work- you decide!

### Homework 11: Industrial Processes

Due Date

Research the process of vacuum forming acrylic - how does it work?

w/c

Write up 'step by step' how the vacuum forming process is done

### Homework 12: Design Task

Due Date

Research the design company 'Dyson' and sketch your own design for a new vacuum cleaner inspired by your findings. Make sure you annotate your design using ACCESSFM.

w/c

### Homework 13: Sourcing Plastics- Reading and Test

Due Date

Read through and revise the information on 'Sourcing Plastics' on pages 23 to 24. Be ready for a test in you next lesson.

w/c

### Homework 14: Specialist Techniques and Processes

Due Date

Use the informative sheet on 'Specialist Techniques and Processes' to complete the table on pages 25 to 26. Add a sketch/drawing to represent the manufacturing process. Add a description which explains the process.

w/c

### Homework 15: Key terms in the Workshop

Due Date

Look up key words and terms, commonly used in the design workshop and explain their meanings- in your own words on page 27.

w/c

# Resistant Materials Homework Checklist/Calendar

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

Homework	Date	Done ✓
<b>Homework 1:</b> Health and Safety investigation	Term / Week 1 W/C:	
<b>Homework 2:</b> Designers research	Term / Week 3 W/C:	
<b>Homework 3:</b> Types of Plastics	Term / Week 5 W/C:	
<b>Homework 4:</b> Design Movement Research	Term / Week 1 W/C:	
<b>Homework 5:</b> The history of <u>CLOCKS</u>	Term / Week 3 W/C:	
<b>Homework 6:</b> What is the difference between Softwood and Hardwood?	Term / Week 5 W/C:	
<b>Homework 7:</b> Product analysis	Term / Week 1 W/C:	
<b>Homework 8:</b> What is Neoprene fabric?	Term / Week 3 W/C:	
<b>Homework 9:</b> Life cycle Assessment-Reading and Test	Term / Week 5 W/C:	
<b>Homework 10:</b> Manufacturing Process-How is a fizzy drink plastic bottle and cap made?	Term / Week 1 W/C:	
<b>Homework 11:</b> Industrial Processes	Term / Week 3 W/C:	
<b>Homework 12:</b> Design task	Term / Week 5 W/C:	
<b>Homework 13:</b> Sourcing Plastics- Reading and test	Term / Week 1 W/C:	
<b>Homework 14:</b> Specialist Techniques and Processes	Term / Week 3 W/C:	
<b>Homework 15:</b> Key terms in the D&T workshop	Term / Week 5 W/C:	

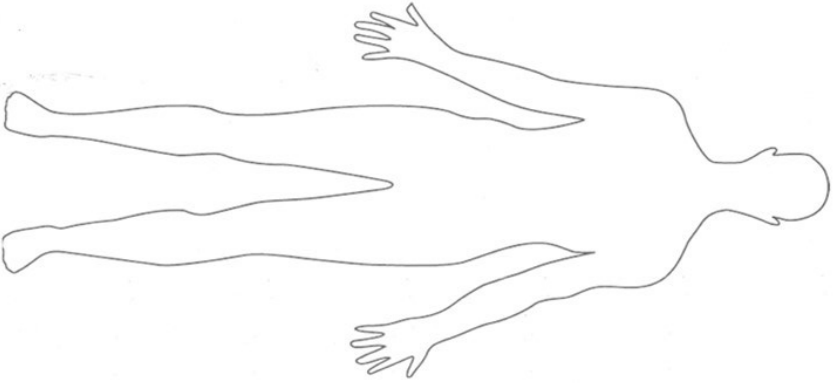
# Health and Safety Investigation

**Name:**

1. Circle which job profile you will choose:

<b>Sophie: Tailor</b>	<b>Archer: Builder</b>	<b>Joe: Carpenter</b>
-----------------------	------------------------	-----------------------

2. On the body template below state which (PPE) personal protective equipment needed for the job profile chosen.



3. Draw safety signs which you would display in the workplace of the job profile chosen and discuss why.


4. Complete a Risk Assessment for your chosen job profile

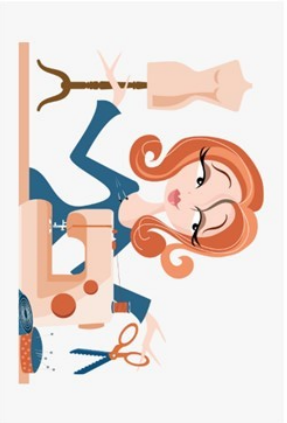
Hazard	Risk	People at risk	Control Measure

# Homework 1: Health and Safety investigation

## Sophie:

### Tailor

Hours	40 per
Salary	£26,000



#### Job Profile:

Tailors create custom-made (bespoke) suits, jackets and coats for men and women. They may make the whole garment, or work in a team where each member has a specialism. If you're interested in textiles and fashion, and can get on well with people, this job could be ideal for you.

