



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

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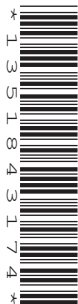
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DESIGN AND TECHNOLOGY

0445/31

Paper 3 Resistant Materials

October/November 2017

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 **16** printed pages.

Section A

Answer **all** questions in this section.

1 Fig. 1 shows a child's scooter.

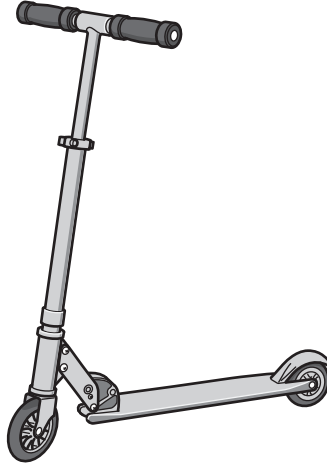


Fig. 1

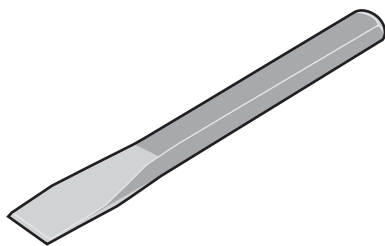
Describe **three** ways in which the designer has considered the child's safety in the design of a scooter.

1

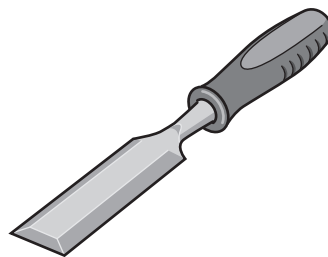
2

3 [3]

2 Describe a specific use for each of the chisels shown in Fig. 2.



cold chisel



bevel-edge chisel

Fig. 2

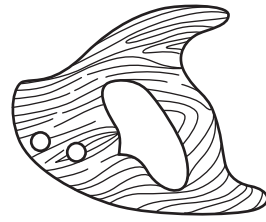
Cold chisel

.....

Bevel-edge chisel

..... [2]

3 Complete the drawing below to show a tenon saw.



[2]

4 SMA is a smart material that, when bent out of shape, will return to its original shape when heated.

SMA stands for: **Shape Memory A**.....

[1]

5 Fig. 3 shows a variety of tools used in a school workshop.

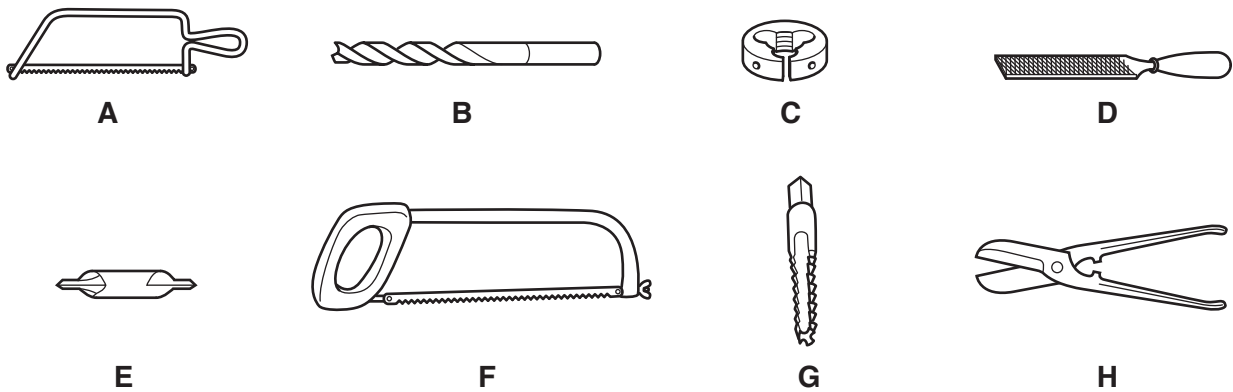


Fig. 3

Complete the table below to show which tool from Fig. 3 would be used for each of the processes listed.

| Process | Tool A–H |
|--|----------|
| cutting through Ø12 mild steel bar | |
| starting off a hole on a centre lathe | |
| cutting a screw thread on a round bar | |
| cutting shapes out of 1 thick copper sheet | |

[4]

- 6 Fig. 4 shows a washing-up liquid bottle made from plastic and a symbol that can be seen on the bottle.



