Year 8

Design and Technology Workbook

I will explain the needs of the subject and teach a broad range of skills and knowledge to you. I will demonstrate how to use tools and equipment safely and effectively and expect you to apply your new and existing learning to projects covered.

WE will learn about different types of wood joints. WE will learn to use of different materials, tools, processes and understand the importance of health and safety in a practical environment. WE will carefully watch and learn from practical demonstrations and apply our learning to our individual project.

YOU will use your skills, knowledge and understanding to independently draw, design, plan, make and evaluate a product to a quality standard.

Name:_____ Class:_____

Grade Achieved:_____

Contents

Subject specific vocabulary

In Design and Technology, there a great many technical words and phrases that are regularly used in your lessons - both theory and practical

Below are definitions of key terms used in our in our project that you should be familiar with and gain an understanding of these terms so that you can talk and write like a true designer and maker!

Abrasive: A material which smoothes and removes marks from wood, plastics and metal

Adhesive: A substance used to stick materials together; examples include pva glue, low temperature hot melt glue

Annotations: Brief notes added to design sketches to make things clearer or to give more detail

Anthropometrics: the practice of taking measurements of the human body and provides categorised data that can be used by designers

Appearance: The way something looks to an observer

Artefact: A made object

Assembly: The way parts of a product are fitted together

Assessment: A judgement of a your achievement

Batch production: Batch production refers to the process of making several to many single items at the same time to give a 'batch' of those items. A tray of jam tarts would constitute a batch

Bench hook: A device to make it easy for pupils to saw strips of wood to length

Biodegradable: Able to be broken down by the action of microorganisms

Characteristics of a material: The physical properties of a particular material; e.g. Its harness, strength and stiffness

Client: A person using the services of a designer. For example, in the primary school the client is likely to be the child who is going to use the final product but in the world outside school the client is often a manufacturer and it is their customers who use the final product

Component: The name given to one of the parts that make up a product

Consumable materials: Materials used to make products e.g. Paper, card, wooden strip, plastic sheet, metal rod. These materials get used up and have to be replaced if pupils are to continue designing and making.

Consumer: Anyone who purchases goods or services

Craft knife: A sharp single bladed knife used to cut paper, stiff card and sheet plastic

Data collection: The collection of information that is useful in understanding a design brief and developing design ideas. Questionnaires are structures used to collect data from potential users.

Decoration: The application of colour, texture and pattern to a surface to improve its appearance

Design brief: A summary of the aims of a design and the kind of product that is needed. A closed brief says what the product will be. An open brief leaves it for the designer to decide

Design criteria: A list describing the standards that a design must meet if it is to be successful

Design decisions: A product is the result of the design decisions made by the designer about things such as Why (is it needed?); Who (is the outcome meant for?, is to be involved in its production?); What (should the outcome do?, should it be made from?, shape/colour should it be?

Design proposal: A response to a design brief, a description of the product to be made in sufficient detail that the designer and/or the client can decide whether it is worth developing the proposal further

Design-related research: Research to find information that is useful in understanding a design brief and developing design ideas

Designer: Any person who designs things

Drill bit: The cutting tool used in a drill. It is held in the chuck and cuts into the material as it rotates

Environmental concern: Worries about these effect of industrial and commercial activity on the natural world and on the people, animals and plants that live in the world

Ergonomics: The study of how easy it is for people to use their working environment

Evaluate: Assess how well a product or service meets the design criteria or specification

File: A tool for removing burs from freshly sawn metal/ wood/ plastic

Finishing techniques: Methods used to make the surface of wood, metal and plastic smooth; these usually involve the use of abrasive papers

Fitness for purpose: A criteria used in evaluating a product; the evaluator asks how well the product performs the function for which it was designed. If the product performs well then the product is said to be fit for purpose

Fixings: Things used to fix materials together, e.g. Nails, screws, nuts and bolts

Flow chart: A way of planning how to carry out a task by drawing a sequence of boxes joined by arrows. Each box contains a short statement about one stage

Functional decoration: A decoration that also has a practical purpose e.g. Wrapping a handle with string not only makes the handle look more attractive it also improves the grip

G-clamp: A device you can use to clamp bench hooks to tables for added stability and/or to hold work steady or to keep parts assembled while glue dries

Health and safety: The activities carried out in your classroom must meet health and safety requirements. You can ensure that this is the case by carrying out risk assessments and organising your activities so that all risks are controlled.

Identifying needs: The process of looking at the behaviour and conditions of people and other living things and identifying what they need to be healthy, comfortable, interested, at ease etc.

Manufacturing: This is the word used to describe the way that products are made in the world outside school. It usually implies making in quantity. For example confectionery such as Kitkats are manufactured at a rate of many thousands per hour.

Mass production: Mass production refers to the process of manufacturing in the world outside school where products are made in there thousands. This requires the use of machines as well as people. Increasingly people are being replaced by machines that are computer controlled and can work 24 hours per day without rest.

Materials: The matter from which things are made e.g. Wood, metal, plastic, fabric, food

Modelling design ideas: The process of representing ideas from `inside the head' in a form that can be shared with oneself and others. The form of the model can be either 2D e.g. A sketch or diagram perhaps with notes, or 3D e.g. A construction from paper, card, straws, pipe cleaners.

One-off production: This is the way you usually make things in school. You make a single item of your design idea, sometimes referred to as a one off. In the world outside school one offs are often very expensive to buy as a lot of time and effort goes into producing the item.

Quality: The degree of excellence in a product or service. It is important that you are taught to understand the difference between quality of design and quality of manufacture (or making).

Reliability: The quality of sound and consistent performance or behaviour

Sanding block: A piece of cork or wood or plastic wrapped round with sandpaper. It is often easier for you to work with a sanding block than with a piece of sandpaper when they are smoothing a flat surface

Scissors: A hand tool that is used to cut paper, thin card and fabric

Sheet material: Material in a form where the length and width are much greater than the thickness e.g. Paper, card, fabric, corrugated plastic

Target audience: A particular group for whom a product or service has been designed; often used in the media industries to describe the group of listeners or viewers

Template: A template is a device that allows a shape to be drawn accurately and repeatedly onto a sheet of materials e.g. paper, card, fabric.

Temporary joining: A joining process in which the joining is temporary and easily reversed e.g. Laces

Testing: Investigating a product or material to find out how it performs in use

User needs: People who use goods and services do so because those good and services meet their needs e.g. A food product meets the need of hunger, a pair of gloves meets the need of keeping warm

User preferences: People who use goods and services show preferences towards particular goods and services that appeal to them in some way e.g. A woolly hat that is bright red with yellow bobbles might appeal to a child but is unlikely to appeal to an adult

User wants: People may want particular products in order to meet a need e.g. If a person is thirsty they need a drink but they might say, "I want a Coke."

Vice: A device for holding materials or parts so that they are easy to work on

Working drawing: Plans which show how a product may be made

Date:_____

Big Questions

1. **How could you use sentence starters to help to explain your ideas?**

2. **What is the relationships between centimetres (cm's) and millimetres (mm's)?**

3. **Why is Health and Safety important in a Design Technology workshop?**

4. **What is an electronic system?**

5. **How can mind mapping help generate ideas for your product?**

6. **How does the torch work?**

7. **How can I show my Design in 3D?**

8. **Why is an technical drawing essential for the making stage of your project?**

9. **What is needed to write a good evaluation?**

10. **Why is a Design brief important in Design? Why is it important to meet the needs of your design client?**

11. **Why is ACCESSFM helpful in designing a product/idea?**

12. **Is the handle the correct size for the client/user?**

13. **How do you ensure a quality finish?**

14. **Why is important to collect this data before designing your handle? What considerations would you need to take if the product was mainly used by a child compared to an adult?**

Literacy Skills: Sentence Starters

Big Question: How could you use sentence starters to help to explain your ideas?

In Design and Technology, **its important that you can communicate your thoughts and ideas through a range of methods**. Speaking and writing are often used but it can be difficult, sometimes, to get your ideas across to others, eg a teacher, a student or an Examiner. Using sentence starters to get your ideas across is a great way to get yourself started!

If explaining or writing a **Design Brief**

- *I am going to design and make…*
- *...the problem I am solving with my [product] is…*
- *My [product] will be made of…*
- *The aesthetics will be in the style of…*
- *The exterior will feature smooth curves and bold colours to capture…..*
- *The design should engage and educate children...*
- *The intended function of the [product] will be…*
- *The [product] will demonstrate various movements such as……*

If explaining or writing a **Design Specification**

- *The style of the [product] will be…*
- *The finish I intend to use on the [product] will be…*
- *To ensure my [product] is safe to I will…*
- *The intended user for my [product] is aimed at…*
- *I will be making my product out of...*
- *My research tells me that…*
- *The [product] needs to be the following dimensions…. mm*
- *I intend to spend £...making the [product] and I intend to sell the [product] for £… making a profit*

Annotations– these are often used when designing a product or listing out ideas and thoughts

- *In this design I have used...this style….*
- *I intend to use this finish… with my design*
- *I will use… processes to create this design*
- *I feel this will be a suitable design to make because …*
- *I don't like this design because…*
- *By making these changes I can*

Evaluation- use this to explain how successful/not an outcome or product is

- *Overall I am feel my [product] is a [success/ failure] because…*
- *I found the making process [hard/difficult/easy]… because...*
- *If I was going to do the project again I would change… to improve it*
- *I would like to add this… to the [product]*

Product Analysis– here, think about cost, materials, quality, aesthetics, etc. of existing products already in use

- *I have found that products in my target market have a similar…*
- *I will take inspiration from this product by…*
- *This product has… which I can use in my design*
- *I like the way this product has been made to...*
- *This product could be adapted by adding...*

Date:_____

Numeracy Skills

Big Question: Do you know the importance of using a ruler? What is the relationships between **centimetres** (cm's) and **millimetres** (mm's)?

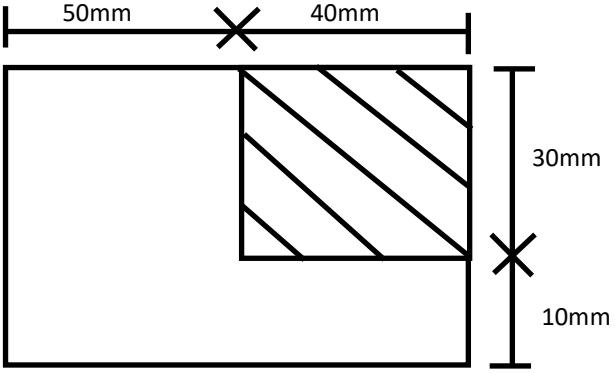
Being able to use a ruler in D&T is very important to let you measure the length and width of different objects.

To draw straight lines and lots of other times where accurate measurements are needed

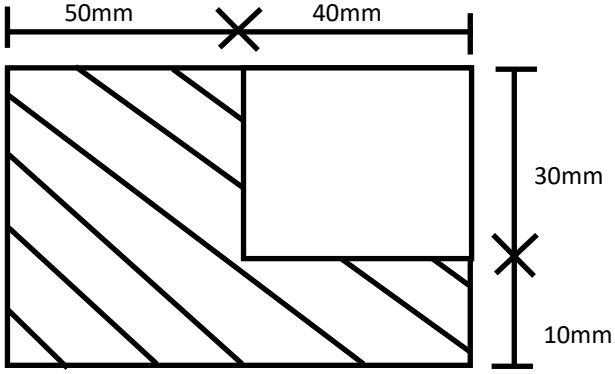
Your task: Convert the following measurements from centimetres (cm's) to millimetres (mm's)

20cm	*Your answer…*	11cm	
5cm		34cm	
15cm		110cm	
130cm		162cm	
How many millimetres are there in 50 centimetres?		How many millimetres are there in 1.2 centimetres?	
How many millimetres are there in 4 centimetres?		How many centimetres are there in 304 millimetres?	

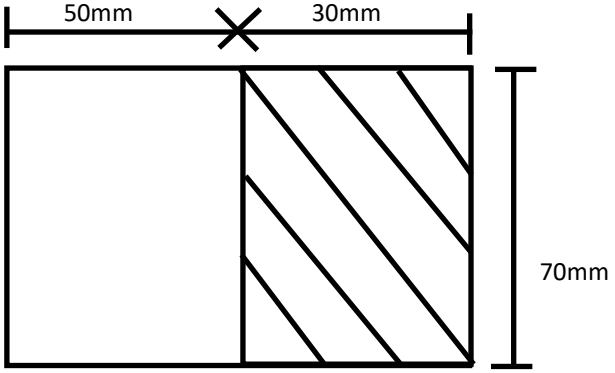
Your task: Calculate the area of waste on these compound shapes. Waste areas are shown with hatching.



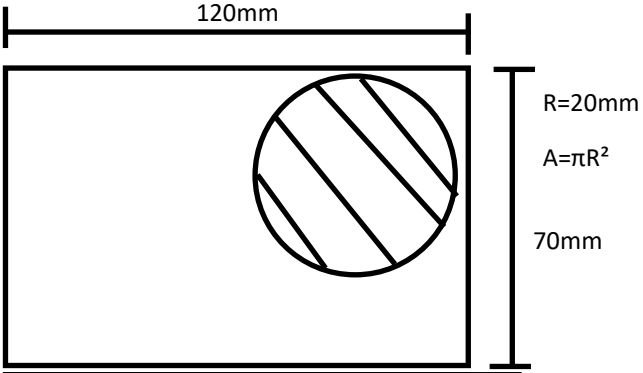
Answer:



Answer:



Answer:



Estimated Answer:

Date:_____

Numeracy Skills

Ratio questions involve comparing quantities or values using ratios. Ratios express the relationship between two or more quantities. Here are some examples of ratio questions for you answer:

Example:

Question: If the ratio of boys to girls in a class is 2:3 and there are 40 students in total, how many boys are there?

Explanation: Since the ratio of boys to girls is 2:3, you need to divide the total number of students (40) into 2 + 3 parts. Each part represents 2 + 3 = 5 students. Thus, the number of boys is (2/5) * 40 = 16.

Task:

1. **Question:** If the ratio of brass screws to steel screws in a bag is 3:5 and there are a total of 64 balls, how many brass screws are there?
   Answer:

3. **Question:** The ratio of pin hammers to screwdrivers in a tool store is 4:7. If there are 84 tools in total, how many pin hammers are there?
   Answer:

4. **Question:** The ratio of students who like Art to students who like Design in a class is 2:5. If there are 35 students in total, how many students like Design?

   Answer:

Ergonomics and Anthropometrics

Anthropometric data refers to measurements and statistical information gathered from the human body. These measurements provide valuable insights into the physical dimensions, proportions, and characteristics of individuals or populations.

Task: Imagine you are designing a classroom desk for students aged 11 to 12 years old. Using the provided table of anthropometric measurements, how would you determine the appropriate dimensions for the desk to ensure ergonomic comfort for the students?

Measurement	Mean (cm)
Seated Height	76.4
Elbow Height	61.8
Thigh Length	42.5
Desk Height	
Desk Depth	

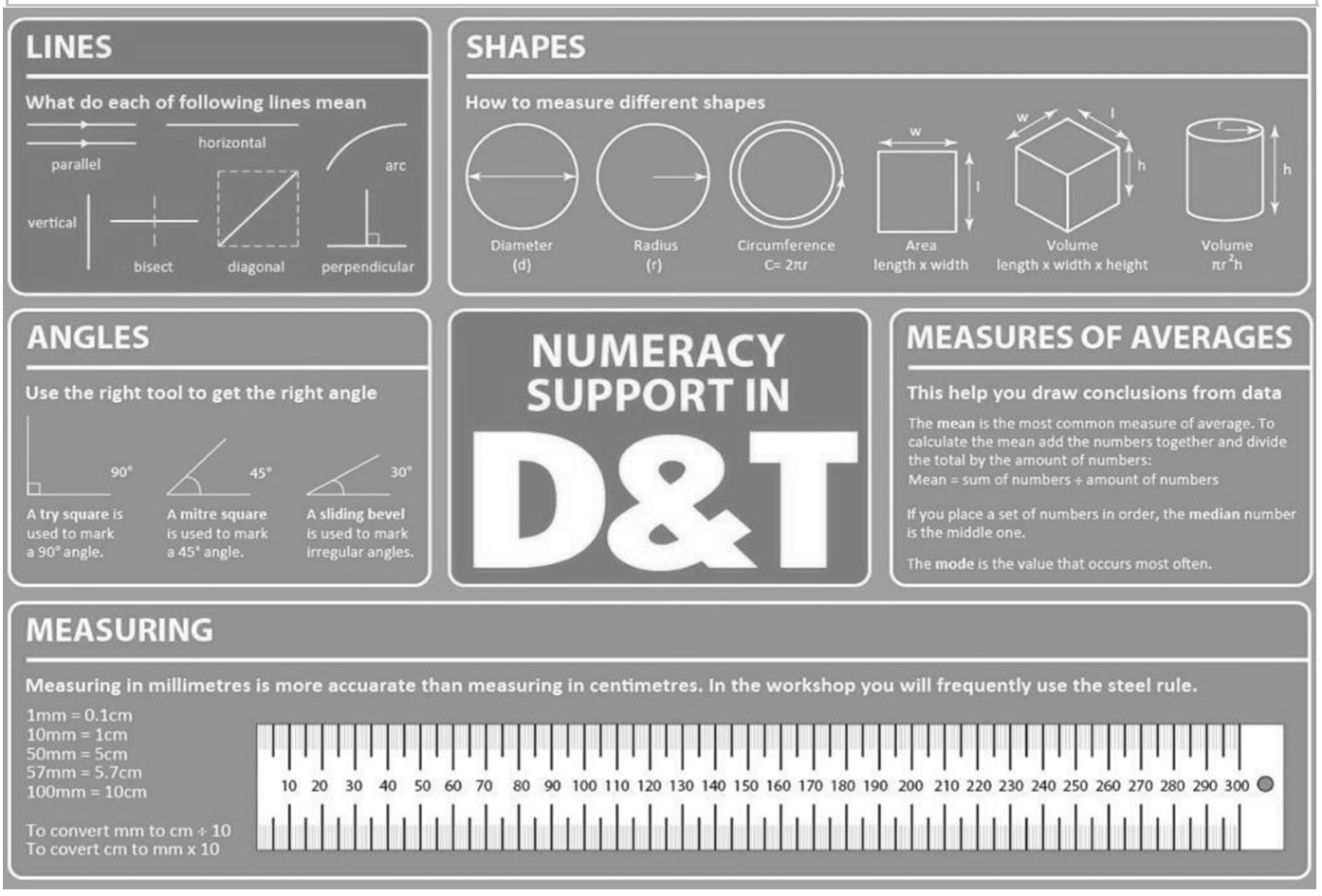
During Year 8 you will….

Progress your skills by: Understand the concept of Sustainability (materials) - Present design ideas – Be able to explain Function Vs Aesthetics – Use advanced measuring/marking – Show quality design presentation - Produce models and test pieces (iteration) – Show developmental decision making – Understand different production techniques - Manufacture with

Develop Literacy skills:	Develop Numeracy skills:	Develop Science 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:** Construct, Annotate, Specification, Promote, Blending, Shaping, Finishing, Design Client, Justify, Modify, Analyse, Specification, Adapt, Input, Process, Output, Weaving, Applique, Embroidery	• Calculations of sizes • Scaling drawings • Determining the amount of materials required • Graphic presentation of ideas to others • Use of metric systems • Analysis of client survey responses • Measurement and marking out	• Use of scientific principles when developing a brief or specification • Measurement of materials and selection of components • Classification of materials and their properties • Protecting materials from corrosion • Selection of appropriate materials • Knowledge of material properties to be applied when designing and making- to include textiles • The use of electronics • Sustainability

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'*



Personal Machine Training Record

Date:_____

As part of your D&T 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!

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

Note:

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!

Engage Questions

1. **Name 2 resistant materials**

2. **Sharp edged, hand held and tapped with a mallet- what am I?**

3. **What are the 3 'families' of wood?**

4. **Name 3 wood joins**

5. **Name 3 types of file (think about the end profile)**

1. **Does a bench vice tighten up clockwise or anticlockwise?**

2. **Which workshop saw is best for cutting curved lines?**

3. **What is a 'bench hook' used for?**

4. **Name 3 pieces of equipment that would be needed to measure and mark out a material**

5. **Name 3 Health and Safety rules that need to be observed in a practical environment**

1. **Which units of measurement are to be found on a ruler? Name them**

2. **Name 3 methods by which wood can be joined**

3. **What is the correct name (or names) for 'sandpaper'?**

4. **How many 'stop' switches does a school workshop pillar drill have?**

5. **How many millimetres are in 1.5 centimetres?**

Engage Questions

1. **Name 3 types of manufactured board**
2. **What is a try square used for?**
3. **What is the correct name for 'glue'?**
4. **Name two ways that a piece of MDF could be wasted**
5. **What is the difference between 'anthropometrics' and 'ergonomics'?**

1. **Name 3 pieces of PPE equipment**
2. **What colour are the workshop emergency stop buttons- and why are they this colour?**
3. **Why should an apron be worn in a practical environment?**
4. **How many centimetres make up 75mm?**
5. **What is a 'dowel'?**

1. **Why is it important to use air extraction on a sanding machine?**
2. **Which tool would be best used to tap a panel pin into a piece of softwood?**
3. **Complete this- 'Brain, Board, Buddy, …….'**
4. **Plywood- in which directions are the veneers laid?**
5. **'Glue' is more correctly known as?**

Notes

Project 1

Electronics

“Light Up!”

I will explain the needs of the project and teach a broad range of skills and knowledge to you. I will demonstrate how to use tools and equipment safely and effectively and expect you to apply your new and existing learning to this project.

WE will learn to use of different materials, tools, processes and understand the importance of health and safety in a practical environment. WE will carefully watch and learn from practical demonstrations and apply our learning to our individual project.

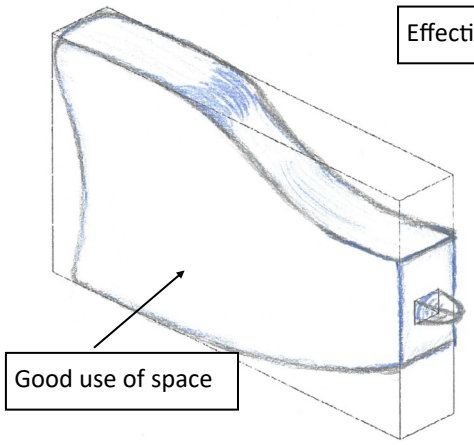
YOU will use your skills, knowledge and understanding to independently draw, design, plan, make and evaluate a ‘The Light up Torch’ product to a quality standard.

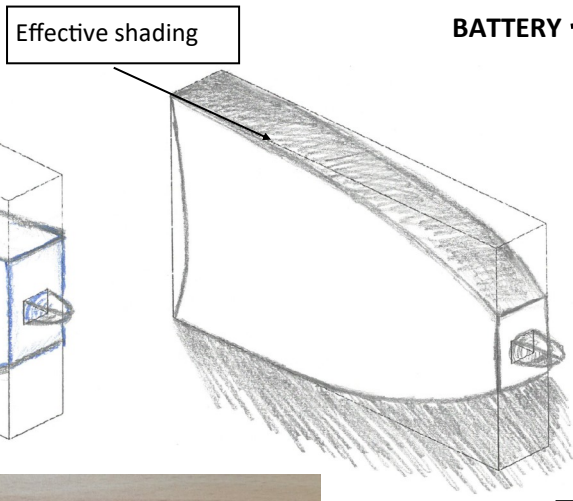
Date:_____

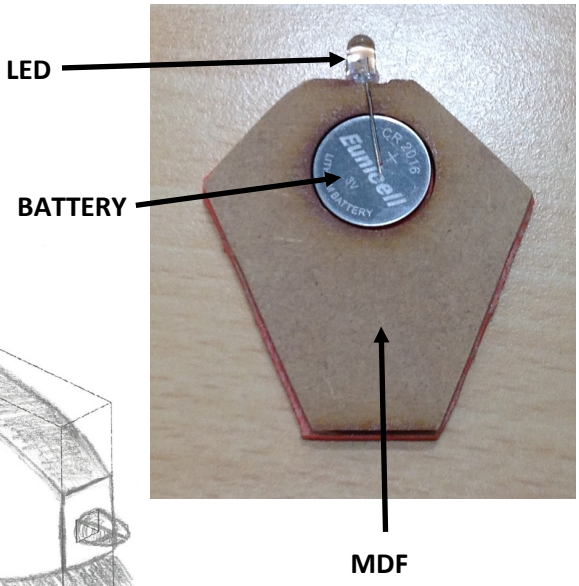
What is involved in this project?

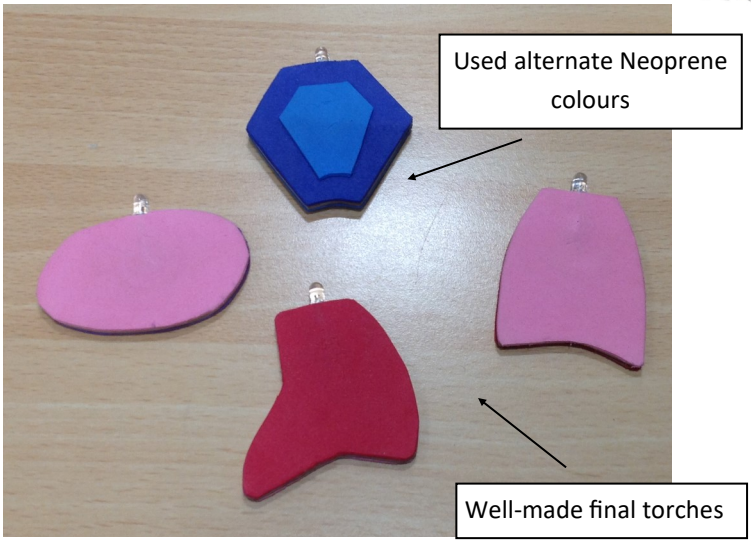
Checklist– Order of Work	Tick
• Understanding Electronics– How does the torch work?	
• Design Brief and specification	
• Market product research	
• Design ideas	
• Isometric and technical drawing	
• Modelling your product	
• Manufacture your final product	

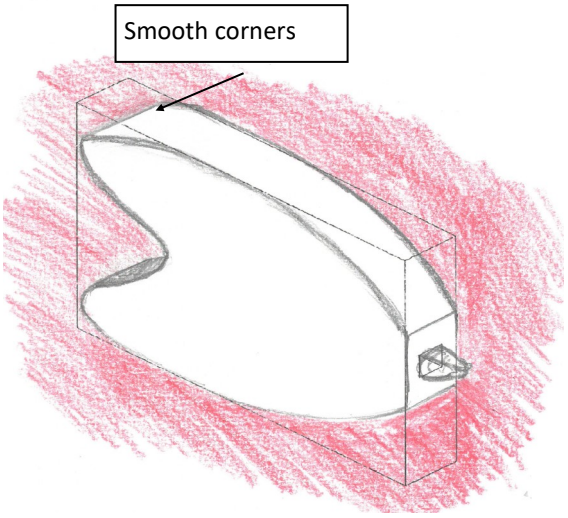
What does success look like?











Date:_____

Theory slides and activities

Date:_____

Theory slides and activities

Date:_____

Theory questions

- Suggest two instances where a light would be more appropriate output than a speaker or buzzer (2 marks)

- Which device does a flashing road beacon use? (1 mark)

- What are the benefits of having smaller circuit boards in a flat screen television? Explain your answer (1 mark)

- Draw a system diagram for a triggered burglar alarm (1 mark)

- Explain what an electronic system is (1 mark)

- Give an example of a closed loop system that you might find in your home (1 mark)

- Using the correct graphical symbol, draw a cell, a bulb and a light dependent resistor (3 marks)

Mark out of 10:
Peer checked

Date:_____

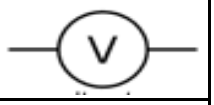
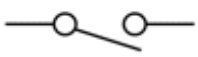
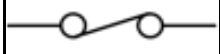
Inputs, Processes and Outputs

Input → **Process** → **Output**

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

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.

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.

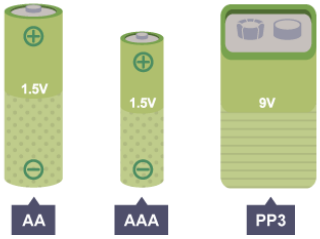
No.	Symbol	Match	Name	Description	Input, Process, Output
1.			**Bulb**	Glows when a circuit is complete	
2.			**Voltmeter**	Measures the voltage produced by a power supply	
3.			**Ammeter**	Measures the flow of electrons in a circuit, which is known as current	
4.			**Resistor**	It slows down the flow of electrons in a circuit	
5.			**Cell**	Transforms chemical energy into electrical energy	
6.			**Battery**	Two or more cells in series	
7.			**Open switch**	The circuit is broken	
8.			**Closed switch**	It connects the components in a circuit	
9.			**Thermistor**	The resistance depends on the temperature	
10.			**Diode**	Current only flows one direction. It doesn't light up if it is the wrong way round.	

Date:_____

Energy Storage– Batteries or Cells

The two main types of batteries that are commonly used are single-use and rechargeable. The single-use batteries, sometimes referred to as primary types, are commonly **alkaline** batteries, and these are readily available in supermarkets and shops.

All batteries are available in a range of sizes and shapes - tiny batteries known as **button-cell batteries** power calculators and hearing aids, while very large batteries power cars and trucks.



Common forms of batteries used in homes are AA and AAA, and both typically produce around 1.5 volts (V) per battery. A larger PP3 battery, often used for smoke alarms and medical equipment, typically produces 9 volts (V) per battery.

Once a battery runs out it has to be replaced unless it is rechargeable, in which case it is connected to a mains power source to be **recharged.**

Rechargeable batteries:

- are more expensive to purchase than single-use batteries
- can be recharged
- are more economical in the long term
- have a limited lifespan

Rechargeable batteries can only be recharged a number of times before they lose battery life, in the same way as **smartphone** batteries lose battery life over time.

Batteries and the environment

Batteries can be recycled to prevent them ending up in **landfill sites**. Batteries contain harmful chemicals and metals that are bad for the environment if disposed of incorrectly; these elements can contaminate the ground or poison the wildlife that may eat them.

Date:_____

Read this:

nature
International journal of science

'Lithium-ion batteries need to be greener and more ethical'

Batteries are key to humanity's future — but they come with environmental and human costs, which must be mitigated.

A low-carbon future rests on an essential, yet also problematic, technology. Lithium-ion rechargeable batteries— already widely used in laptops and smartphones— will be the beating heart of electric vehicles and much else. They are also needed to help power the world's electric grids, because renewable sources, such as solar and wind energy, still cannot provide energy 24 hours a day. The market for lithium-ion batteries is projected by the industry to grow from US$30 billion in 2017 to $100 billion in 2025. But this increase is not itself cost-free– lithium-ion technology has downsides — for people and the planet. Extracting the raw materials, mainly lithium and cobalt, requires large quantities of energy and water. Moreover, the work takes place in mines where workers — including children as young as seven — often face unsafe conditions.

Policymakers, industry leaders and researchers need to mitigate these problems, and quickly, to reduce the unintended consequences of an important technology. One crucial intervention, which needs further study, is the acceleration of battery reuse instead of, or in addition to, recycling them or disposing of them in landfills. Around one-third of the world's lithium — the major component of the batteries — comes from salt flats in Argentina and Chile, where the material is mined using huge quantities of water in an otherwise arid area. Battery-grade lithium can also be produced by exposing the material to very high temperatures — a process used in China and Australia — which consumes large quantities of energy. There are ways to extract lithium more sustainably: in Germany and the United Kingdom, for example, pilot projects are filtering lithium from hot brines beneath granite rock. Cobalt is an important part of a battery's electrode, but around 70% of this element is found in just one country: the Democratic Republic of the Congo (DRC). Around 90% of the DRC's cobalt comes from its industrial mines (90,000 tonnes annually). But in a country where people earn, on average, less than $1,200 annually, the world's demand for cobalt has attracted thousands of individuals and small businesses, called artisanal miners — and child labour and unsafe working practices are rife. Chemists are researching ways to replace cobalt with more abundant metals such as iron or manganese but human-rights groups such as Amnesty International say this should not detract from cleaning up the DRC's existing industry by providing jobs in safe conditions. Many countries are aware that mining needs to be done responsibly and more sustainably. Yet some are advocating policies — especially in battery recycling — that risk having a detrimental impact on the environment.

The European Union, for example, requires companies to collect batteries at the end of their life and either repurpose them or dismantle them for recycling. The current requirement is for 45% of the EU's used batteries to be collected — but few of these are lithium-ion batteries. This is partly because such batteries are often built into the devices they power and are hard to dismantle, or the devices themselves are valuable, which means they are likely to be exported for resale and disappear from the EU unreported. Meanwhile, the EU is considering a 70% target for batteries to be collected by 2030. In addition, it wants 4% of the lithium in new batteries made in the EU to be from recycled material by 2030, increasing to 10% by 2035.

Such requirements could have unintended consequences. As batteries improve, they will last longer. But if the EU mandates a higher collection rate, companies might feel compelled to take them out of service prematurely — to meet the numerical collection target — even though they could still have useful life left.

Similarly, there could be adverse consequences to mandating the inclusion of more recycled material in lithium-ion batteries. There's already a shortage of recycled material. So, to satisfy the new recycling rules, Europe's manufacturers could need to import recycled material, in particular from China — which, along with South Korea, has become an important global centre for battery recycling. This would have a considerable carbon footprint. There is also a risk that battery production will stall because there isn't enough recycled material available.

Battery reuse is one potential solution that more countries should be considering — a target for reuse is not yet part of the EU proposal. Although batteries do eventually run out completely, many are taken out of use when they have merely become inefficient for a particular use, such as powering a car, but still have plenty of life in them for less-intensive applications, such as renewable-energy storage.

Without incentives in place for battery reuse and repurposing, incinerating batteries or sending them overseas for recycling will remain more economical. A shift in thinking is needed: scientists should consider how materials can be recycled, reused and repurposed as they design them.

Batteries are crucial for Earth's low-carbon future. It's in everyone's interests to make sure they are clean, safe and sustainable.

Questions:

1) It is projected that, by 2025, the battery industry will be worth how much?

2) Where does a third of the worlds lithium come from?

3) How much cobalt is mined in the DRC, annually, and what is the impact on humans and the environment?

4) Why is it difficult to collect and recycle some types of battery?

5) When a battery has reached the end of its life, eg in a car, how can it still be made useful for storing energy?

Date:_____

Big question: 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.

Date:_____

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 arrives, 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 womens 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?

Date:_____

Design Brief and Problem Analysis

Design Brief

In the winter months, the night draw in quickly each day. You are to design and make a small torch. The torch will be lightweight, portable and easy to hold. It will be easy to turn on and off. The light will be produced by an LED.

The Design problem

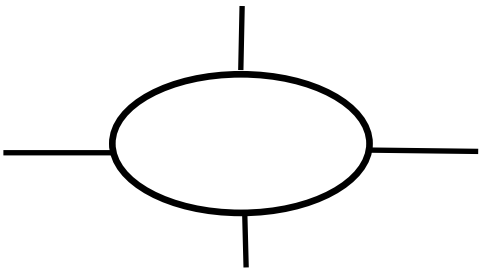
Write a sentence or two, in the box below, explaining why a person might need a torch

For example: ***When I get home at night, its difficult to see the front door keyhole. This means that it takes time to open the door and if its raining, I get wet***

Your problem:

Date:_____

Use this space to mind map your opportunities and thoughts:

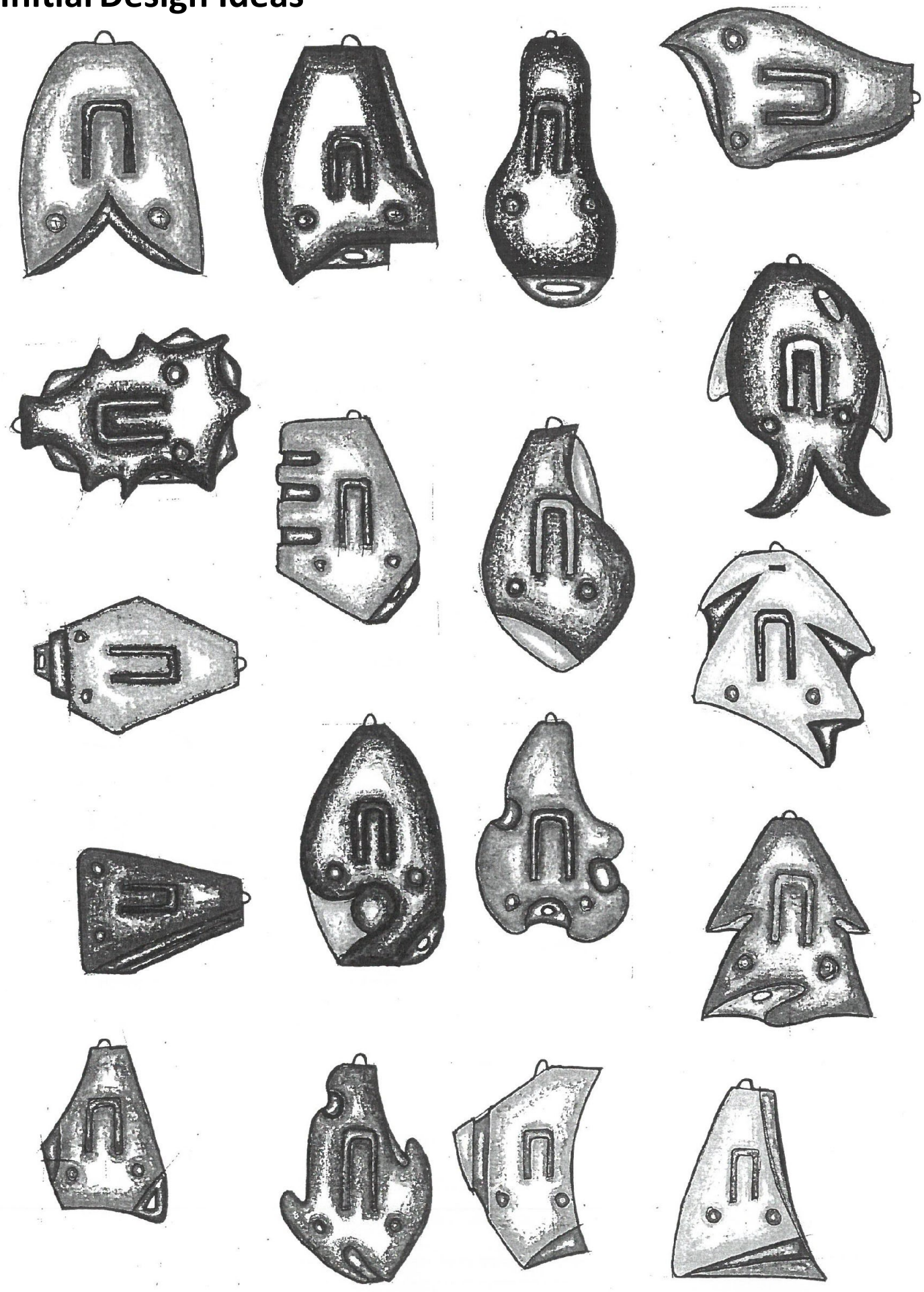


Your Specification– what does a torch need to do to be seen as a success?

Now having mind mapped your opportunities (and problems) you will need to write a Specification to guide your design work. Use the ACCESSFM system to put down on paper as much information as you can

Aesthetics	
Cost	
Customer	
Environment	
Size	
Safety	
Function	
Material	

Initial Design Ideas



Date:_____

Initial Design Ideas

In the space below sketch out initial ideas for your light up torch. Remember to sketch to scale and ANNOTATE your ideas with dimensions, components, materials etc

Important dimensions: Neoprene foam is 2mm thick, Cell diameter is 19mm, LED positive leg is 18mm

Date:_____

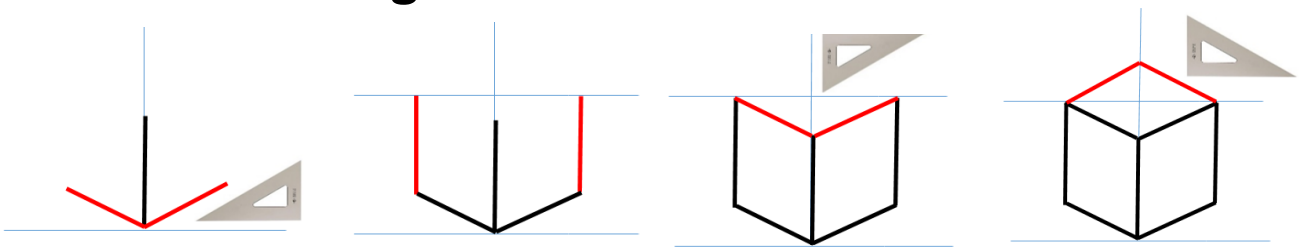
Technical scale drawing

Once you have finalised your design, you are to draw out (to scale) the **centre component** of your product in the space, below. Using careful measurements, show where the lamp(s) and cell are to be positioned - and then any other details needed eg tools required for manufacture

Remember that all dimensions should be in **MILLIMETRES**

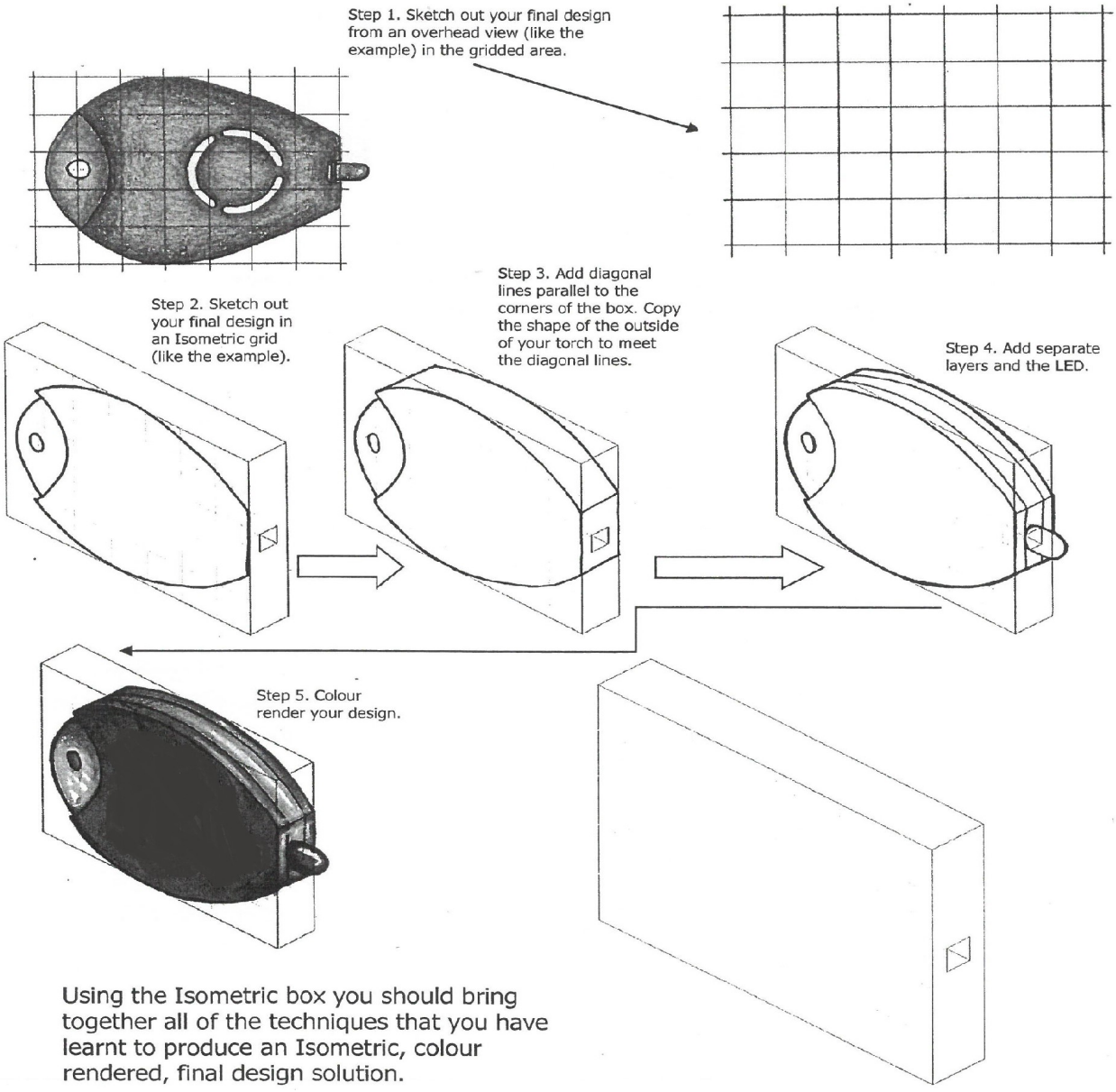
Date:_____

Isometric Drawing



Using the space below Follow the steps and practice drawing cubes using the isometric paper

Three Dimensional Drawing

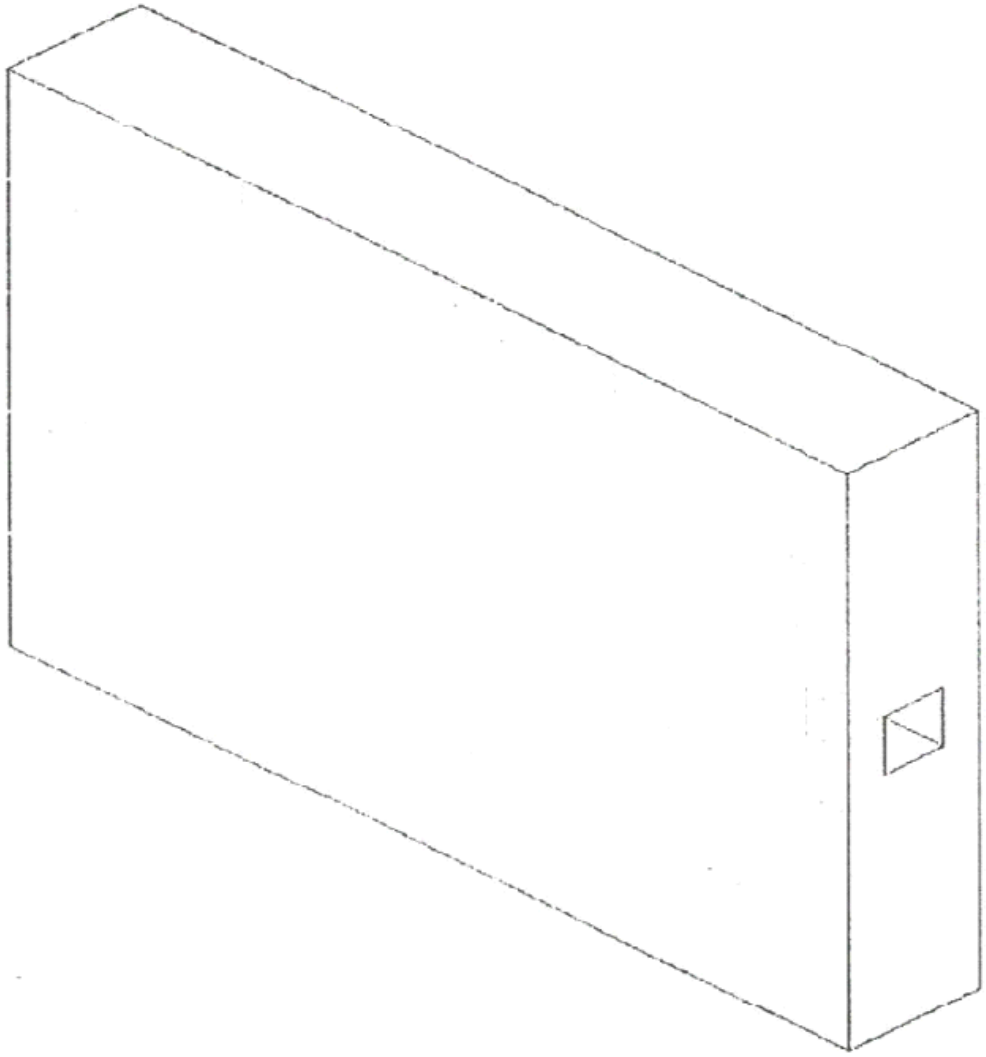


Isometric Design Idea

Date:_____

Draw your design with in the outline box of the torch using the step on the previous page to help you.

Annotate your design ideas with comments linking to ACCESSFM.



Electronics: Evaluation

Big question: What is needed to write a good evaluation?

I will explain the purpose and value of completing a project evaluation and explain all of the main elements needed to make it a success!

1. What do you think of the overall design ? What changes would you make ?
2. Are you happy with the materials you chose ? Would you make adjustments next time ?
3. Did the project take too long to make ?
4. Would it be easy to set up a production line for the manufacture of your solution ?
5. Is your solution safe ? Could it be made safer ?
6. Are the techniques you used to make your solution adequate or would you use a different range of manufacturing techniques ?
7. Is the solution the right size/shape ?
8. What are the views of other people regarding your design ?
9. Does it work ? What changes are required ?
10. What was the most and least successful part of the project for you?
11. Does the product meet the needs of each point of your Brief and Specification?
12. Which parts of the project went well for you?
13. Which parts of the project didn't go so well for you?
14. If you had another two lessons, how would you improve your work?

We will read through the sentence starters and consider how they can be used to improve your evaluation.

Evaluation- use this to explain how successful/not an outcome or product is

- *Overall I am feel my [product] is a [success/failure] because…*
- *I found the making process [hard/difficult/easy]…because...*
- *If I was going to do the project again I would change… to improve it*
- *I would like to add this… to the [product]*

Date:_____

Electronics: Evaluation

We will read through the model example and highlight the key details that have been discussed

Example:

I made a squeeze torch using neoprene foam and MDF. The neoprene foam grip is comfortable and easy to squeeze, making it user-friendly. The MDF body is strong and keeps the torch sturdy. However, MDF isn't water-resistant, so the torch can get damaged if it gets wet. I thought about making the design simple so that it was easier to cut on the scroll saw. The squeeze mechanism works well, but it shows wear after a lot of use. The LED light is bright and eco-friendly since it charges with the squeeze. I found it difficult to cut the card with a craft knife although I did find it easier to cut the neoprene. Overall, I'm happy with my design, but adding waterproofing and making the squeeze mechanism more durable would improve it.

You will write your own evaluation based on your personal project and include as many of the points discussed as possible

Project 2

The Trox

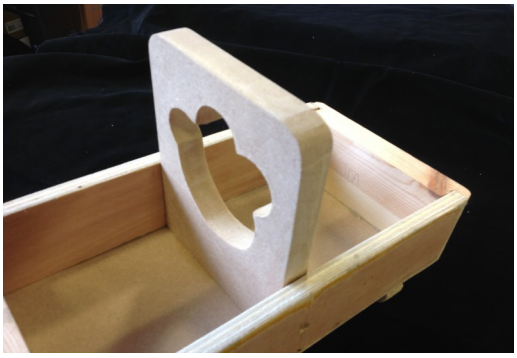
‘Contemporary, user centred, portable storage’

I will explain the needs of the project and teach a broad range of skills and knowledge to you. I will demonstrate how to use tools and equipment safely and effectively and expect you to apply your new and existing learning to this project.

WE will learn about different types of wood joints. WE will learn to use of different materials, tools, processes and understand the importance of health and safety in a practical environment. WE will carefully watch and learn from practical demonstrations and apply our learning to our individual project.

YOU will use your skills, knowledge and understanding to independently draw, design, plan, make and evaluate a ‘The Trox’ product to a quality standard.

What does Success look like?- its important to know!



This project will build on your knowledge and understanding from last years projects and introduce you to new skills and, GCSE based, theory content. **In order to be successful, you will need to:**

• **Be accurate in your measuring and marking out of materials.**			• **Select and use tools and processes appropriately and with skill**		
Met	**Partially met**	**Not Met**	**Met**	**Partially met**	**Not Met**
• **Use a range of materials and joints to assemble your product to a high level of accuracy and finish**			• **Use collected data to design a handle component suited to a specific user group**		
Met	**Partially met**	**Not Met**	**Met**	**Partially met**	**Not Met**

How you will be assessed?

Whole Class Feedback

THE DUSTON SCHOOL

Art, Design and Technology Marking Crib Sheet

AD&T

Group: [redacted]

Big Question: How do you ensure successful planning at the start of a design project?

Praise:

- Most have completed a design brief what they are making and who for
- Most have been able to complete a design specification using ACCESSFM. Some have shown clear understanding into the meanings of ACCESSFM.
- All completed their orthographic projection on first wood joint.

Developments:

- Show a clear understanding on who your design client is and how you are going to meet their specific expectations
- Be specific on the type of timber you are using
- Have a clear understanding into the specific areas into your product you are making using ACCESSFM with clear links to your client needs.
- Make sure you use a ruler to ensure straight line in your orthographic drawing
- Make sure measurements are written in millimetres

SPaG:

Aesthetics

Function

Manufacture

Orthographic

Wow!:

[redacted]

C4C:

Do no use pen when drawing always use a pencil!

To do now:

Double check you have measurements on your orthographic drawing and use the drawing to help you with the practical lesson.

Design Scenario and Brief

Date:_____

Scenario:

You have been commissioned to design a personal storage product which has a handle designed to meet the design client specific requirements. Which client you choose will determines what requirements you will meet.

You need to write a personal response to the scenario on how you will approach this project and how you are going to meet the needs of your design client.

Design Client Profile Examples:

Name:	Linda
Age:	56
Problem:	I need something to store my gardening tools so I can carry them around with me while gardening.
Requirements:	• A stylish design with a garden theme • A good strong handle to hold the weight of the tools • I like daisy flowers
Location	Outdoors-Garden

Name:	Robert
Age:	26
Problem:	I need something to store my tools and stationary as working on a construction site they easily get lost.
Requirements:	• I love sports so this would be a great theme • A good strong handle to hold the weight of the tools
Location	Outdoors-Construction

Name:	
Age:	
Problem:	
Requirements:	
Location	

Activity: Write your own Design Brief– refer to page 7 to help you

Peer Assessment

Grade:

Developmental feedback:

Design specification

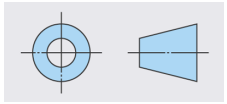
Date:_____

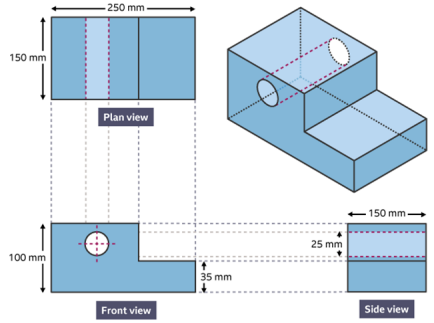
A design specification is used to describe all of the client and technical requirements gathered throughout the research process It is a series of statements that outline, the function and type of materials to be used in the product and the client requirements including anthropometric data. Before manufacture, the design specification is used to help create the final designs for the product.

Aesthetics What is your final product going to look like?	
Cost How much do you think it will cost to make and sell for?	
Customer How are you going to meet your design client needs? Describe what type of person your client is.	
Environment Where is your final product going to be used?	
Size Roughly what size is your final product?	
Safety How are you going to ensure your final product is safe to use?	
Function What does the final product do? How does it work?	
Material What is the final product going to be made of?	

Orthographic Projection

The ability to **sketch** and understand **3rd Angle Orthographic Projection** is an important aspect of your current and future learning in Art, Design and Technology. Use the space below to sketch your component(s) **to scale** and with care—it is expected that a **third party** could use your sketch to make this component.





Datum ●

Point

Date:_____

Date:_____

Big question: *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.

Scots Pine Tree Beech Tree

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.

Date:_____

Big question: *What is the difference between Hardwood and Softwood?*

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?

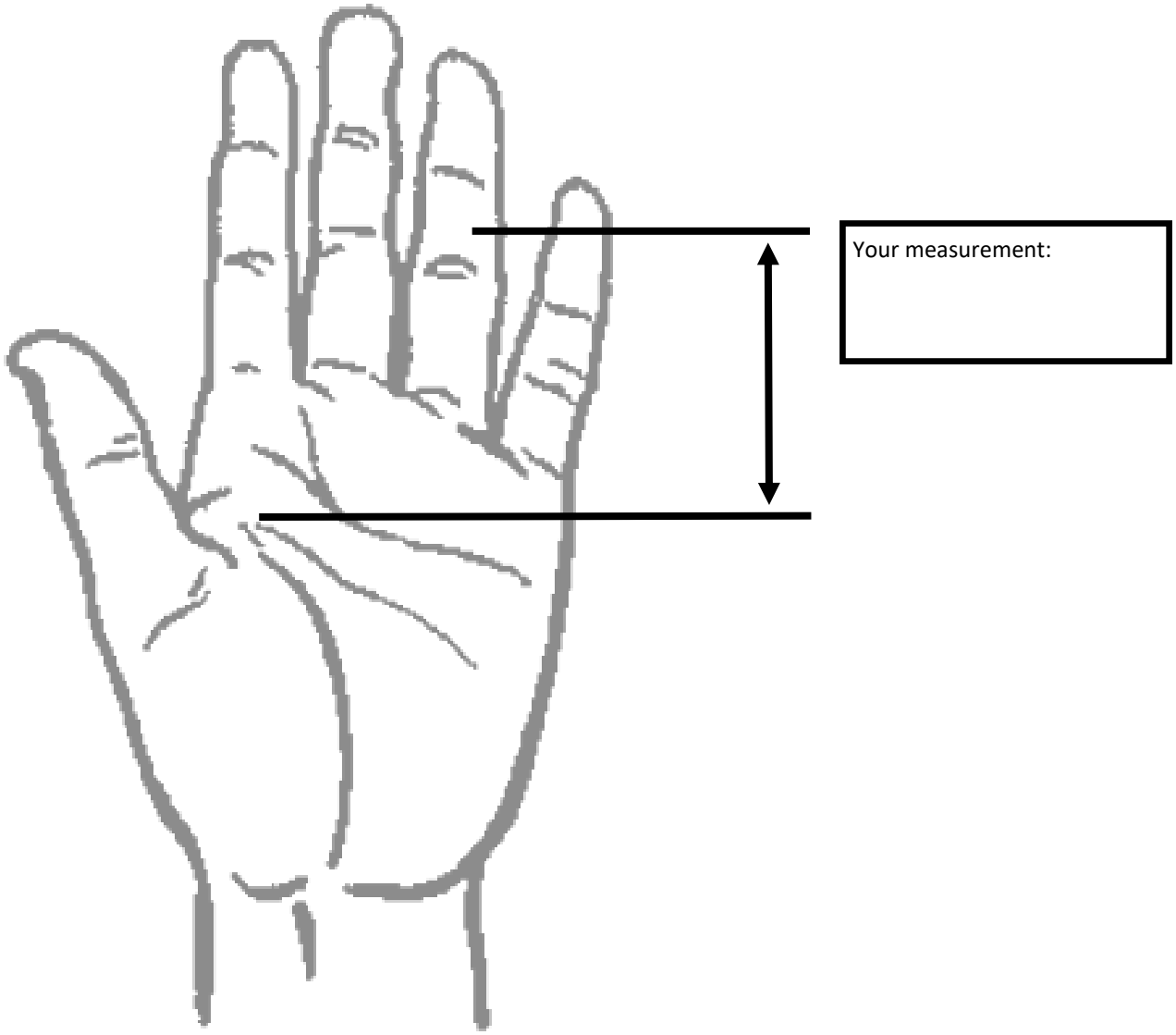
Date:_____

Handle Design: Ergonomics & Anthropometrics

So that your product is fit for purpose, it is very important that you measure your user(s) hand before designing and manufacturing the handle.

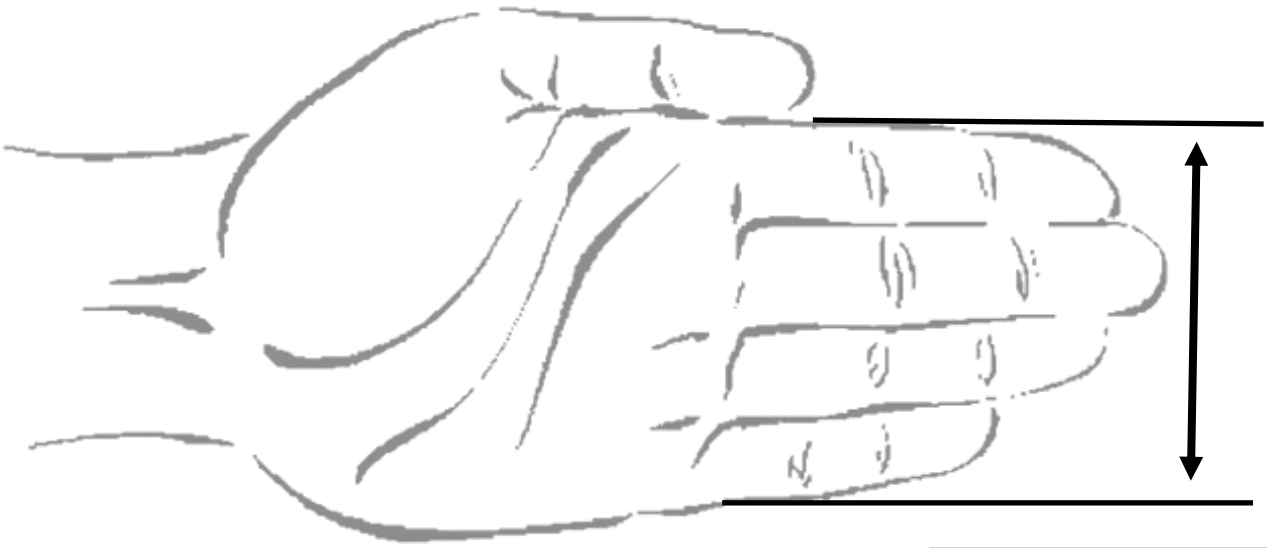
Collecting such information is known as gathering **'anthropometric data'** and is of vital importance if the product is going to be **ergonomically comfortable to use**. In industry a large number of tiny measurements of lots of different peoples hands would be taken so that the product can be designed to fit the maximum number of people—think mobile phones, for instance.

- On the drawing, below, record the distance between the two lines indicated—this will give you a good idea of how large your handle grip will need to be.
- Use **MILLIMETRES** as your unit of measurement and write your answer in the box.



Date:_____

- Next, close the fingers together and measure the width of your four fingers - then **add 20mm** to the measurement to allow for a comfortable grip. **USE MILLIMETRES!**



MM:

- Finally, **measure the diameter of your first finger—**this will help you understand how wide the hand slot needs to be**. USE MILLIMETRES!**

MM:

Extension Task:

Why is important to collect this data before designing your handle? What considerations would you need to take if the product was mainly used by a child compared to an adult?

_____

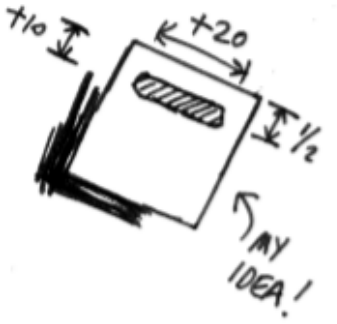
_____

_____

_____

Date:_____

Handle Design



Use the rectangles, below, to sketch out your design proposals.

- Start by sketching your hand slot design– use the data that you have gathered from measuring your client's hand on the previous two pages. Your design approach can be very personal and you will have to think carefully about how the Trox will be held in a hand
- As a guide, **halve your first measurement** for the grip depth, **add 20mm to your second measurement** for the grip width and **add 10mm to the third measurement** for the finger slot depth

Your Final, Developed Design

Peer Assessment:

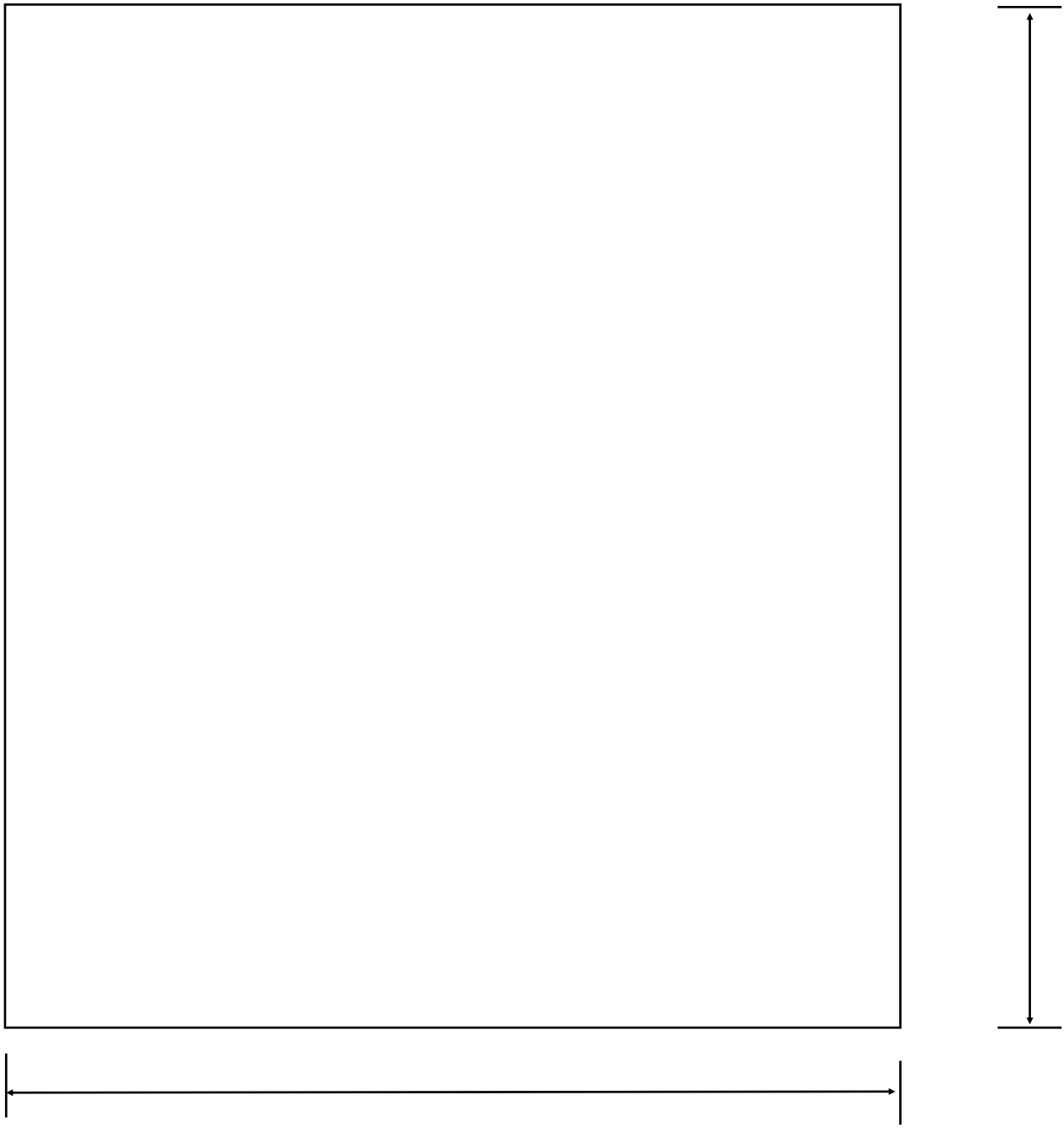
Feedback:

Date:_____

Final Handle Design

Use the space below to neatly draw your chosen, final handle design. Measurements must be included, indicated in millimetres. **The initial MDF block measurement is 18x160x140 millimetres**

Draw your intended design to full scale and include all key measurements on the measurement bars provided



Activity: List the workshop tools you intend to use.

1._____

2._____

3._____

4._____

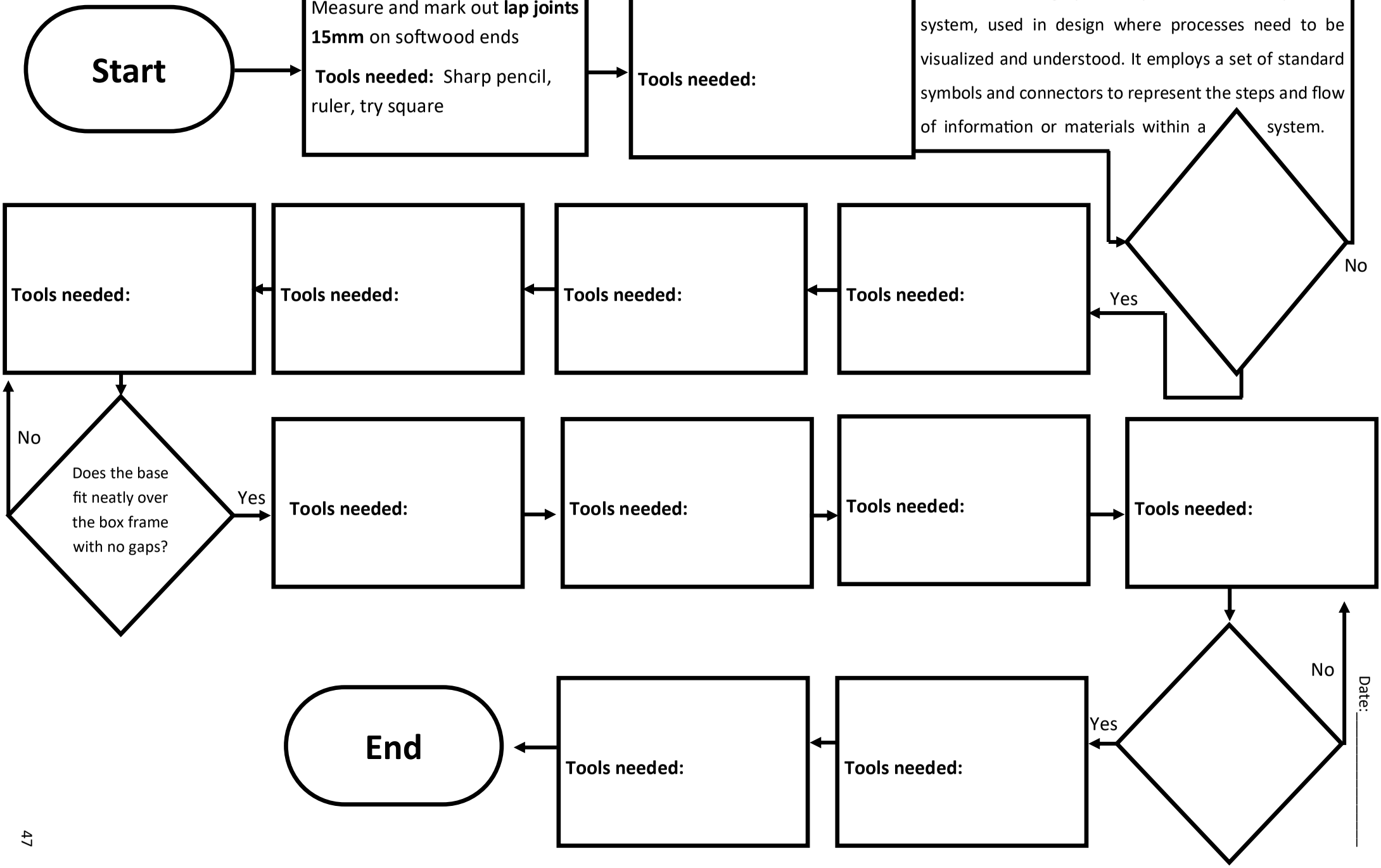
Date:_____

Flowchart planning task– Place your tasks in order

Which step?	Task	Tools needed
	Clamp lap joint in position to attach **long front/back piece**, glue and panel pin to **secure** the joint- creating an "L" shape	Wood glue, bench vice or g-clamp, panel pins, pin hammer
	Sand edges of joints to remove the **overlap**	Sanding machine, abrasive paper
1	Measure and mark out **lap joints 15mm** on softwood ends	Sharp pencil, ruler, try square
7	Using a **bench plane** to remove any **overlap** of wood from the base so that all the **edges are smooth**	Bench plane, bench vice
	Waste out **lap joints** using a tenon saw	Bench hook, tenon saw, bench vice
	Find the **internal measurement (internal side to side)** of the base box for your handle. Measure and **mark out the handle**. Refer to your handle design ideas and make a cardboard prototype	Design sheet, pencil, try Square
	Repeat step to ensure all side pieces are attached to front and side pan-els	Wood glue, bench vice or g-clamp, panel pins
	Use a tenon saw/ scroll saw to **cut out the shape** of your handle	Bench hook, tenon saw, bench vice
6	Position MDF base under the box frame- making sure **one corner** is aligned **straight to the edge and end of the MDF sheet**. Panel pin to secure into position.	Wood glue, bench vice or g-clamp, panel pins, pin hammer
	Measure and **mark out the dowel joint** and attach your handle to the base box.	Pencil, ruler, try square, pil-lar drill, 6mm dowels
	Mark out and **drill a large diameter hole** for the handle using the pillar drill and Forstner drill bit	Pillar drill, 34mm diameter Forstner drill bit, g clamp
	Sand and finish your Trox to a high standard of finish and then admire your work!	Abrasive paper, varnish, paint, newspaper
Questions/Decisions: Which steps do these decisions fit between?		
	Does the lap joint **fit correctly** with the side sections?	Ruler, try square, eyes!
6-7	Does the base fit neatly over the box frame with **no gaps**?	Eyes!
	Is the handle the correct size for the client/user?	Ruler, eyes!

Making the Trox—Flowchart

A flowchart is a graphical representation of a process, system, used in design where processes need to be visualized and understood. It employs a set of standard symbols and connectors to represent the steps and flow of information or materials within a system.



Date:_____

Risk Assessment

Health and Safety is an essential element of your course. Now and in future years, you will be expected to be able to plan your work as safely as possible for yourself and others before you start work—this can be the potential risks and dangers from the processes, finishes, joins and tools that you intend to use. Use the table below, to **identify the potential risks** to yourself/others and **how you could either avoid or minimise** the problem.

Tools or Process	Use	Risk	Avoidance	Minimisation
Tenon saw	*Cutting different types of materials eg softwood or MDF*	• *Cuts to hands* • *Breathing in of wood particles*	• *Use of a Hegner scroll saw*	• *Ensure room is well ventilated* • *Work is clamped down firmly using a G clamp* • *Use of a bench hook* • *Concentration on task*

The Trox: Evaluation

Big question: What is needed to write a good evaluation?

I will explain the purpose and value of completing a project evaluation and explain all of the main elements needed to make it a success!

1. What do you think of the overall design ? What changes would you make ?
2. Are you happy with the materials you chose ? Would you make adjustments next time ?
3. Did the project take too long to make ?
4. Would it be easy to set up a production line for the manufacture of your solution ?
5. Is your solution safe ? Could it be made safer ?
6. Are the techniques you used to make your solution adequate or would you use a different range of manufacturing techniques ?
7. Is the solution the right size/shape ?
8. What are the views of other people regarding your design ?
9. Does it work ? What changes are required ?
10. Is the handle secure, strong and ergonomically suited to your user?
11. Have you met the design client needs?
12. Did your wood joints connect successfully?
13. What was the most and least successful part of the project for you?

We will read through the sentence starters and consider how they can be used to improve your evaluation.

Evaluation- use this to explain how successful/not an outcome or product is

- *Overall I am feel my [product] is a [success/failure] because…*
- *I found the making process [hard/difficult/easy]…because...*
- *If I was going to do the project again I would change… to improve it*
- *I would like to add this… to the [product]*

Date:_____

The Trox: Evaluation

We will read through the model example and highlight the key details that have been discussed

Example:

Overall I am happy with the design which is both functional and is aesthetically pleasing. Constructed from high-quality softwood and plywood, the storage unit is sturdy and durable. The choice of materials not only provides a natural look but also are sustainable. The smooth finish and attention to detail in the construction reflect a high level of skill and dedication. The portability of the unit is another standout feature. Equipped with secure personalised handle and a design which links with the clients requirements. This aspect of the design shows a thoughtful consideration of the end-user experience with ease of use.

You will write your own evaluation based on your personal project and include as many of the points discussed as possible

Feedback Sheets

Glue your whole class feedback sheets here