



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

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER



**DESIGN AND TECHNOLOGY**

**0445/31**

Paper 3 Resistant Materials

**May/June 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 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 **18** printed pages and **2** blank pages.

**Section A**

Answer **all** questions in this section.

- 1 Two signs used in a workshop are shown below.



Describe a specific workshop process when:

ear defenders must be worn

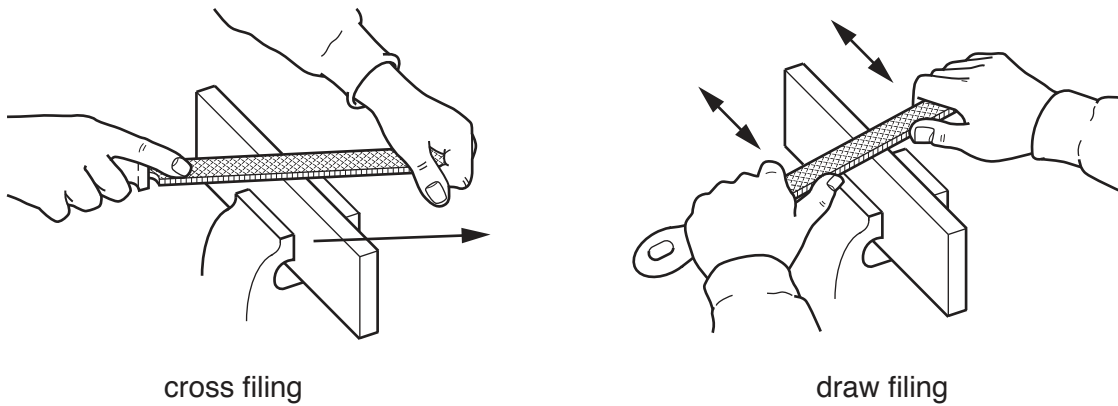
.....

safety glasses must be worn.

.....

[2]

- 2 Fig. 1 shows two different methods of filing metal.



**Fig. 1**

Describe the purpose of each method of filing.

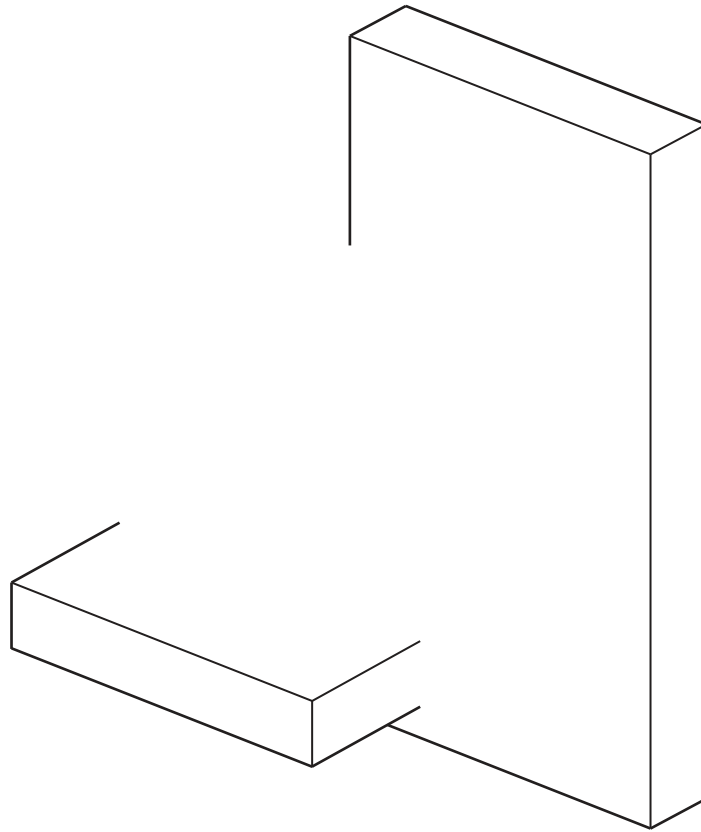
Cross filing .....

