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DESIGN & TECHNOLOGY

0445/33

Paper 3 Resistant Materials

October/November 2022

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

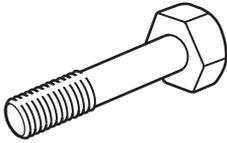
- The total mark for this paper is 50.
- The number of marks for each question or part question is shown in brackets [].
- All dimensions are in millimetres.

This document has **28** pages. Any blank pages are indicated.

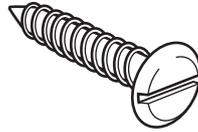
Section A

Answer **all** questions in this section.

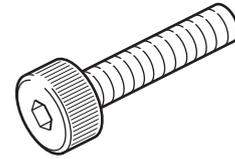
1 Fig. 1.1 shows three fastenings, **A**, **B** and **C**, used to join materials.



A



B



C

Fig. 1.1

Name an appropriate tool for use with each fastening.

A

B

C

[3]

- 2 Fig. 2.1 shows part of a table top with an area to be cut out so that a container can fit inside.

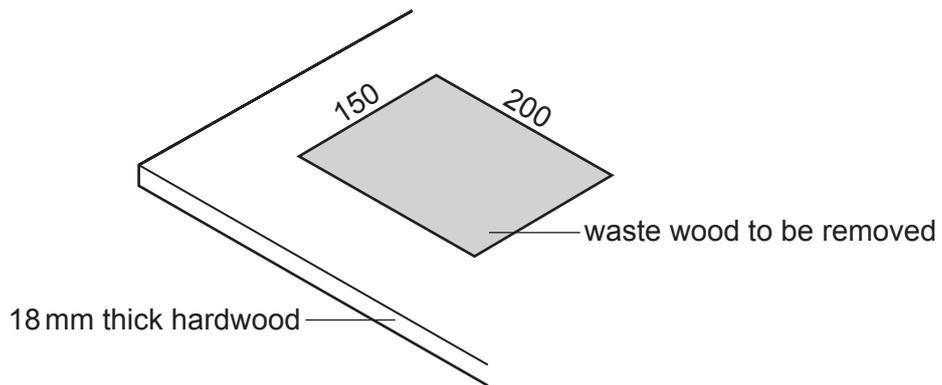


Fig. 2.1

Complete Table 2.1 by stating the name of a specific tool required for each process.

Table 2.1

Process	Specific tool
Make a hole in corner of waste wood drill
Cut out waste wood saw
Make cut edges smooth paper

[3]

3 Fig. 3.1 shows a set of hardwood skittles that have been made using a woodturning lathe.

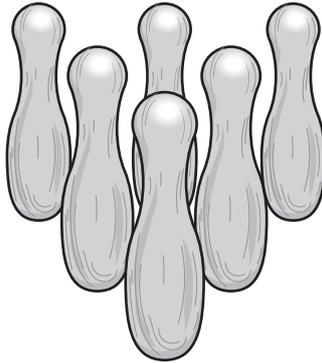


Fig. 3.1

(a) State **one** benefit of using a close-grained hardwood for the skittles.

..... [1]

(b) Name **one** tool that could be used to check the diameter of a skittle when it has been ‘turned’ on a woodturning lathe.

..... [1]

- 4 Fig. 4.1 shows a cycle rack used in a public park.
The wooden posts are made from oak and the metal tubes from mild steel.

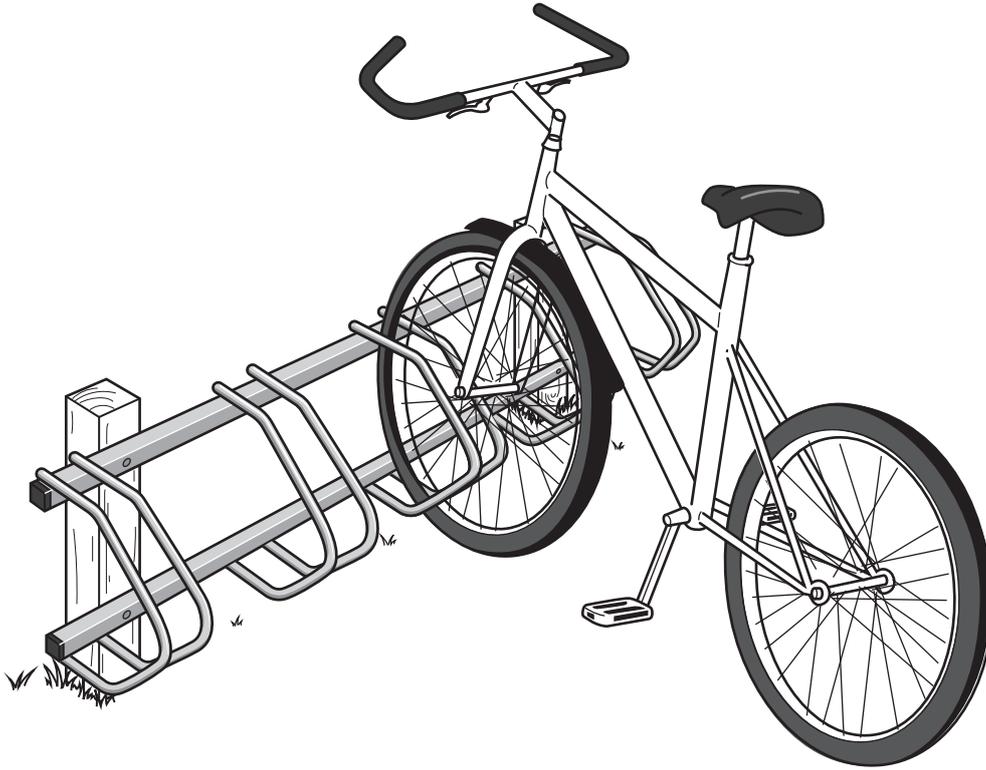


Fig. 4.1

- (a) Give **one** property of oak that makes it suitable for outdoor use.

