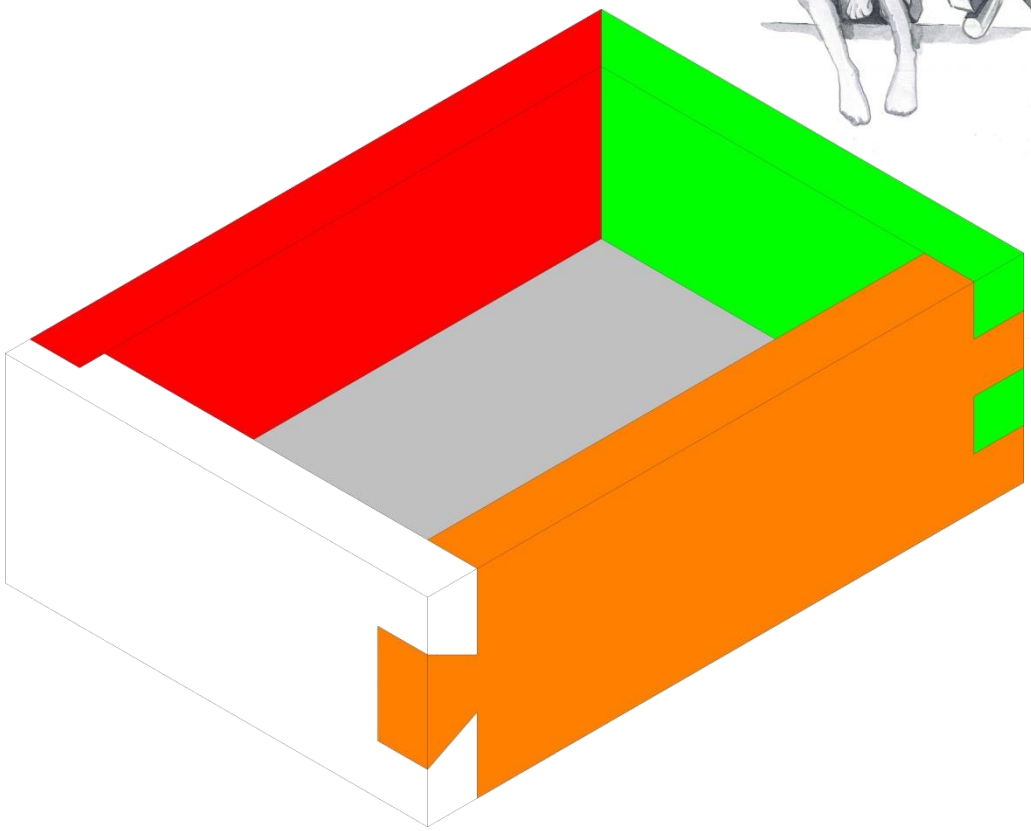
OUTSIDE THE BOX!
SKILLS PROJECT

GCSE D&T



Design & Technology
PROBLEM SOLVED!

Name .....

School Target Grade: .....

AQA GCSE Design and Technology

Skills Assessment

Requirement	Method of Assessment	Due Date
Identify the hand tools and materials commonly used to perform carpentry and joinery tasks	On a prepared worksheet, you will need to identify and describe the use of a range of hand tools used in the workshop. Page ?	
Identify machine tools commonly used to perform carpentry and joinery tasks	On a prepared worksheet, you will need to identify and describe the use of a range of machine tools used in the workshop. Page ?	
Know the relevant PPE information related to working within a workshop environment	On a prepared worksheet you will need describe the purpose a range of Personal Protective Equipment Page ?	
Know the relevant Health and Safety Hazard Symbols used in a workshop environment	On a prepared worksheet, you will need to identify the appropriate Hazard for specific symbols and describe appropriate action that should be taken to avoid complications and ensure safe use. Page ?	
Use hand and machine tools accurately to perform set tasks to a high quality finish	You will be required to produce a box with a different 'Box Construction' joint on each corner – to a given tolerance Page ?	
Be able to name and independently construct a range of wood joints.	On prepared worksheets you will need to identify different wood joints and then using guidance sheets, independently construct them to a degree of tolerance. Page ?	
Be able to select appropriate wood joints for specific uses.	On a prepared worksheet you will need to research and identify a range of appropriate joining techniques for specific uses. Page ?	
To understand and perform different finishing techniques to enhance the quality of practical work	On a prepared worksheet you will be required to explain how to perform finishing techniques to woods and then apply a technique to your own practical box project. Page ?	
To be able to describe a range of appropriate adhesives and their correct working properties	On a prepared worksheet you will identify the correct adhesive for set tasks and describe how adhesives work. You will also be required to use an adhesive to glue your box project together ensuring that it is square and cleaned up to a high standard. Page ?	

Design Brief

Scenario

You are required to design and make a small container for use in the bedroom that will hold safely the content of pockets. It must fit into it all the items that you carry every day that do not already have their own box. Items such as Phones, Loose Change, Wallets, and Watches need to be able to be stored.

