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**DESIGN AND TECHNOLOGY**

**0445/31**

Paper 3 Resistant Materials

**October/November 2019**

**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 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.

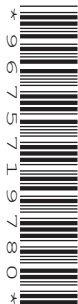
You may use a calculator.

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.

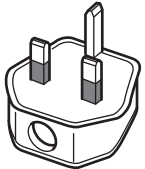
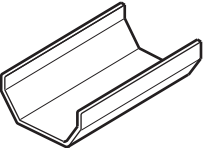
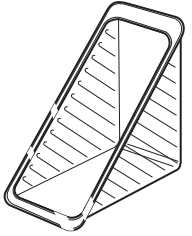
This document consists of **18** printed pages and **2** blank pages.



## Section A

Answer **all** questions in this section.

- 1 Complete the table by stating the manufacturing process used to make each plastic product.

Plastic product	Manufacturing process
 electrical plug	
 guttering	
 sandwich container	

[3]

- 2 Fig. 1 shows a block of metal marked out ready to be drilled.

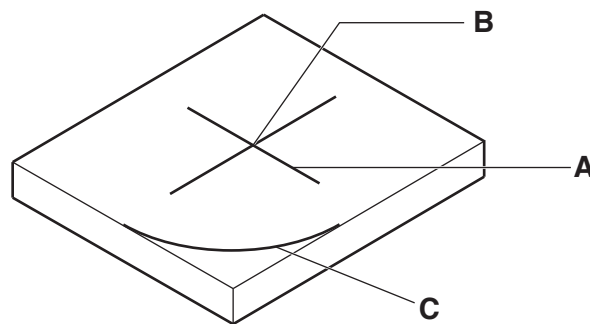


Fig. 1

Name the marking out tool used to mark line **A**.

.....

Name the marking out tool used to mark centre **B**.

.....

Name the marking out tool used to mark arc **C**.

.....

[3]

3

3 Fig. 2 shows two basic designs for kitchen roll holders.

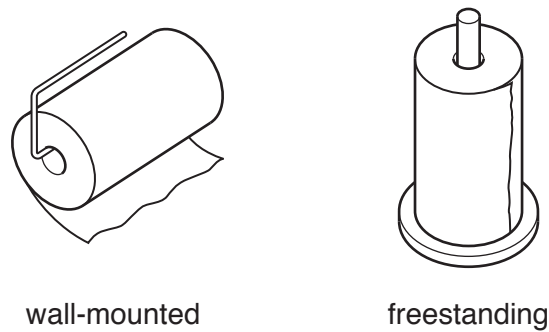


Fig. 2

Give **two** reasons why consumers may prefer to buy a wall-mounted kitchen roll holder rather than a freestanding kitchen roll holder.

1 .....

2 .....

[2]

4 Fig. 3 shows timber being seasoned in a kiln.

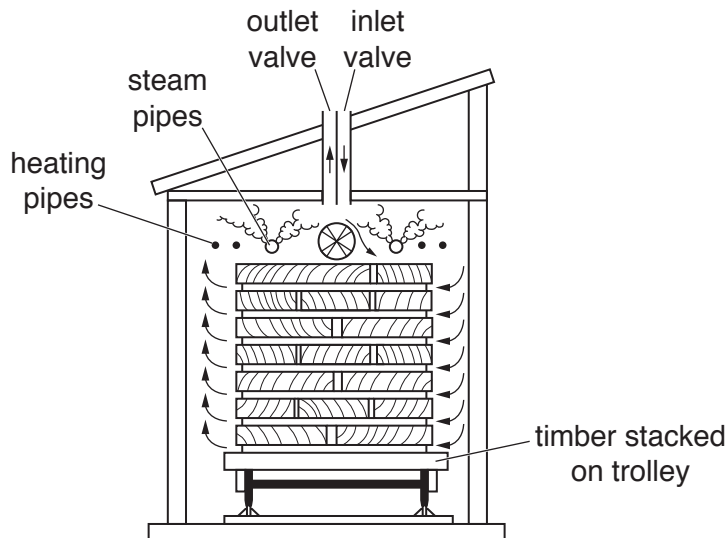


Fig. 3

(a) Explain why timber needs to be seasoned.

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

(b) Name a different method of seasoning timber.

..... [1]

4

- 5 A  $\text{Ø}10$  hole will be drilled in a sheet of 4 mm thick acrylic.  
 Fig. 4 shows part of a drilling machine used to drill the hole.  
 Add to Fig. 4 to show how the acrylic sheet would be held when drilling the hole.

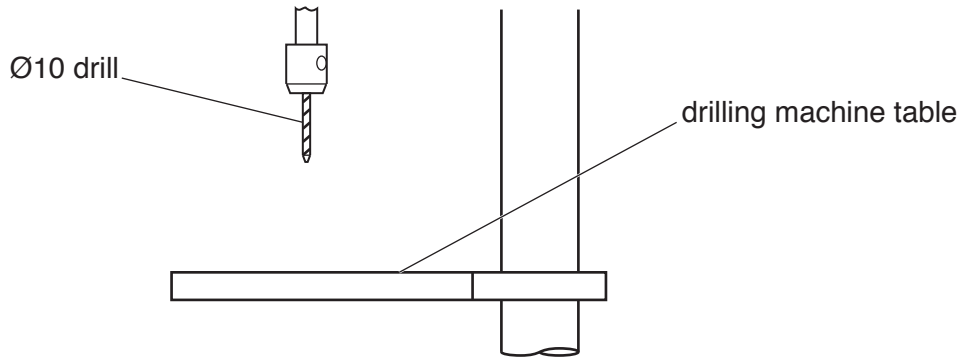


Fig. 4

[3]

- 6 Fig. 5 shows the end grain of a piece of hardwood being planed. The wood is planed from each end to the centre, as shown by the arrows, to prevent it from splitting.

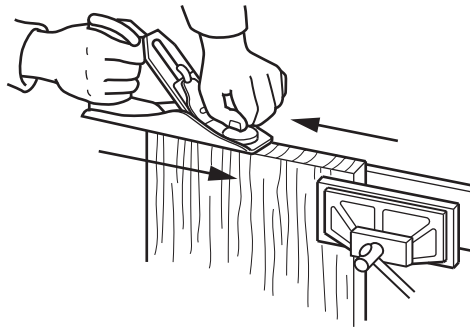


Fig. 5

Describe a different method of planing the end grain that will prevent the wood from splitting.

.....

.....

..... [2]

- 7 Circle from the lists below **one** material that is:

(a) from a sustainable source

acrylic                  stainless steel                  oak                  nylon                  [1]

(b) biodegradeable.

polystyrene                  cast iron                  pine                  copper                  [1]

8 Fig. 6 shows a computer desk.

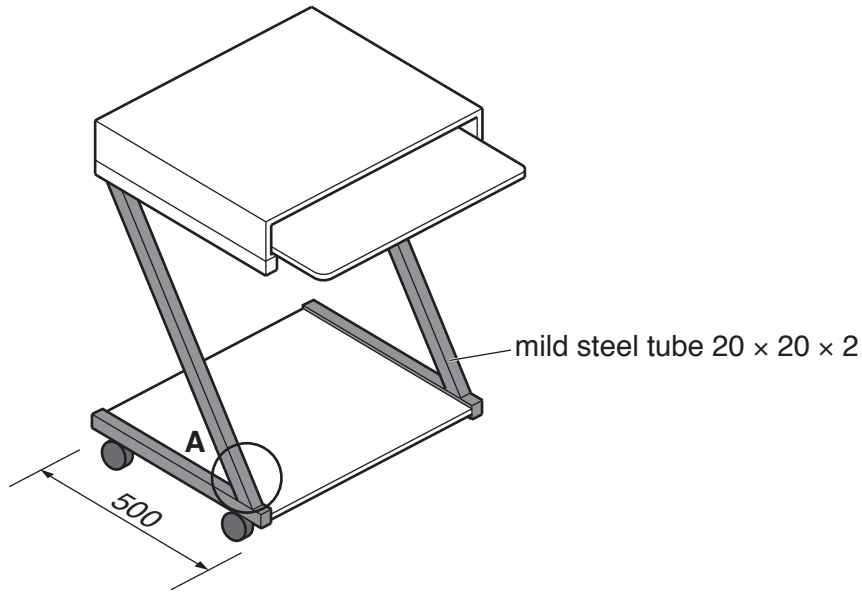
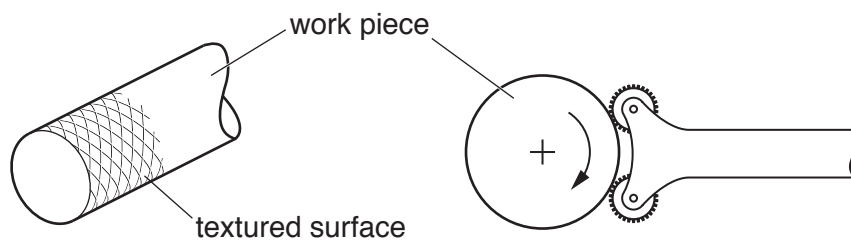


Fig. 6

Use sketches and notes to show how the corner joint at **A** could be strengthened. State any constructions and fittings used.

[3]

9 (a) Name the centre lathe operation shown below.



..... [1]

(b) State the purpose of the textured surface produced by the operation shown in part (a).

..... [1]

10 Fig. 7 shows two small wooden tables. Both tables are the same overall size. Table **A** is made by laminating. Table **B** is made by fabrication.

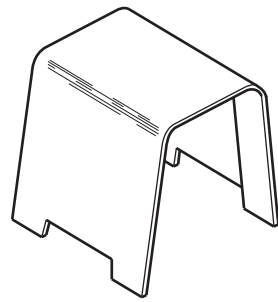


Table **A** laminated

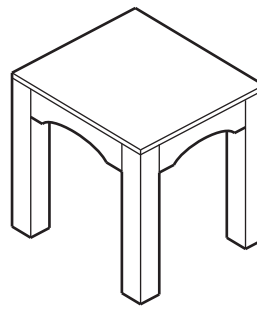


Table **B** fabricated

**Fig. 7**

Compare the methods of manufacture and state which of the two tables would cost less to batch produce. Give **two** reasons for your decision.

Chosen table .....

Reason 1 .....

.....

Reason 2 .....

.....

[2]

Section B

Answer **one** question in this section.

- 11 Fig. 8 shows views of a planter box and stand.  
The planter box is made from 12 mm thick marine plywood and the stand from Ø12 mild steel tube.

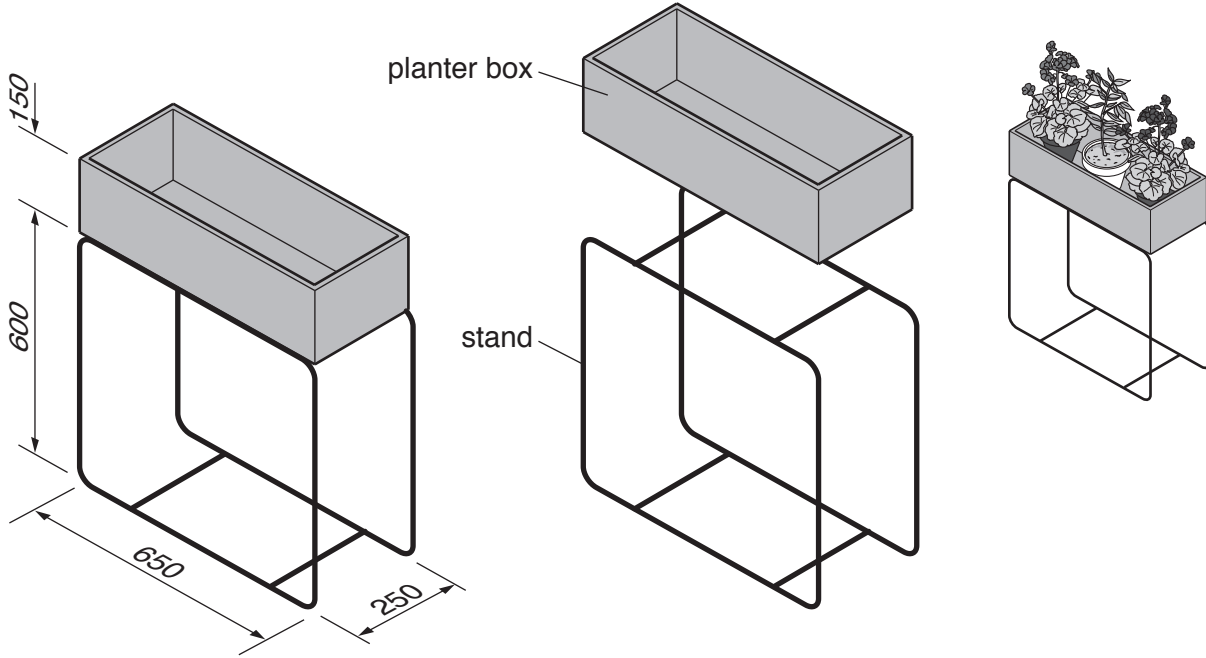


Fig. 8

- (a) Give **two** benefits of using marine plywood for the planter box.

1 .....

2 ..... [2]

- (b) The mild steel stand will have a dip-coated finish.  
Give **two** benefits of a dip-coated finish for the mild steel stand.

1 .....

2 ..... [2]

- (c) The planter box and stand is designed as flat-pack for self-assembly by the consumer. Fig. 9 shows the separate parts of the planter box.

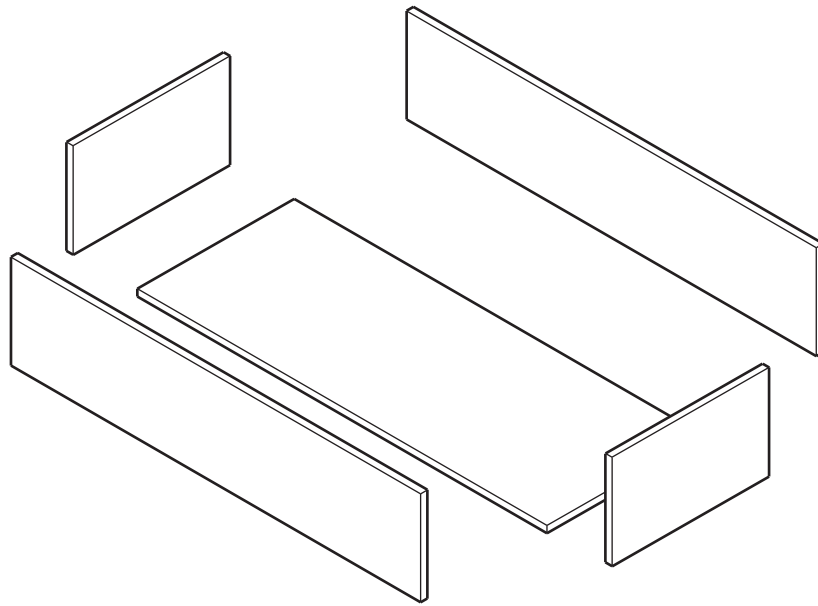


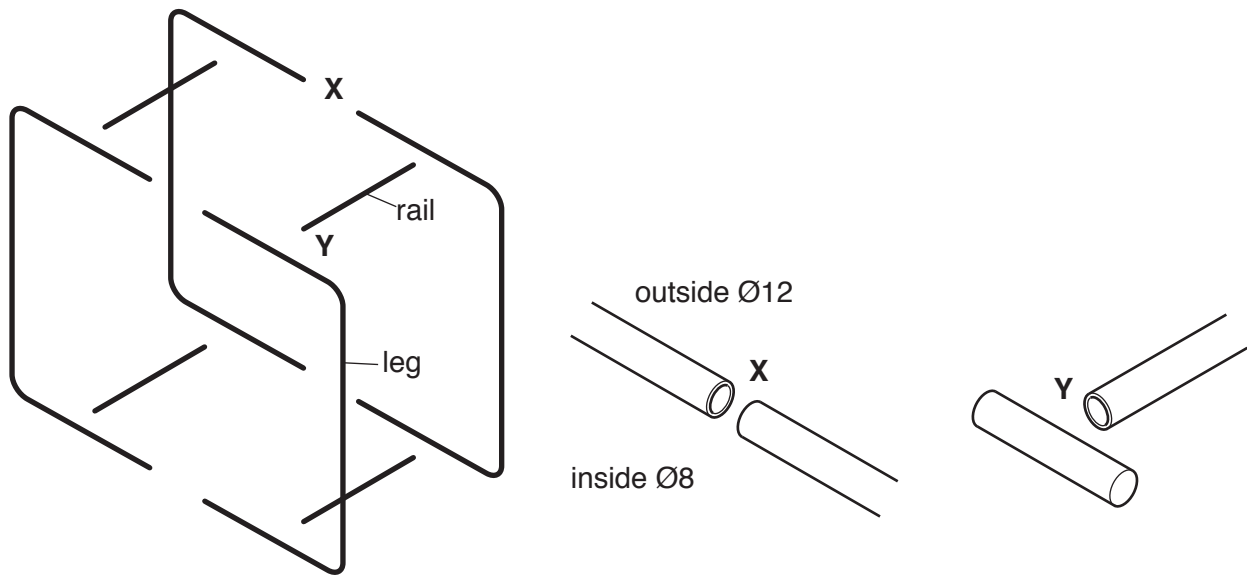
Fig. 9

Use sketches and notes to show how the parts could be joined together using basic tools.

[4]



- (d) Details of the stand are shown in Fig. 10.  
The stand is to be self-assembled from eight separate pieces of  $\text{Ø}12$  mild steel tube.



**Fig. 10**

Use sketches and notes to show details of connecting pieces that could be used to join:

- (i) the legs together at **X**

[4]

- (ii) a rail to a leg at **Y**.

[4]

- (e) Use sketches and notes to show how the planter box could be fixed to the stand. The method of fixing must allow the planter box to be removed.

[4]

- (f) Fig. 11 shows the basic shape of a box used to package all the parts of the planter box and stand for delivery to consumers.

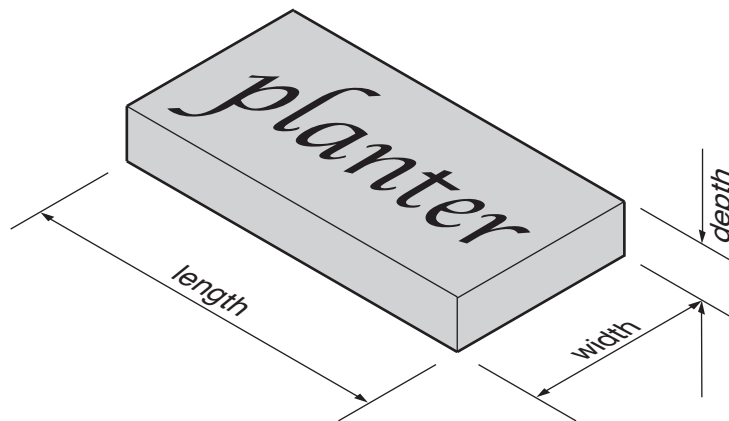


Fig. 11

Indicate on Fig. 11 a suitable length, width and depth for the box in which **all** the parts will fit. [3]

- (g) When designing and making products it is important to consider the choice of materials. Complete the following statement:

*Using a manufactured board and a ferrous metal for the planter box and stand is not harmful to the environment because .....*  
.....  
.....  
..... [2]

12 Fig. 12 shows views of an incomplete design for a toy helicopter made from 6 mm thick plywood.

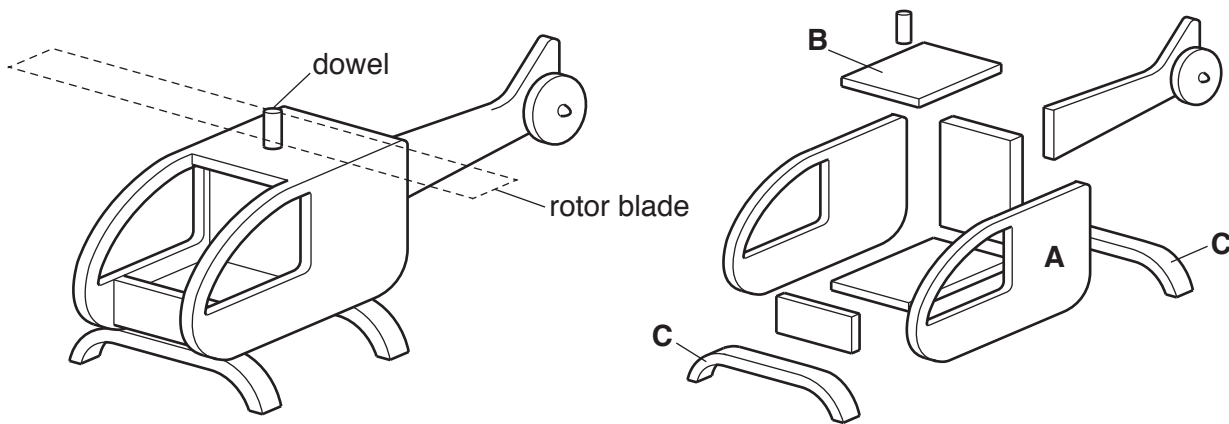


Fig. 12

(a) Give **two** reasons why 6 mm thick plywood is suitable for the toy helicopter.

- 1 .....
- 2 .....

[2]

(b) Fig. 13 shows side **A** marked out ready to be cut to shape.

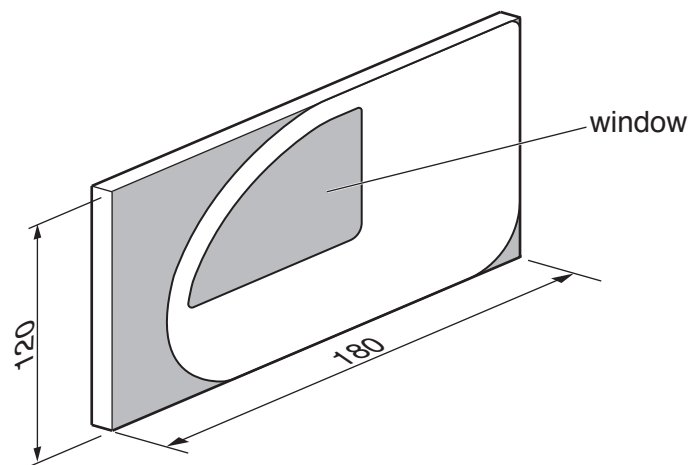


Fig. 13

Complete the table by naming the tools or items of equipment that could be used to make the side **A**.

Stage	Process	Tools / items of equipment
1	Mark out the shape	
2	Remove the window shape	
3	Smooth all cut edges	

[3]

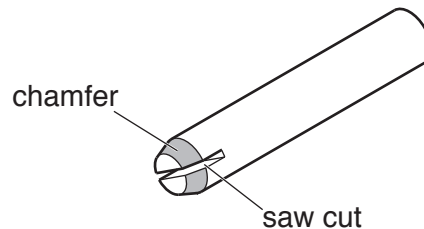
- (c) A contact adhesive will be used to join most of the parts of the toy helicopter. Give **two** advantages of using a contact adhesive rather than PVA to join the parts.

1 .....

2 .....

[2]

- (d) Fig. 14 shows the  $\text{Ø}6$  dowel that will be glued into the roof, part **B**.



**Fig. 14**

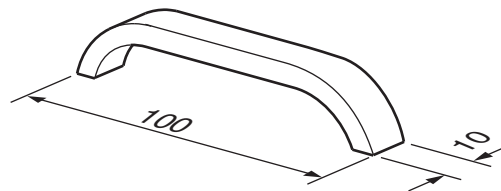
Describe the purpose of the saw cut and the chamfer in the dowel.

Saw cut .....

Chamfer .....

[2]

- (e) Fig. 15 shows one of the feet, part **C**, made from 5 mm thick acrylic sheet.



**Fig. 15**

Use sketches and notes to show how the foot could be made.

Include details of:

- marking out
- cutting out the shape
- producing the curved shape.

[5]

(f) The outline shape of a rotor blade that will be attached to the Ø6 dowel is shown in Fig. 12.

Choose a specific wood, metal **or** plastic for the rotor blade.

Use sketches and notes to show a design for a rotor blade that could be fitted to the Ø6 dowel.

The rotor blade must be able to turn freely.

Include all constructions, named materials and **two** important sizes.

[6]

(g) Identify **three** ways by which the designer has made the toy helicopter suitable for use by young children.

1 .....

2 .....

3 .....

[3]

(h) Plywood is a manufactured board. Explain why some manufactured boards can be considered environmentally friendly.

.....

.....

..... [2]

13 Fig. 16 shows a ladder plant stand.

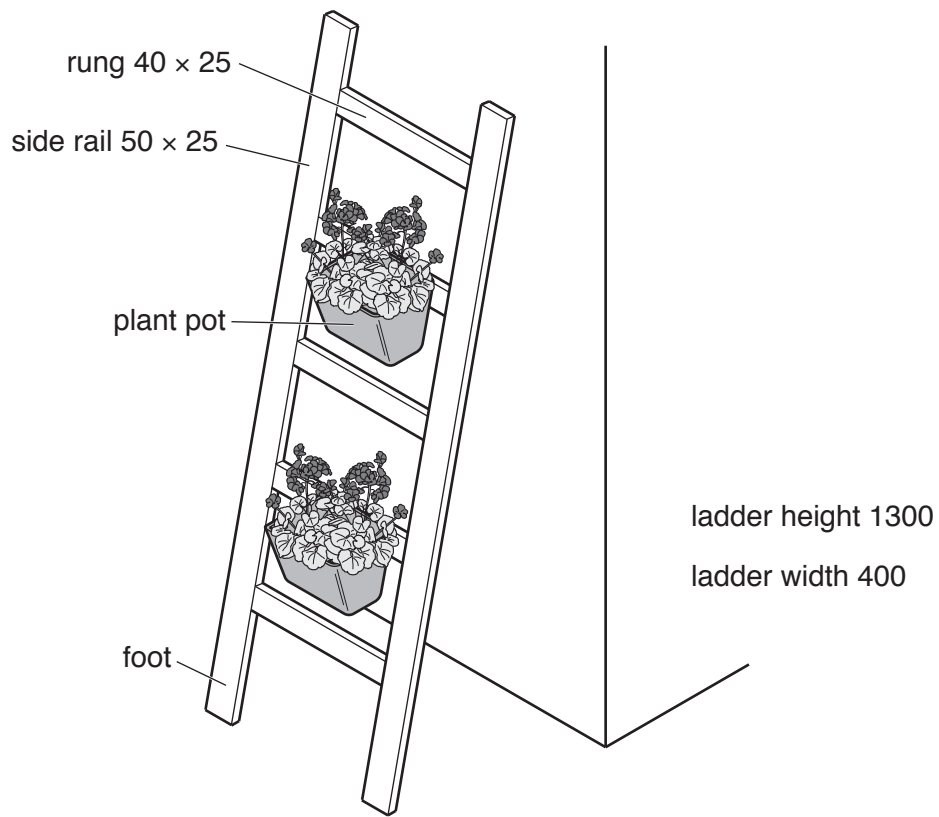


Fig. 16

(a) Name and sketch a permanent construction that could be used to join a rung to a side rail.

Name of construction .....

[4]

(b) Fig. 17 shows the side rails and rungs ready to be glued together.

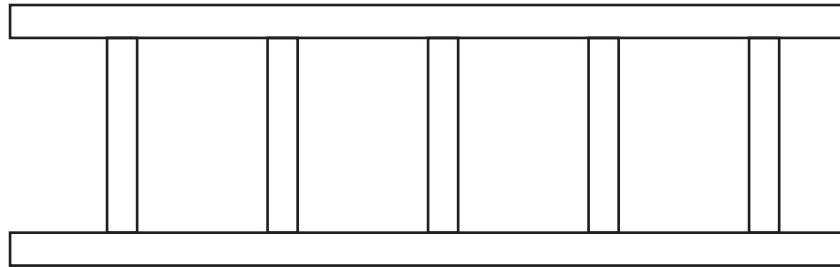


Fig. 17

(i) Add to Fig. 17 to show how cramps would be used to hold the side rails and rungs while the adhesive sets. [2]

(ii) Name the type of cramps used.

..... [1]

(iii) Name a suitable adhesive.

..... [1]

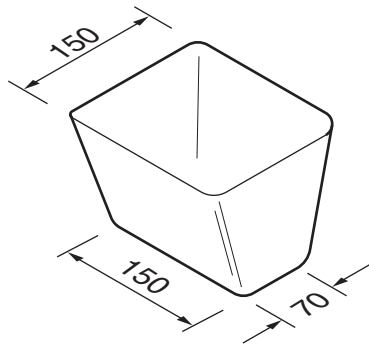
(iv) Describe **two** checks that would be made after the side rails and rungs have been glued and clamped.

1 .....

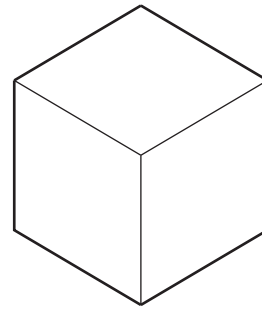
2 .....

[2]

- (c) Fig. 18 shows views of one plant pot and a block of wood that will be made into the former used to vacuum form the plant pots.



plant pot



block 150 × 150 × 150

**Fig. 18**

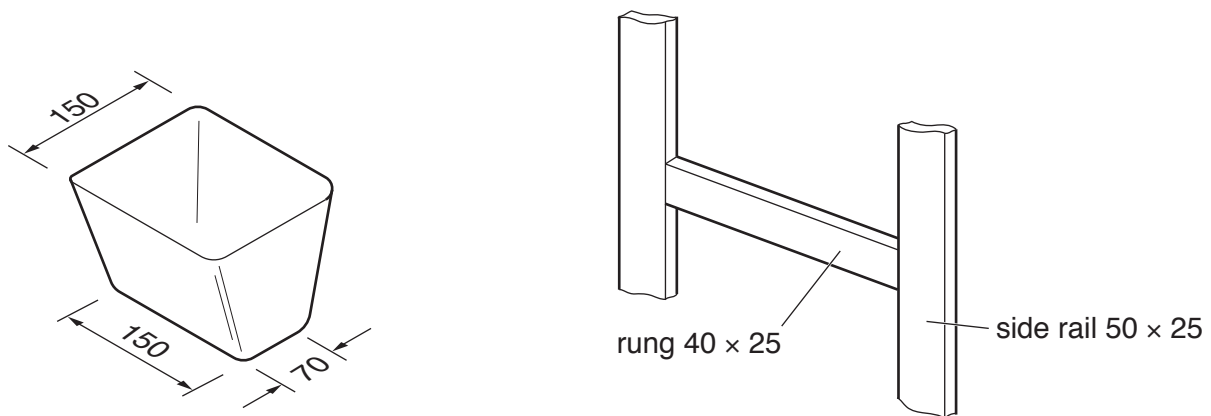
- (i) Name a specific plastic that could be used to vacuum form the plant pots.  
 ..... [1]
- (ii) Draw on Fig. 18 to show the finished former ready to be used to make the plant pots. [2]
- (iii) Use sketches and notes to show how the plant pots would be vacuum formed.

[6]



17

- (d) The plant pots will be attached to the rungs securely but must allow for easy removal. Fig. 19 shows details of a plant pot and part of the ladder.



**Fig. 19**

Use sketches and notes to show how a plant pot could be attached to a rung while allowing for easy removal. Additional materials must be used. Include details of materials used and any constructions.

[4]

**Question 13 continues on page 18.**

- (e) Use sketches and notes to show a modification to the feet of the ladder that will prevent it from slipping away from a wall.

[2]



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