..... [1]

- (b) Name a suitable finish, other than paint, for the mild steel tubes.

..... [1]

5 Fig. 5.1 shows a centre lathe.

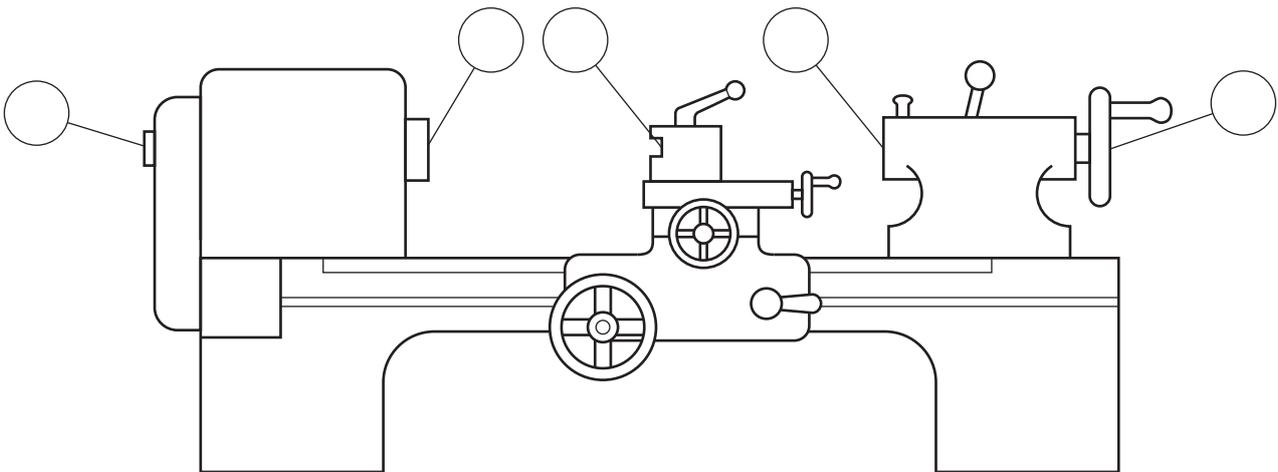
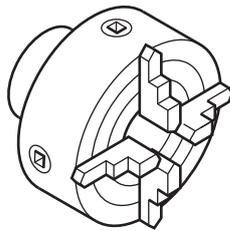
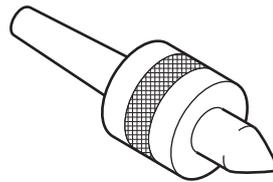


Fig. 5.1

Two items of centre lathe equipment are shown below.



A



B

Add the labels **A** and **B** to Fig. 5.1 to indicate where each part would be fitted.

[2]

6 Fig. 6.1 shows an incomplete drawing of a mortise and tenon joint.

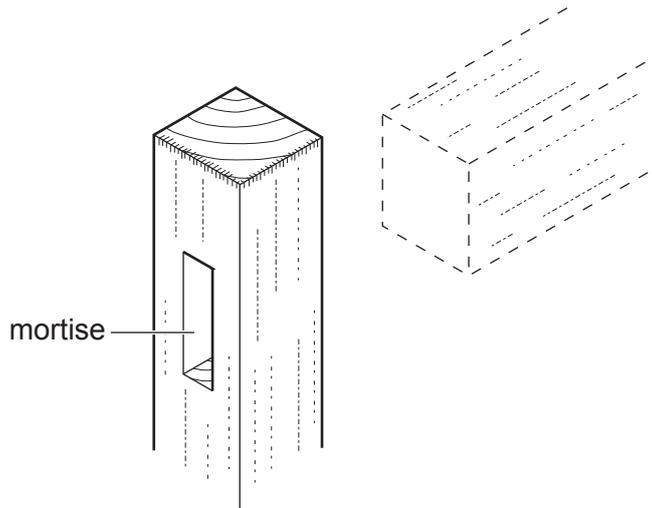


Fig. 6.1

Complete Fig. 6.1 to show a tenon that would fit into the mortise.

[3]

7 Fig. 7.1 shows a yoghurt pot with a plastic foldable spoon attached to the inside of the lid of the pot.

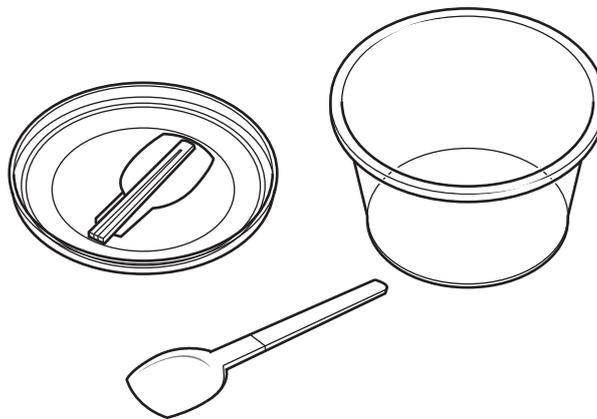


Fig. 7.1

(a) Give **one** benefit to consumers of supplying a spoon with the yoghurt pot.

..... [1]

(b) State **one** negative impact on the environment of supplying a spoon with the yoghurt pot.