#### Responsibilities:

- Taking customers' measurements, discussing styles and fabric
- Working out how much the clothing will cost and how long it will take
- Creating a design by hand or using computer software
- Fitting the garment to the customer and making final adjustments

## Archer:

### Builder

Hours	35-40 per
Salary	£30,000+



#### Job Profile:

The main duties of a builder include building residential, commercial and industrial constructions and carry out road works - in stone, brick, reinforced concrete, including pre-cast and prefabricated structures. Laying piping and ducting; Soundproofing and insulation work.

#### Responsibilities:

- Prepping and cleaning the construction areas
- Delivering and distributing supplies (expect some heavy lifting)
- Assisting workers with equipment
- Assembling and disassembling scaffolding
- Learning new skills from experienced builders

## Joe:

### Carpenter

Hours	35-40 per
Salary	£30,000+



#### Job Profile:

Carpenters are skilled artisans who construct, erect, install and renovate structures made of wood and other materials, ranging from kitchen cabinets to building frameworks. They work in various areas of construction.

#### Responsibilities:

- Cutting and shaping timber for floorboards, doors, skirting boards and window frames
- Making and fitting wooden structures like staircases, door frames, roof timbers and partition walls
- Making and assembling fitted and free-standing furniture
- Installing kitchens, cupboards and shelving, making and fitting interiors

## Homework 6: What is the difference between Hardwood and Softwood?

As part of your KS3 course, it is important that you understand where materials come from and their properties. This project will be giving you the opportunity to use a range of 3 manufactured board types. Read the notes, below, then answer the questions to, perhaps, help you to decide on your own final choice

### Hardwoods and Softwoods

The names simply define which type of tree the timber comes from. A Hardwood would be from deciduous trees, broad-leaved trees that lose their leaves each Autumn, and a Softwood comes from evergreen trees that do not shed their needles in the winter.

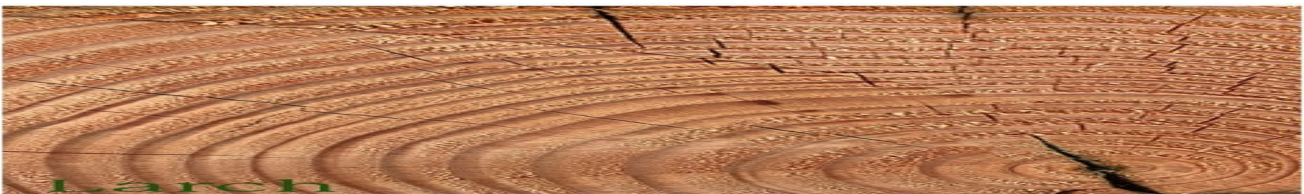


The name does not define how strong the timber is, it is just which type of tree they come from. Scots Pine is a Softwood; Beech is a Hardwood.

The name Conifer just means 'cone bearer', they produce cones as a container for their seeds rather than flowers.

### Softwoods

Softwoods are from coniferous trees such as pine, spruce, larch and fir- you'll find many of these at Harlestone Firs near to Duston. These evergreen trees grow quickly when compared to hardwoods and are less dense with a simple cell structure.



Most coniferous forests are found in the northern hemisphere, where they have long winters and wet summers e.g. Scandinavia, Russia, and Canada. Conifers growing in cold weathers are slow-grown and are denser than those grown in temperate (warmer) climates.

Softwoods are used commercially for all kinds of construction, sheds and outdoor furniture. This is because they tend to grow straighter, and faster, can easily be dried for processing, are easier to work with and are therefore less expensive. Of all the wood consumed globally around 80% is softwood timber.

## Hardwoods

Hardwoods are from trees like Elm, Oak, Beech and Ash. These are all native to the UK and used for furniture, tools, and cabinetry.