Aim and purpose

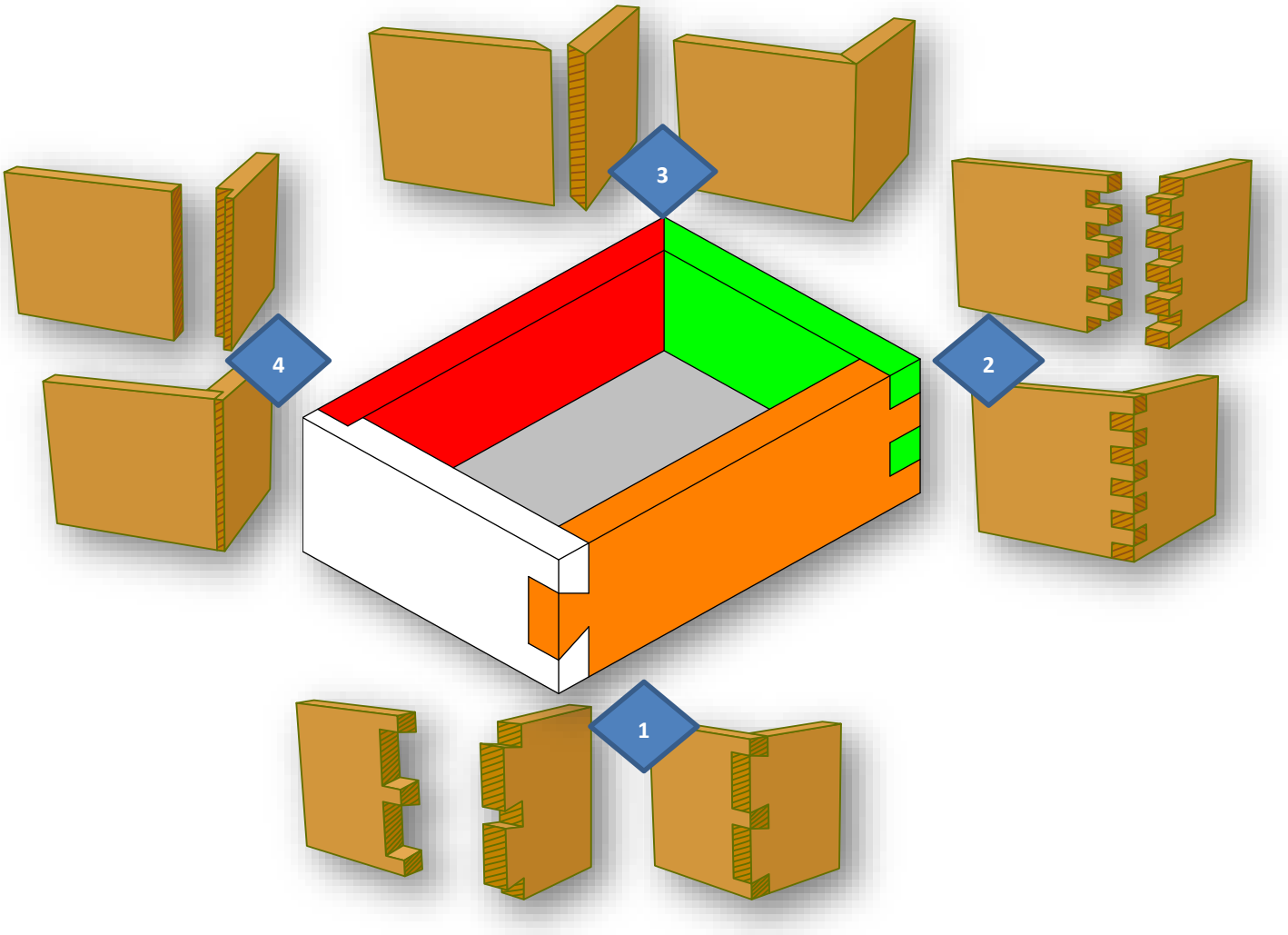
The aim of this project is to enhance your accuracy and skills in a range of workshop tools and equipment. To enable you to identify a range of equipment, describing their uses in preparation for the examination. It also expands the range of knowledge on wood construction techniques and processes in preparation for designing within your controlled assessment design task.

Learning outcomes

On completion of this unit you should:

1. Be able to identify, describe and use safely a range of hand tools with accuracy
2. Be able to identify, describe and use safely a range of machine tools with accuracy
3. Know how to answer confidently the first two examination questions regarding workshops tools and a safe working environment.
4. Be confident in identifying a range of Box and Frame construction joints.
5. Be confident in constructing, independently, a range of wood construction joints.
6. Have an understanding of the marking criteria for the manufacturing section of your controlled assessment.
7. Understand that quality manufacturing marks are based on quality manufacturing techniques and you should know how to apply these with relation to working with wood.

Box Construction Joints



Use 'Focus on Wood Joints' on the network to research the name of the joints we are going to use in our box:

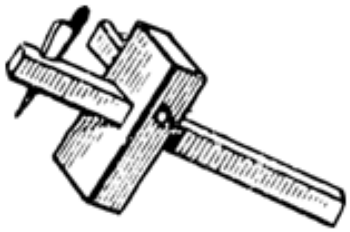
1. ……

2. ……

3. ……

4. ……

Tools 1 – Examination Questions

	Name:	
	Process:	
	Name:	
	Process:	
	Name:	
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	Process:	

….. / 12 Feedback:……

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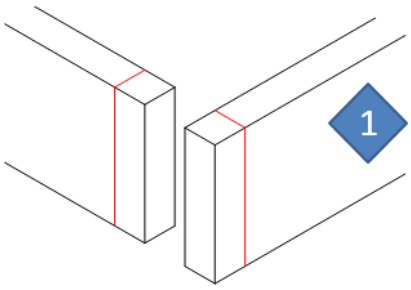
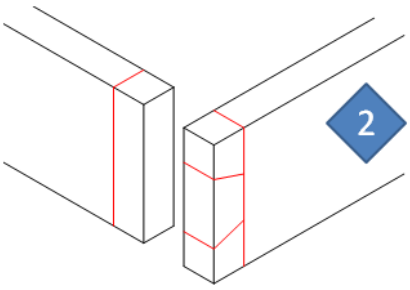
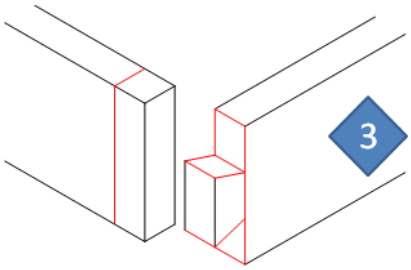
Through Dovetail Joint



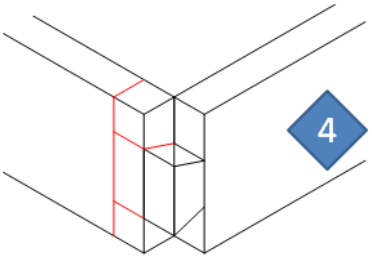
Mark a line perpendicular to the edge using a Try Square, 17mm from the end.