..... [1]

8 Fig. 8.1 shows a barbecue made from 1.5 mm thick mild steel sheet.

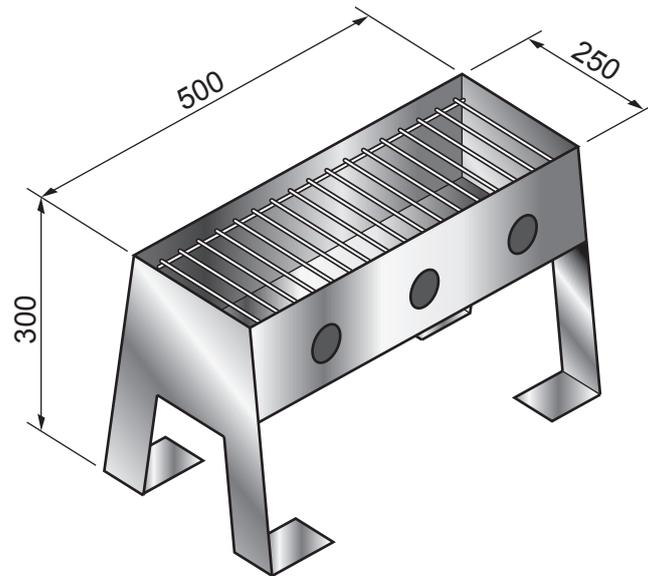


Fig. 8.1

Use sketches and notes to show a modification to the barbecue shown in Fig. 8.1 that would make it easier to carry.

[2]

- 9 Fig. 9.1 shows a child's counting toy that could be made in a school workshop.

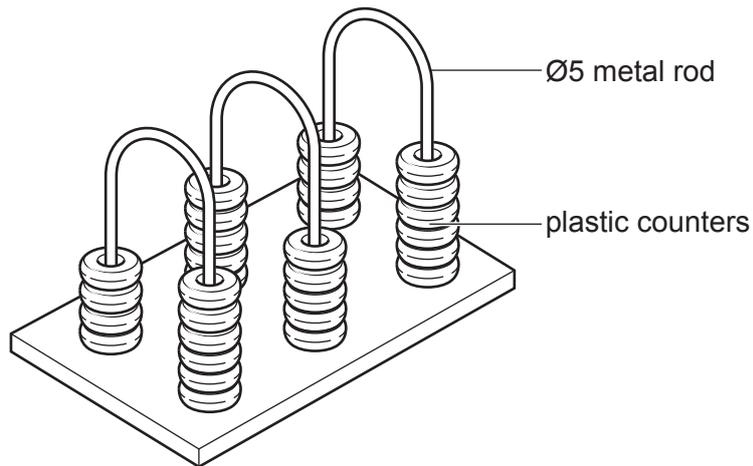


Fig. 9.1

- (a) Name a process that could be used to produce the plastic counters.

..... [1]

- (b) Use sketches and notes to show how all the metal rods could be bent to the same shape.

[3]

10 Fig. 10.1 shows a picnic table made from recycled plastic.

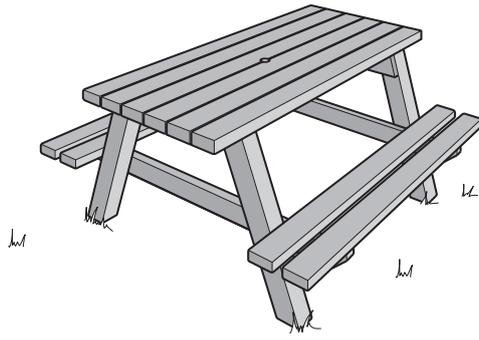


Fig. 10.1

Give **two** benefits of using recycled plastic for the picnic table rather than softwood.

1

2

[2]

Section B

Answer **one** question from this section.

- 11 Fig. 11.1 shows an incomplete design for a cabinet with a drawer. The cabinet is made from 18mm thick veneered chipboard and designed as flat pack for self-assembly.

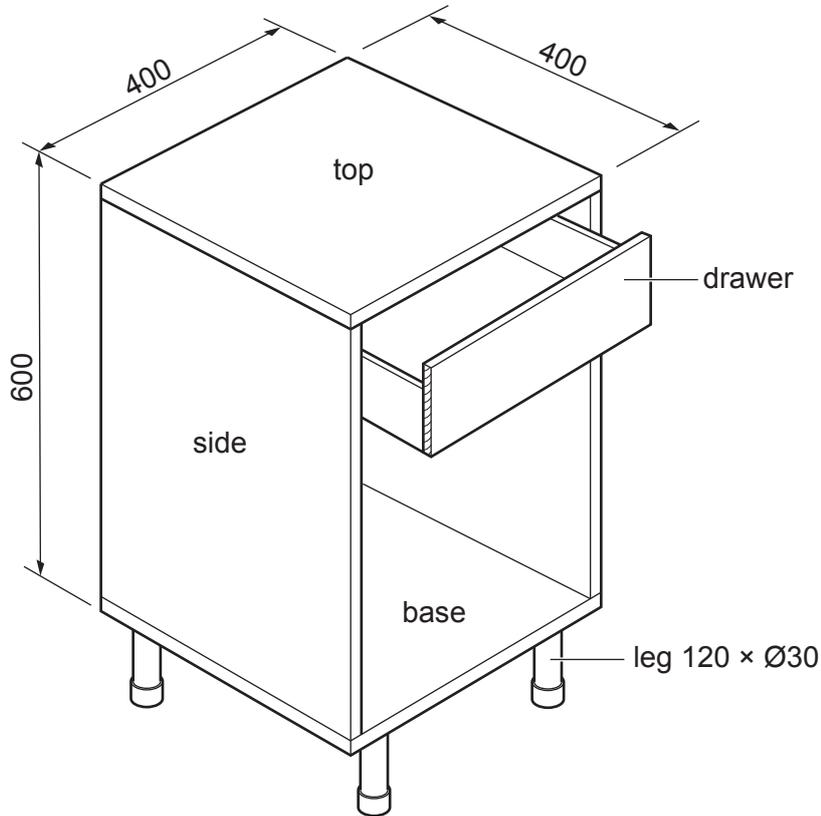


Fig. 11.1

- (a) Give **two** reasons why manufactured boards are often covered with veneer.

1

2

[2]

- (b) The top and base of the cabinet are joined to the sides using dowels.

(i) State a suitable diameter for the dowels [1]

(ii) State a suitable length for the dowels [1]

(iii) State the number of dowels used to join **one** side to the top of the cabinet [1]

- (c) PVA adhesive will be used for the dowel joints.
State **one** benefit of using PVA adhesive.

