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DESIGN & TECHNOLOGY

0445/32

Paper 3 Resistant Materials

October/November 2020

1 hour

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Section A: answer **all** questions.
- Section B: answer **one** question.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Answer in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

INFORMATION

- The total mark for this paper is 50.
- The number of marks for each question or part question is shown in brackets [].
- All dimensions are in millimetres.

This document has **24** pages. Blank pages are indicated.

Section A

Answer **all** questions in this section.

- 1 Fig. 1.1 shows parts of a fastening device.

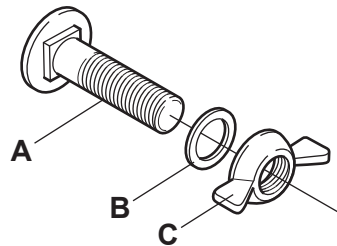


Fig. 1.1

Give the correct name to parts **A**, **B** and **C**.

A

B

C

[3]

- 2 Fig. 2.1 shows part of a jig used when bending metal.
The base and pegs are made from mild steel. The pegs will be brazed into the base.

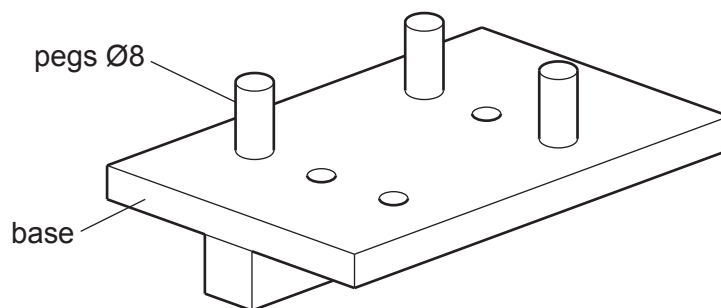


Fig. 2.1

Complete Table 2.1 by giving the missing stages required to braze the pegs into the base.

Table 2.1

Stage	Description of stage
1	Degrease and clean ends of pegs
2	
3	
4	
5	Allow to cool

[3]

3

- 3 Fig. 3.1 shows views of a mortise and tenon joint. Add sketches and notes to Fig. 3.1 to show how the joint could be strengthened.

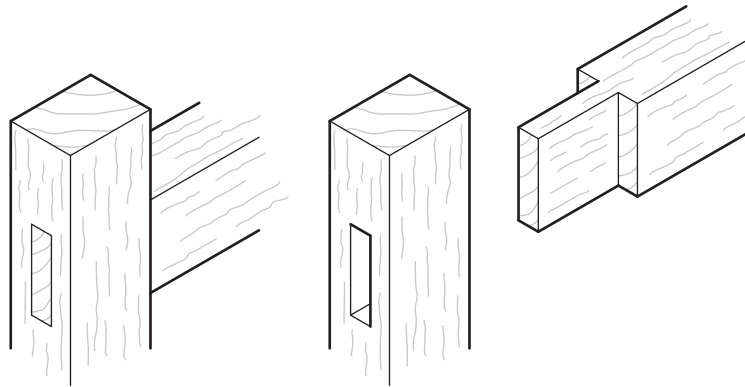


Fig. 3.1

[2]

- 4 Fig. 4.1 shows a wall-mounted bench used outdoors.

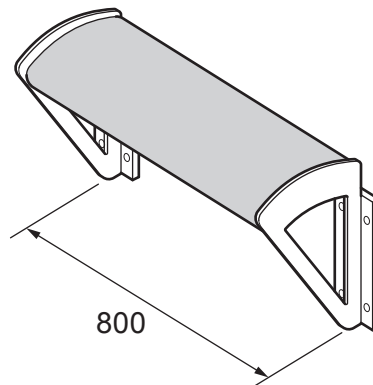


Fig. 4.1

Explain how anthropometric data would be used to decide the height at which the bench should be fixed to a wall.

.....

.....

..... [2]

5 (a) Explain what is meant by the term 'alloy'.

.....

.....

..... [2]

(b) Circle, from the list below, two alloys.