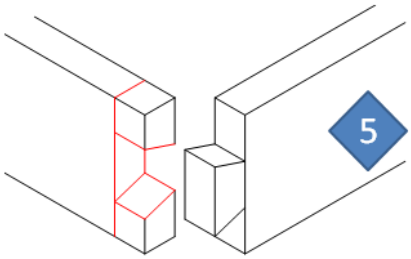
Mark out the Dovetail using a Dovetail Template. The size of the dovetail is your choice, but must be over ½ the width of the timber.



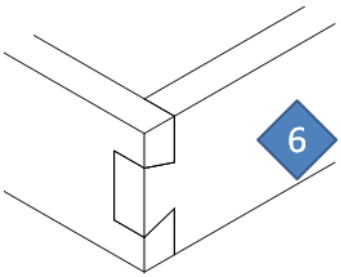
Use a Tenon Saw to cut the dovetail roughly, keeping outside your line. Pair back with a Bevelled Edged Chisel to the line.



Use the completed dovetail to mark out the Through Housing. You need a sharp pencil for this.



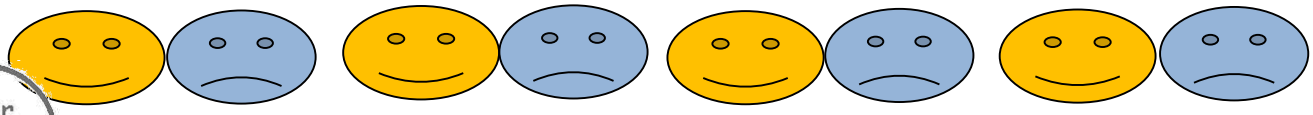
Use a Tenon Saw to cut the sides of the housing. Then carefully cut the housing out using a Coping Saw. Be careful not to cut into the sides. Then pair back to your line using a Bevelled Edged Chisel.



Clean out the joint before carefully putting together, ready for final assembly.

Through Dovetail Joint

Insert Photo of Your Dovetail Joint	***Teacher Feedback / Next Step:***



Peer assessed

Measuring **Cutting** **Chiselling** **Fit / Tolerance**

Tools 2 – Examination Questions

	Name:	
	Process:	
	Name:	
	Process:	
	Name:	
	Process:	
	Name:	
	Process:	
	Name:	
	Process:	

….. / 10 Feedback:……

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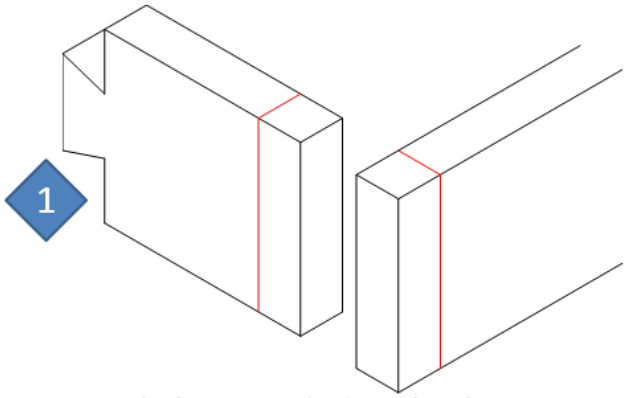
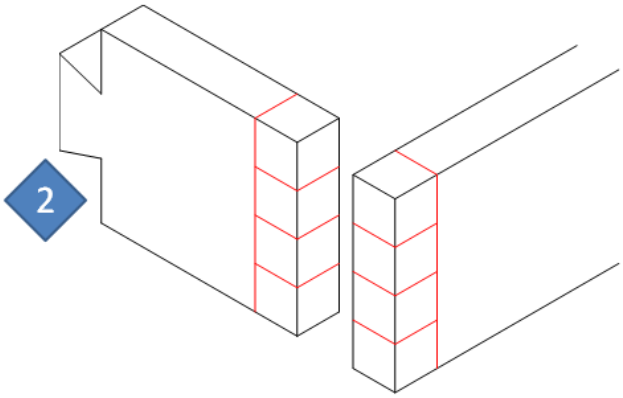
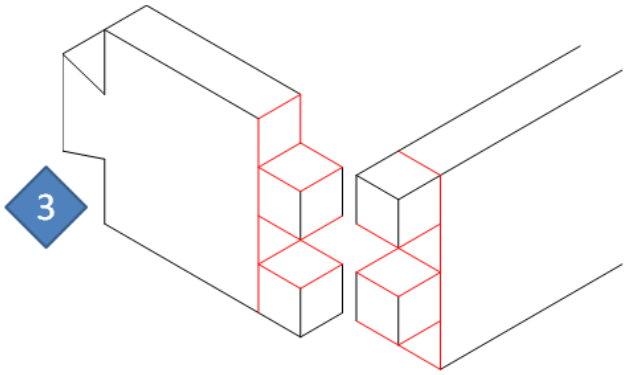
Comb Joint - *Independent*

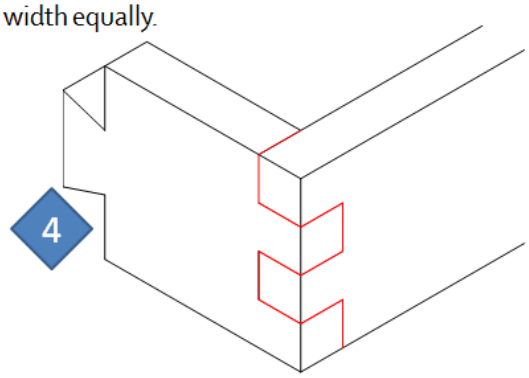


Mark a line perpendicular to the edge using a Try Square, 17mm from the end.



Using a Marking Gauge, divide then end into equal sections. You may need a calculator to help you divide the width equally.