..... [1]

- (d) Working with chipboard can be difficult.
Describe **one** problem that can be encountered when working with chipboard and how the problem could be solved.

Problem

.....

Solution

.....

[2]

- (e) The drawer front will be joined to the sides of the drawer using cam lock knock-down (KD) fittings. Fig. 11.2 shows details of the drawer and a cam lock fitting.

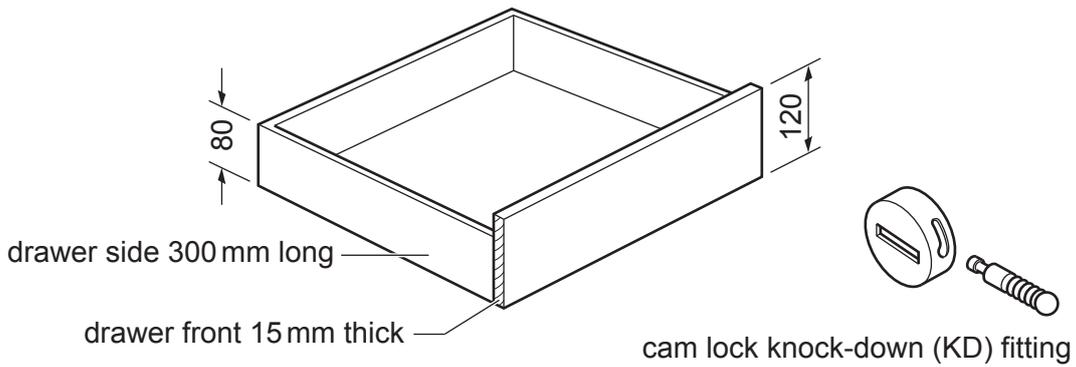


Fig. 11.2

Use sketches and notes to show how **one** cam lock fitting could be used to join the drawer front to **one** of the sides.

[3]

- (f) (i) Use sketches and notes to show a design for a handle that could be attached to the drawer front to enable the drawer to be opened and closed.
Include:
- the name of the material used for the handle
 - the method of attaching the handle to the drawer front.

[4]

- (ii) Use sketches and notes to show how the drawer could be supported inside the cabinet.
The drawer must be:
- able to slide in and out of the cabinet
 - prevented from going too far inside the cabinet.
- Include details of fittings and fixings used.

[4]

(g) Fig. 11.3 shows one corner of the back of the cabinet and part of the hardboard back.

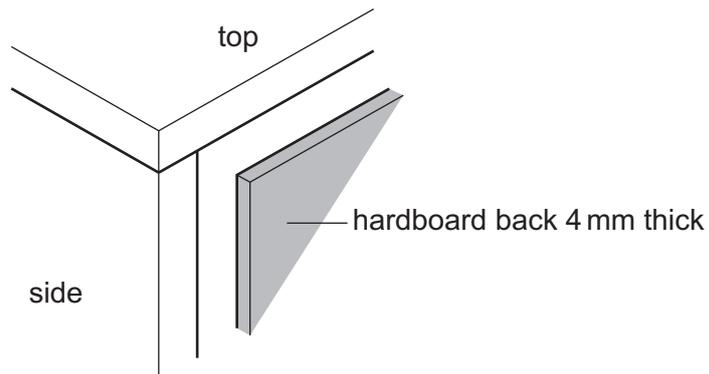


Fig. 11.3

Use sketches and notes to show how the hardboard back could be fitted permanently to the cabinet so that the edges of the hardboard are not visible.

[3]

(h) Fig. 11.4 shows a box in which **all** the parts of the cabinet and drawer will fit for delivery to customers.

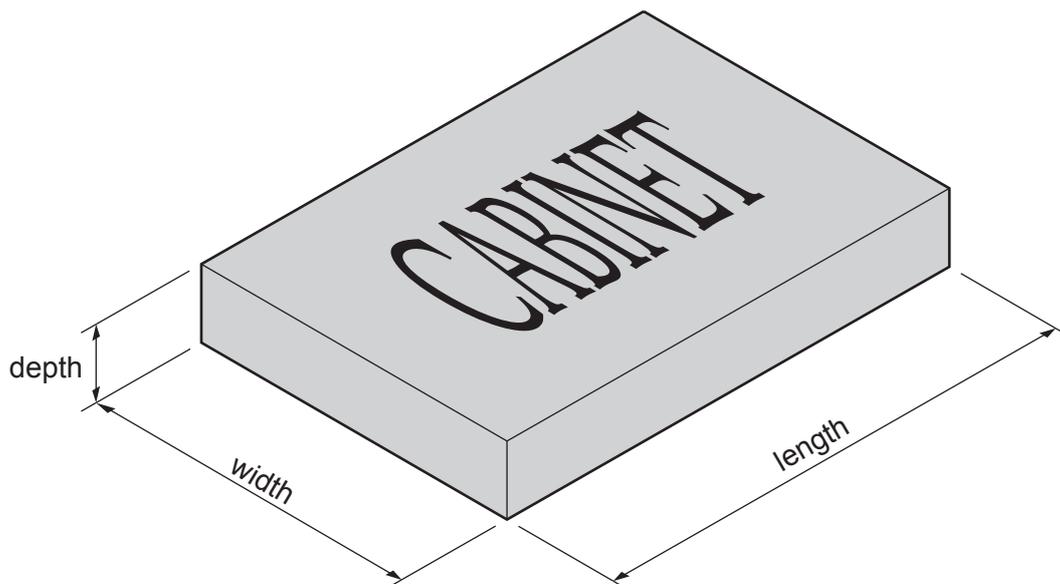


Fig. 11.4

Add to Fig. 11.4 by stating an appropriate length, width and depth for the box to contain all the parts of the cabinet and drawer.