- stainless steel** **aluminium** **tin** **brass** **copper** [2]

6 Fig. 6.1 shows the back of a hardwood gate.

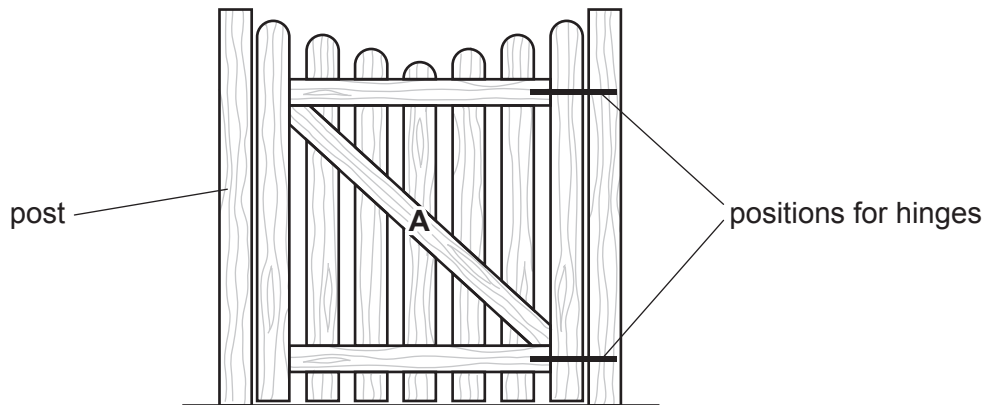


Fig. 6.1

(a) State the purpose of part A.

..... [1]

(b) Circle, from the list below, the most suitable hinge that could be used to support the gate against the post.

- flush** **backflap** **tee** **butt** [1]

7 Fig. 7.1 shows a notelet holder made from plastic.

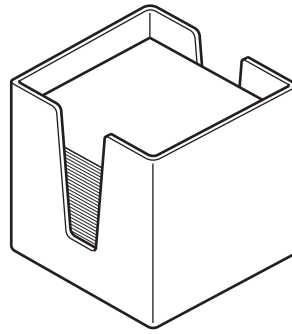


Fig. 7.1

Explain why the use of plastic to make products has an impact on the environment.

.....

.....

..... [2]