.....

Draw filing .....

[2]

3 Complete the drawing below to show an exploded view of a stopped housing joint.



[3]

4 Fig. 2 shows a small dish made from plastic. The dish has been vacuum formed.

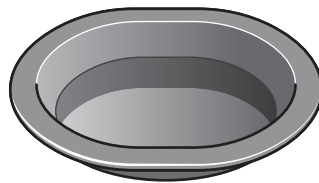


Fig. 2

(a) The former used to vacuum form the dish could be made from hardwood or MDF. Give **two** advantages of making the former from MDF rather than hardwood.

1 .....

2 .....

[2]

(b) Describe **two** features of the design of the former to ensure that the dish will be vacuum formed successfully.

1 .....

2 .....

[2]

5 Fig. 3 shows two electric drills.

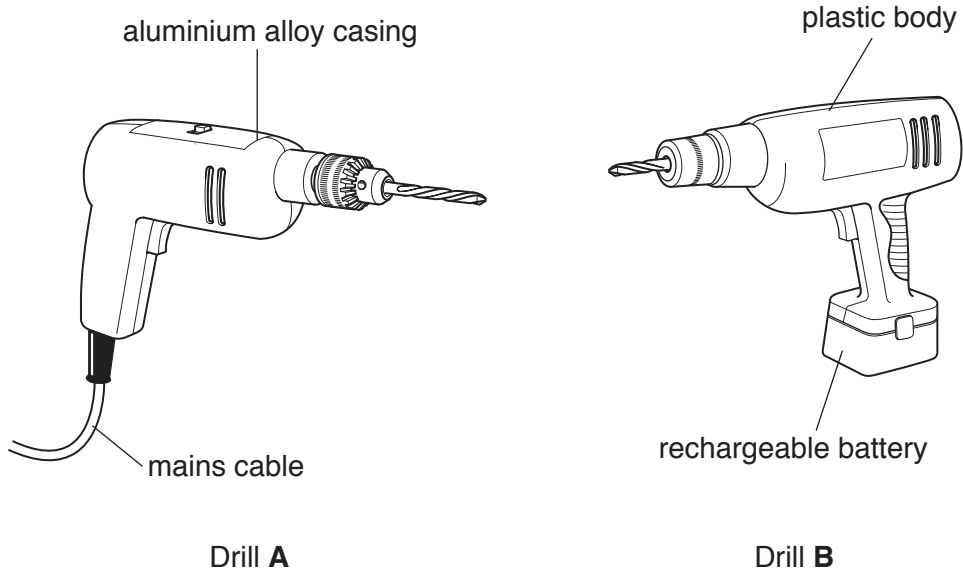


Fig. 3

(a) Name the manufacturing process used to produce the casing for drill A.

..... [1]

(b) Give **one** advantage of using drill B compared to drill A.

..... [1]

6 Fig. 4 shows a kitchen roll holder made from acrylic.

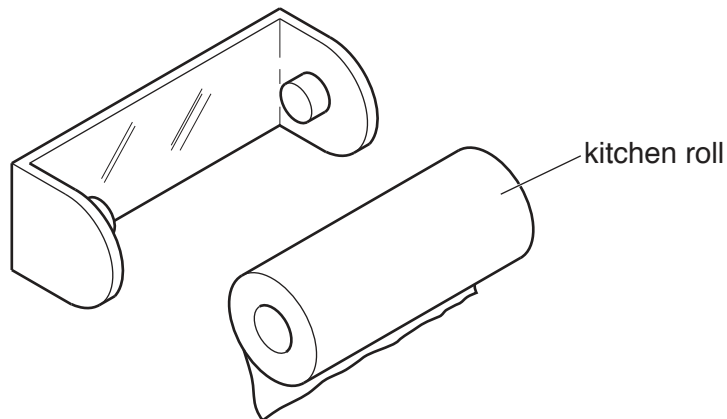


Fig. 4

Explain how the designer has used the flexible property of acrylic in the design of the kitchen roll holder.