[3]

12 Fig. 12.1 shows a tray made from 5 mm thick acrylic.

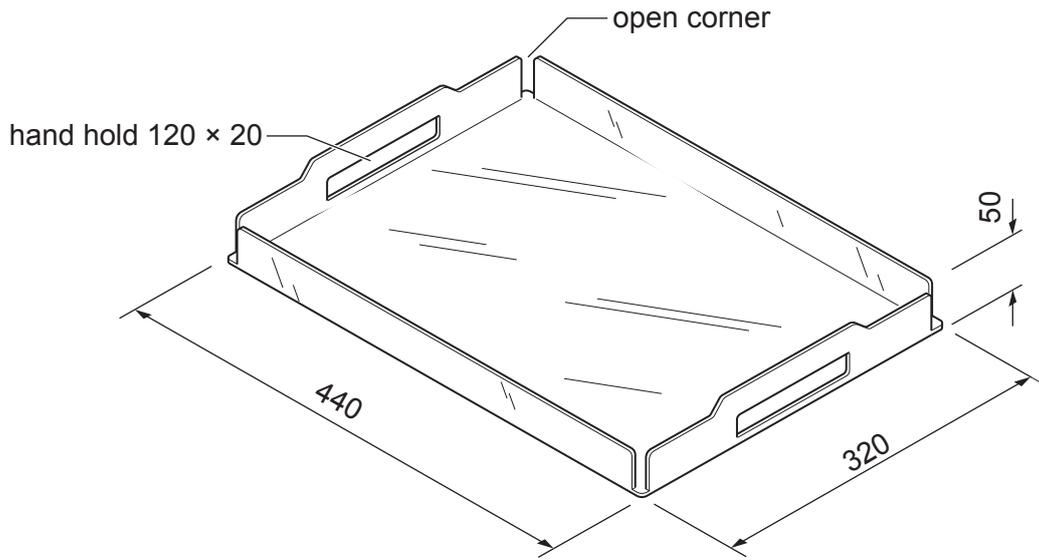


Fig. 12.1

(a) (i) State **two** properties of acrylic that make it suitable for the tray.

1

2

[2]

(ii) Acrylic sheet has a thin backing film covering both sides. State the purpose of the thin backing film.

..... [1]

(b) State **two** items of research that a designer would need to consider when designing the tray.

1

2

[2]

(c) The corners of the tray shown in Fig. 12.1 are 'open'. State **one** advantage of the corners being 'open' rather than 'closed'.

..... [1]

(d) Describe **one** example of how the designer has considered ergonomics in the design of the tray.

.....

..... [2]

(e) Fig. 12.2 shows a screenshot of the development (net) of the tray produced using CAD software.

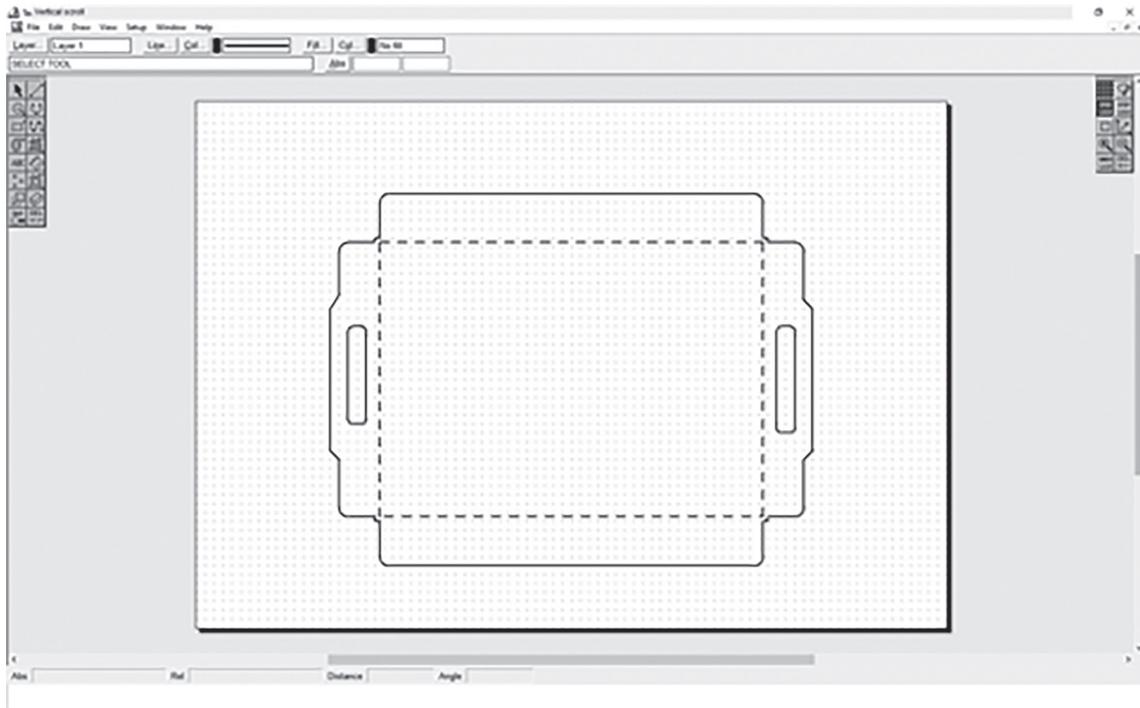


Fig. 12.2

(i) State **two** benefits, other than speed and accuracy, of using CAD to produce the development (net) of the tray.

1

2

[2]

(ii) State **one** drawback of using CAD.

..... [1]

(f) Fig. 12.3 shows the development (net) of the tray ready to be cut to shape.