8 Fig. 8.1 shows views of an incomplete design for a photograph frame.

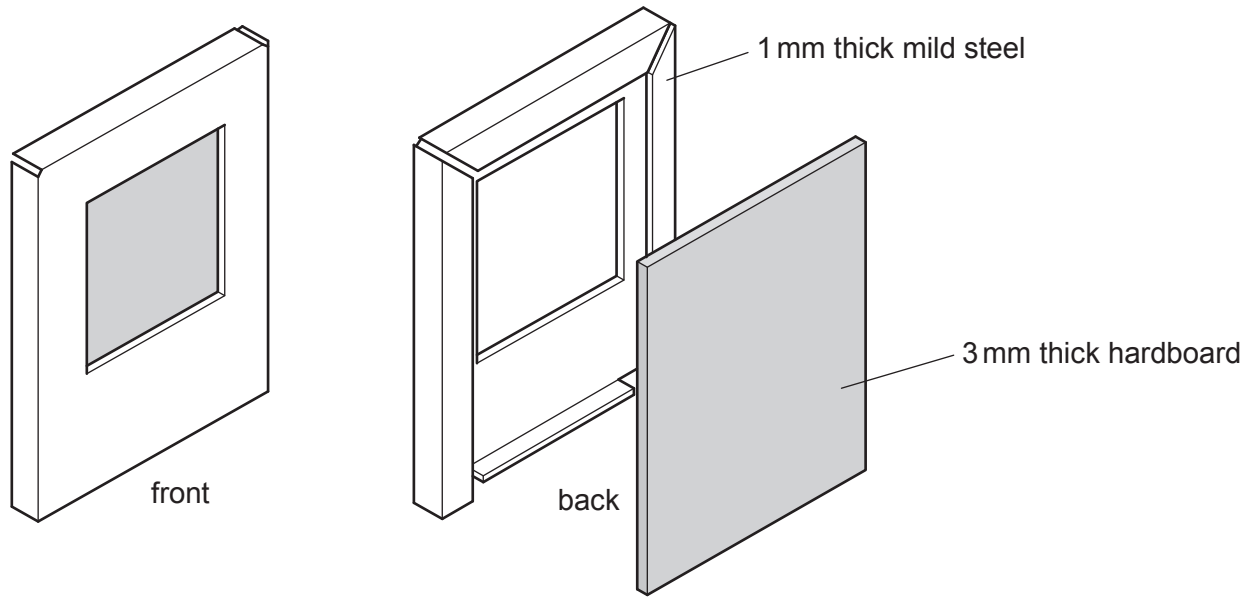


Fig. 8.1

Use sketches and notes to show how the photograph frame could be made freestanding.

[3]

9 Fig. 9.1 shows a mild steel rod that will be joined to a mild steel base by means of a screw thread.

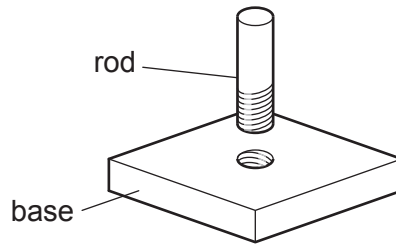


Fig. 9.1

Name the tool that would be used to cut the thread:

(a) on the rod

(b) in the hole in the base

[2]

10 Fig. 10.1 shows a hot melt glue gun.



Fig. 10.1

Give **one** advantage and **one** disadvantage of using a hot melt glue gun compared to PVA adhesive.

Advantage

Disadvantage

[2]

Section B

Answer **one** question in this section.

- 11 Fig. 11.1 shows a balance that will be used by young children. The balance will be made in a school workshop.

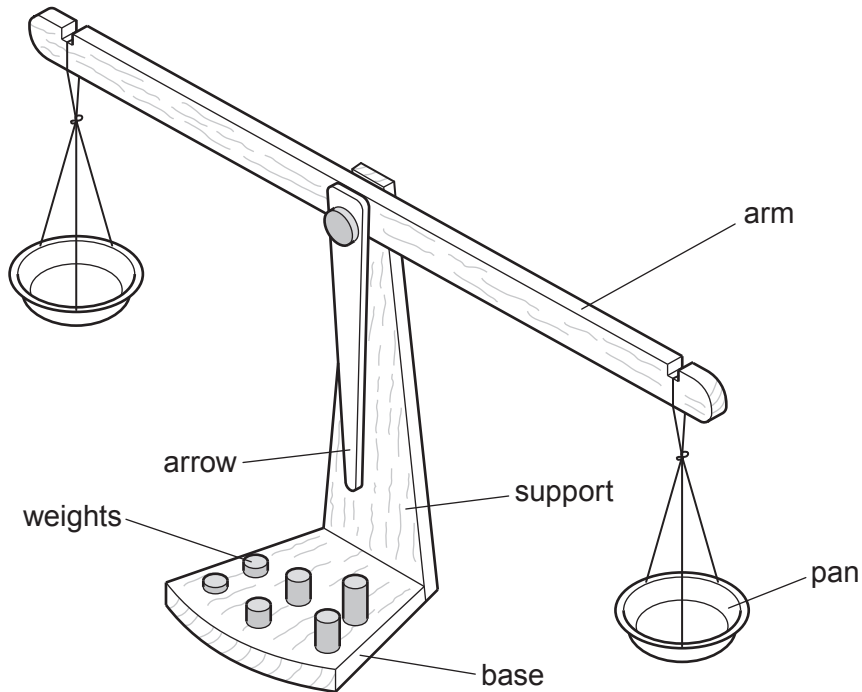


Fig. 11.1

- (a) Complete Table 11.1 by naming a specific material for each of the parts of the balance.

Table 11.1

Parts	Type of material	Specific material
Arm, support, base	Hardwood	
Arrow	Manufactured board	
Pans	Thermoplastic	
Weights	Non-ferrous metal	

[4]

9

(b) Fig. 11.2 shows the support that will be joined to the base.