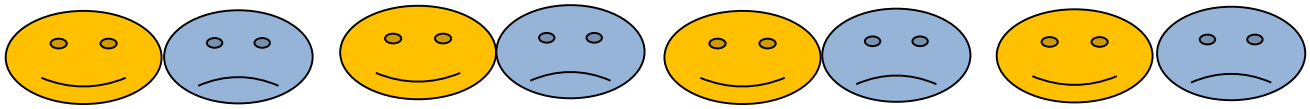




Work out the rest for yourself! Try to be independent!

Comb Joint

Insert Photo of Your Comb Joint	***Mini Self Evaluation of what I need to do to improve the quality of my practical work:***

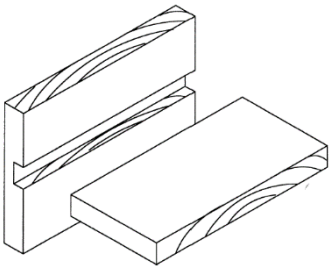


Measuring **Cutting / Chiselling** **Independence** **Fit / Tolerance**

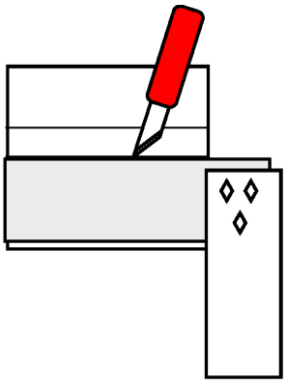
Hazardous Symbols

Symbol	Hazard	Description
		
		
		
		
		
		
		

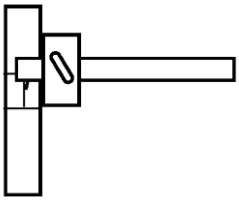
Housing Joint & Lap Joint



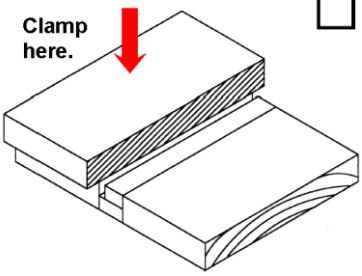
1. Using a try-square and marking knife or pencil, mark out the position of the housing. The lines should be the same distance apart as the thickness of the wood going into the joint.



2. Using a marking gauge scratch the line that shows the



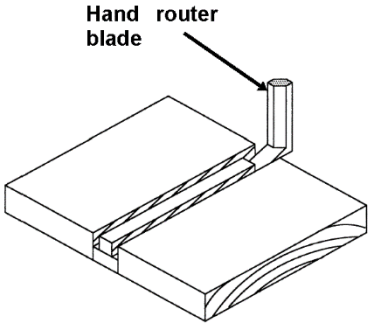
bottom of the housing groove on both edges.

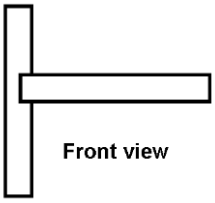


3. Clamp a piece of straight edged waste wood in line with one of the groove lines and using the waste wood as guide, saw down to the bottom of the housing groove. Repeat for the other line.

4. Edge clamp the wood and use a hand router to cut away the center section.

Note: For a clean finish only try and cut up to 1mm at a time. Lower the blade 1mm between each pass.





5. The joint should now fit together.

Once glued together as a complete box we will cut the outside edge of the box off to create a Lap Joint.

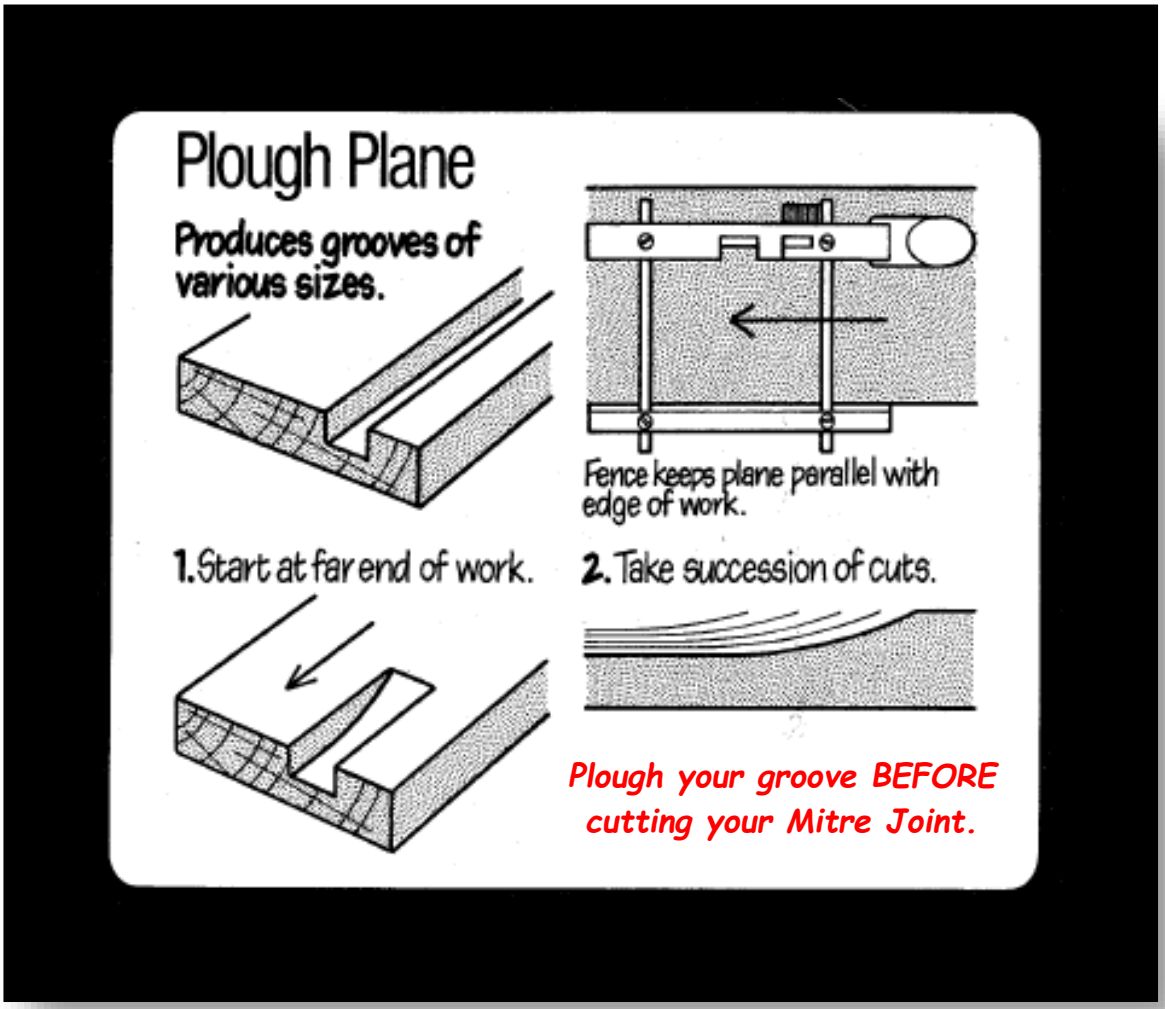
Softwoods	Hardwoods	Man-made Boards
Describe:	Describe:	Describe:
Name:	Name:	Name:
Name:	Name:	Name:

PPE – Personal Protective Equipment

	Name	Example use
		
		
		
		
		
		

Teacher Feedback on progress so far:

Plough Groove for Base, Mitre Joint

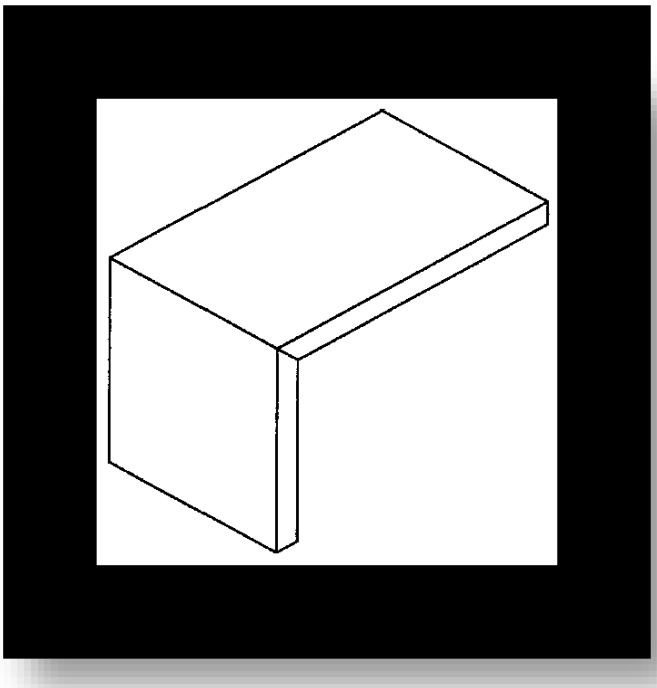


Mitre Joint

This joint although weak, has the advantage of not showing any end grain, it looks neat and clean.

Important Things to Remember for marking out final joint:

-
-
-



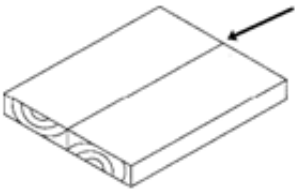
Joint Types

FABRICATION - WOOD JOINTS

The word **fabricate** means to join together.

Most wooden products are held together with adhesive. Adhesive works very well when the edge of a piece of wood is being glued to the edge of another piece of wood (side-grain to side-grain). A solid wood table top is made this way.

Rubbed joint

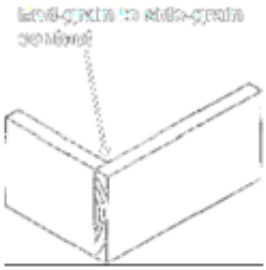


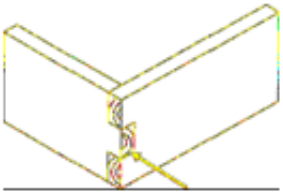
Adhesive is put between the two edges. They are then rubbed together to spread the adhesive evenly. The boards are lined up and held together with sash cramps

If, however, you are making a framework or box and need to join end-grain to side-grain, adhesive on its own will be too weak. By cutting joints, side-grain surfaces on one piece of wood can be made to come in contact with side-grain surfaces on the other piece of wood. The side-grain to side-grain contact means that the adhesive will now be stronger.

Butt joint

This is a very weak joint unless it is strengthened with pins or screws

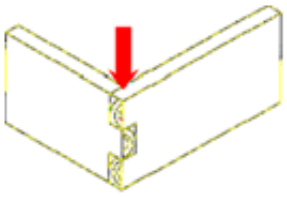




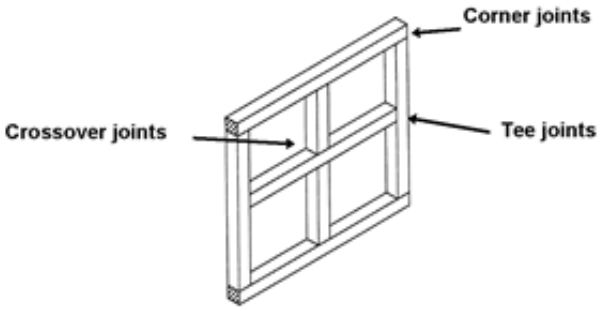
Comb or Finger joint

Side-grain to side-grain contact for extra strength

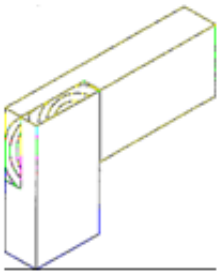
The joint is also mechanically stronger. Any force in the direction of the arrow will not push the joint apart even if there is no adhesive holding it together.