.....  
 .....  
 .....

[2]

- 7 Fig. 5 shows a basic design for a desk tidy made in a school workshop. The desk tidy is made from 4 mm thick acrylic.

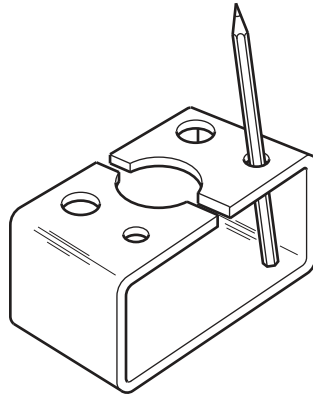


Fig. 5

Use sketches and notes to show **one** functional improvement to the design of the desk tidy.

[2]

- 8 Fig. 6 shows part of a garden tool rack.

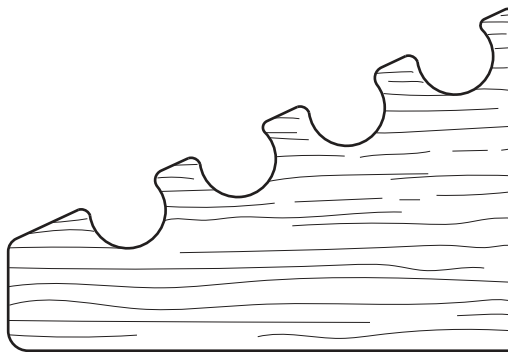


Fig. 6

- (a) Indicate clearly on Fig. 6 **one** example of 'short grain'. [1]
- (b) Explain why 'short grain' is a problem that occurs only in solid wood and not in manufactured boards.

.....

.....

..... [2]

9 Fig. 7 shows a round tube that will be joined to a metal strip made from mild steel.

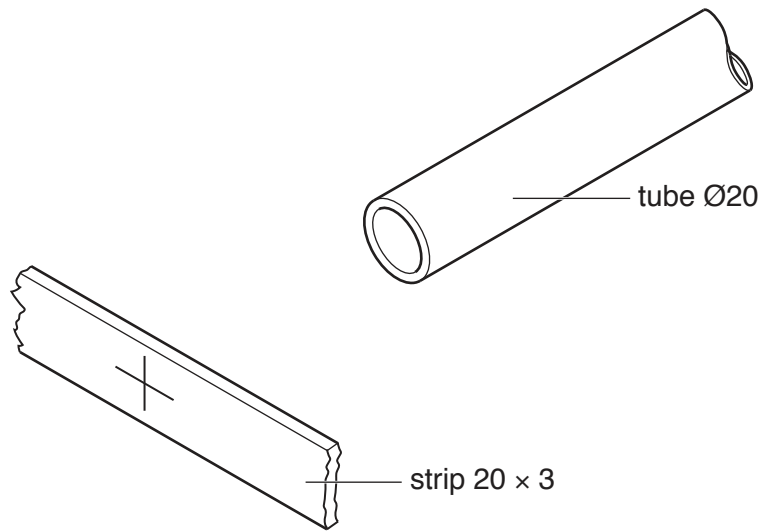
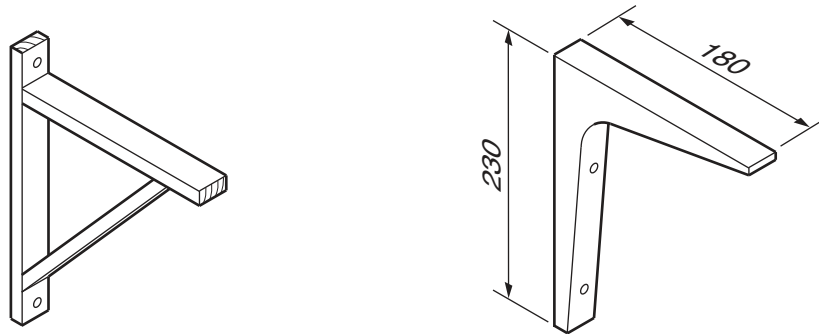


Fig. 7

Add sketches and notes to Fig. 7 to show how they could be joined together. Your method must allow the tube and strip to be taken apart.