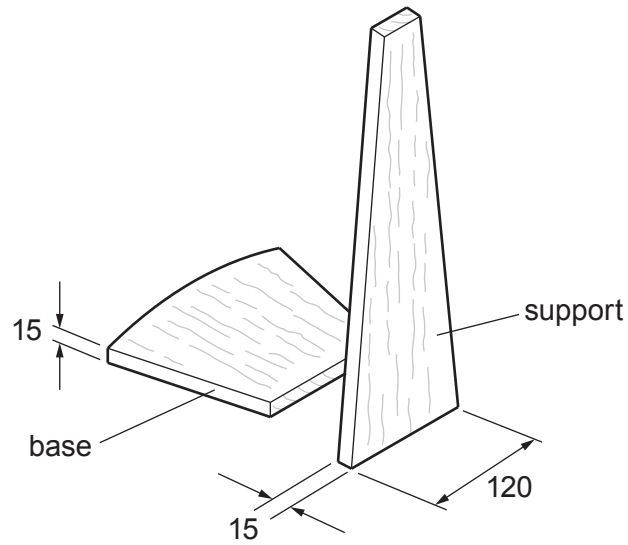


Fig. 11.2

Use sketches and notes to show how the support could be joined permanently to the base.

[3]

- (c) Fig. 11.3 shows details of one end of the arm. The ends of the arm are rounded and there are slots for the string holding the pans to hook over.

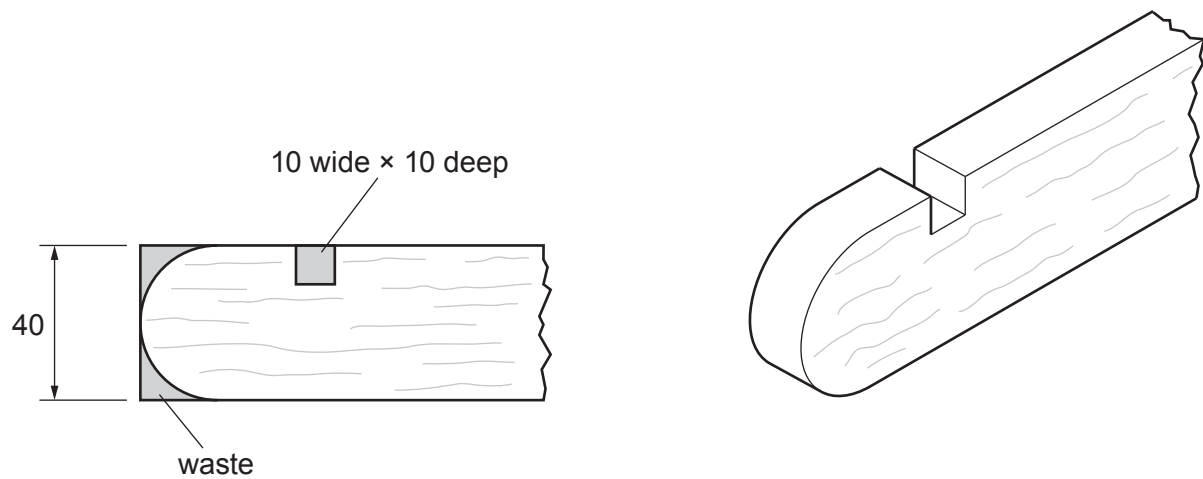


Fig. 11.3

Use sketches and notes to show how:

- (i) the slots could be cut out

[2]

- (ii) the waste wood could be removed and the ends rounded.

[2]

(d) (i) Fig. 11.4 shows a length of Ø25 non-ferrous metal rod from which the weights will be cut.

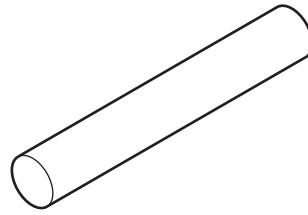


Fig. 11.4

Use sketches and notes to show how **one** weight, 40 mm long, could be marked out and cut to length using hand tools.
Name all the tools and equipment used.

[4]

(ii) Give **two** advantages of using non-ferrous metal for the weights rather than ferrous metal.

