



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

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**DESIGN AND TECHNOLOGY**

**0445/31**

Paper 3 Resistant Materials

**May/June 2018**

**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.

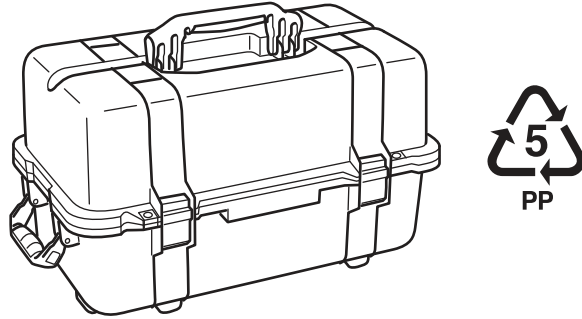
The total of the marks for this paper is 50.

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

**Section A**

Answer **all** questions in this section.

- 1 Fig. 1 shows a tool box made from plastic and a symbol found on the tool box.



**Fig. 1**

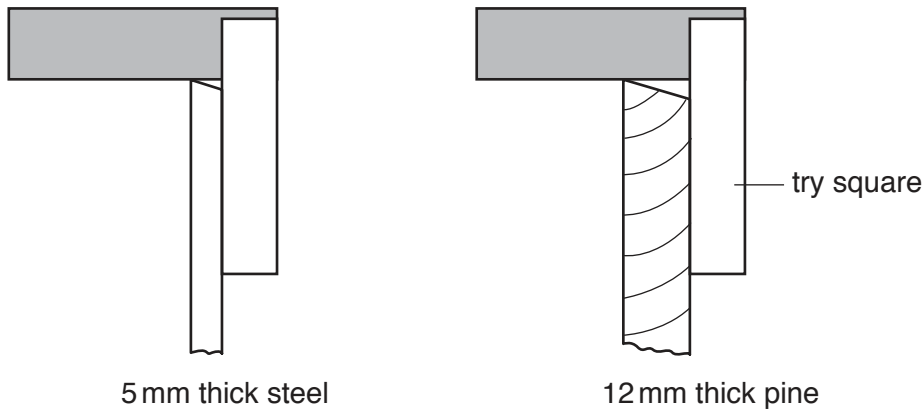
- (a) Name the plastic.

.....[1]

- (b) Give **one** benefit of using this plastic for the tool box.

.....[1]

- 2 Fig. 2 shows a try square being used to test an edge for squareness.



**Fig. 2**

Give the correct name of a specific hand tool that could be used to make the edge square when made from:

- (a) 5 mm thick steel .....[1]

- (b) 12 mm thick pine .....[1]

3

3 Fig. 3 shows a block joint.

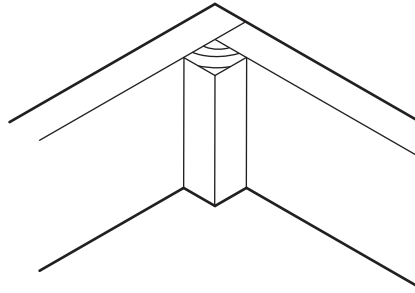


Fig. 3

Add to Fig. 3 to show how the block joint could be strengthened.

[2]

4 Fig. 4 shows views of a smart phone desk stand.

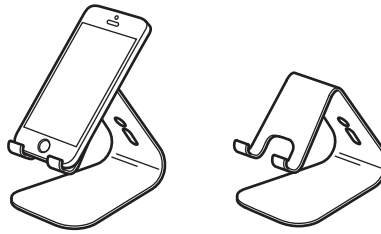


Fig. 4

(a) Name a suitable non-ferrous metal that could be used to make the stand.

.....[1]

(b) Give **one** reason for your choice of non-ferrous metal.