[3]

10 Fig. 8 shows two different wall brackets.



bracket A fabricated from softwood

bracket B moulded plastic

Fig. 8

(a) Describe **one** quality control check that would be carried out during the manufacture of bracket A.

.....  
 ..... [1]

(b) Describe **one** quality control check, different to that in part (a), that would be carried out during the manufacture of bracket B.

.....  
 ..... [1]

**Section B begins on page 8.**

## Section B

Answer **one** question in this section.

- 11 Fig. 9 shows views of a child's counting toy. When the discs are stacked on the rod, the collar slides down on top of the discs to show the number of discs stacked.

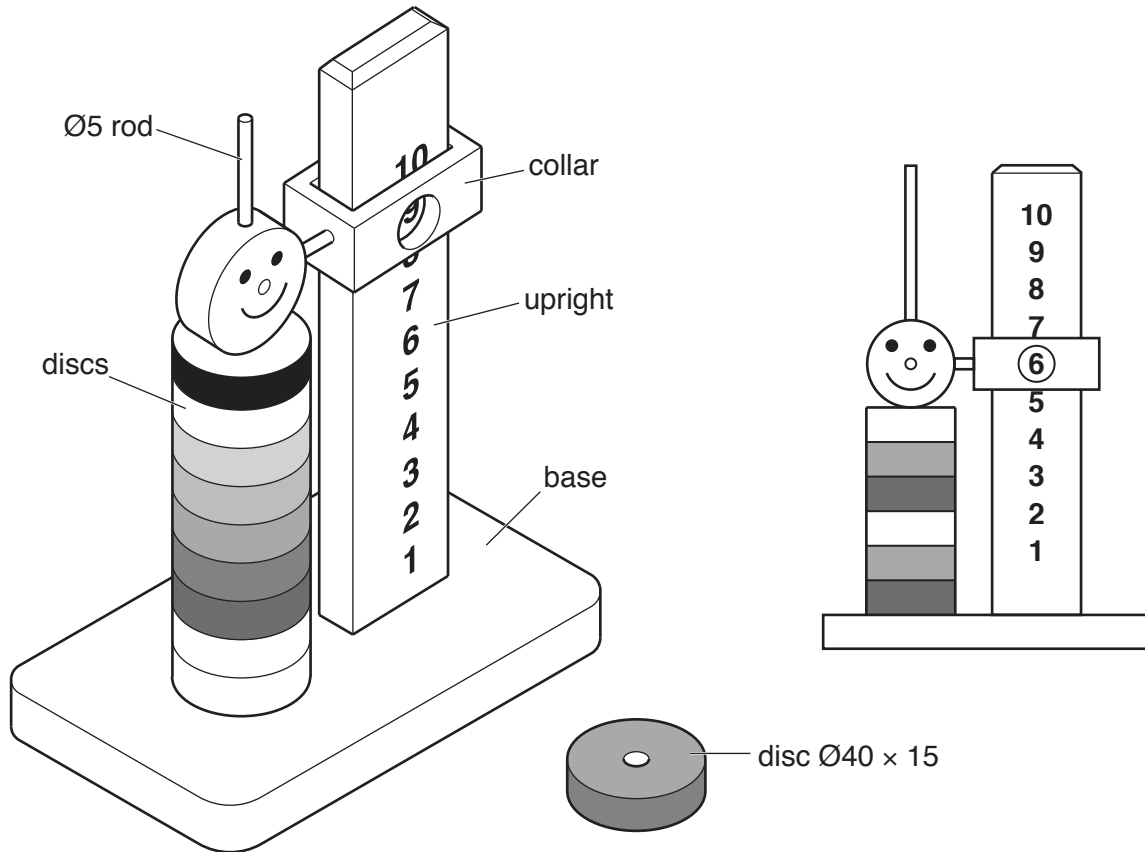


Fig. 9

- (a) Fig. 10 shows the base of the counting toy. The base is made from beech.

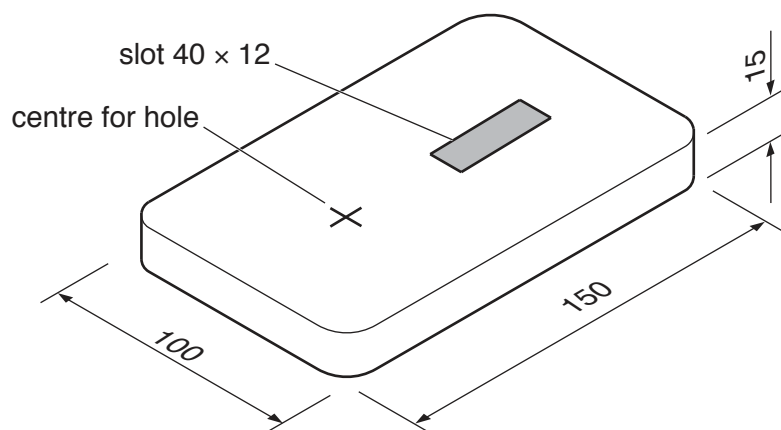


Fig. 10

- (i) Give **two** reasons why beech is commonly used to make children's toys.

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

[2]



(ii) Name **three** marking out tools, other than a pencil, that could be used to mark out the centre for the hole and the slot.

1 .....

2 .....

3 .....

[3]

(iii) Describe how the slot could be cut out 10 mm deep to take the upright.

.....

.....

.....

.....

..... [3]

(b) The Ø5 rod is made from non-ferrous metal.

(i) Name a suitable non-ferrous metal for the rod.

..... [1]

(ii) Give **one** reason why a non-ferrous metal could be more suitable than a ferrous metal for the rod.

..... [1]

(c) Use sketches and notes to show how **ten** identical wooden discs could be made in a school workshop. Show clearly how the holes in each disc could be produced accurately.

[5]

(d) The discs could also be made from plastic and produced by injection moulding. Give **two** advantages of using the injection moulding process to produce plastic discs rather than making them from wood.

1 .....

2 .....

[2]

(e) Fig. 11 shows a length of beech that will be used to make the four parts of the collar.

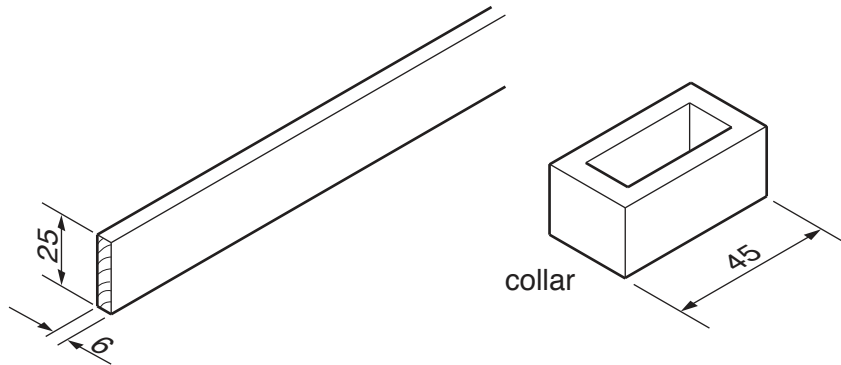


Fig. 11

Use sketches and notes to show how the collar could be constructed. Name the tools and equipment used to construct the collar.

[4]

(f) Describe how CAD/CAM could be used to produce the numbers on the upright.

.....  
.....  
.....  
.....  
.....  
.....

[4]

- 12 Fig. 12 shows an incomplete design for a reading lamp to be made in a school workshop. The arms, base and supports are made from hardwood.