Fig. 4

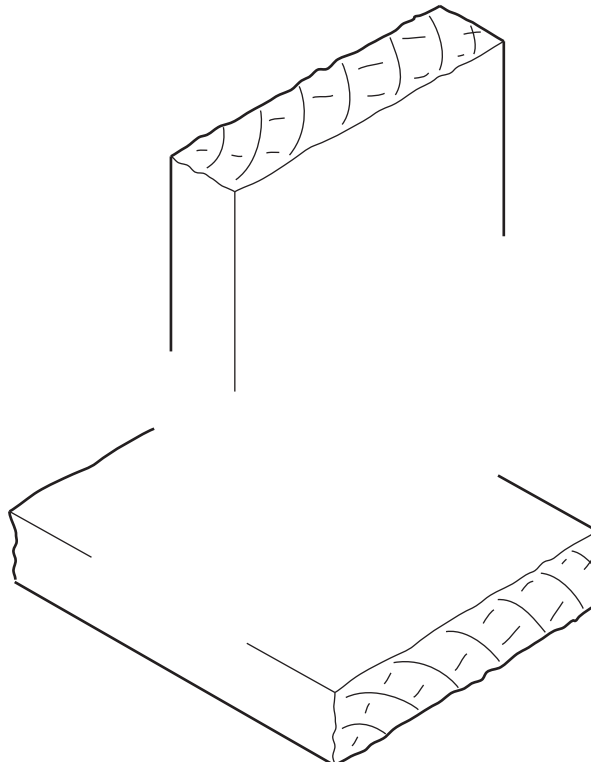
- (a) Name the plastic.

.....[1]

- (b) Describe **one** problem for the environment when using products made from plastic.

.....[1]

- 7 Complete the drawing below to show a stopped housing joint.



[3]

8 Fig. 5 shows a house number plate made from brass, a non-ferrous alloy.



Fig. 5

Explain the term 'non-ferrous alloy'.

.....
 [2]

9 Fig. 6 shows a hot melt glue gun.





Fig. 6

Give **one** benefit and **one** drawback of using a hot melt glue gun.

Benefit

Drawback

10 The table below shows two fastening devices.
 Complete the table by naming each fastening device and stating how each would be tightened.

| Fastening device | Name | Method of tightening |
|---|------|----------------------|
|  | | |
|  | | |

[4]

Section B

Answer **one** question from this section.

- 11** Fig. 7 shows two bookends. The bookends could be made from plastic **or** metal. One bookend has two storage strips where pens and pencils could be stored.

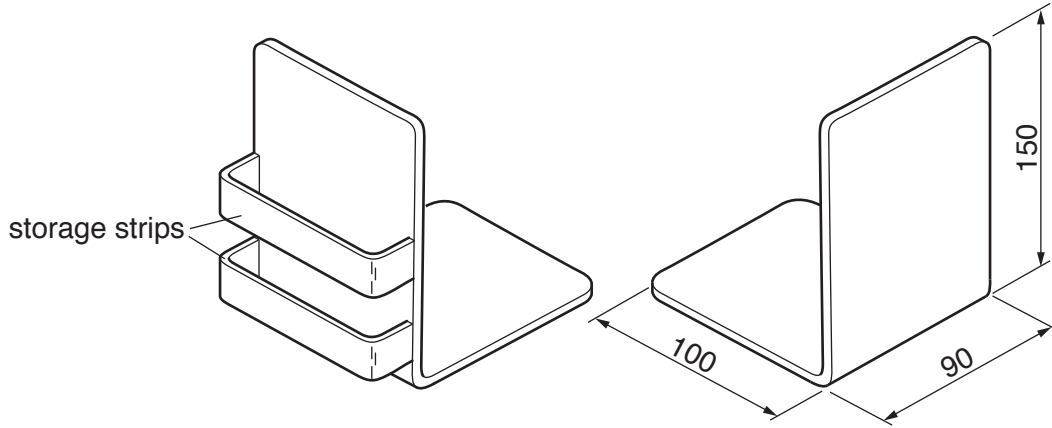


Fig. 7

- (a)** Complete the table below by naming a suitable specific material and appropriate thickness of material for the bookends.

| Material | Specific name | Appropriate thickness |
|---------------|---------------|-----------------------|
| thermoplastic | | |
| ferrous metal | | |

[4]

- (b)** Fig. 8 shows one bookend marked out ready to be bent to shape.

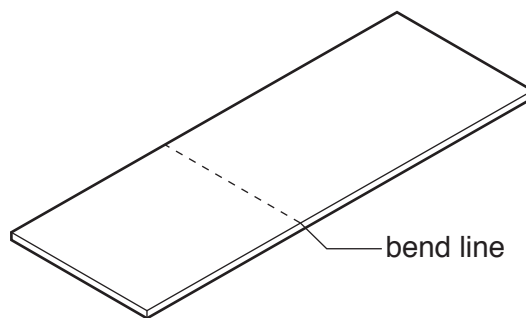


Fig. 8

Name **one** appropriate way of marking a line on the surface of:

- (i)** thermoplastic;

.....[1]

- (ii)** ferrous metal.

.....[1]

(c) Use sketches and notes to show how the bookends could be bent to shape when made from:

(i) thermoplastic;

[3]

(ii) ferrous metal.

[3]

(d) Fig. 9 shows the storage strips that will be joined to the bookend of the same material.

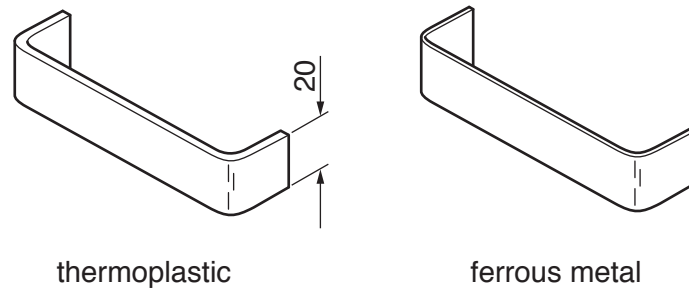


Fig. 9

(i) Describe **three** main stages when joining a storage strip to the bookend permanently when made from **either** thermoplastic **or** ferrous metal.

Chosen material

1

2

3[3]

(ii) Use sketches and notes to show a modification to the thermoplastic bookend and storage strips so that the storage strips could be attached to the bookend without using a permanent method of joining.

[3]

(e) (i) The thermoplastic bookend will be self-finished.
Explain what is meant by the term 'self-finished'.

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

(ii) The ferrous metal bookend will be finished by dip coating with plastic.
Describe **three** main stages in the process of dip coating with plastic.

1
2
3[3]

(f) The bookends are to be manufactured in large quantities.
Give **two** benefits to a manufacturer to produce the bookends **without** the storage strips.

1
2[2]

- 12 Fig. 10 shows a sign that will be located in a school corridor to give directions to a Design and Technology display.
The sign is made from 15 thick hardwood and can be made to be wall-mounted **or** freestanding.

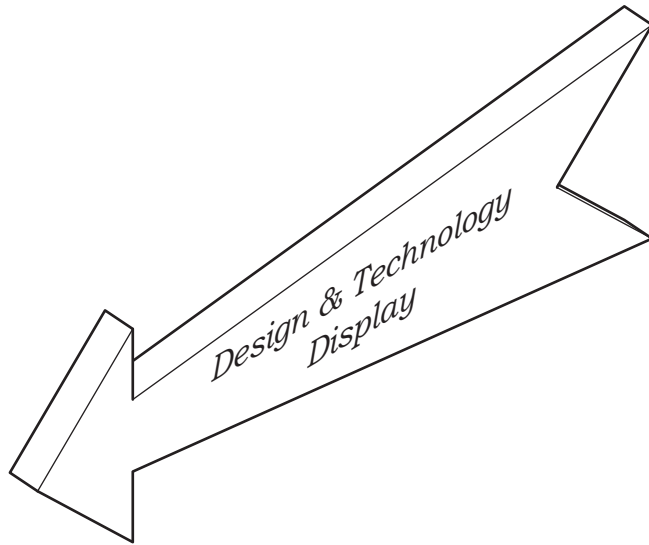


Fig. 10

- (a) Fig. 11 shows the sign marked out ready to be cut to shape.

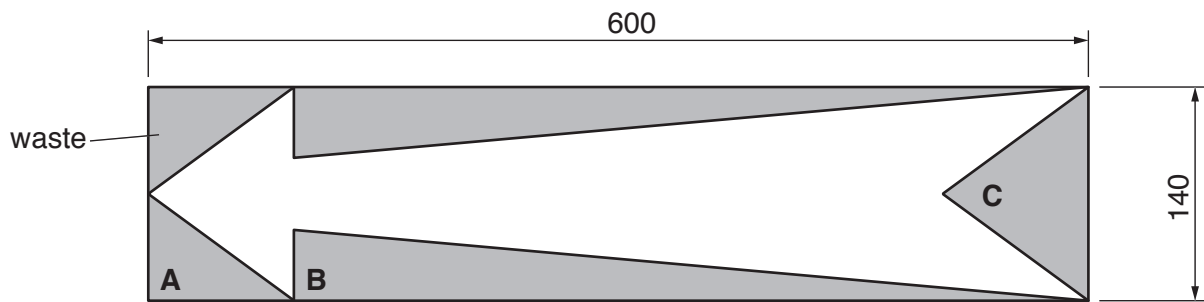


Fig. 11

- (i) Name an attractive hardwood for the sign.

.....[1]

- (ii) For each of the areas **A**, **B** and **C**, name a different tool that could be used to remove the waste.

A

B

C[3]

(iii) Describe how the surfaces of the sign could be prepared to take an applied finish.

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

(iv) Name a suitable finish and describe how it could be applied to achieve a high quality finished surface.

Suitable finish.....[1]

How to achieve a high quality finished surface.

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

(b) Use sketches and notes to show how the sign could be fixed to a wall.
Your method of fixing must not be seen on the front of the sign.
Include all named materials and methods of construction.

[5]

(c) Use sketches and notes to show how the sign could be freestanding and supported at a height of 1.5 metres above the ground.

Your design must include:

- a stable base;
- a method of joining the sign to the support;
- **two** important sizes.

Include all named materials and methods of construction.

[8]

(d) The sign and lettering could be produced using Computer-Aided-Design, [CAD].

Describe how CAD could be used to design the words 'Design & Technology Display'.

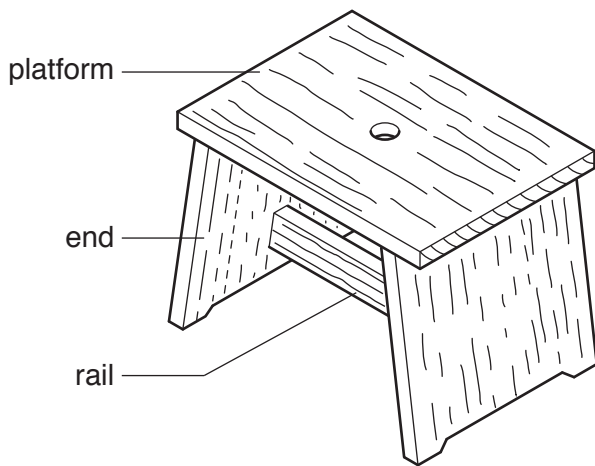
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.....

.....

.....[3]

13 Fig. 12 shows a wooden stool and a parts list. The stool is designed for a person to stand on.



| Part | Number Required | Length × width × thickness |
|----------|-----------------|----------------------------|
| platform | 1 | 350 × 250 × 20 |
| end | 2 | 250 × 250 × 20 |
| rail | 1 | 300 × 50 × 20 |

Fig. 12

(a) From the list of materials below, circle a hardwood that would be suitable for making the stool.

plywood

ash

pine

cedar

[1]

(b) The platform for the stool is 250 wide. The widest available hardwood board is only 150 wide. Fig. 13 shows two boards, each 150 wide.

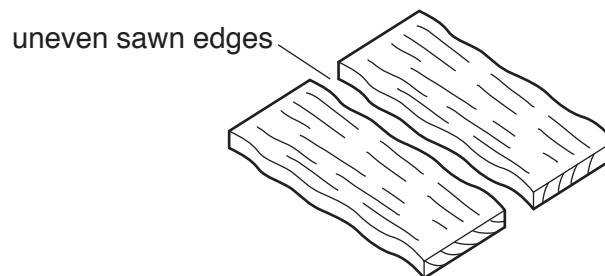


Fig. 13

Use sketches and notes to show how the **two** boards, each 150 wide, could be prepared and joined to make the platform for the stool.

(c) Sketch and name a method of permanently joining the rail to one end.

[4]

(d) Fig. 14 shows the shaping to be carried out to one end.

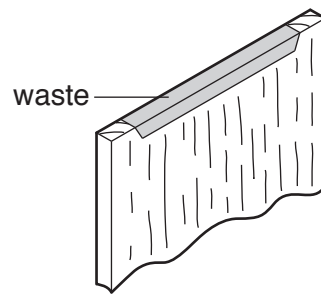


Fig. 14

Use sketches and notes to show how the waste wood could be removed and the sawn edges made flat and smooth.

[3]

(e) Fig. 15 shows a bit that could be used to drill the hole in the stool platform.



Fig. 15

(i) Name the bit shown in Fig. 15.

.....[1]

(ii) When drilling the wood there is a danger that the wood can split as the drill passes through the wood. Use sketches and notes to show how this could be prevented.

[3]

(f) Describe how more grip could be applied to the surface of the platform so that a person standing on it would be less likely to slip.

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

- (g) Fig. 16 shows a stool made from plastic that has the same purpose as the stool made from wood.

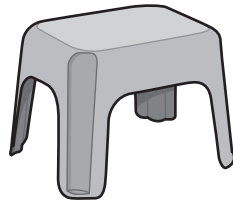


Fig. 16

- (i) Name a suitable plastic for the stool.

.....[1]

- (ii) Name a process that could be used to produce the stool.

.....[1]

- (iii) Explain why the wooden stool would be more expensive to manufacture in large quantities than the plastic stool.

.....
.....
.....
.....[3]

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