Framework joints



Corner joints

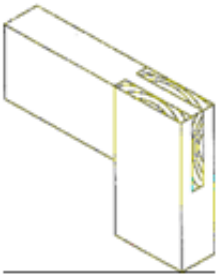


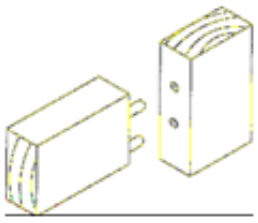
Corner Halving

Used for lightweight frames and frames that are to be covered by boarding e.g. a door. The joint is quick and easy to cut

Corner Bridle

Used for heavier, stronger frames because it has a large area of contact and cannot be twisted apart unlike the halving joint. The joint is quite difficult to cut





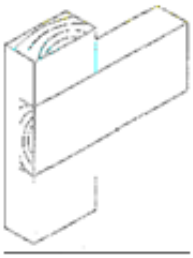
Dowel

Used for lightweight frames. The holes are difficult to line up unless a doweling jig is used.

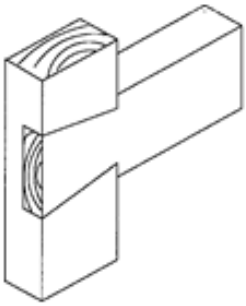
Tee joints

Tee Halving

Used for lightweight frames, especially those to be covered with boarding. The joint is quick and easy to cut.



Joint Types

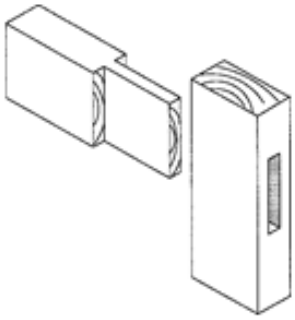


Dovetail Halving

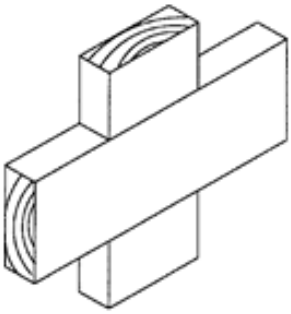
A stronger version of the Tee Halving. Used for medium weight frameworks.

Mortise and Tenon

A strong joint that is quite difficult to cut and fit by hand. Used for heavier frameworks and uncovered frameworks.



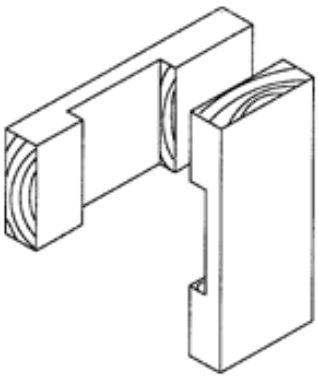
Crossover joints



In some frameworks pieces of wood have to cross one another

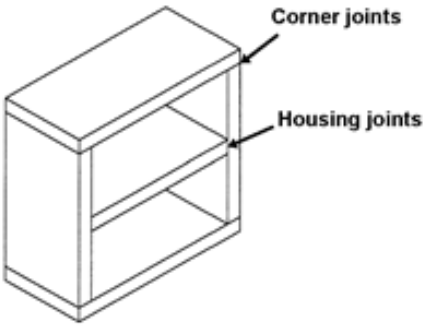
Cross Halving

This joint is quite strong and resists twisting. This is the only crossover joint that is flush (flat) on both sides.



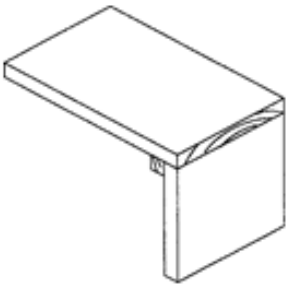
Box joints

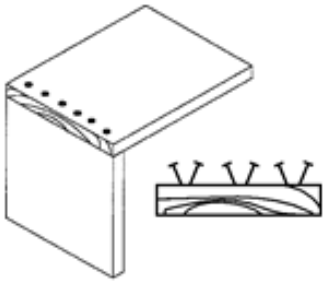
Used for general furniture construction.



Butt joint

A weak joint on its own. The example shown has a reinforcing wooden strip glued to the inside. A quick and easy joint to make. This joint can also be used with manufactured board.

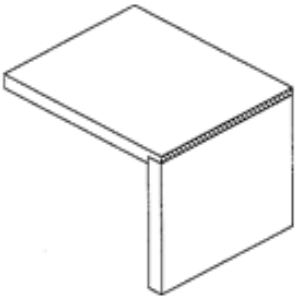




Another way of reinforcing the joint is to use pins. For greatest strength the pins are best used in pairs and angled towards each other. This is known as dovetail pinning.

Lap joint

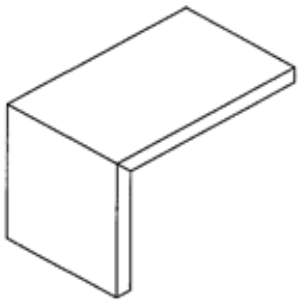
Although stronger than a butt joint, the lap joint is best when reinforced with dovetail pinning or screws.

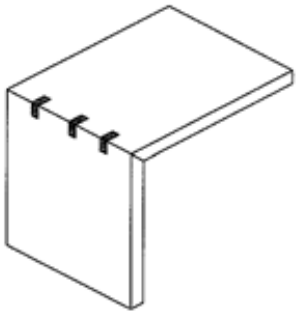


Joint Types

Mitre joint

This joint although weak, has the advantage of not showing any end grain, it looks neat and clean.

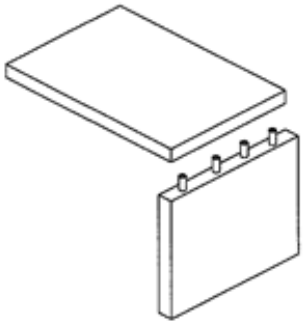




To reinforce the joint, grooves can be cut into the corner and and then triangular pieces of thin wood are glued into the grooves.