There are about a hundred times more types of hardwood trees than there are softwood trees, and these are grown in temperate and tropical regions around the world. They grow far more slowly than softwood trees and are typically more complex in their cell structure. They are strong, durable, and have a much nicer grain so are selected for furniture making, timber frame buildings and boat making.

### Which wood is the best for outdoors?

Once processed, softwoods tend to degrade and decay faster than hardwoods when exposed to the weather and water. Softwoods are perhaps more prone to wood-boring insects and fungi so need extra protection.

Some softwoods, like Scandinavian Redwood, contain a natural tannin that repels insects, but other Whitewoods are more prone without treatment. To avoid any decay setting in, when softwood is used for outdoor purposes, it would need to be treated with a preservative. This does not make the timber waterproof but does protect against insects and fungi-causing bacteria. Equally, you can use paint or apply a waterproof protector to prolong life.

Hardwoods, although more expensive, are less likely to need preservative treatment so can be used indoors and outdoors. However, for prolonged use outdoors, most timbers would benefit from a protective coating.

### Answer the questions, below:

1. Name 2 examples of a hardwood
2. Name 1 example of a softwood
3. Do softwoods grow faster in temperate or colder environments?
4. Are softwoods or hardwoods the most expensive to use?
5. Which type of wood is preferred by designers to manufacture furniture with?
6. Where, nearby, might you be able to walk through a softwood forest?
7. Where in the world are most coniferous forests to be found?
8. What percentage of softwood is used annually across the world?



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**



**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 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?

**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?

## Homework 8: What is Neoprene fabric?

As part of your KS3 course, it is important that you understand where materials come from and their properties. This project will be giving you the opportunity to use a range of materials to model and make your product. Read the notes, below, then answer the questions.

### The history of Neoprene

Originally produced by the American DuPont Corporation, Neoprene is a brand name of polychloroprene, which is used as a substitute for rubber. Among other things, Neoprene is entirely waterproof, which makes it an ideal material for wetsuits and other gear designed to insulate against wet and cold environments.

Like many history-altering inventions, chloroprene rubber was born out of necessity. By the first few decades of the 20th century, a global natural rubber shortage became a primary concern of industrial giants in the Western nations, and a solution to the problem was needed.

In 1930, a professor of chemistry at the University of Notre Dame named Fr Julius Arthur Nieuwland gave a lecture that a leading DuPont (a very large chemical company) executive happened to attend. DuPont recruited Nieuwland to develop a mass-producible compound that had many of the characteristics of natural rubber, and Neoprene came onto the market in 1930.

As a viable alternative to rubber, Neoprene played a critical role in the Allied efforts in World War II. Everything from Jeep tyres to wetsuits were suddenly issued in Neoprene instead of real rubber, and without DuPont's miracle invention, it's possible the war would have gone very differently.

#### 1. Impermeability

Neoprene forms a solid barrier between the wearer and the elements. While this attribute completely eliminates breathability, it also provides insulation from environmental conditions that would otherwise be uncomfortable or harmful.

#### 2. Elasticity

Despite providing a perfect barrier against moisture, Neoprene fabric is also quite stretchy. It's a good thing, too—otherwise, divers and surfers wouldn't be able to get into their suits!

#### 3. Heat retention

While Neoprene and all other petrochemical-based fibers melt at the slightest touch of heat, this particular synthetic fabric provides excellent insulation against cold. Thanks to this property, surfers are able to surf in climates that would otherwise be far too cold for them.

#### 4. Formability

While most fabrics are woven, Neoprene is formed. Therefore, it can be pre-made into practically any shape and size, which saves work for fashion designers.

## How is Neoprene fabric made?

Neoprene is a petrochemical substance, which means that it is made from petroleum in a factory. Basic ingredients are usually delivered to textile factories in liquid form. Once they arrive, they are combined with additives to increase elasticity. Next, they are placed in a mixer and baked in an industrial oven. The block of hardened material is called a “loaf,” and this loaf can then be sliced into chunks of various widths.

This slicing process is performed by a large industrial machine. There are a variety of widths of Neoprene material available, and the thicker it is, the more insulative and waterproof it is. Neoprene can be made in a wide range of thicknesses but the average thickness for Neoprene is 3-5 millimetres. The sliced Neoprene is loaded onto pallets and shipped to product manufacturers. Upon arrival, patterns are traced onto “slices,” and accessories, or industrial products are then cut from a single slice.