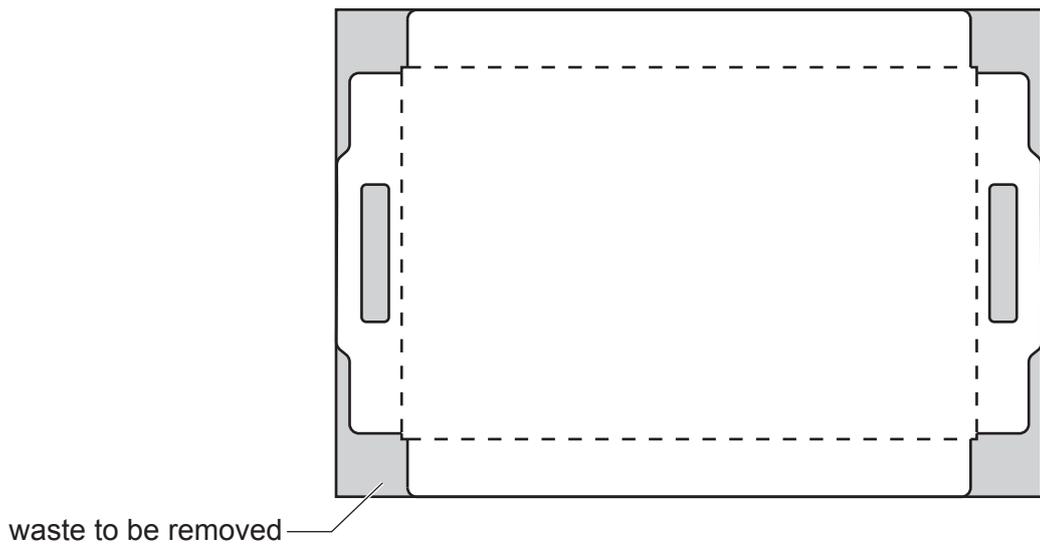


Fig. 12.3

(i) Name **one** suitable machine saw that could be used to cut out the waste acrylic.

..... [1]

(ii) Name **one** suitable saw that could be used to cut out the waste acrylic by hand.

..... [1]

- (g) Fig. 12.4 shows one corner of the tray after the waste acrylic has been removed using a machine saw.

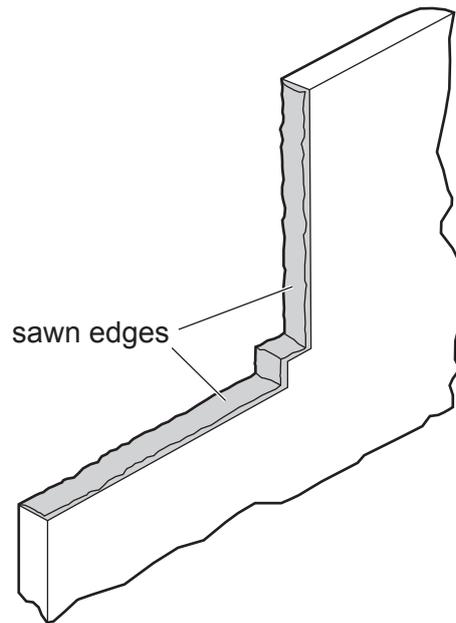


Fig. 12.4

Circle, from the list of files below, the most suitable file that could be used to make the sawn edges flat and smooth.

warding

hand

square

half-round

[1]

(h) Fig. 12.5 shows the development (net) of the tray ready to be heated and bent to shape.

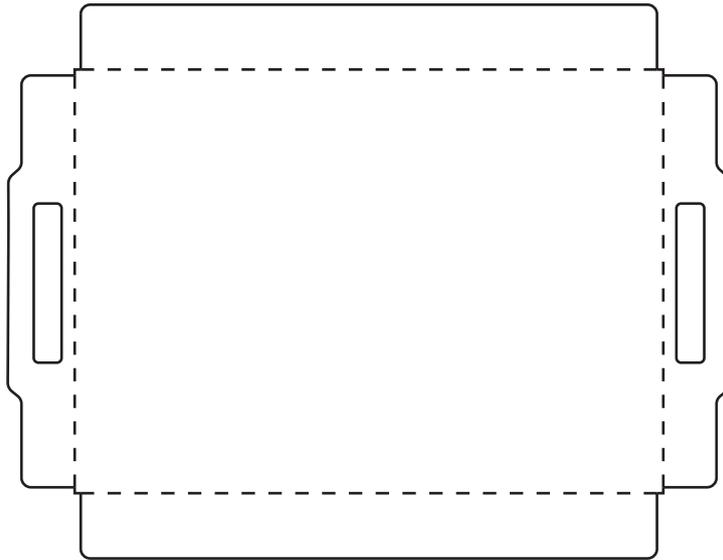


Fig. 12.5

Use sketches and notes to show how the development (net) of the tray could be heated and bent to shape.

Include details showing how the acrylic could be:

- heated and softened
- bent to the correct shape and retained in position while it cooled.

[5]

- (i) The tray will have a handle that would enable a person to carry it using one hand. Fig. 12.6 shows the tray with an incomplete handle that will fold flat inside the tray when it is not required.

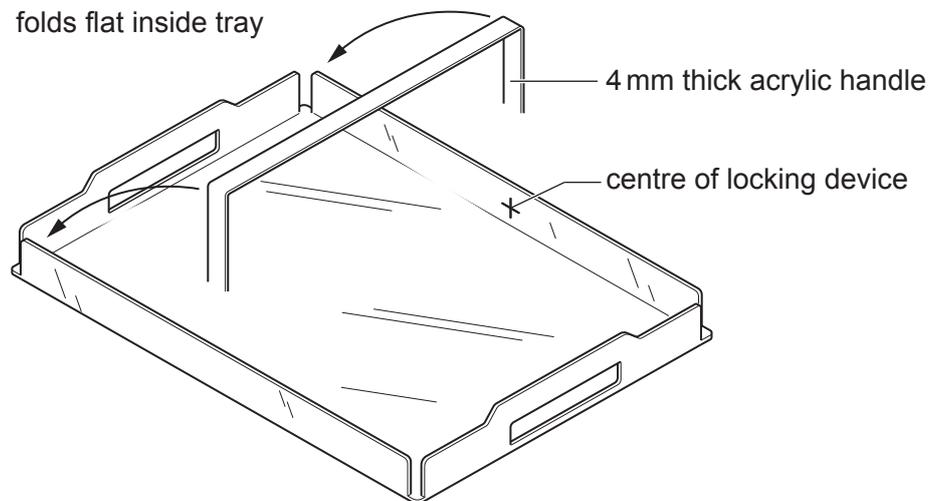


Fig. 12.6

Use sketches and notes to show a completed design for the handle and show how it could be:

- attached to the sides of the tray
- locked securely in the upright position when the tray is carried.