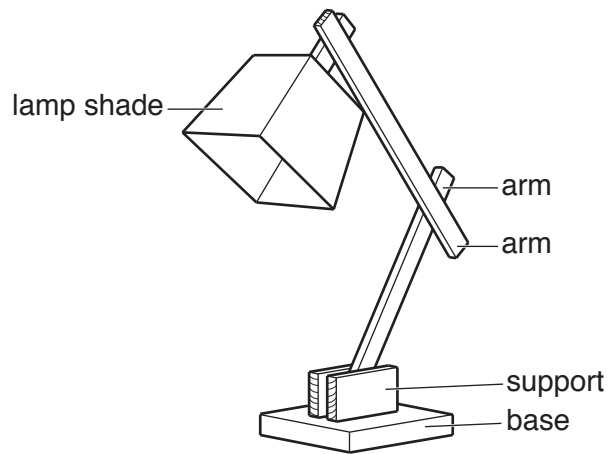


Fig. 12

- (a) Fig. 13 shows details of the base and supports.

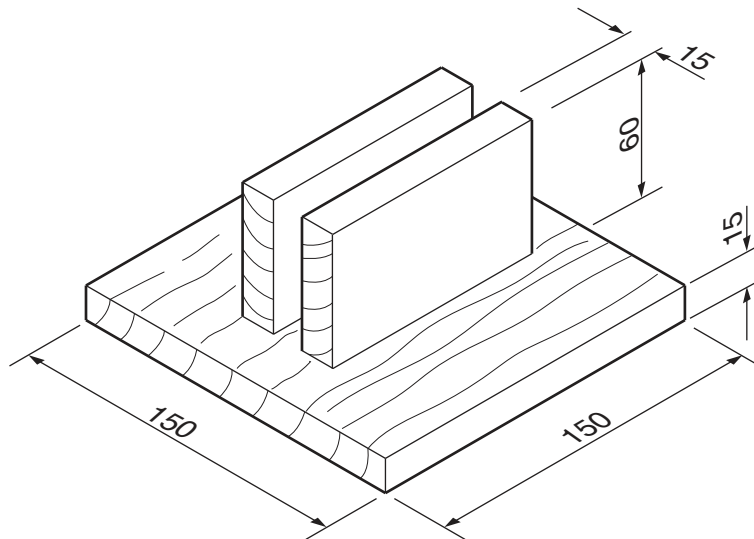


Fig. 13

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

(b) Fig. 14 shows views of parts of both arms of the reading lamp.

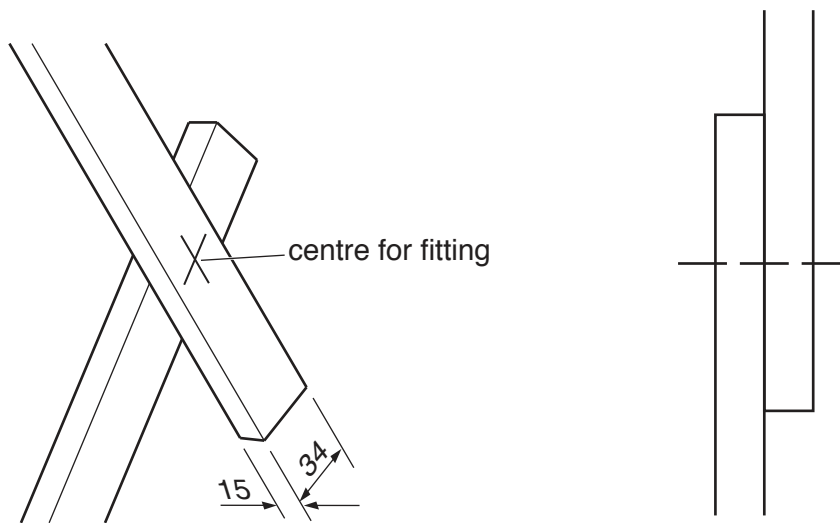


Fig. 14

(i) Draw on Fig. 14 to show a metal fitting that could be used to join the arms together and allow them to be adjusted and locked in position. Add **two** important sizes to the fitting. [4]

(ii) The fitting will be chrome plated. Give **two** benefits of chrome plating metal fittings.

- 1 .....
  - 2 .....
- [2]

(c) Fig. 15 shows one of the four sides that will be joined together to make the lamp shade. The sides are made from 3 mm thick veneered plywood.

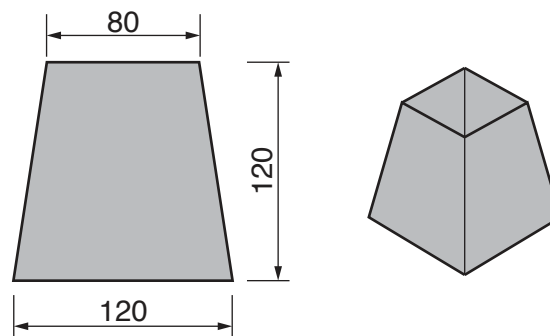


Fig. 15

(i) Give **two** advantages of using 3 mm thick veneered plywood rather than solid wood for the sides of the lamp shade.

- 1 .....
  - 2 .....
- [2]

- (ii) Use sketches and notes to show how the sides could be joined together to form the lamp shade. Consider carefully that the veneered plywood is only 3 mm thick.

[4]

- (d) The lamp shade shown in Fig. 15 could be made from brass.  
State **two** properties of brass that make it suitable for the lamp shade.

1 .....

2 .....

[2]

(e) Fig. 16 shows a template of the lamp shade glued onto a sheet of 1 mm thick brass.

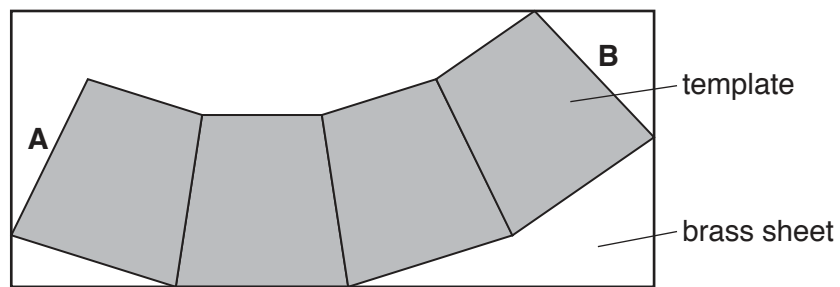


Fig. 16

Use sketches and notes to show how the lamp shade could be made from **one** piece of brass. Include the method of:

- cutting out the shape
- bending the brass to shape
- soldering edge **A** to edge **B**
- cleaning and finishing.

[8]

- 13 Fig. 17 shows views of a children’s play table. The height of the table can be adjusted by means of sleeves that fit over the ends of the legs. The table is produced as flat-pack for self-assembly.

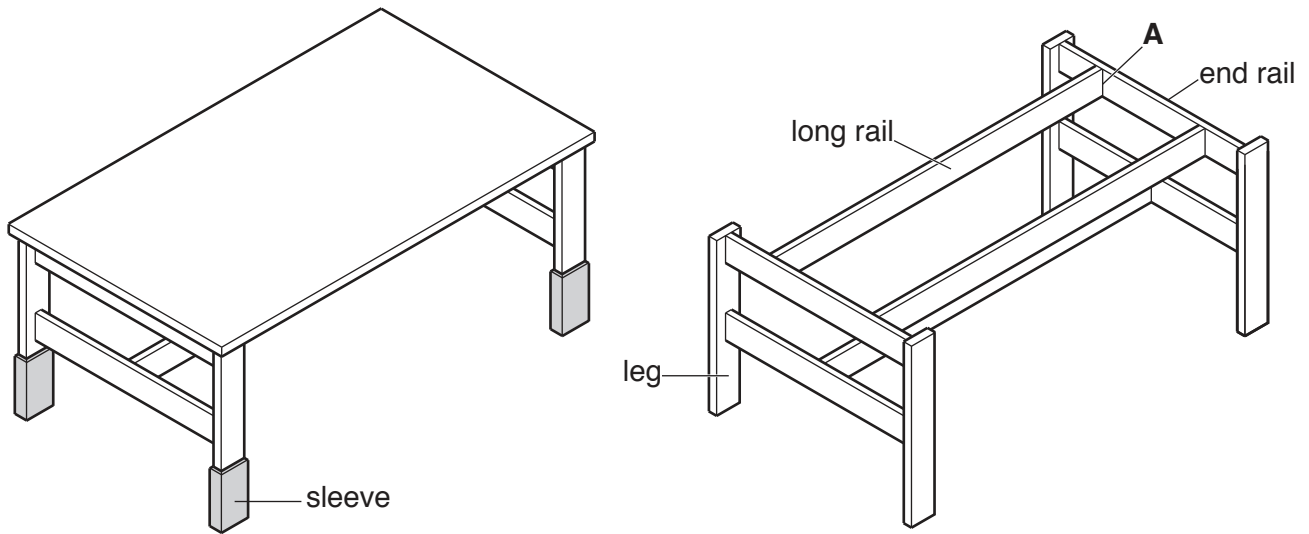


Fig. 17

- (a) (i) Name a suitable manufactured board for the table top.  
 ..... [1]
- (ii) Name a suitable softwood for the legs and rails.  
 ..... [1]
- (b) Describe **two** benefits of covering the manufactured board used for the table top with melamine sheet.  
 1 .....  
 2 ..... [2]
- (c) (i) Explain why the designer has made the table height adjustable.  
 .....  
 .....  
 ..... [2]

- (ii) The height of the table can be adjusted by means of sleeves that fit over the ends of the legs. The sleeve shown below will be produced by the extrusion process.

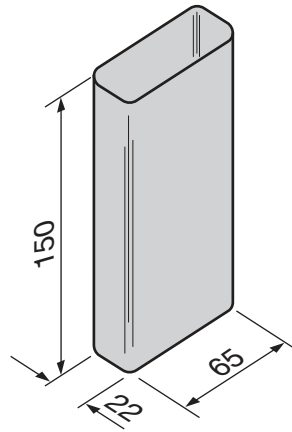


Fig. 18 shows part of an extrusion moulding machine.  
Add notes to Fig. 18 to describe the extrusion process.

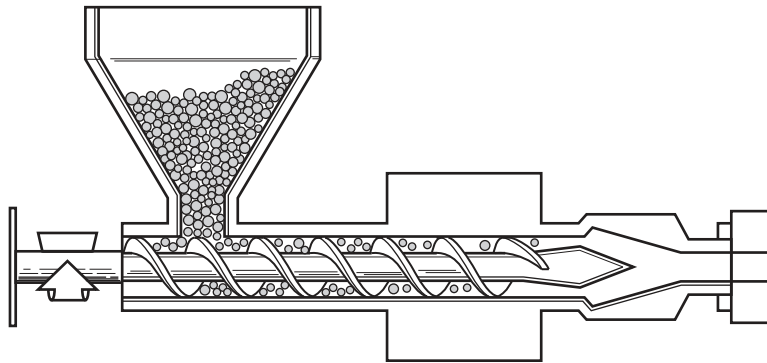


Fig. 18

[3]

- (iii) The height of the table can be adjusted by moving the sleeve up or down and locking it in position.  
Use sketches and notes to show how the table could be set at **three** different heights.  
Include details of any fittings and materials used.

[4]



- (d) The legs and rails are made from the same size section softwood, 60 × 20.  
Explain **one** benefit to the manufacturer of using the same size section softwood.

.....

.....

..... [2]

- (e) The parts of the table shown in Fig. 17 will be assembled using dowels and screws.

- (i) Use sketches and notes to show how screws could be used to join two rails at **A**.

[3]

- (ii) Use sketches and notes to show how dowels could be used to join the table top to the rails.

[3]

- (f) Explain **one** benefit to manufacturers of making products that can be self-assembled by consumers.

.....

.....

..... [2]

- (g) Use sketches and notes to show **one** functional improvement to the design of the children’s play table.

[2]



**BLANK PAGE**

---

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at [www.cambridgeinternational.org](http://www.cambridgeinternational.org) after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.