Lastly, the cut slices are sewn together to make the final products. Waterproofing or fireproofing spray may be applied, and then the finished item is packaged and shipped to the retailer.

## How is Neoprene fabric used?

### 1. Apparel applications

While Neoprene use in apparel is sparing, it isn't uncommon to see this substance used in summertime women's garments and other apparel geared toward younger women.

### 2. Accessory applications

Neoprene is commonly used as a material for electronics cases. While this plastic does not absorb shocks especially well, it provides a minimal buffer that protects electronics from scratches and minor drops.

### 3. Sporting applications

Scuba suits and wetsuits are common applications of chloroprene rubber. Since this substance is waterproof and insulative, it keeps divers warm and dry even in fully submerged conditions.

## Questions:

1. In which decade was Neoprene first produced?
2. Which Company was the first to see the possibilities of Neoprene?
3. Which material did Neoprene replace?
4. Name 2 products made from Neoprene
5. What does the word 'insulative' mean?
6. What sort of substance is Neoprene?
7. Once the ingredients of Neoprene have been combined and baked, what is the block called?
8. What are the average thicknesses of Neoprene sheet?

# SUSTAINABILITY

Sustainability looks to protect and maintain the needs of the present without compromising the ability of future generations to meet their needs.

Designers now have a better understanding of which materials are sustainable, which are not, and the effect that overharvesting and overconsumption has on the planet.

## Finite resources

**Finite** resources are in limited supply and are being used more quickly than can be replaced. Use of finite resources should be avoided where possible or used only in small amounts for essential reasons where an alternative cannot be used. Fossil fuels, some minerals and metal ores are examples of finite resources.

## Non-finite resources

**Non-finite** resources are in abundant supply and are unlikely ever to be exhausted. They can be grown or replaced at the rate that they are being used. Examples include solar and wind energy, timbers and cotton.

## Life Cycle Assessment

Conducting a **Life Cycle Assessment (LCA)** is a way for companies to assess the environmental impact of a product during the different stages of a product's life.

### 1. Extraction and processing:

The amount of energy used to extract raw material from the earth, or to produce it through farming or other methods, and process it ready for manufacturing.



### 2. Manufacturing and production:

The energy required to manipulate the raw and refined materials into a product ready for sale.



Life Cycle Assessment (LCA)

### 3. Distribution:

The packaging and transportation of the product to the end user.



4. Use



### 5. End of life



## Waste disposal

Careful planning of **waste disposal** has many positive effects, particularly in large scale manufacturing plants. Waste materials can be reused internally for alternative parts and products. Some of the cost of materials is recouped through the sale of recyclable waste. The energy used to heat and power a business may also be generated from waste material such as biomass.

# SOURCES AND ORIGINS

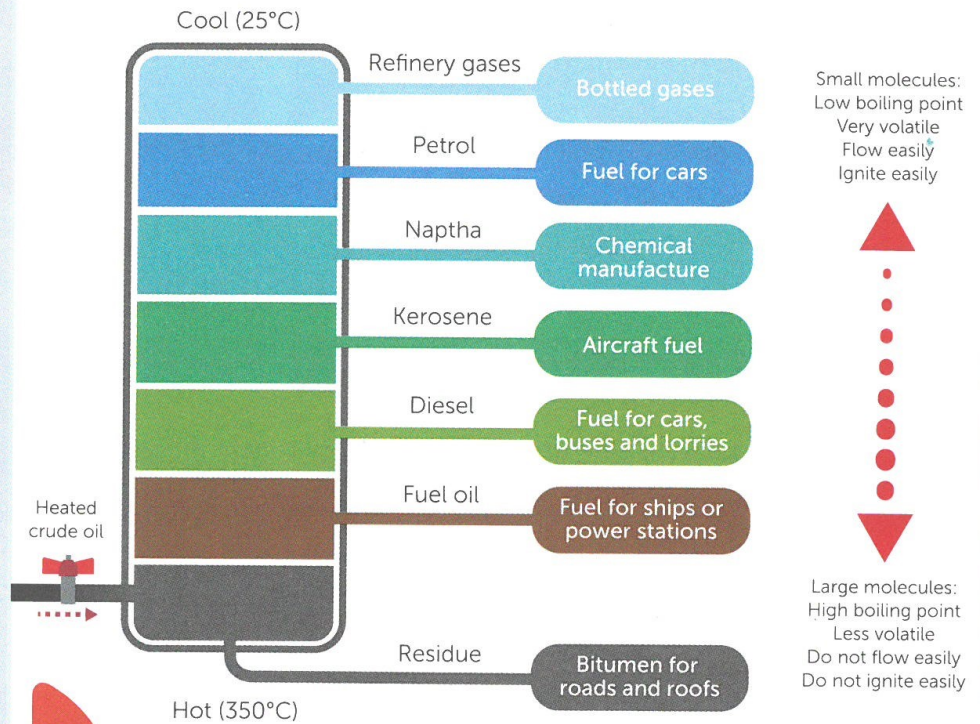
Man-made polymers are referred to as plastics. Plastics are derived from coal, gas, cellulose and commonly crude oil. Crude oil needs to be processed before use.