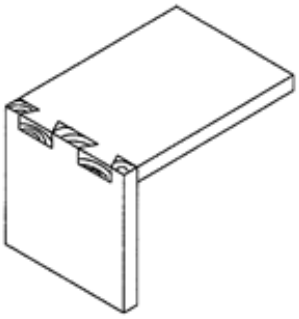
Dowel joint

This looks like a butt joint but is a lot stronger. It is difficult to line up the holes without using a dowelling jig. This joint can also be used with manufactured board.



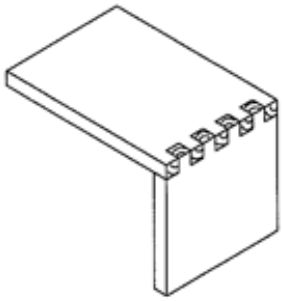
Dovetail joint

A very strong joint. Used for drawers where the front is pulled every time the drawer is used. It is difficult to mark out and cut. This joint is also used as a design feature.

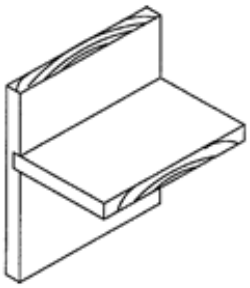


Comb or Finger joint

A strong joint (a lot of side-grain to side-grain contact). The joint can be considered as a design feature because if it is well fitted it adds to the good looks of the furniture.



Housing joints

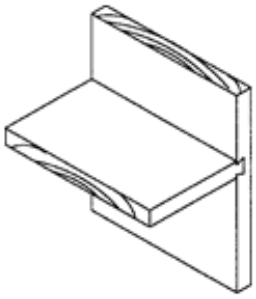


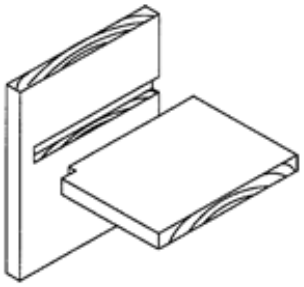
Through Housing

Used for fitting shelves into cabinets or units and partitions in boxes.

Dovetail Housing

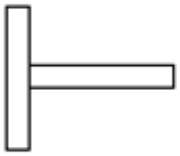
A stronger form of a through housing. The groove is best cut with an electric router.





Stopped Housing

Can be either a plain or dovetail housing. It has the advantage of not showing the joint at the front



Homework Questions:

1. In what way should wood be glued together to get maximum strength?
2. In what ways is a cut joint stronger than a butt joint?
3. Name and sketch **two** joints suitable for the corner of a framework.
4. Name and sketch **two** joints suitable for tee sections of a framework.
5. Show how a weak butt joint can be reinforced.
6. Show how a mitre joint can be reinforced.
7. What is the main problem to overcome when making a dowel joint?
8. Name and sketch a joint that is suitable for joining a drawer front to its sides.
9. How can you join two lengths of wood that cross over each other?
10. Name and sketch a joint suitable for holding a shelf In place.

A Select a piece of furniture at home or in the classroom, sketch it and then draw the joints that you think have been used for the fabrication.

Joint Types – Homework Answers

Joint Types – Homework Answers

Joint Types – Homework Answers

Homework Teacher Feedback and Next Steps:

Orthographic CAD Printout

Please print out and Engineering 3rd angle Orthographic Projection of your Box from Solidworks CAD

Peer assessed

How accurate is the CAD drawing:

Could you make the item from the information given? *If Yes, how easily?* *If No, what is missing?*

Mark:

/ 10

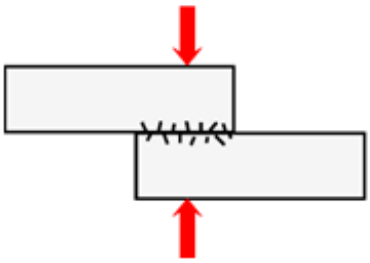
Adhesives

WOOD ADHESIVES

The use of adhesives is a form of **permanent** joining.

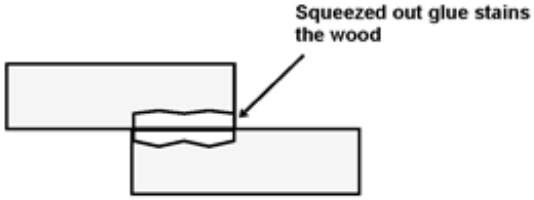
Most wood adhesives are made up of solid particles of glue being dissolved in a solvent (water or spirit). The solvent needs to evaporate (dry) before the adhesive works. The time this takes is called the **setting time** and the joint should not be handled until this time is up.

Strong joints rely upon the adhesive soaking into the wood before setting. It is therefore very important that the surfaces to be glued are freshly cleaned with glass paper to remove any dirt or oily residue left by touching the surface with your fingers. Any dirt or residue stops the adhesive from soaking in.



The glue soaks into the pores of the wood and then sets like lots of little fingers grabbing onto the wood on both sides. Using a **cramp** to hold the two halves of a joint together firmly helps to force glue into the pores of the wood. Cramping also holds the joint still while the glue is setting.

When the joint is cramped excess glue should squeeze out of the joint. If it doesn't, not enough glue has been used. The excess glue should be wiped away with a damp cloth quickly, before it sets.



The squeezed out glue stains the wood white and the stain will show under any clear varnish that might be put on later.

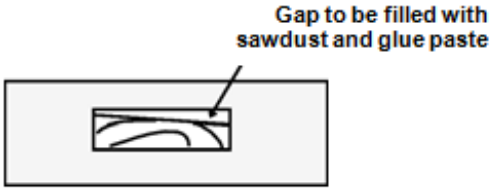
Tip: Varnish the wood before you glue the parts together, the glue will not stain varnished wood.