The method of locking and unlocking the handle must be quick and easy to operate. Include details of the materials used and give **two** important sizes.

- 13 Fig. 13.1 shows a jewellery stand made in a school workshop. The jewellery stand could be delivered to customers as flat pack for self-assembly. The tray and uprights are made from oak. The rail and support are made from brass.

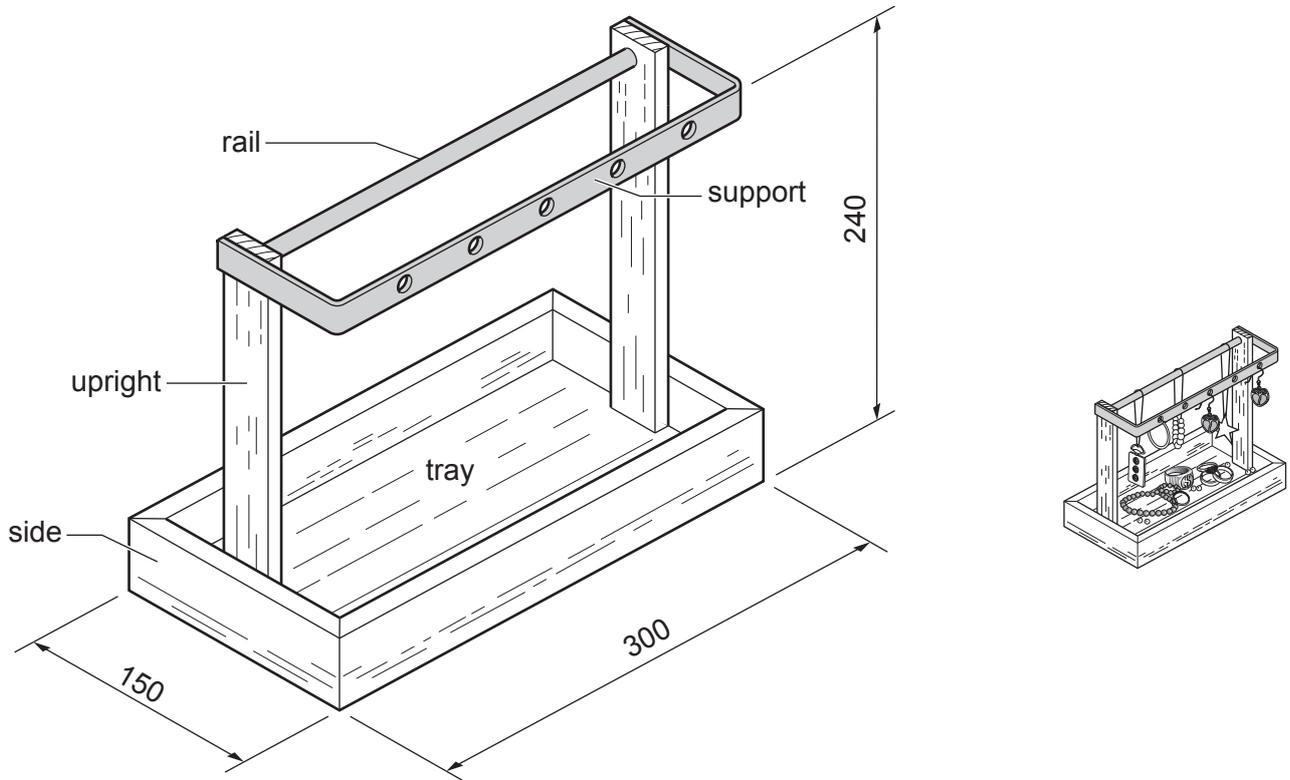


Fig. 13.1

- (a) State **two** items of research the designer would need to consider when designing the jewellery stand.

1

2

[2]

- (b) The sides of the tray will be joined by mitre joints at each corner.
 Fig. 13.2 shows part of one of the sides of the tray with the joint marked out.

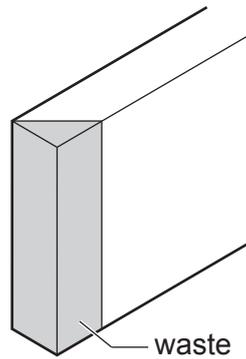
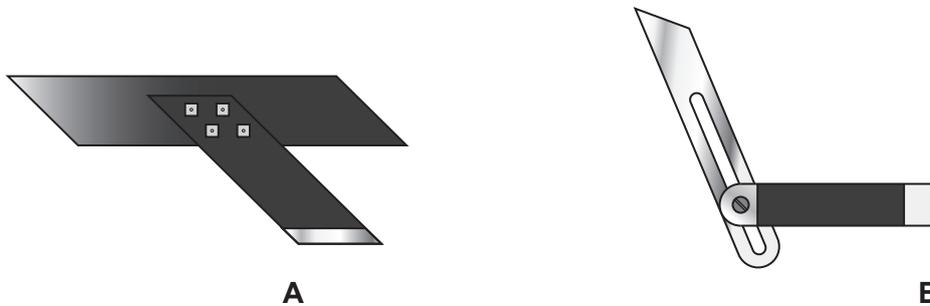


Fig. 13.2

- (i) Name the tools, **A** and **B**, that could be used to mark out the joint.



A

B [2]

- (ii) Fig. 13.3 shows the sides of the tray ready to be glued at each corner.