## Refining crude oil

The process of **fractional distillation** separates crude oil into useful hydrocarbon products. The different components that are separated out are known as fractions. The fractions include petrol, kerosene, diesel and bitumen.

Before the fractions can be used, they need to be broken down by the process of **cracking**.

Cracking breaks large hydrocarbons into individual hydrocarbons called **monomers**.



## Polymerisation

The individual monomers are joined to form a longer polymer chain. 'Poly' means 'many'. For example, a long chain of ethylene forms **polyethylene** which is used to make carrier bags, toys and bottles.



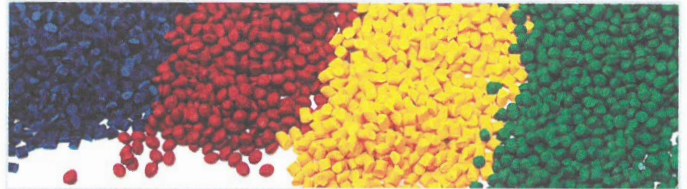
# STOCK FORMS, TYPES AND SIZES

Plastics are produced in a range of stock forms, to meet the many uses for manufacturing such as blow moulding, injection moulding and line bending.



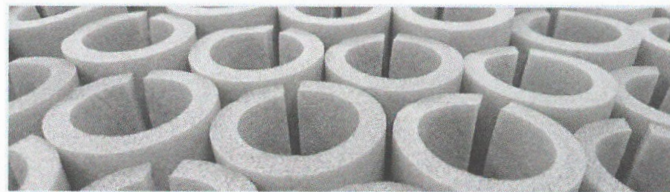
## Film

Used for packaging, bags, labels and sheeting.



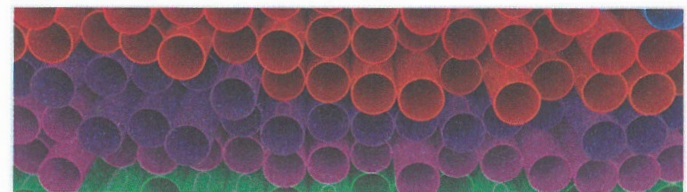
## Granules / pellets

Used for extrusion and injection moulding.



## Foam

Flexible or rigid. Used for thermal insulation and packaging.



## Rods / tubes

Used in electrical, plumbing, garden, military and medical applications. Can be bent to shape.



## Powder

Mixes well with additives and dyes. Also used in resin glues, spray coating and 3D printing.



## Sheet

Durable and lightweight. Used for protective surfaces, roofing and signage. Can be cut to size, bent, curved or vacuum formed.

## Standard dimensions

Dimensions are given in mm.

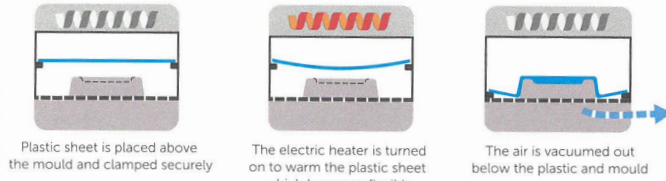
Standard dimensions for **sheet** are given as length x width x thickness.