1

2

[2]

- (iii) The weights could also be cut to length on a centre lathe. Fig. 11.5 shows two centre lathe operations, **A** and **B**, that could be used to produce the weights.

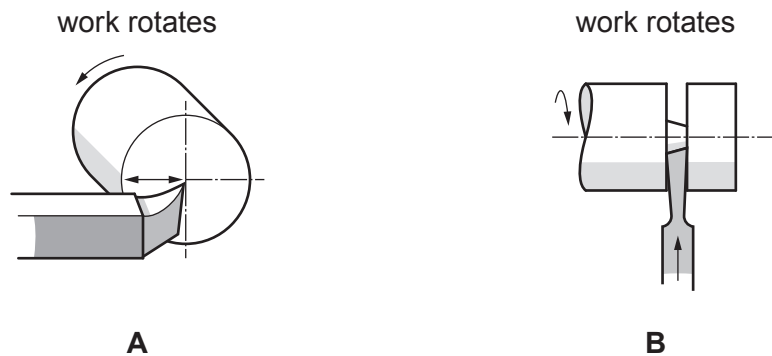


Fig. 11.5

Name the **two** centre lathe operations **A** and **B**.

A

B

[2]

- (iv) Use sketches and notes to show how the basic shape of the weights could be modified so that they could be picked up more easily by young children.

[2]

- (e) Fig. 11.6 shows the basic shape of a wooden former that will be used when vacuum forming the pans.

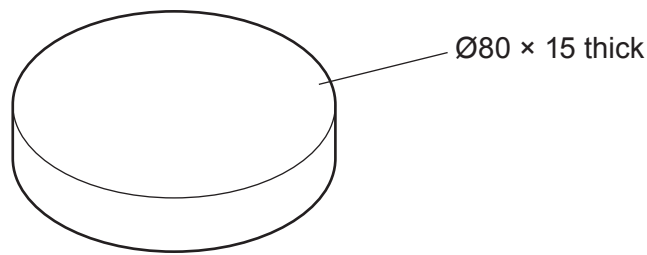


Fig. 11.6

- (i) Use sketches and notes to show **two** modifications that need to be made to the basic shape so that the thermoplastic can be vacuum formed successfully.

[2]

- (ii) Explain why it is important to heat the plastic to the correct temperature when vacuum forming.

.....

.....

..... [2]

12 Fig. 12.1 shows a box of giant dominoes used by young children. The dominoes are made from 10 mm thick MDF and the box from 15 mm thick hardwood.

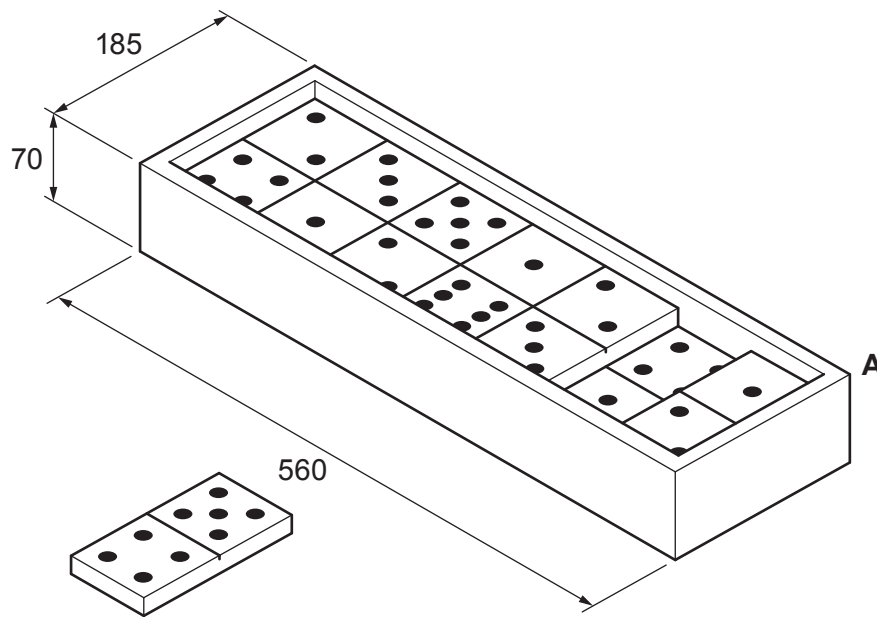


Fig. 12.1

(a) Give **two** advantages of using MDF rather than hardwood for the dominoes.

- 1
 - 2
- [2]

(b) Sketch and name a suitable joint, other than a butt joint, that could be used at corner **A**.

[4]

- (c) A 5 mm thick MDF base will be fitted inside the box. Fig. 12.2 shows one inside corner of the box.

Add sketches and notes to Fig. 12.2 to show how the base could be fitted inside the box. The edges of the base must not be seen.

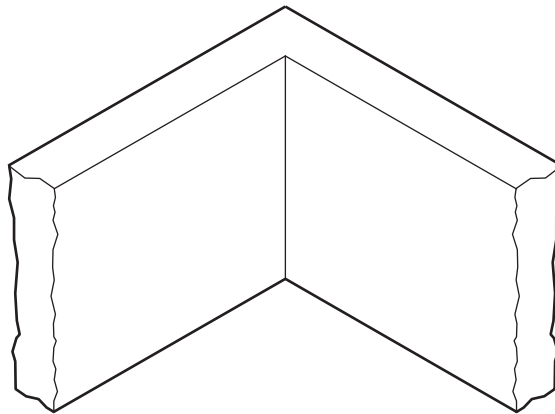


Fig. 12.2

[3]

- (d) Fig. 12.3 shows details of a bench hook and a length of MDF from which the dominoes will be sawn. Each domino is 150 mm long.

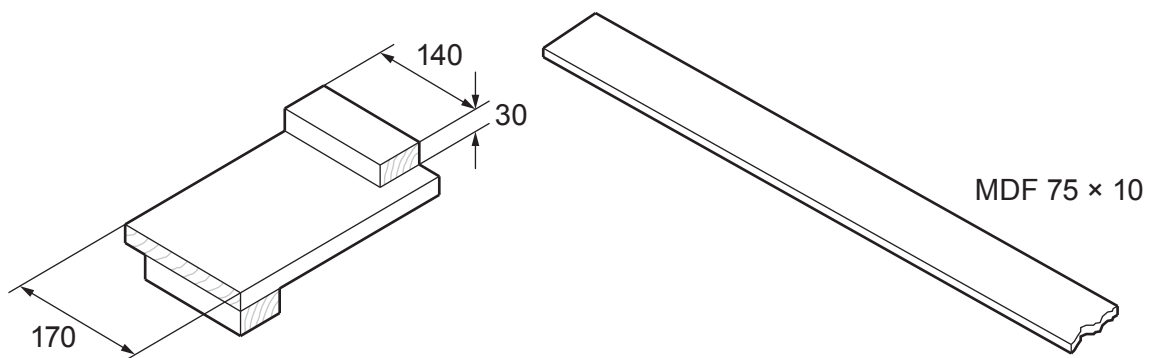


Fig. 12.3

- (i) Use sketches and notes to show how the bench hook could be modified into a sawing jig so that all the dominoes could be cut exactly to the same length.

[4]

- (ii) Use sketches and notes to show how the sawn ends of the dominoes could be made square and smooth.

[3]

- (e) Fig. 12.4 shows one domino. Each set of numbers is represented by dots.

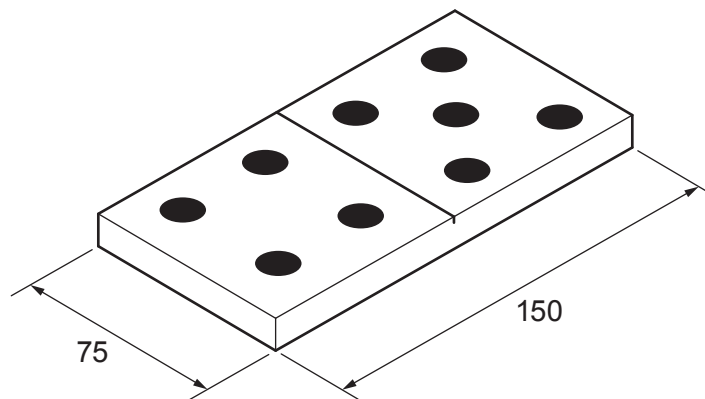


Fig. 12.4

Describe how CAM (Computer Aided Manufacture) could be used to make the dots on a domino.

.....

.....

.....

.....

.....

[4]

(f) The dominoes could be made in large quantities from plastic.

(i) Give **two** advantages to the user of making the dominoes from plastic rather than MDF.

1

2

[2]

(ii) Name an industrial process that could be used to manufacture plastic dominoes.
Give **two** reasons for your choice.

Named industrial process

Reason 1

Reason 2

[3]

- 13 Fig. 13.1 shows a plant holder and the brackets that will support it on a wall. The sides and ends of the plant holder are made from 15 mm thick hardwood and its base from 10 mm thick manufactured board. The brackets are made from mild steel.

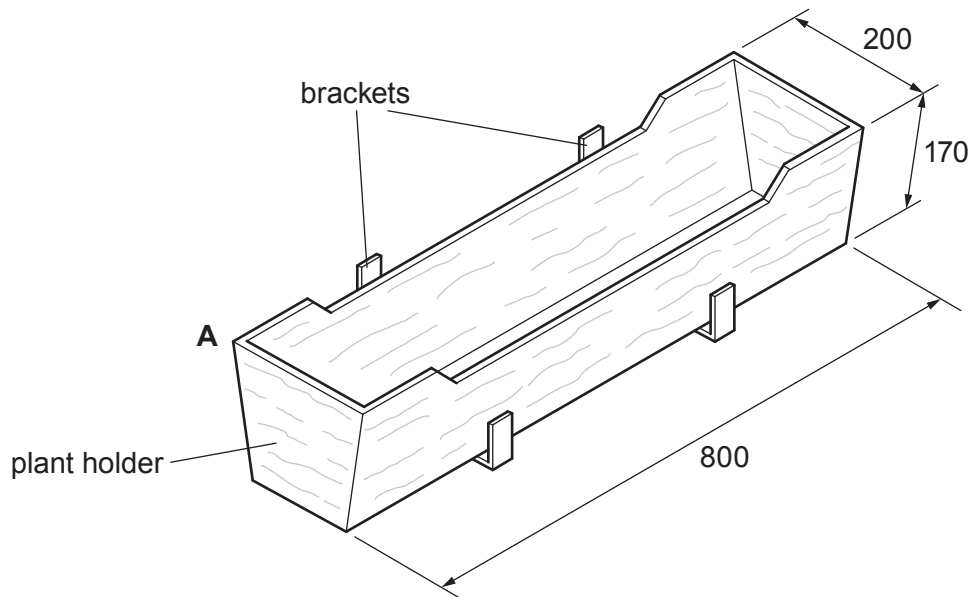


Fig. 13.1

- (a) Give **two** properties of hardwood that makes it suitable for the plant holder.

1

2

[2]

- (b) The plant holder will be joined at each corner by means of a dowelled joint. Use sketches and notes to show how a side and an end could be joined at corner **A** by means of a dowelled joint.

Include the following details:

- the size and number of dowel pegs to be used
- accurate marking out of the dowel positions
- a suitable adhesive.

[5]

(c) Fig. 13.2 shows the base of the plant holder with Ø15 holes drilled to allow for drainage.

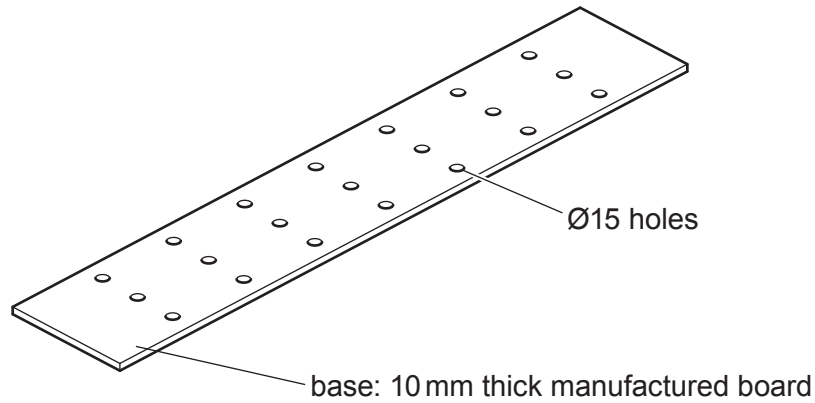


Fig. 13.2

(i) Name a specific type of drill bit that could be used to drill the Ø15 holes.

..... [1]

(ii) Give **two** reasons why the base would need to be clamped to a scrap wood board when drilling the Ø15 holes.

1

2

[2]

(d) Fig. 13.3 shows one bracket and a strip of 3 mm thick mild steel from which the bracket will be made. Holes will be drilled at centres **A** and the strip will be bent at **B**.

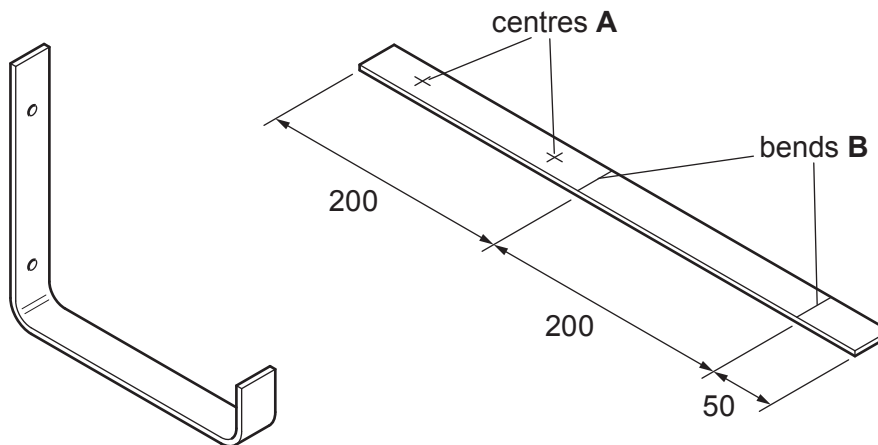


Fig. 13.3

(i) Name **two** marking out tools that could be used to mark out centres **A**.

1

2

[2]

(ii) Use sketches and notes to show how the mild steel strip could be bent to shape at **B**. Name **all** the tools and equipment used when making the bends.

[3]

(iii) Give **two** reasons why the mild steel brackets would need to be painted.

1

2

[2]

(e) The hardwood used to make the plant holder is a sustainable material. Explain what is meant by the term 'sustainable'.

.....

.....

..... [2]

- (f) The plant holder could be freestanding rather than wall-mounted. Fig. 13.4 shows the plant holder 500 mm above the ground.

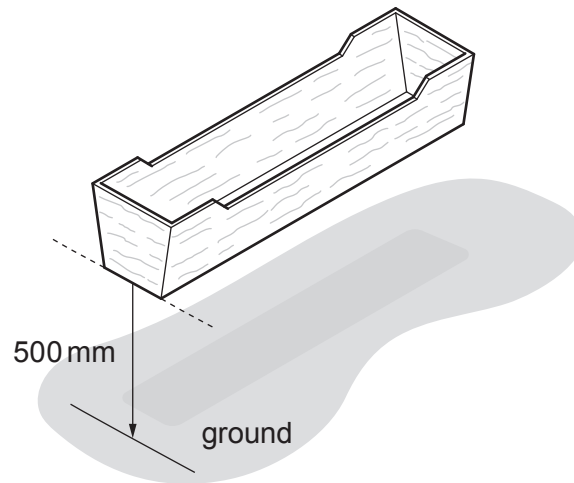


Fig. 13.4

Use sketches and notes to show how the plant holder could be made freestanding at a height of 500 mm above the ground.

Include details of materials, constructions, fittings and fixings used.

[6]

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