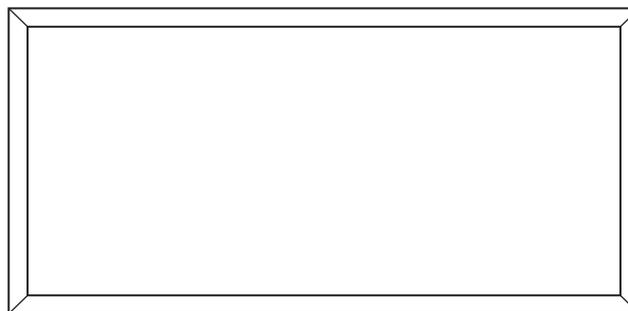


Fig. 13.3

Add sketches and notes to Fig. 13.3 to show how the sides could be held in position while the glue sets. [2]

- (c) Use sketches and notes to show how the space inside the tray could be divided into **three unequal** parts to keep different items of jewellery separate. Give details of the materials and constructions used.

[5]

- (d) The support is made from 1.5 mm thick brass strip. Fig. 13.4 shows part of the support marked out ready for the holes to be drilled and the strip to be bent to shape.

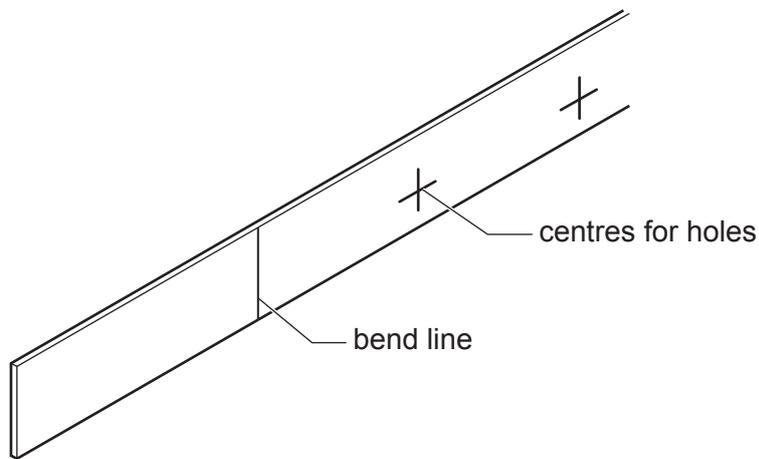


Fig. 13.4

- (i) Name **two** marking out tools that could be used to mark out the centres and bend lines on the brass strip.

1

2

[2]

(ii) State **two** precautions, other than personal protective equipment (PPE), that must be taken before drilling the holes in the brass strip.

1

2

[2]

(iii) Use sketches and notes to show how the brass strip could be bent to the shape of the support. Name all the tools and equipment used.

[3]

(e) An abrasive paper could be used before the brass support is polished.

(i) Name a suitable abrasive paper that could be used when finishing the brass strip.

..... [1]

(ii) Explain why it is important to select the correct grade of abrasive paper when finishing the brass strip.

.....

.....

..... [2]

- (f) Parts of the jewellery stand will be joined so that customers could assemble them using basic tools.
Use sketches and notes to show suitable joints at **A** and **B** shown in Fig. 13.5.
Give details of fittings and show clearly how they are used.

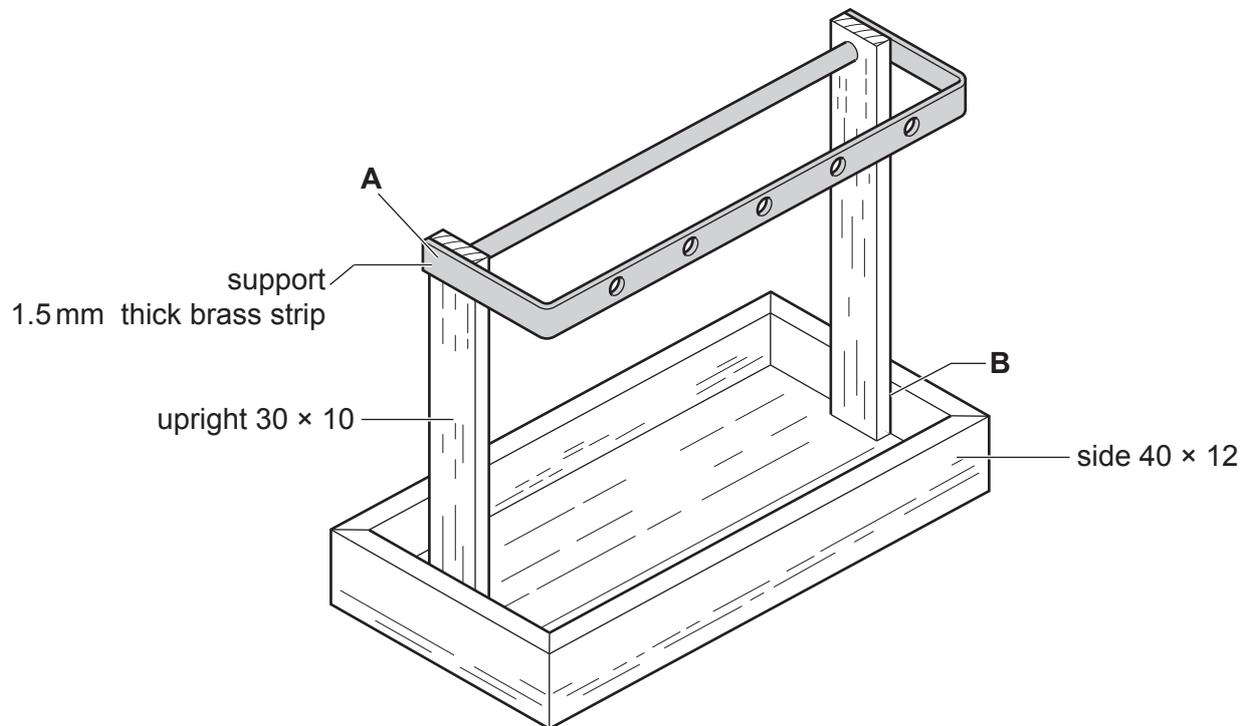


Fig. 13.5

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