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

**Granules** and **powders** are measured by weight in mg.

# SPECIALIST TECHNIQUES AND PROCESSES

## Vacuum forming

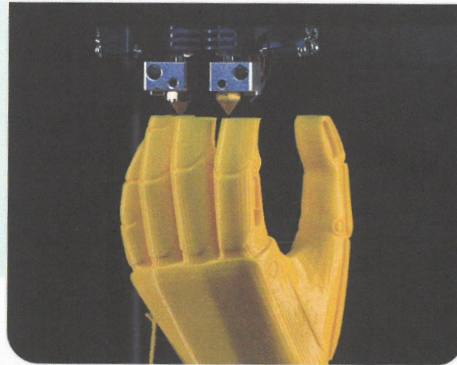


This technique is used to shape plastic. It works by heating a sheet of plastic, which is then pulled by the vacuum to form around the shape or mould. Once the plastic has cooled and set hard it can be removed from the moulding tool.

## 3D printing

The 3D printing process builds a three-dimensional object formed from reels of thermoplastic. 3D printers use CAD files which are converted into a series of co-ordinates called G-code that the printer will follow to build up the object in layers.

It is also known as additive manufacturing, as the material is added in layers.



## Drape forming

Plastic sheet is heated to a softened state, where it can be formed over a mould. It takes on the shape of the mould without stretching the plastic and retaining the dimensional thickness. It is a slow tool process without the need for a vacuum, so is low cost, but it does take time. It is typically used for components with a gentle curve such as motorcycle windscreens and bath panels.

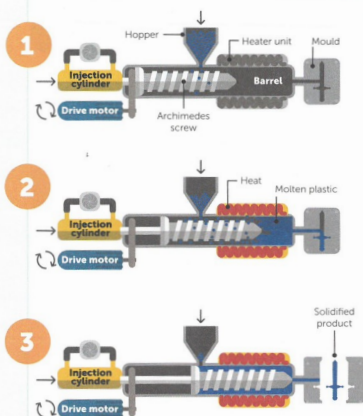


## Injection moulding

Products such as bottle caps, toys and automotive parts are produced with injection moulding. Molten material is injected into a mould. Once the plastic has cooled and set hard, the mould is opened to release the shape.

Injection moulding can handle complex parts and shapes to produce consistent products in large quantities.

The process can be automated for a high output rate which helps with cost efficiencies.



## Welding

Plastics can be joined by welding. Heat softens the polymers and they can be joined with a plastic filler material in the form of a long thin cable.

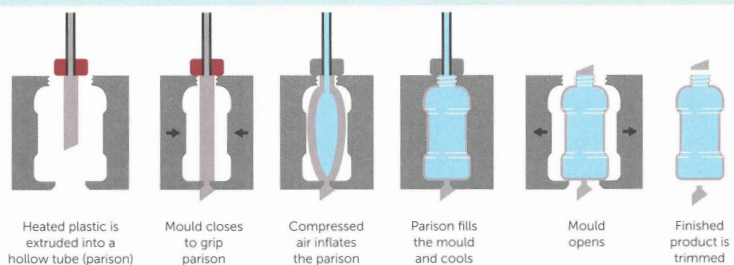
The heat source comes from hot gas welding guns which produces a thin jet of hot air to soften the polymers. Other techniques include laser and friction welding.

Solvent plastic welding can also be used to partially dissolve the plastics, so that they can bond together.



## Blow moulding

A tube of softened plastic, known as a parison is fed into a hollow mould. The parison is pinched at the bottom so it can be filled with warm air and inflates to fill the mould, taking on the shape. This method is used for plastic bottles and containers.



## Homework 14: Specialist Techniques and Processes

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

Process	Sketch/Drawing	Description
<b>Vacuum Forming</b>		
<b>3D Printing</b>		
<b>Drape Forming</b>		
<b>Injection Moulding</b>		
<b>Welding</b>		
<b>Blow Moulding</b>		

## Homework 15: Key terms in the Workshop

<b>Keyword/Term</b>	<b>Meaning</b>
<b>Design</b>	
<b>Resistant Materials</b>	
<b>Sustainability</b>	
<b>Iterative Design</b>	
<b>Polymer</b>	
<b>Batch Production</b>	
<b>CAD (Computer Aided Design)</b>	
<b>Tenon Saw</b>	
<b>Design Fixation</b>	
<b>Aesthetics</b>	
<b>Life Cycle Assessment</b>	
<b>Crating</b>	
<b>Orthographic Projection</b>	
<b>Deciduous Trees</b>	
<b>Design Client</b>	
<b>Injection Moulding</b>	
<b>Quality Control</b>	

# Notes