



**Cambridge International Examinations**  
Cambridge International General Certificate of Secondary Education

CANDIDATE  
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**DESIGN AND TECHNOLOGY**

**0445/31**

Paper 3 Resistant Materials

**May/June 2016**

**1 hour**

Candidates answer on the Question Paper.

No Additional Materials are required.

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, glue or correction fluid.

**DO NOT WRITE IN ANY BARCODES.**

**Section A**

Answer **all** questions in this section.

**Section B**

Answer **one** question in this section.

You may use a calculator.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [ ] at the end of each question or part question.

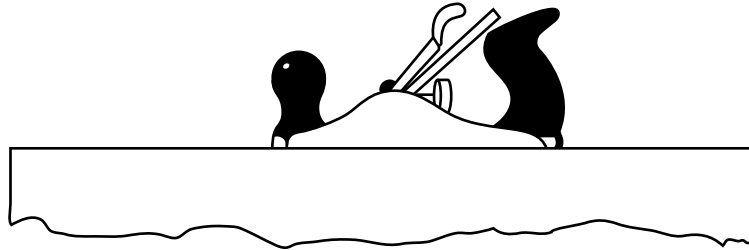
The total of the marks for this paper is 50.

This document consists of **16** printed pages.

**Section A**

Answer **all** questions in this section.

1 Fig. 1 shows the edge of a piece of wood being planed.



**Fig. 1**

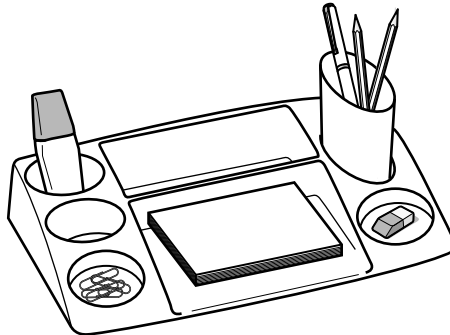
(a) Name the type of plane in Fig. 1.

.....[1]

(b) Draw on the wood in Fig. 1 to show the correct grain direction.

[1]

2 Fig. 2 shows a desk tidy made from a plastic.



**Fig. 2**

Give **three** specification points for the desk tidy.

1 .....

2 .....

3 .....[3]

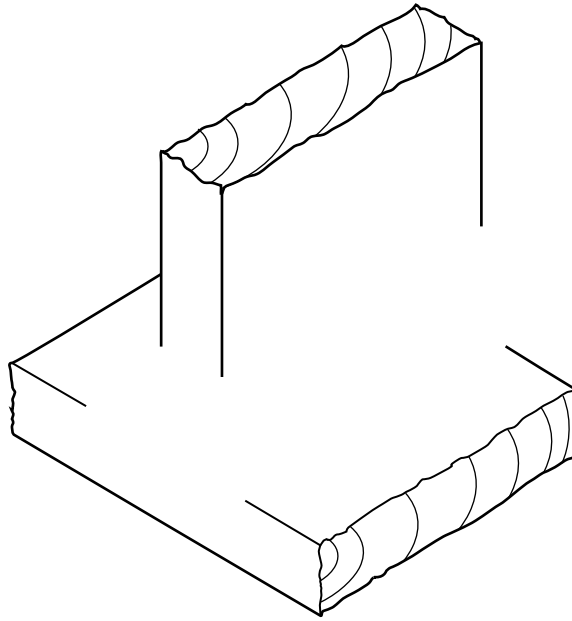
3 Complete the statement by adding the correct material from the list below.

‘Hardening and tempering is a process that is carried out on

.....’

**thermosetting plastic    manufactured board    carbon steel    composite material** [1]

4 Complete the drawing below to show a through housing joint.



[3]

5 Fig. 3 shows a container used in a fast food outlet.

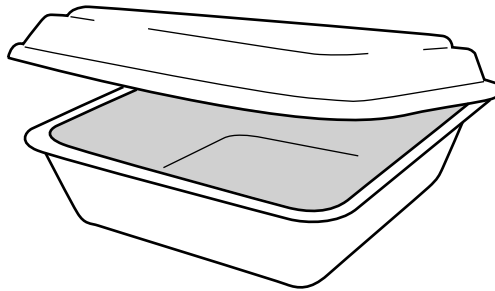


Fig. 3

(a) Name a suitable plastic that could be used to make the container.

.....[1]

(b) (i) Give **one** advantage of using a plastic for this type of container.

.....

(ii) Give **one** disadvantage of using a plastic for this type of container.

.....[2]

6 Fig. 4 shows a chisel.



Fig. 4

(a) Name the type of chisel shown in Fig. 4.

.....[1]

(b) Describe **two** features of the chisel shown in Fig. 4 that makes it suitable for its purpose.

1 .....

2 .....[2]

7 Fig. 5 shows a remote control.

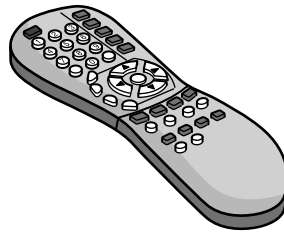


Fig. 5

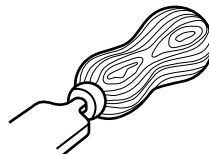
Give **three** ergonomic features in the design of the remote control.

1 .....

2 .....

3 .....[3]

8 Complete the drawing below to show a flat file.



[2]

- 9 Fig. 6 shows a chair made from wood.

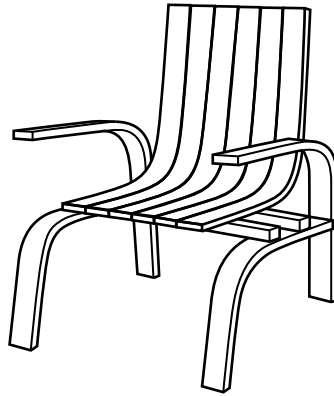


Fig. 6

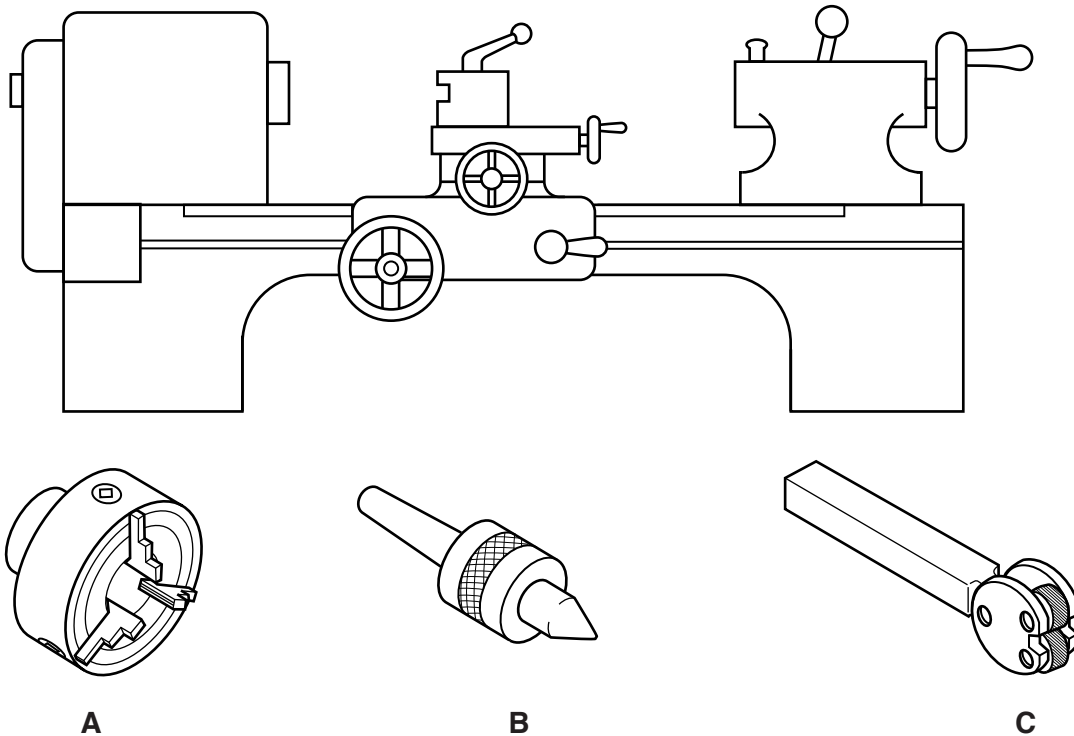
- (a) Name the process by which the parts of the chair are shaped.

.....[1]

- (b) Give **one** benefit of this type of process when making the chair.

.....[1]

- 10 Show clearly on the drawing of the centre lathe below where each of the parts labelled **A**, **B** and **C** would be fitted.

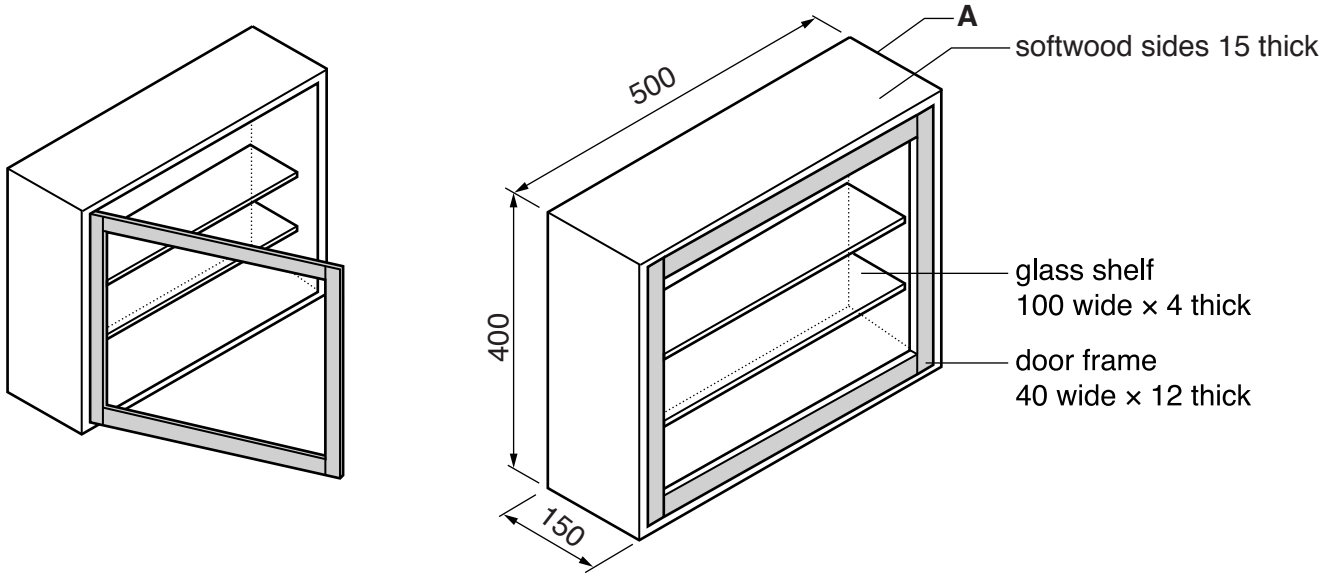


[3]

**Section B**

Answer **one** question in this section.

**11** Fig. 7 shows views of an incomplete design for a wall-mounted cabinet.



**Fig. 7**

**(a) (i)** Name a suitable softwood for the sides of the cabinet.

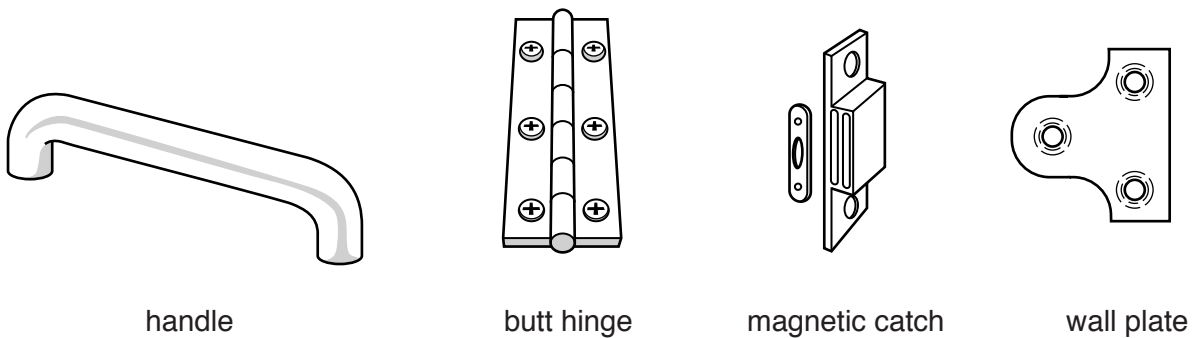
.....[1]

**(ii)** Name a manufactured board for the back of the cabinet and suggest a suitable standard thickness.

Manufactured board .....[1]

Suitable thickness .....[1]

**(b)** Fig. 8 shows four pre-manufactured components that could be used in the construction of the cabinet.



**Fig. 8**

(i) Give **two** benefits of using pre-manufactured fittings when constructing the cabinet.

1 .....

2 ..... [2]

(ii) Describe where each of the pre-manufactured components could be used in the cabinet and how they would be fitted.

Handle .....

.....

..... [2]

Butt hinge .....

.....

..... [2]

Magnetic catch .....

.....

..... [2]

Wall plate .....

.....

..... [2]

(c) Sketch and name a permanent joint that could be used at corner **A** in Fig. 7.

- (d) Use sketches and notes to show how **one** of the glass shelves could be supported at **three** different positions inside the cabinet.

[3]

- (e) Fig. 9 shows details of one corner of the door frame.

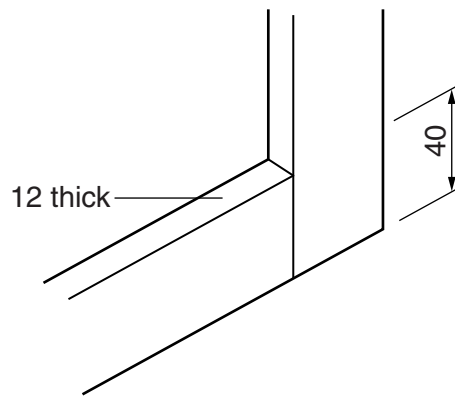


Fig. 9

- (i) Name a suitable corner joint for the door frame.

.....[1]

- (ii) Use sketches and notes to show how a 4 thick glass panel could be fitted to the door frame.

[3]

- (f) Many cabinets have solid doors.  
Give **one** advantage of a framed door with a glass panel rather than a solid door.

.....[1]



12 Fig. 10 shows details of a table football game.

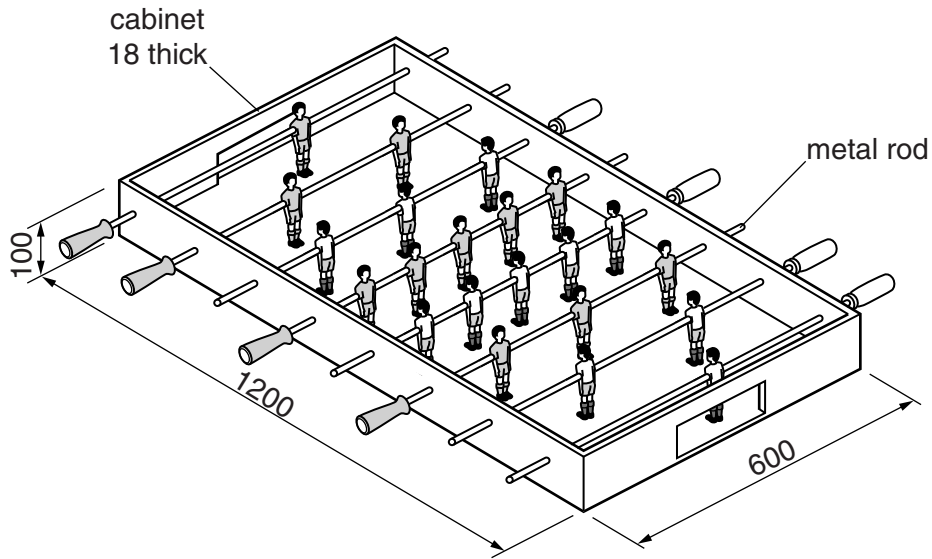


Fig. 10

- (a) (i) The metal rods could be made from  $\text{Ø}10$  mild steel **or** aluminium. Choose **either** mild steel **or** aluminium and give a reason for your choice.

Chosen metal .....

Reason .....[1]

- (ii) When pulled and pushed, the rods cause the holes in the side of the cabinet to become worn and enlarged. Use sketches and notes to show how this problem could be overcome. Name any materials used.

[3]

- (b) (i) Fig. 11 shows a metal rod that will be attached to a wooden handle by means of an epoxy resin adhesive.

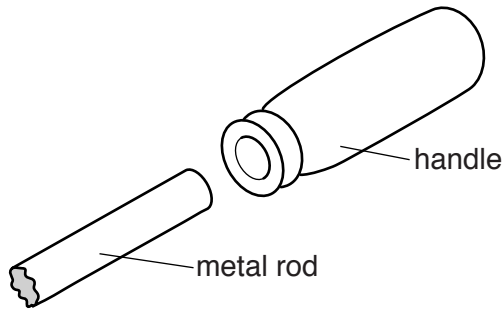


Fig. 11

Describe how an epoxy resin adhesive would be prepared and applied.

.....  
.....  
.....[2]

- (ii) The handles could be produced using a smart material such as polymorph. Describe how polymorph could be used to produce the handles.

.....  
.....  
.....[3]

- (c) (i) Fig. 12 shows one of the players and the metal rod to which it is attached. The players are made from injection moulded plastic. Add sketches and notes to Fig. 12 to show how the player could be fixed to the metal rod without the use of adhesive.

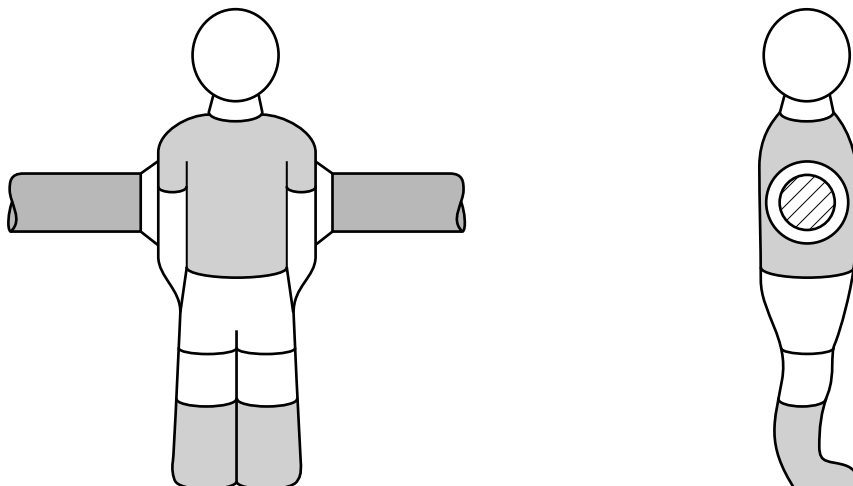


Fig. 12

[3]

- (ii) Fig. 13 shows a cross-sectional view of an injection moulding machine. Complete the table to give the stages in the injection moulding process.

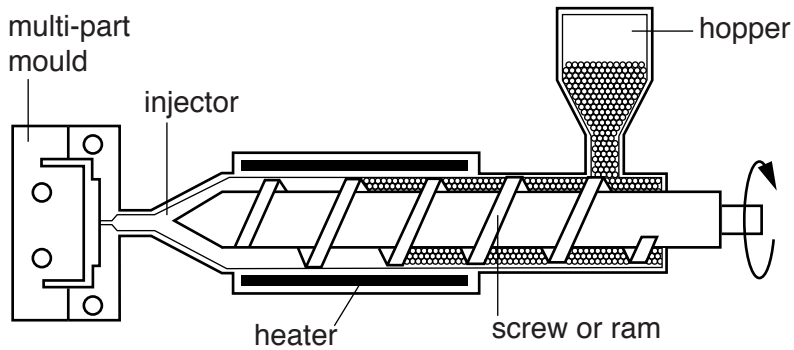


Fig. 13

| Stage | Process                                      |
|-------|--|
| 1     |  |
| 2     |  |
| 3     |  |
| 4     |  |
| 5     | The mould is cooled and the moulding ejected |

[4]

- (iii) Explain why the injection moulding process is only suitable when manufacturing in large quantities.

.....  
 .....  
 .....[2]

- (d) The players could be made from aluminium. Name a process that could be carried out in a school workshop to produce the players using aluminium.

.....[1]

- (e) Use sketches and notes to design a scoring system that could be used during a game of table football.

The scoring system must:

- be fixed to the cabinet;
- record a maximum of five goals scored at each end.

Include details of materials and fittings used.

[6]

- 13 Fig. 14 shows a hardwood shelf supported by two end brackets. The brackets could be made from acrylic or aluminium.

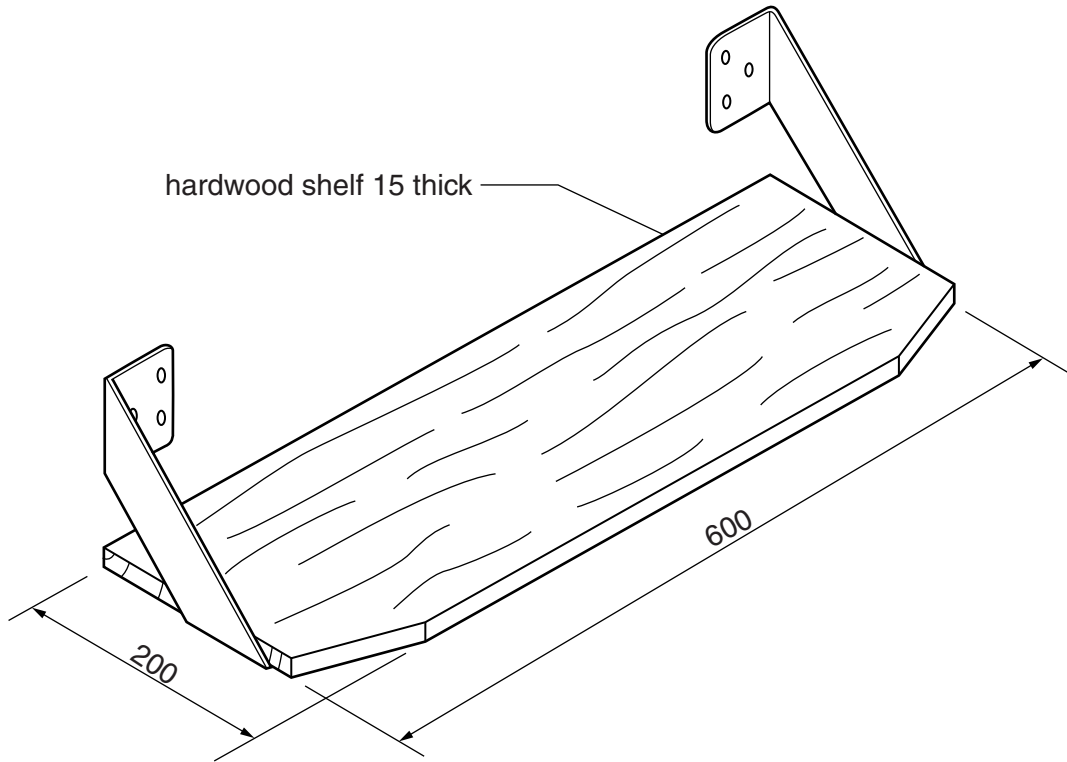
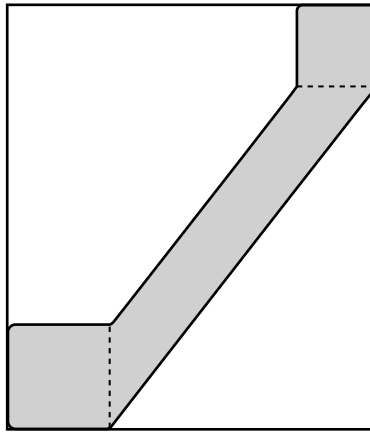


Fig. 14

- (a) (i) Give **two** benefits of using a template to mark out the shape of a bracket.
- 1 .....
- 2 ..... [2]
- (ii) Explain why a template would need to be made from wood or metal rather than card or paper when marking out large quantities of brackets.
- .....
- .....
- ..... [2]
- (b) (i) Acrylic and aluminium are materials that can be self-finished. Explain what is meant by the term 'self-finished'.
- .....
- .....
- ..... [2]

- (ii) Fig. 15 shows the shape of one bracket marked out on sheet material.



**Fig. 15**

You may choose to make the bracket in **either** 4 thick acrylic **or** 1.5 thick aluminium. Use sketches and notes to show how **one** bracket could be cut out by hand and the edges made smooth in the material of your choice. Name all the tools and equipment used.

Chosen material .....

(c) Use sketches and notes to show how one of the bends could be produced when the bracket is made from:

(i) 4 thick acrylic;

[3]

(ii) 1.5 thick aluminium.

[3]

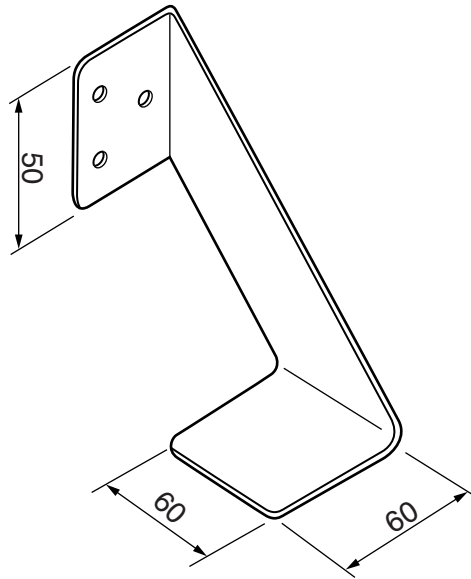
(d) Explain why round head screws rather than countersink head screws would be used to screw the brackets to the wall when the brackets are made from 1.5 thick aluminium.

.....  
.....  
.....[2]

(e) Explain why the hardwood shelf would **not** be glued permanently to the brackets.

.....  
.....  
.....[2]

(f) Fig. 16 shows details of the right hand bracket.



**Fig. 16**

Use sketches and notes to show how the shelf and bracket could be modified so that the shelf could be secured to the bracket **without** the use of fittings, fixings or adhesive.

[4]

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