Warning: Do not varnish the joint contact surfaces because the varnish will stop the glue soaking into the wood and result in a very weak joint.

KEY WORDS **Adhesive: Cramp: Setting time: Toxic:**

Gap filling

Most wood glues do not fill gaps well because they soak into the wood. If a joint is badly cut and leaves a gap, glue the joint in the normal way and let it set. Now saw some waste wood of the same type and colour and collect the sawdust. Mix the sawdust with new glue to create a paste. The paste can now be forced into the gap so that it fills it completely and is sticking out a little. When the paste has set it can be sanded down flush with the wood surface.



Contact glue

This is useful for joints where no sliding together is required e.g. lap joints. The glue is applied to both surfaces and they must be left apart for at least ten minutes (until the glue looks dry) to allow the spirit to evaporate. The joints can then be lined up and pushed together.

ADHESIVE	SETTING TIME	COMMENTS
PVA (polyvinyl acetate)	1 hour	Non-toxic, white, water-based glue for general use. Normally water resistant when set.
Synthetic Resin (Cascamite)	2 - 6 hours	Non-toxic, white, water-based glue. Used when extra strength is important. Waterproof when set.
Contact Adhesive (Evostick)	instant	Highly toxic, brown, spirit based, waterproof glue. Used on non porous surfaces. Must be used in a well ventilated area. DO NOT sniff the glue.
Glue sticks	15 seconds	Non-toxic plastic. Not very strong. Only useful for spot gluing. Excess glue difficult to clear away.

1. What type of jointing are adhesives used for?
2. Explain the term 'setting time'.
3. How is an adhesive made up?
4. How does a water-based adhesive work on wood?
5. What preparations should be made before using an adhesive?
6. What is the purpose of cramping a joint together?
7. How can you avoid a glue stain showing through a clear varnish finish?
8. How can you use glue to fill a gap in a badly cut joint?
9. Which adhesive would you choose for holding together a garden seat and why would you choose it?
10. What precaution should you take when using contact adhesive?

Adhesives – Homework Answers

Homework Teacher Feedback and Next Steps:

Joint Construction – Making Assessment
Peer & Self Assessment

A* 30-32 **A** 26-29	• Final outcome(s) shows a high level of making/modelling/finishing skills and accuracy • Selected and used appropriate tools, materials and/or technologies including, where appropriate, CAM correctly, skilfully and safely • Worked independently to produce a rigorous and demanding outcome • Quality controls are evident throughout the project and it is clear how accuracy has been achieved. • The outcome has the potential to be commercially viable and is suitable for the target market
B 23-25 **C** 19-22	• Final outcome shows very good level of making/modelling/finishing skills • Selected and used appropriate tools, materials and/or technologies including, where appropriate, CAM correctly and safely • Outcome demonstrates a high level of demand • Quality control checks applied in the manufacture of the product • The outcome is suitable for the target market and could be commercially viable with further development
D 16-18 **E** 12-15	• Final outcome shows good level of making/modelling/finishing skills • Used appropriate materials, components, equipment and processes correctly and safely (including CAM) • Parts of outcome show high levels of demand • Applied quality control checks broadly but superficially • The outcome requires further development in order to be suitable for the target market
F 9-11 **G** 6-8	• Final outcome is largely complete and represents a basic level of making/modelling/finishing skills • Used materials, components and equipment correctly and safely (including CAM if appropriate) • Some aspects of outcome are demanding • Some evidence of limited quality control applied throughout the process • The outcome has some weaknesses which limit its suitability for the target market
U 0-5	• Final outcome is incomplete or represents an undemanding level of making/modelling/finishing skills • Used materials, components and equipment safely under close supervision • Worked with some assistance to produce outcome of limited demand • There is limited evidence of any quality control and levels of accuracy are minimal • The outcome has significant weaknesses which limit its suitability for the target market

Peer assessed

Peer Reflection Comment – Making:

Grade:

Joint Construction – Making Assessment
Peer & Self Assessment

- My final product shows a high level of skill and accuracy ☐
- I selected and used appropriate
  - tools ☐
  - materials ☐
  - technologies (ie CAM) ☐
- I worked correctly, skilfully and safely ☐
- I worked <u>independently</u> ☐
- Quality controls are evident throughout the project and it is clear how accuracy has been achieved. ☐
- My product has the potential to be commercially viable ☐
- My product is suitable for the target market ☐

- My final product shows a very good level of skill ☐
- I selected and used appropriate
  - tools ☐
  - materials ☐
  - technologies (ie CAM) ☐
- I worked correctly, and safely ☐
- I primarily work under my own initiative ☐
- I applied quality control checks in the manufacturing my product ☐
- My product could be commercially viable with further development ☐
- My product is suitable for the target market ☐

- My final product shows a good level of skill ☐
- I selected and used appropriate
  - tools ☐
  - materials ☐
  - technologies (ie CAM) ☐
- I worked correctly and safely ☐
- I worked with a little assistance ☐
- I applied quality control checks but not in detail ☐
- My product requires further development to be suitable for the target market ☐

- My final product is mostly complete and shows basic skill ☐
- I selected and used appropriate
  - tools ☐
  - materials ☐
  - technologies (ie CAM) ☐
- I worked correctly and safely ☐
- My making was simple to do ☐
- I have limited quality control in my making ☐
- My product has some weaknesses which limit its suitability for the target market ☐

- My final product is incomplete **OR** ☐
- My product required an undemanding level of skill ☐
- I used materials, components and equipment safely under close supervision ☐
- I worked with assistance to produce a simple outcome ☐
- I have little evidence of any quality control ☐
- Levels of accuracy are minimal ☐
- My product has significant weaknesses which limit its suitability for the target market ☐

Self-Reflection Comment – Making:	Grade:

Final Feedback

Things that went well:

- ……
- ……
- ……

Things that could be improved:

- ……

Photos of Final Box:

Final Project Grade & Next Step:

Re-write a section: