Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

DESIGN & TECHNOLOGY **0445/32**

Paper 3 Resistant Materials **May/June 2025**

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 unless otherwise stated.

This document has **20** pages. Any blank pages are indicated.

DC (KS/CT) 343367/2

[Turn over

Section A

Answer **all** questions in this section.

1 Fig. 1.1 shows three tools, **A**, **B** and **C**, that can be used to cut sheet metal.

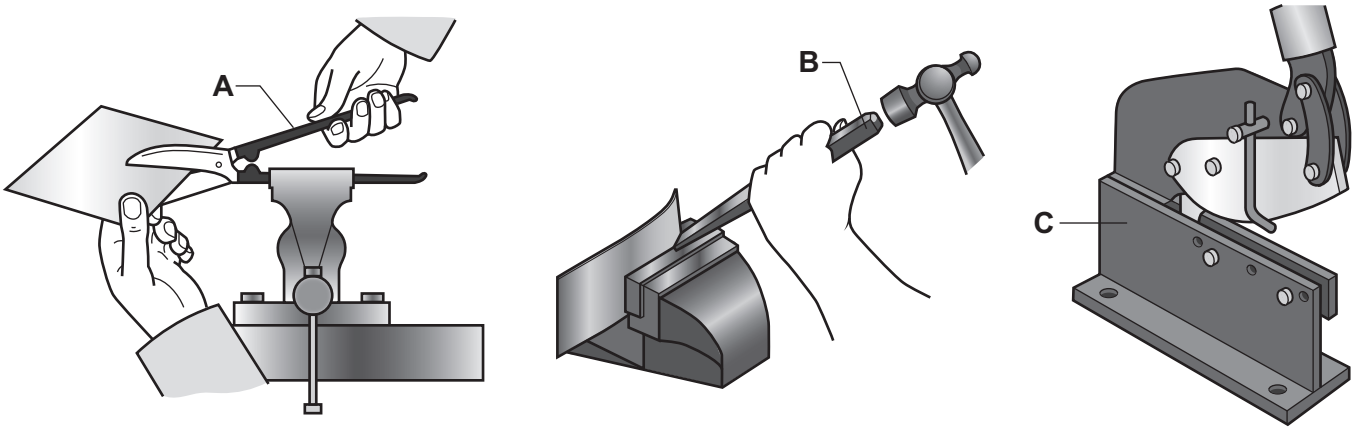


Fig. 1.1

Name each of the tools.

A .....

B .....

C .....

[3]

2 Fig. 2.1 shows parts of two wooden boards that will be joined using a tongue and groove joint.

Fig. 2.1

Complete Fig. 2.1 to show a tongue and groove joint. [3]

3 Fig. 3.1 shows a handle made from aluminium.

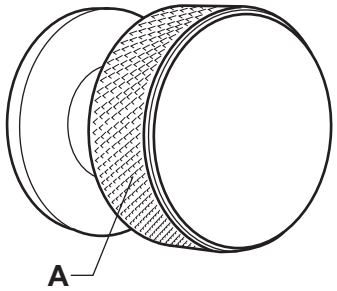


Fig. 3.1

(a) Name a machine that could be used to make the handle.

..... [1]

(b) Give the correct term to describe the surface produced at **A** in Fig. 3.1.

..... [1]

4 Fig. 4.1 shows three hardwood boards glued together to make a table top.

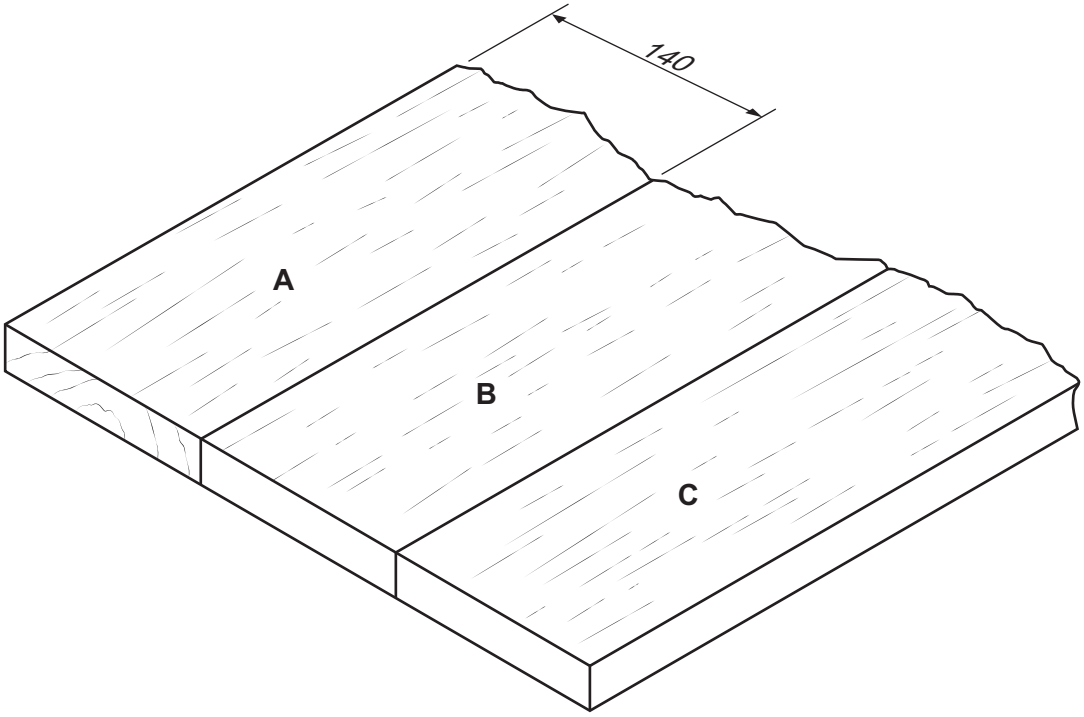


Fig. 4.1

(a) Draw the end grain on boards **B** and **C**. [2]

(b) Give **one** reason why three boards have been used to make the table top rather than one wide board.

..... [1]

5 Fig. 5.1 shows a bucket made from a thermoplastic.

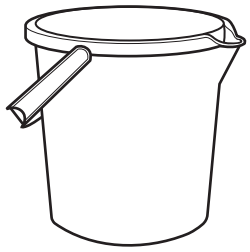


Fig. 5.1

(a) Name a suitable thermoplastic for the bucket.

..... [1]

(b) Give **one** advantage of the plastic bucket in use when compared to a bucket made from steel.

..... [1]

6 Fig. 6.1 shows the end grain of hardwood being planed.
When planing end grain there is a danger that it could split.

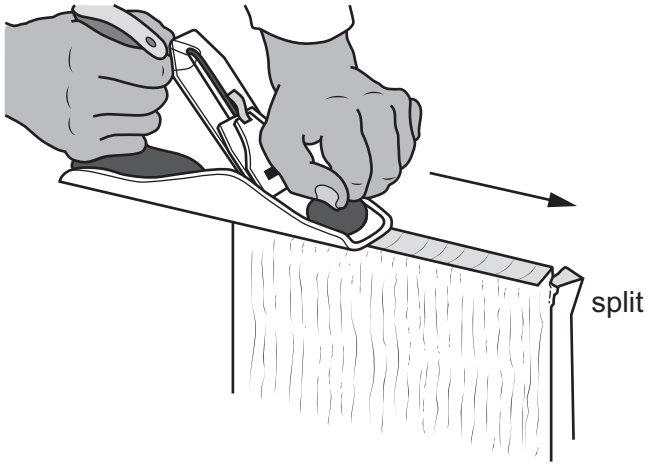


Fig. 6.1

Use sketches and notes to show how the end grain could be planed without it splitting.

[2]

7 Fig. 7.1 shows a strip of metal that has been work hardened.

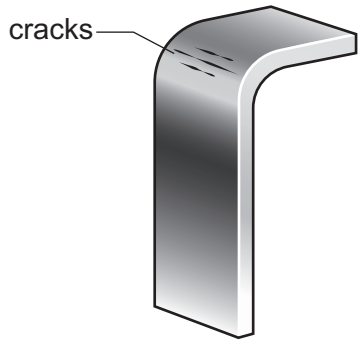


Fig. 7.1

Explain what is meant by the term 'work hardened'.

.....

.....

..... [2]

8 Complete Fig. 8.1 to show an exploded view of a stopped housing joint.

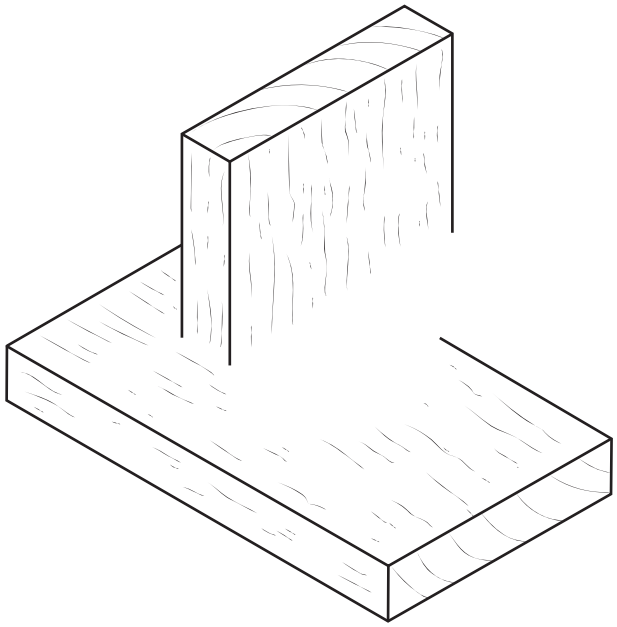


Fig. 8.1

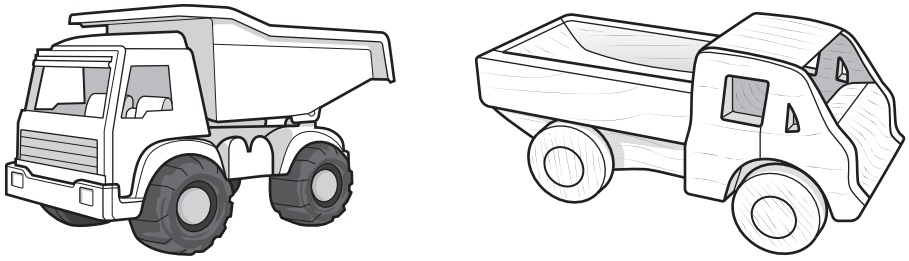
[3]

9 Shape memory alloy (SMA) is a smart material.
Complete the statement by adding the word that applies to shape memory alloy (SMA).

moisture **weight** **heat** **light**

Shape memory alloy (SMA) is a smart material that reacts to ..... [1]

10 Fig. 10.1 shows two children's toy trucks.
Truck **A** is made from plastic. Truck **B** is made of wood.



A **B**

Fig. 10.1

(a) Give **two** reasons why children might prefer to play with the plastic truck rather than the wooden truck.

1 .....

2 .....
[2]

(b) Give **one** reason why the materials used to make truck **B** could be considered to be more sustainable than those used to make truck **A**.

..... [1]

(c) State the method of manufacture for the plastic truck **A**.

..... [1]

Section B

Answer **one** question from this section.

11 Fig. 11.1 shows a design for a rack to hold whiteboard marker pens and a board rubber. The rack is made from 4 mm thick acrylic.

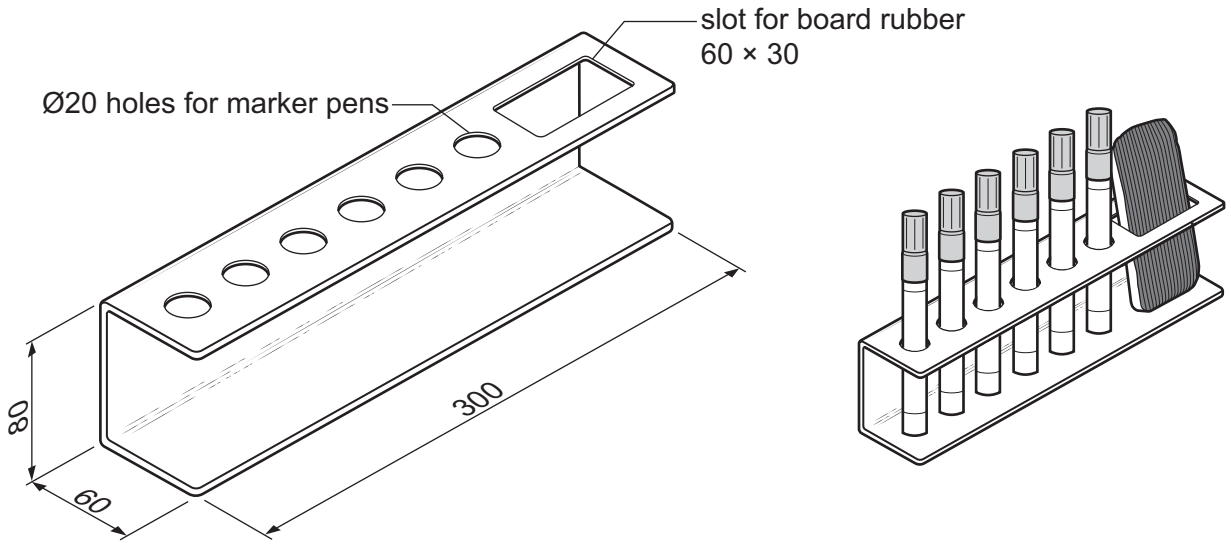


Fig. 11.1

(a) Give **two** properties of acrylic that make it suitable for the rack.

1 .....

2 .....
[2]

(b) Give **two** items of research that the designer of the rack would need to consider.

1 .....

2 .....
[2]

(c) Modelling can be very useful when designing and making a product.
Modelling can be done using card or by using a computer program.
Give **one** benefit of using:

(i) card modelling .....

..... [1]

(ii) a computer program .....

..... [1]

(d) Fig. 11.2 shows the development (net) of the rack.

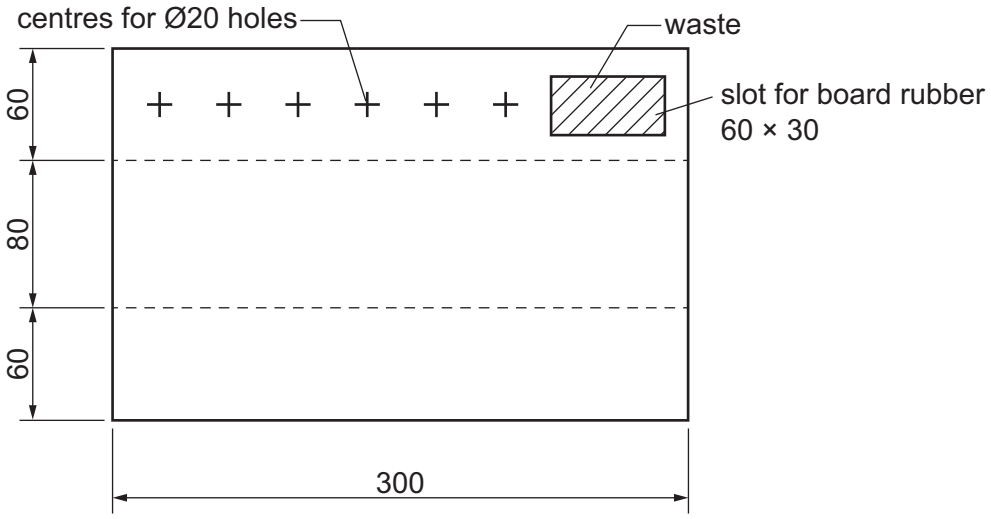


Fig. 11.2

(i) Name **two** tools or items of equipment that could be used to mark out the centres for the Ø20 holes.

1 .....

2 .....

[2]

(ii) The slot for the board rubber will be cut out by hand.
Use sketches and notes to show how the waste could be removed and the cut edges made flat and smooth.
Name all the tools and equipment used.

[5]

(e) A batch of ten racks will be produced in a school workshop.
Use sketches and notes to show a jig that would allow the holes to be drilled accurately.
Name the material used to make the jig.

[5]

(f) When drilling acrylic sheet there is a danger that the drill bit could snag and cause the sheet to snap.
Use sketches and notes to show how holes could be drilled safely and accurately without damaging the acrylic sheet.

[3]

(g) Use sketches and notes to show how the acrylic sheet could be bent to form the shape of the rack.
Give details of all the equipment used.

[4]

12 Fig. 12.1 shows a design for a holder to contain salt and pepper shakers.
A batch of 12 holders will be produced for use in a local café.

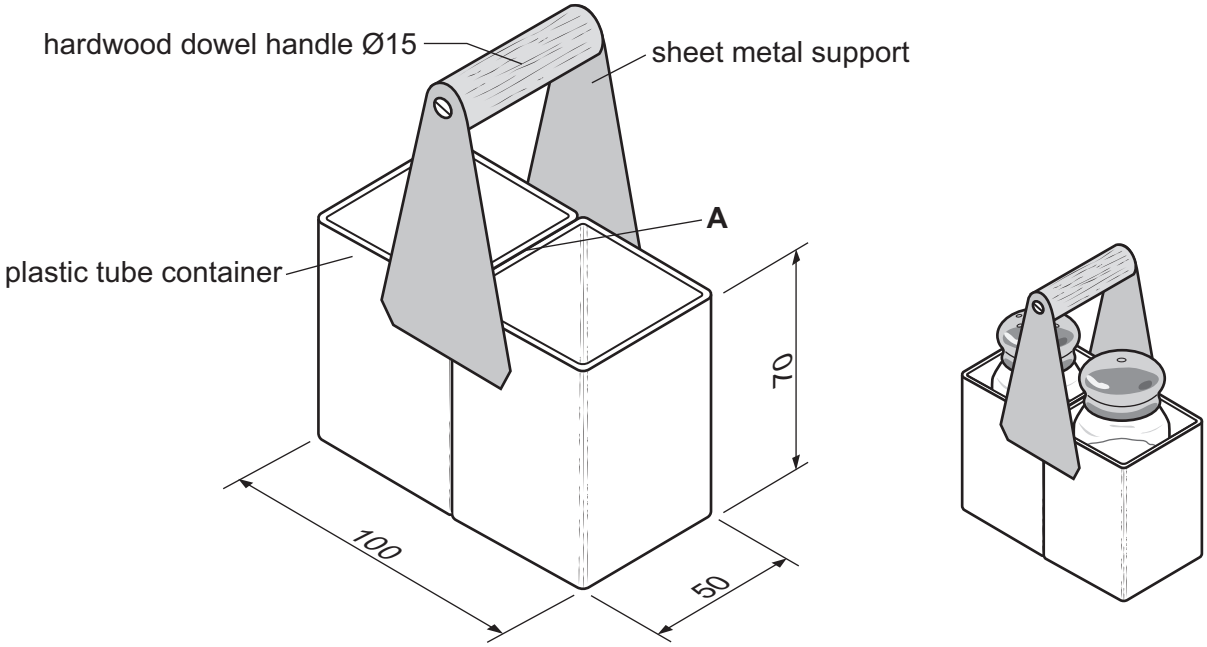


Fig. 12.1

(a) Name a suitable material for each of the parts of the holder.

(i) a hardwood for the dowel handle ..... [1]

(ii) a thermoplastic for the container ..... [1]

(iii) a ferrous metal for the support ..... [1]

(b) The containers will be connected at position **A** shown in Fig. 12.1.
Use sketches and notes to show how the containers could be connected while allowing them to be taken apart quickly.
The method of connection must not interfere with the salt and pepper shakers.
Give details of all materials and constructions used.

[4]

(c) Fig. 12.2 shows the shape of the support marked out on 1.6 mm thick ferrous metal sheet.

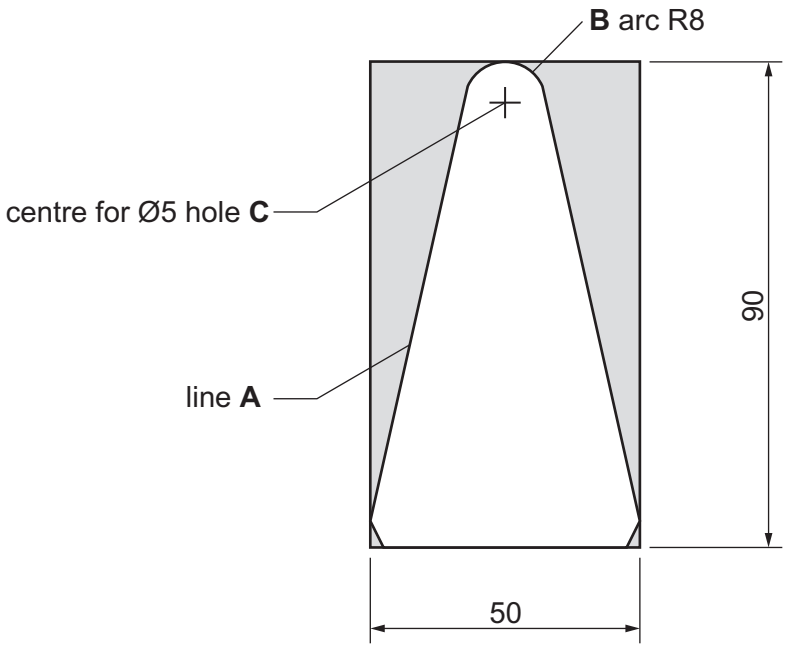


Fig. 12.2

Name the marking out tools that could be used to mark out the following:

(i) line **A** ..... [1]

(ii) arc **B** ..... [1]

(iii) centre for hole **C** ..... [1]

(d) The supports will be 'dip coated' to provide an attractive finish.
The surfaces of the metal must be prepared before dip coating.

(i) Name **two** types of abrasive that could be used to prepare the metal.

1 .....

2 .....
[2]

(ii) Give the name of the plastic used in the dip coating process.

..... [1]

(iii) State **two** other finishes that could be applied to the supports.

1 .....

2 .....
[2]

(e) Fig. 12.3 shows the hardwood dowel handle with its centre marked out on the end.
A Ø3 mm hole will be drilled in the centre of the dowel.

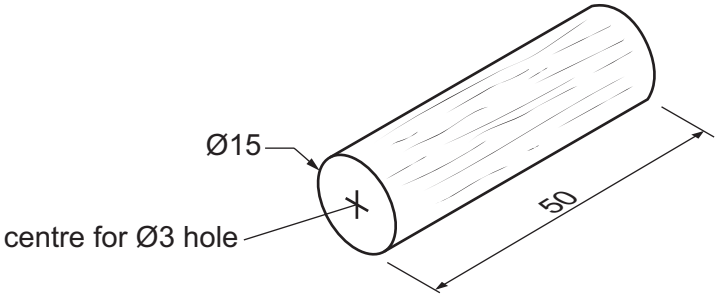


Fig. 12.3

Describe how the Ø3 mm hole could be drilled accurately in the centre of the dowel.

.....

.....

.....

..... [3]

(f) Fig. 12.4 shows one of the containers made from plastic tube.

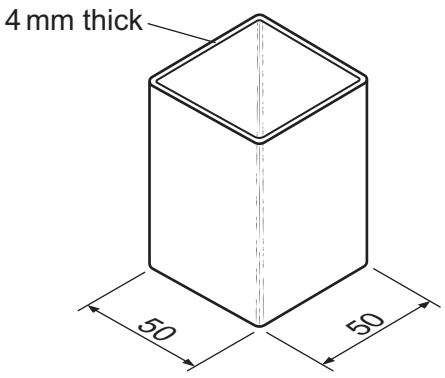


Fig. 12.4

Use sketches and notes to show how a base could be fitted inside the tube.
Show clearly the method of fitting and name any materials used.

[3]

(g) Three different materials have been used to produce the holder for the salt and pepper shakers. The only material that could be considered sustainable is the dowel used for the handle.

Explain why:

(i) sheet metal could not be considered a sustainable material.

.....

.....

..... [2]

(ii) plastic could not be considered a sustainable material.

.....

.....

..... [2]

13 Fig. 13.1 shows views of a desk made of wood.

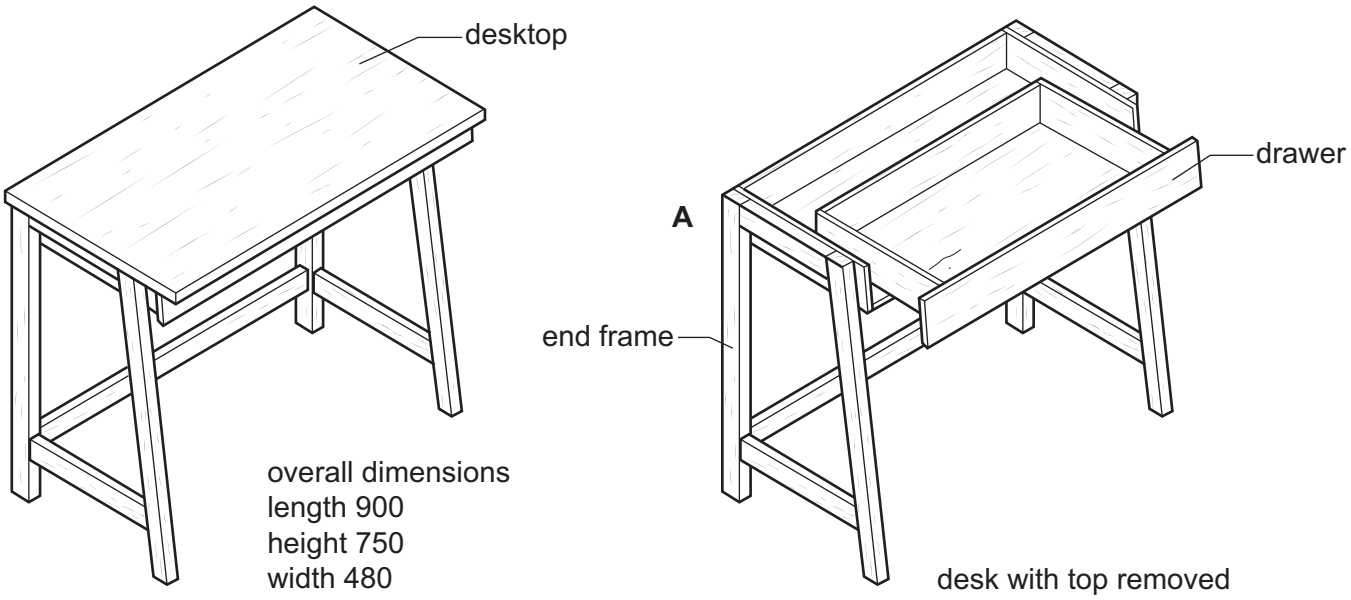


Fig. 13.1

(a) (i) Name a suitable hardwood for the end frame.

..... [1]

(ii) Give **two** reasons why the designer of the desk has decided to use hardwood rather than softwood for the desk.

1 .....

2 .....

[2]

(iii) Name a suitable manufactured board for the desktop.

..... [1]

(iv) The surface of the manufactured board has a thin decorative wood covering.
State the term to describe the thin decorative wood covering.

..... [1]

(v) Give **one** reason why a thin decorative wood covering has been applied to the desktop.

..... [1]

(b) Fig. 13.2 shows part of the rail and leg at corner **A** in Fig. 13.1.
The rail and leg will be joined using dowels.
Centre lines for the dowels have been marked out .

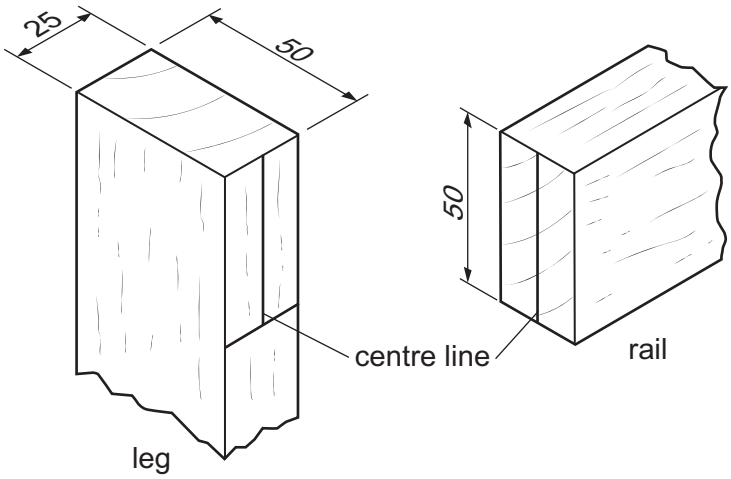


Fig. 13.2

(i) Give the name of a gauge that could be used to draw the centre lines for the dowels.

..... [1]

(ii) State the number of dowels required to join the rail to the leg.

..... [1]

(iii) State an appropriate diameter for the dowels.

..... [1]

(c) Fig. 13.3 shows parts of an end frame ready to be glued and clamped.

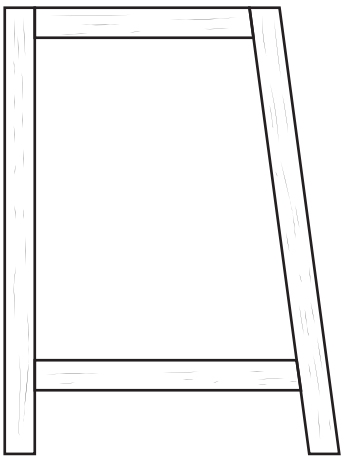


Fig. 13.3

(i) Add sketches and notes to Fig. 13.3 to show how the frame could be clamped. [4]

(ii) Name the type of cramps used.

..... [1]

(iii) State **two** checks that should be carried out immediately after gluing and clamping the frame.

1 .....

2 .....

[2]

(d) Fig. 13.4 shows the drawer removed from its support.

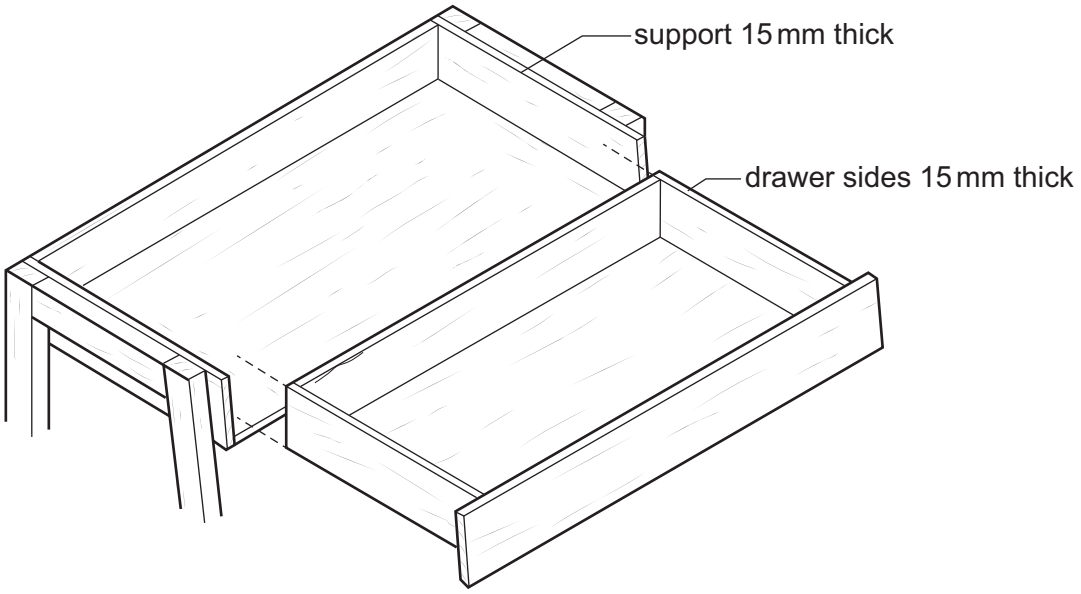


Fig. 13.4

Use sketches and notes to show some sort of 'runners' or drawer guides that would allow the drawer to slide in and out of the support more easily.
Do **not** use pre-manufactured metal or plastic drawer guides.
Give details of all materials and constructions used.

[4]

(e) Fig. 13.5 shows the dimensions of the drawer.

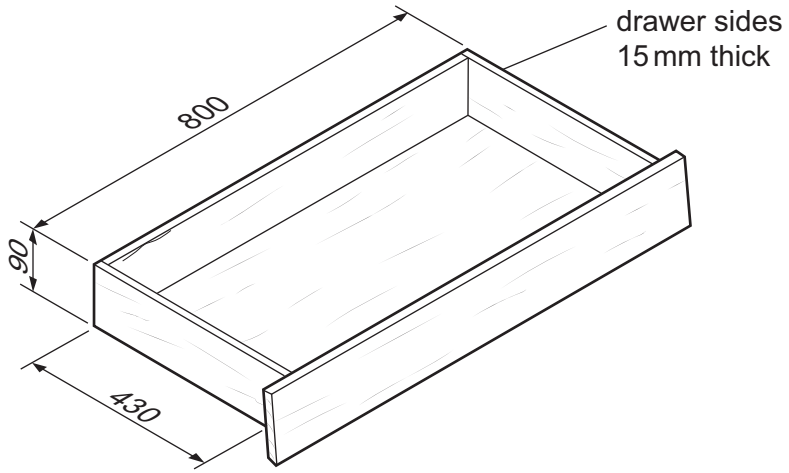


Fig. 13.5

Use sketches and notes to show how the inside space of the drawer could be divided into **three** areas by means of additional partitions.
Give details of the materials used for the partitions, their sizes and the method of joining them to the sides of the drawer.

[5]

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