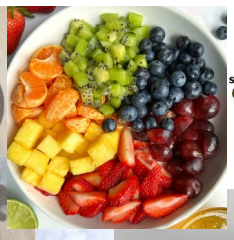
Year 7
Design & Technology
Pathway
Knowledge Booklet

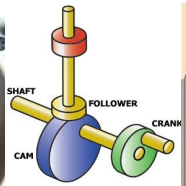
This is your copy to KEEP for the entire school year

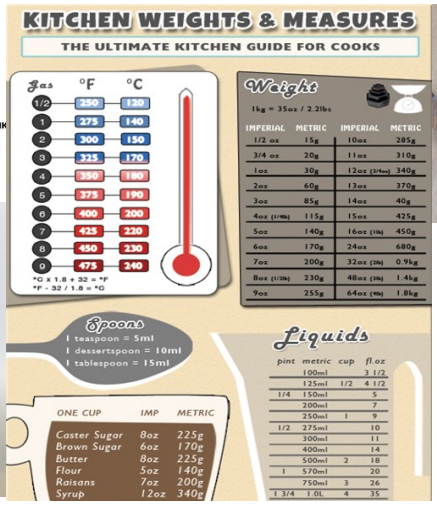
From September to July

Name:

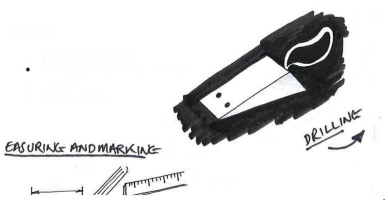
Class and Teachers:







Year 7 D&T: The Doormouse



Design and Technology Pathway:

Year 7 Resistant Material

	Year 7	Year 8	Year 9
Core Projects	• Dave the desk tidy • Door mouse • Cam car	• Electronics • The Trox	• Acoustic dock • Metal bottle opener
Additional Projects	• Avian housing	• Spatula • Money box • Metal twist	• Mirror organiser • Acrylic sliding top box

In Resistant Materials, we teach the topic of the 'Cam Car' project, because the National curriculum for D&T states that students should:

Understand and use mechanical systems in their products for example, gears, pulleys, cams, levers and linkages'. Other projects enable students to build upon existing basic knowledge from Year 5/6 and act as an excellent introduction to the KS3 TDS curriculum i.e. the safe use of tools and equipment, designing, planning, manufacture and evaluation.

Year 7 Catering

	Year 7	Year 8	Year 9
Core Projects	• Scones • Small cakes • Fruit salad	• Cheese straws • Bread and butter pudding • Rock cakes	• American-cookies • England– fruit crumble • Italy-Pasta bolognaise Bake
Additional Projects	• Pizza	• Fruit kebabs	• Spain-Risotto

"An introduction to basic food preparation skills and healthy eating"

In year 7, we teach the students the topics above, because:

The National Curriculum states that *'students need to develop the knowledge, skills and practical ability to meet all the requirements needed to lead a better quality of life. Food has a role to play in linking aspects of education that relate to health, life skills and in preparing young people as citizens'.*

What will you learn in the Design and Technology Pathway?

You will learn about tools/ processes in the workshop/catering room, mechanisms, motion, 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 and apply them to your own working practice

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 www.thinkfast.co.uk www.health4schools.net

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.carlclerkin.co.uk www.dornob.com www.alessi.com www.designmuseum.org

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

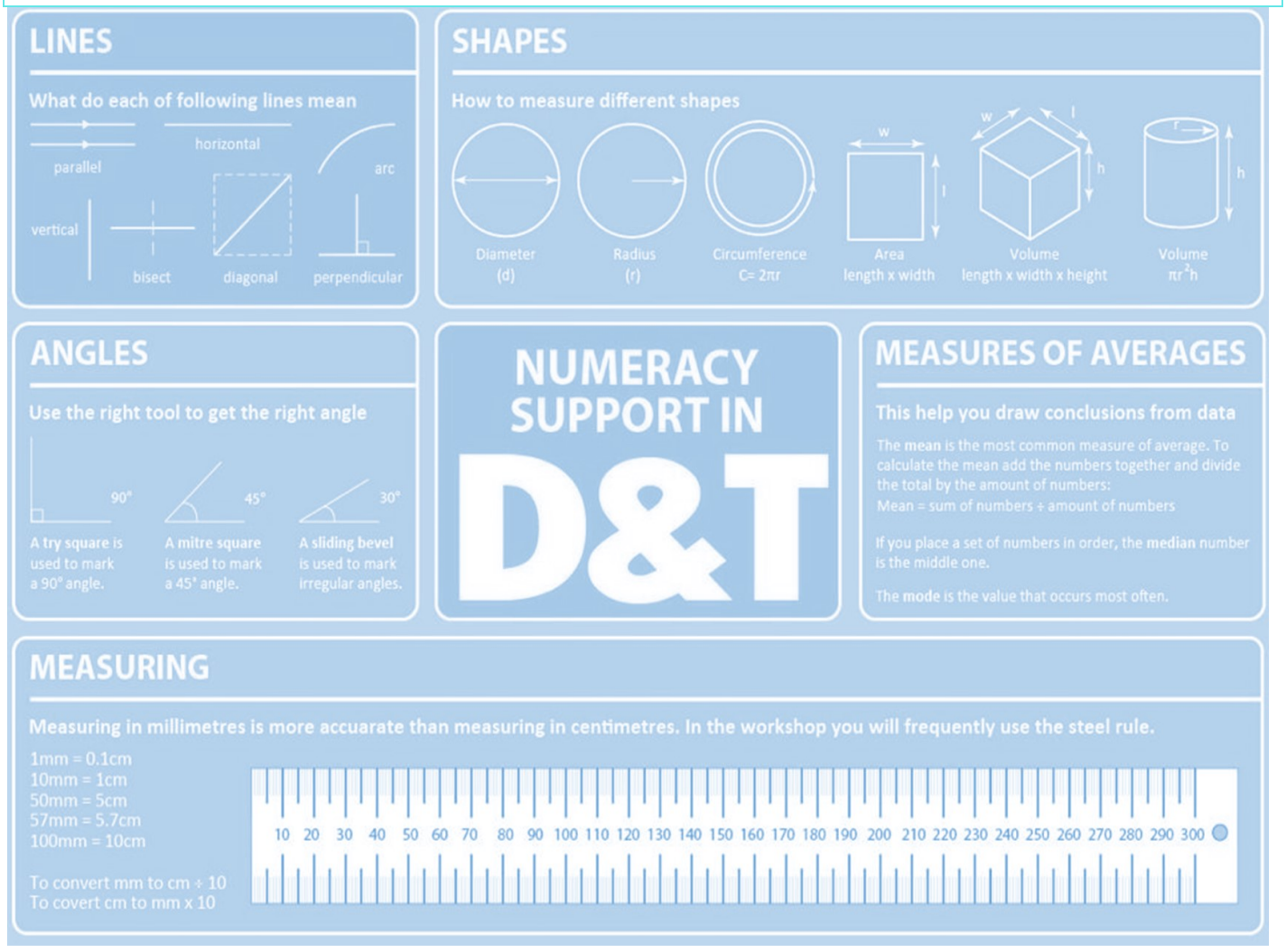
During Year 7 Design and Technology pathway you will….

Key skills & Knowledge: Understand the importance of Health & Safety and workshop rules – Carefully use a pencil and ruler to conduct basic measuring & marking – Understand Machine Safety - Laminate – Use a range of finishing techniques– Make design considerations - Test & Evaluate a product – Produce dimensioned engineering style drawings – Understand and use Basic Standard Components – Identify material properties (basics) – Understand the work of existing designers & iconic design

Develop Literacy skills:	Develop Numeracy skills:	Develop Scientific skills:
Literacy: There are a range of extended writing opportunities for each of the projects delivered **Oracy:** In line with TDS policy, students are expected to answer questions in full sentences during discussion work and encouraged to read out loud where appropriate **Keywords:** Research, Design, Manufacture, Rendering, Materials, Health & Safety Techniques, Construction, Investigate, Evaluate, Identify, Generate, Original, Target, Market, Evaluate, Develop, Creative	• Calculations of sizes • Use of metric systems • Data interpretation • Scaling drawings • Determining the amount of materials required • Accurate measurement and marking out • Graphic presentation of ideas to others	• Use of scientific principles when developing a brief or specification • Measurement of materials and selection of components • Classification of materials and their properties • Knowledge of material properties to be applied when designing and making • Knowledge of function of mechanical devices- movement, forces, changing magnitude

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

Safely and confidently, interpret and use a range of drawing conventions and sketch methods, hand tools, scroll saws, pillar drills and sanders to design, realise and modify a range of personalised products. Understand the principles of motion via mechanisms. Understand the work of others. Be able to interpret and then write a personalised brief and specification and analyse and develop outcomes in light of feedback



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		

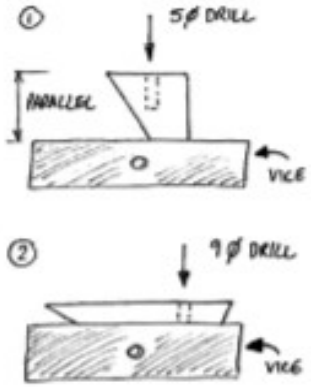
If you require further instruction on the machinery during your lessons, ask!

Year 7 D&T: The 'Doormouse'

Objective: To create a personalised door arresting device (?!) using a range of skills and processes.

Key Skills

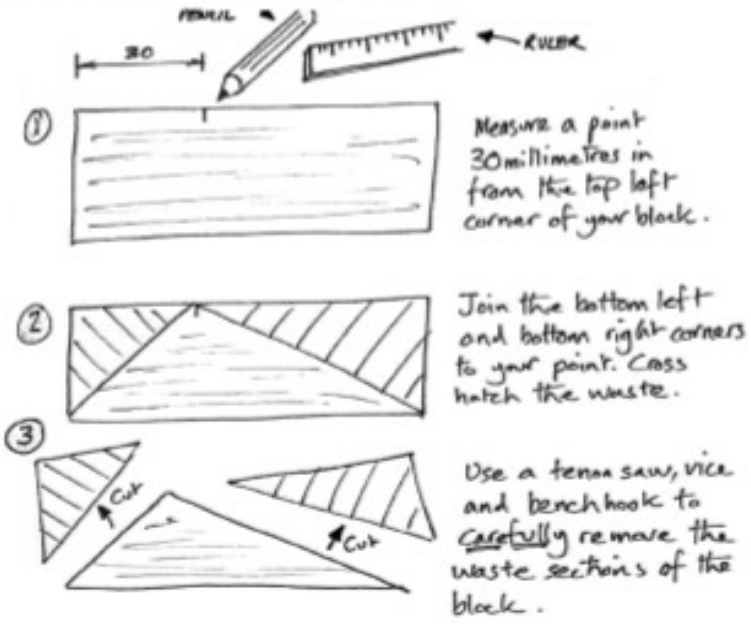
- Accurate marking out
- Wasting (sawing, drilling, sanding)
- Finishing
- Heat treatment



Health and Safety- the basics!

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

MEASURING AND MARKING:



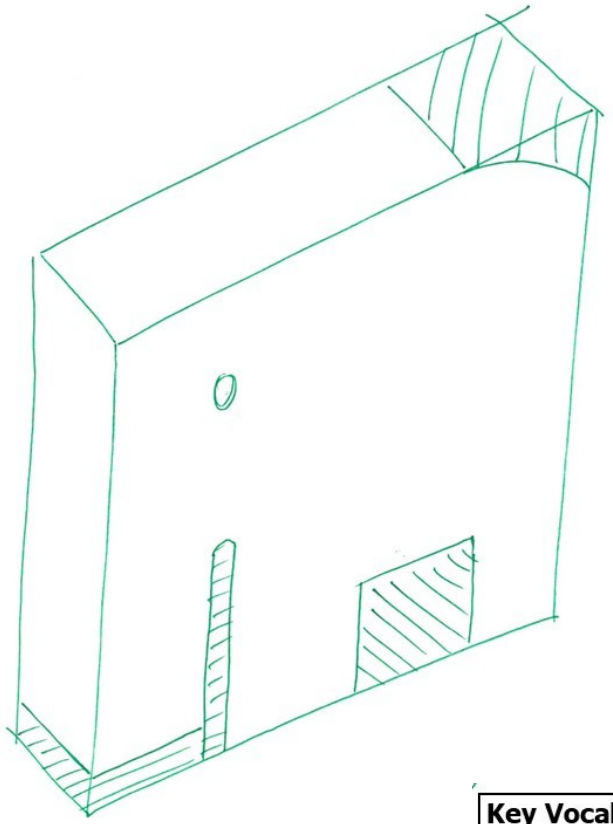
Softwoods	A fast growing, light coloured, low cost family of trees. Softwoods can be easily shaped using a range of tools and processes.

Key Vocabulary	
Pillar Drill	An electrically powered drill. Enables accurate holes to be drilled to different depths
Tolerance	An acceptable variation in dimension. This is how much larger or smaller a size can be eg 1 or 2mm
Tenon Saw	A handheld saw used for accurate line cutting
Bench Vice	Used for holding work securely whilst being cut, sanded etc
Linisher	A flat faced sander used for a variety of materials and tasks (not metals)
Ruler	An accurate measuring tool
Bench Vice	A holding device

Final outcome- next steps...?

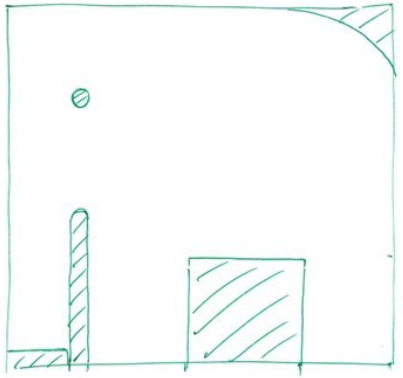
Once the basic product has been made, **how could you develop it for a specific Client** eg a young child, a football fan or a businessman?

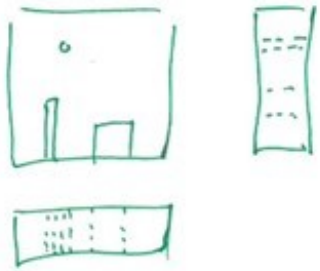
Year 7 D&T: Elephant Desk Tidy



Health and Safety- the basics!

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





Key Vocabulary	
Laser Cutter	A technology that uses a laser to vaporize materials, resulting in a cut edge.
Quality Control	Check the quality of your product to ensure it is the best it can be
Aesthetics	The appearance of your product
Precision	The quality, condition, or fact of being exact and accurate
Abrasive paper	Strong paper coated with a layer of sand or other abrasive, used for smoothing or polishing

Year 7 D&T: Mechanisms

Objective: To create a pull or push toy that converts rotary into reciprocating motion.

Health and Safety- the basics!

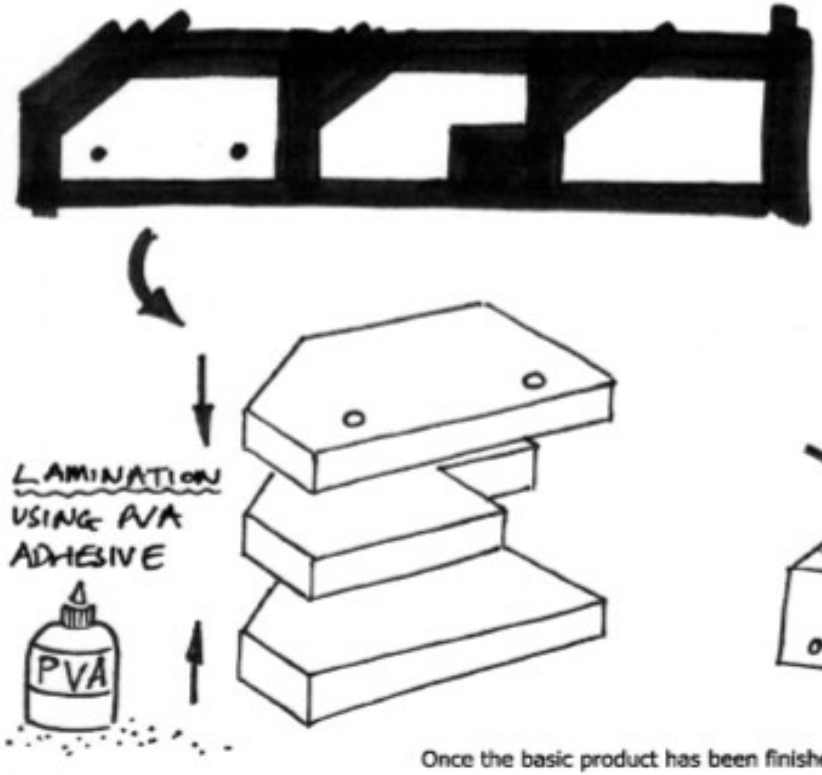
- Always cut away from your body
- Clamp work down firmly using your bench vice
- Wear eye protection when using all machinery
- Tie long hair back and wear an apron
- Be aware of those around you
- Behave sensibly at all times

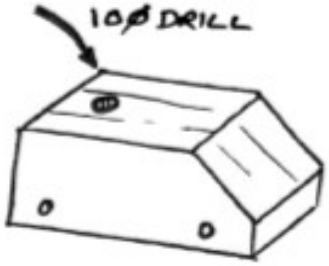
Key Skills

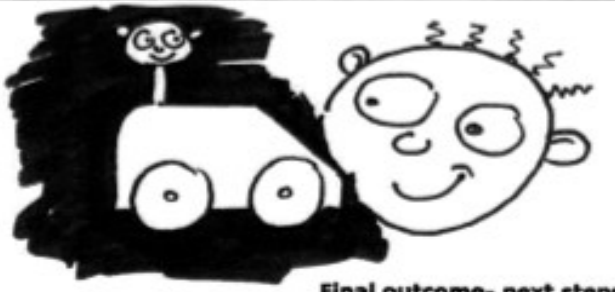
- Accurate marking out
- Wasting (sawing, drilling, sanding)
- Laminating
- Understanding and identifying motion types

MDF	A commonly available, sustainable, factory made sheet material. MDF is smooth on both sides and comes in a variety of thicknesses.

Key Vocabulary	
Pillar Drill	An electrically powered drill. Enables accurate holes to be drilled to different depths
Tolerance	An acceptable variation in dimension. This is how much larger or smaller a size can be eg 1 or 2mm
Tenon Saw	A handheld saw used for accurate line cutting
Bench Vice	Used for holding work securely whilst being cut, sanded etc
Linisher	A flat faced sander used for a variety of materials and tasks (not metals)
Dowel	An accurately made wooden rod
Lamination	The process of applying layers of material to each other, so that the properties of the product are improved







Final outcome- next steps...?

Once the basic product has been finished, **how could you develop it to show different types of motion eg linear or oscillating**?

Year 7 Catering

Big Question: To learn the basics of food hygiene, food packaging, healthy eating and practical techniques.

Key Skills
Rubbing in method
Creaming method
Kneading
Folding
Knife skills

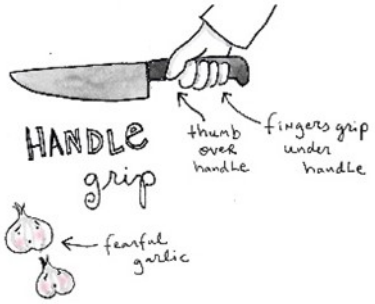
Menu

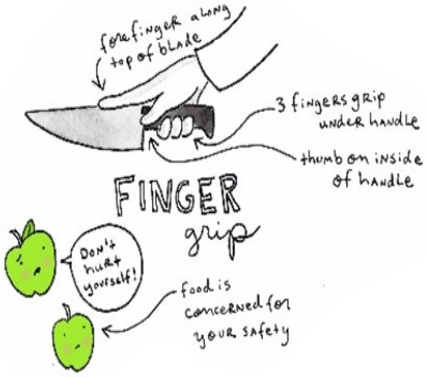
Scones

Small cakes

Fruit salad

Health and Safety
Wash hands before you begin
Long hair should be tied back
Aprons must be worn
Dirty equipment must be stacked behind the taps
Clean surfaces and equipment where possible as you go





Key Vocabulary: Word Bank	
Appearance	Flat, bright, burnt, cloudy, colourful, dull, even, decorated, patterned, smooth, watery, undercooked
Taste	Bland, meaty, spicy, salty, zest, sweet, strong, creamy, sharp, mild, tasteless
Texture	Chilled, firm, flaky, runny, sticky, tough, hot, juicy, rubbery, chewy, crumbly, crunchy, dry, soggy, brittle, natural
Aroma	Aromatic, scented, rancid, strong, spicy, savoury, weak, acrid, musty, pungent, floral, appealing
Umami	Sight, hearing, smell, taste, touch, Salt, sugar, bitter, sour and umami. The word Umami is Japanese and means "delicious and savory taste"

- Be organised- write everything down
- Check dates for homework/cooking
- Check spellings
- Write in full sentences

Recipes & Homework are found displayed outside the DT office and on Teams

Homework in Design and Technology

You will be set homework tasks in each subject pathway that is equivalent to three 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

Catering	
Homework 1	**Due Date**
	w/c

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

Food Packaging

Many foods come in packaging. They come in many shapes and designs, and are made from different materials. All packaging has advantages and disadvantages.

Cardboard e.g. pizza boxes

Advantages- is easy to write on, can be recycled, strong, reusable.

Disadvantages- breaks easily, weak when wet, crushes easily.

Glass e.g. milk bottles

Advantages- strong, can see through it, recyclable

Disadvantages- breaks easily, expensive to manufacture

Metal e.g. tin cans

Advantages- recyclable, strong, rigid

Disadvantages- cannot be used in a microwave, cannot be used when dented

Packaging needs to have plenty of information on it so that the customer understands in full what they are buying as well as being colourful, and having a logo it also has:

- Name of product
- Name and address of the manufacturer
- Weight of product
- Use by/ sell by dates
- Nutritional information
- Cooking/storage instructions
- Allergy advice

Catering

Homework 2	Due Date
	w/c

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

Health, safety and hygiene in the kitchen

Health, safety and hygiene is of utmost importance in a kitchen. It is very important that all equipment is used sensibly and carefully.

- Knives should not be left on the work surface
- Knives should be carried with blade pointing downwards
- You should not catch a falling knife
- You should not place a knife in the sink
- Knives should be kept in a knife block
- All bags etc. should be kept out of the way, this includes chairs and cables which can be tripped over
- Any food spillages on work surfaces should be cleaned immediately, especially those on the floor as this can cause slips and falls. Once cleaned a 'beware' safety sign should be put in place
- To prevent burns, use oven gloves for food being put into and taken out of the oven
- All food not being used should be kept in the fridge at 5 degrees which is out of the danger zone
- All dirty utensils should be placed behind the sink in readiness for washing up
- All work surfaces should be wiped down with a dish cloth using either hot soapy water or anti-bacterial spray. Remember to clean as you go, and throw away rubbish, this prevents cross contamination

To wash and dry up correctly, you should

- Put the sink plug in
- Fill the sink with hot water
- Add washing up liquid
- Use a dish cloth to wash the dishes, place them upside down on the draining board
- Use a tea towel to dry the dishes

Catering

Homework 3

Due date

w/c

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

Nutrients

Nutrients are found in all food and drink that we consume. Nutrients are needed to give us healthy bodies and to help us to grow. Every nutrient does a different job. There are 5 nutrients as well as dietary fibre and water.

Young children and adults up to young adulthood need nutrients to help their bodies grow and develop. In older people nutrients are needed to protect and maintain the body. The skeleton stops growing at the age of 21.

Nutrient	Food it's found in	Job in the body
Carbohydrates	Wheat products	Gives slow releasing energy
Proteins	Fish meat cheese	Growth and repair of the body
Fat	Butter, oils, cakes etc.	Gives energy, insulates
Vitamins	Fruit, vegetables, meat	Helps make healthy red blood cells, releases energy, prevents heart disease, helps to produce calcium
Minerals such as Calcium Iron	Dairy products Red meats, liver, spinach	Strong teeth and bones Prevents anemia, carries red blood cells which contain oxygen round the body.
Water	Tap, fruit juices, fruit	Keeps body hydrated
Dietry fibre	Cereals, fruit and veg	Removes waste from body

Catering	
Homework 4	**Due Date**
Read the text below and create a poster showing how intensive arable farming can harm the environment • Sustainable food and intensive farming The aim of intensive farming is to produce as much food as possible in the space available, as quickly and as efficiently as possible Intensive arable farms spray their crops with chemical pesticides, herbicides and fertilisers These chemicals can cause water pollution and get into the food chain, affecting animals that have eaten poisoned fish Some types of pesticides have been shown to be harmful to bees and are contributing to a decline in their numbers Intensive farming exhausts the soil, so more chemical fertilisers are needed	
Homework 5	**Due Date**
Healthy Eating You need to research healthy eating and the Eatwell plate. Look at all the nutrients you need to have a healthy body. Complete a food diary for a week showing all the foods you have eaten for breakfast lunch and tea and explain what nutrients they contain. Decide if your weekly menu contains all the nutrients you should have to help you grow and develop.	
Homework 6	**Due Date**
Different diets– Why do we eat the foods we do? Research the following dietary requirements and explain what they mean. Give examples of the foods that can and cannot be eaten Vegan Vegetarian Celiac Lactose	

Resistant Materials

Homework 1: Health and Safety Hazard Signs	Due Date
Using the worksheet provided by your teacher Find out what the workshop signs mean and where they are likely to be placed in the room	**w/c**

Homework 2: Designers Research	Due Date
Create an interesting, thoughtful and illustrated biography of your chosen person. • **Coco Chanel** • **Harry Beck** • **Norman Foster** • **Sir Alec Issigonis** • **Marcel Breuer** • **William Morris** 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.	**w/c**

Homework 3: Types of timber	Due Date
Create an informative, A3 sheet on hardwoods, softwoods and manufactured boards. List properties, uses and differences between the different types of timber.	**w/c**

Homework 4: The history of AUTOMATONS	Due Date
On 1 side of A4 paper, create an informative report on 'Automatons'. What are their history?, What is an automaton? Find 3 examples– how do they work?	**w/c**

Homework 5: Design Movement Research	Due Date
From the list, below, create an interesting, thoughtful and illustrated report on your chosen design movement. • **Art and Crafts movement** • **Art Deco** • **De Stijl** You will produce a 150 word, edited report, showing 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: How is MDF Made?	Due Date
Read the text about how MDF is made and complete the set of questions. Page 19 of the KO.	

Resistant Materials

Homework 7: Product Analysis	Due Date
Research the 'DCW chair' (Dining Chair, Wood) designed by Charles and Ray Eames. Use the worksheet provided on page 20 to analyse the product using ACCESSFM.	**w/c**
Homework 8: What is plywood and how is it made?	**Due Date**
Read through and revise the information on what is plywood and how is it made. Complete the set of questions on pages 21-24.	**w/c**
Homework 9: Cam, Gears– Reading and Test	**Due Date**
Read through and revise the information on 'Cams and Linkages' on page 25. Ready for a test in you next lesson.	**w/c**
Homework 10: Manufacturing Process-How to create a 50p coin	**Due Date**
Create a flowchart or 'step by step' diagram of how a 50p coin is made– from the moment the metal is extracted from the ground to it leaving the Royal Mint You might want to include sketches and photographs to explain your work– you decide!	**w/c**
Homework 11: Industrial Processes	**Due Date**
Research steam bending wood– how does it work? Write up 'step by step' how to steam bend wood on A4 plain paper	**w/c**
Homework 12: Design Task	**Due Date**
Research the design company 'Alessi' and then design your own kitchen appliance inspired by what you have seen. Make sure you annotate your design using ACCESSFM.	**w/c**
Homework 13: Sourcing Timber- Reading and Test	**Due Date**
Read through and revise the information on 'Sourcing Timber' on page 26. Ready for a test in you next lesson.	**w/c**
Homework 14:Wood Joints	**Due Date**
Complete the worksheet on different types of wood joints on page 27 by discussing the advantages and disadvantages. Investigate how to make the wood joint and where you might use the joint.	**w/c**
Homework 15: Key terms in the Workshop	**Due Date**
Look up keyword and terms, commonly used in the design workshop and explain their meanings- in your own words on page 28.	**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 ✓
Homework 1: Health and Safety Hazard signs	Term / Week 1 W/C:	
Homework 2: Designers research	Term / Week 3 W/C:	
Homework 3: Types of timber	Term / Week 5 W/C:	
Homework 4: The history of AUTOMATONS	Term / Week 1 W/C:	
Homework 5: Design Movement research	Term / Week 3 W/C:	
Homework 6: How is MDF Made?	Term / Week 5 W/C:	
Homework 7: Product analysis	Term / Week 1 W/C:	
Homework 8: What is plywood and how is it made?	Term / Week 3 W/C:	
Homework 9: Cams, Gears– Reading and test	Term / Week 5 W/C:	
Homework 10: Manufacturing Process-How to create a 50p coin	Term / Week 1 W/C:	
Homework 11: Industrial Processes-Steam bending	Term / Week 3 W/C:	
Homework 12: Design task	Term / Week 5 W/C:	
Homework 13: Sourcing Timber- Reading and test	Term / Week 1 W/C:	
Homework 14: Wood joints	Term / Week 3 W/C:	
Homework 15: Key terms in the D&T workshop	Term / Week 5 W/C:	

Homework 1: Health and Safety Hazard Signs			
			
			
			

• Safety overalls must be worn	• Face protection must be worn	• Now wash your hands	• Danger of death
• Hearing protection must be worn	• Foot protection must be worn	• CAUTION High Voltage	• Eye protection must be worn
• Hand protection must be worn	• Protective garments must be worn	• Head protection must be worn	• Wear a dust mask

Homework 1: Health and Safety Hazard Signs			
			
			
			

• CAUTION Slippery surface	• Do not extinguish with water	• CAUTION Hazardous area	• CAUTION Dangerous chemical
• Fire Alarm Call Point	• CAUTION Flammable Material	• CAUTION Biohazard	• CAUTION Overhead hazard
• Not drinking water	• CAUTION Trip hazard	• CAUTION Corrosive material	• DANGER Compressed gas

Homework 6: How is MDF Made?

MDF, standing for Medium Density Fibreboard, is a type of engineered wood product. It's very widely used across the world in furniture making, interior decoration, flooring and far beyond.

How is it made?

Step-By-Step:

Step 1: Collection and Preparation of Raw Material

Every great story has a beginning. For MDF, it's the collection of wood waste and offcuts. These timber industry by products, sourced mainly from forestry operations and timber mills- Harleston Firs, for example, undergo chipping into small pieces. Afterward, a drying process removes any remaining moisture

Step 2: Processing

Next, a machine called a 'defibrator' enters the scene. It subjects the chipped wood to heat and pressure, leading to the emergence of individual fibres that looks and feels like a pulp-like substance (think cooking flour) that forms the main component in MDF production

Step 3: Application of Resin

As the journey continues, bonding agents get their turn. The most common choice is urea-formaldehyde resin, but alternatives like phenol-formaldehyde occasionally make an appearance for moisture-resistant MDF- you can tell which MDF is which because the moisture resistant type usually has a green colour to it. Additionally, certain additives contribute to enhancing fire and pest resistance

Step 4: The Pressing of the Fibre-Resin Mixture

In manufacturing, 'resins' are often used- they are often similar to 'glues' or 'adhesives' in that they bond together materials. Resins tend to be very thin and watery which makes them great for mixing in with loose materials- think water and sand?(!). Following the resin application, the fibre-resin mix gets fed into a hot press. Here, heat and pressure flatten the fibres into a unified, solid sheet. The flexibility at this stage allows for a variety of product thicknesses- such as 6mm, 9mm, 12mm, and 18mm

Step 5: Final Touches to the Product

After pressing, the MDF sheet cools down and undergoes a sanding process in a huge sanding machine. This step guarantees a smooth surface. Depending on its destined use, the MDF might receive a veneer or real wood, or a plastic laminate as a finishing touch to make it more attractive or hardwearing

Answer the following questions:

- What is a 'resin'?
- Where does the raw material to make MDF come from?
- How can the look of MDF be improved?
- What does 'MDF' stand for and where might you find MDF being used?
- Name 3 thicknesses of MDF sheet

Homework 7: Product Analysis

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

M is for **Material**

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

Homework 8: *What is plywood and how is it made?*

As part of your KS3 course, it is important that you understand where materials come from and their properties. This project will be using plywood (a manufactured board) as its key material. Read the notes, below and answer the questions at the end.

Plywood: The Production Process

Plywood is a wood-based panel product comprised of a collection of veneers that are glued together with a resin. To sum up the production process; logs are peeled into veneers, the veneers are coated in glue, laid up so that the grain direction of each veneer is perpendicular to its adjacent veneer, pressed together, trimmed and sanded.

Step 1: The Forest

It's important to us that all raw logs used in our plywood are sourced from legal and sustainable forest concessions. We only use mills who use the Timber Trade Federation's Responsible Purchasing Policy to ensure this.

Once trees reach an acceptable level of maturity, they are felled by trained harvesters. Depending on the operation of the mill, vehicles like those in the image above can be used to select and fell trees using satellite imagery.

Step 2: Transport to the Mill

Using large lorries, logs are transported from the forest to the mill to be processed.

Transportation comes with its own environmental issues in some instances, as forest areas are cleared to make room for roads and therefore new trees cannot grow.

Step 3: The Log Pond

On arrival at the mill, logs are stored in the Log Yard. Mills will use various methods to retain the moisture in the logs, many opting for sprinkler systems. Logs will then eventually make their way to the Log Pond. Logs are submerged in water for a long time so that they are easier to cut down to size and easier to peel. Some mills in colder climates have heated log ponds as the heat also improves the quality of the peeling; they refer to this as hydro-thermal processing.

Step 4: De-barking the Logs

Before the logs are cut and peeled, the bark must be removed. Mills use industrial machines such as this to de-bark logs as they continue along the production line.

Step 5: Cutting the Logs

De-barked logs then move on to be cut to size. The size that the logs are cut to is usually dependent on the production at the time of cutting; finished panel size & grain direction play a part in the cutting of logs.

Step 6: Peeling the Logs

Logs are peeled using a rotary lathe. This peels the log in a manner similar to that of a pencil sharpener except the blade is completely parallel to the log at the time of cutting.

Step 7: Sizing and Grading

Once they've been peeled the resultant sheets are fed to the next step on a conveyor.

Following peeling, the veneers are moved along the production line in long streams. They need to be cut to size and go through an initial grading process. Grading is especially important in regards to Birch Plywood so the majority of mills use scanning technology to check for defects in the veneers, cutting to the required sizes and then separating potential face veneers from core veneers.

Unlike mills from Eastern Europe and the Baltics, countries like China will peel the veneers in smaller squares and then stitch them to the appropriate size as a more cost effective (but quality reducing) method.

Step 8: Drying the Veneers

At this point, the veneers are still wet from being soaked in the log pond. The veneers must be dried for a variety of reasons; from protecting the wood from fungal decay to increasing the mechanical properties of the finished board. Most mills use large, industrial dryers, often connecting to the log peeler via conveyor belt; however, more frugal methods can also be used. For example, some log peelers in China leave the veneers out in the open to dry throughout the day.

Step 9: Repairing Defects

Once dry, veneers need to be repaired where defects exist. In the case of Birch Plywood for example, open knots (where branches used to be) can be 'plugged' in. Splits in veneers on plywood can also be filled in and mis-sized veneers can be joined together. Some mills have a machine that scans the veneers and automatically plugs open holes or knots. (See below).

Step 10: Application of Glue and Lay-Up

Veneers are run through a gluing machine which essentially rolls the glue onto the face and back of the veneer. They are then placed on top of an unglued veneer so that the stack alternates; Glued, Unglued, Glued, Unglued and so on.

Step 11: Cold Pressing

Cold Pressing occurs after glue has been applied in order to prepare the veneers for Hot Pressing. This works to flatten out the veneers and ensure the glue is distributed across the veneers evenly.

Step 12: Hot Pressing (Daylight Press)

This part of the production process is where the actual panels begin to take shape. Multiple panels are loaded into the daylight press. The Daylight Press then compresses and maintains heated pressure on the boards for a long period of time. This creates and maintains required contact between the glue and veneers. It also decreases tension in the glue line and the thickness of glue layer.

Step 13: Trimming, Sanding and Finishing

Following Hot Pressing, the board is left to stabilise and cool down before further processing. Then it is a case of trimming down any excess veneer so the board has square edges, then the boards are most commonly sanded using a large, industrial sander.

Step 14: Quality Control

The final product has to be assessed for quality but it wouldn't be very efficient just to wait until the end of the process to find a large problem with production. For this reason, mills control their production by carrying out a number of tests on different sections of the production process e.g. testing moisture levels, formaldehyde release, durability, etc.

Many mills have what is called a Factory Production Control certificate which means they have been checked by a third party and had their production process approved to relevant European standards.

Step 15: Packaging

Finished products are then stacked up and banded together. Any relevant CE marks are printed on the packaging.

Questions:

1. What is a ‘CE’ mark? What does it mean?
2. In relation to D&T, describe what ‘tension’ is and sketch the symbol to show it
3. How do the logs get to the factory from the forest?
4. What is the name of the process used to remove the bark from the logs?
5. What is a ‘veneer’?
6. Which countries are the largest producers of plywood?
7. After being coated in resin, the wood veneers are laid on top of each other in what way?

MECHANICAL DEVICES

Mechanical devices can change one form of force to another. An input motion transforms into force to make an output motion.

Different types of movement

Linear motion is movement in one direction along a straight line.

Reciprocating motion. This is repetitive up-and-down or back-and-forth linear motion.

Rotary motion is movement on or around an axis.

Oscillating motion is movement backwards and forwards along a curved path.

Which type of motion best describes the movement of a sewing machine needle? [1]

Reciprocating motion.[1]

Changing magnitude and direction of force

A lever is a very simple way to gain mechanical advantage (MA), making lifting or moving something much easier. It consists of a rigid bar that pivots or rotates about a fulcrum with a load applied.

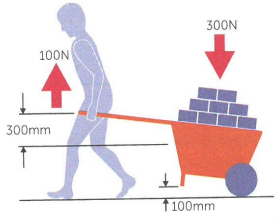
A typical lever consists of:

Fulcrum - a pivot point around which a lever turns
Effort - an input force
Load - an output force

To calculate the mechanical advantage, use the following formula:

$$MA = \frac{\text{Load}}{\text{Effort}} = \frac{300N}{100N} = \frac{3}{1}$$

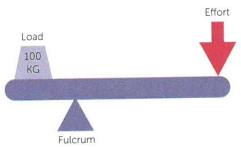
Also written as 3:1 or just MA of 3.



First order lever

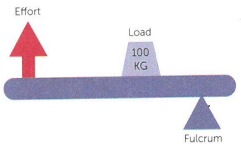
First class levers have the fulcrum between the force and the load.

Example: Pliers.



Second order lever

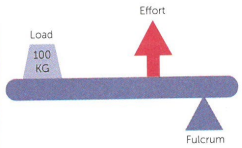
Second order levers (Class 2) are most easily remembered as having a wheelbarrow action. The fulcrum is at one end with the effort at the opposite end. The load is anywhere in the middle.



Third order lever

A Class 3 lever has the fulcrum at one end, the load at the opposite end and the effort applied in the middle.

Example: Tweezers.

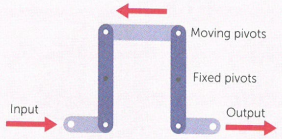


LINKAGES

A linkage is a mechanism made by connecting rigid parts. Linkages can change the magnitude of a force, change the direction of a force or transform it into a totally different motion.

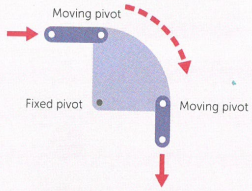
Push pull

The push/pull linkage maintains the direction of the input motion so that the output travels in the same direction.



Bell crank

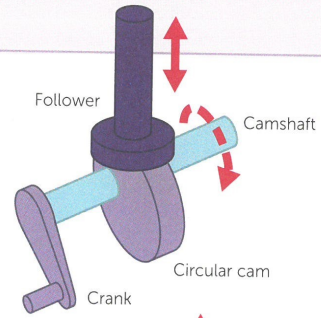
The bell crank linkage changes the direction of the input motion through 90°. It can be used to change horizontal motion into vertical motion or vice versa.

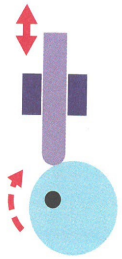


Rotary systems

Rotary systems are used to drive mechanisms in equipment and machinery. They transfer the direction of force along different paths and through changes of angle and direction.

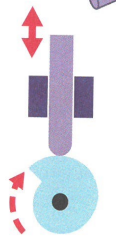
A **cam** is mainly used to change rotary motion into reciprocating motion through the use of a **follower**. A crank is used to rotate the shaft, which rotates the cam and moves the follower up and down.



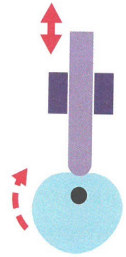


Circular cam or **eccentric cam** – steady rise and fall.

Pear cam – rapid rise and fall followed by long dwell (rest).



Snail cam – long dwell followed by steady rise and sudden drop. This can only turn in one direction, otherwise the mechanism would jam.



Heart shaped cam – slight rise and fall with no dwell period.

An child's toy crocodile has a mouth that slowly opens and snaps shut again when a handle is turned. Suggest the most suitable cam to be used to create this mechanism. [1]

A snail cam.[1]

Homework 13: Sourcing Timber– Reading and Test

SOURCES AND ORIGINS

There are two main types of natural wood – hardwood and softwood. Softwood trees mature more quickly, hardwood trees take longer to grow and replace, making the timber more expensive.

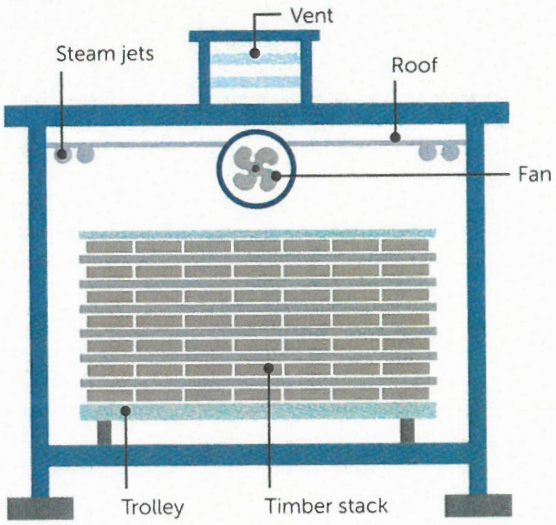
After a tree is felled and cut into manageable lengths, it is then converted into planks. This is known as timber.

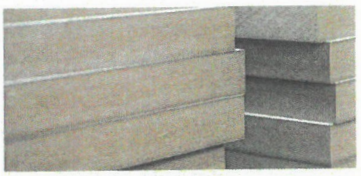
Seasoning

Newly cut timber, known as green timber, contains a lot of moisture. In order to reduce the moisture content it should be seasoned.

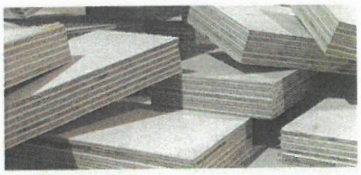
Air dried timber is separated and stacked under a protective, roofed structure, but with open sides so that air can circulate. This is a slow process.

Kiln dried timber is a quicker process. The kiln is filled with steam, and the moisture content gradually reduced, to dry out the wood. This is a more expensive treatment, but enables timber to be sold more quickly requiring much less storage space.

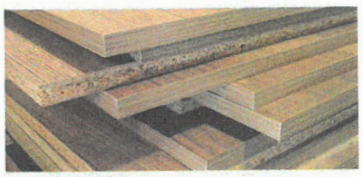




Medium Density Fibreboard (MDF)
Waste hardwood or softwood is broken down into fibres and combined with a resin binder.
It is pressed into sheets which are dense and very strong.



Plywood
Thin layers or **veneers** of wood are glued together. Each layer has its wood grain rotated at 90° to each other to produce a composite material that is strong in all directions.



Chipboard
Wood chips of varying sizes are mixed with resin, pressed (to create a strong bond) and formed into a sheet.

Sizes

Timber is supplied in two main types of finish, **rough sawn** or **planed all round** (**PAR**).

A common size of rough sawn timber is 50 mm x 25 mm. This is used for frame and carcase construction.

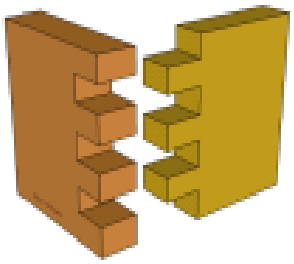
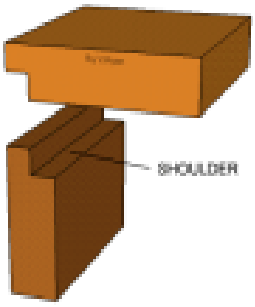
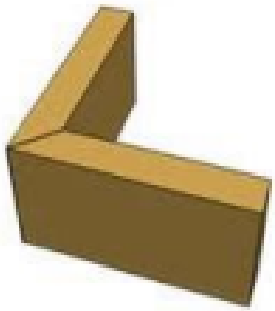
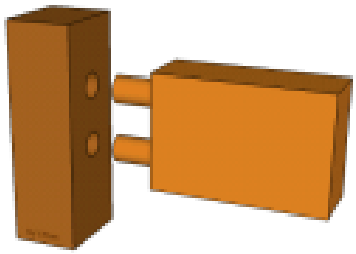
Planks, sheets and strips come in a range of stock sizes. Standard practise for measurements is in mm: length x width x thickness. Length x diameter for rod and dowel.

Manufactured board is 2440 mm long x 1220 mm wide. The thickness is usually supplied in 3 mm increments i.e. 6 mm, 9 mm and 12 mm.


Rough sawn timber

Homework 14:Wood Joints

Wood Joints

Finger Joint 	**Discuss how to make the wood joint**	**Where could you use the joint?**
Lap Joint 		
Mitre Joint 		
Dowel Joint 		
Sketch one other wood joint:		

Homework 15: Key words and terms in the workshop

Keyword/Term	Meaning
Design	
Resistant Materials	
Sustainability	
Iterative Design	
Timber	
Batch production	
CAD (Computer Aided Design)	
Tenon Saw	
Design Fixation	
Aesthetics	
Try Square	
Isometric Drawing	
Manufactured Boards	
Mechanical	
Softwood	
Wood Grain	
Function	

Notes