.....[1]

5 Fig. 5 shows views of a basic frame construction in wood.

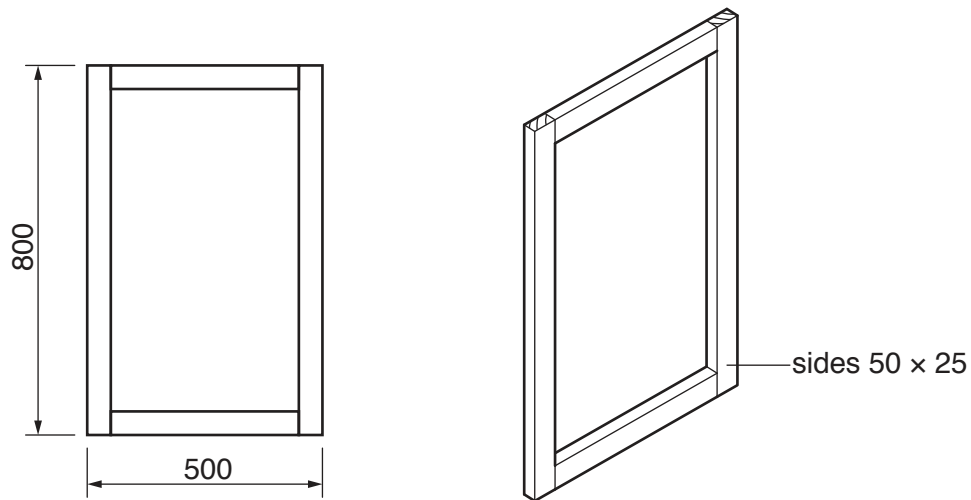


Fig. 5

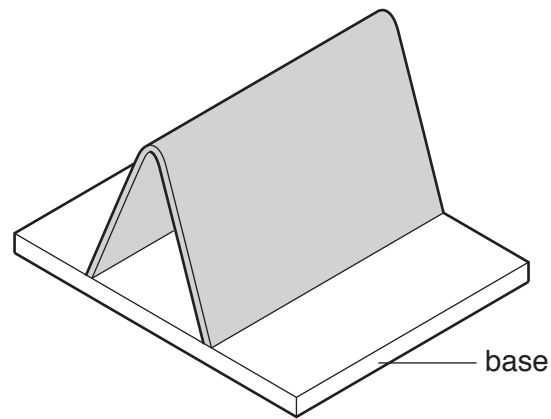
Add sketches and notes to Fig. 5 to show **two** ways of strengthening the frame construction. [4]

6 Complete the table by selecting the correct material from the list below to match each description. [3]

Material	Description of material
ash	tough, wide-grained hardwood used for tool handles, cricket stumps, hockey sticks
plywood	manufactured board made by sandwiching strips of softwood between two plies
blockboard	manufactured board made by compressing and gluing wooden fibres together
MDF	
oak	

[3]

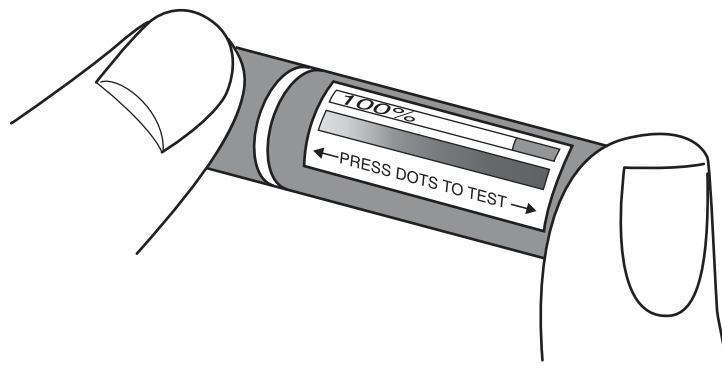
7 Fig. 6 shows acrylic sheet bent to shape.



**Fig. 6**

Add sketches and notes to Fig. 6 to show how the bent shape of the acrylic could be held in position while it cooled. [2]

8 Fig. 7 shows a battery with a test strip. When the contacts at each end are pressed, a current flows through the strip which then indicates how much charge is left in the battery.



**Fig. 7**

Complete the statement below by adding the correct term from the list.

**conductive**

**fabricating**

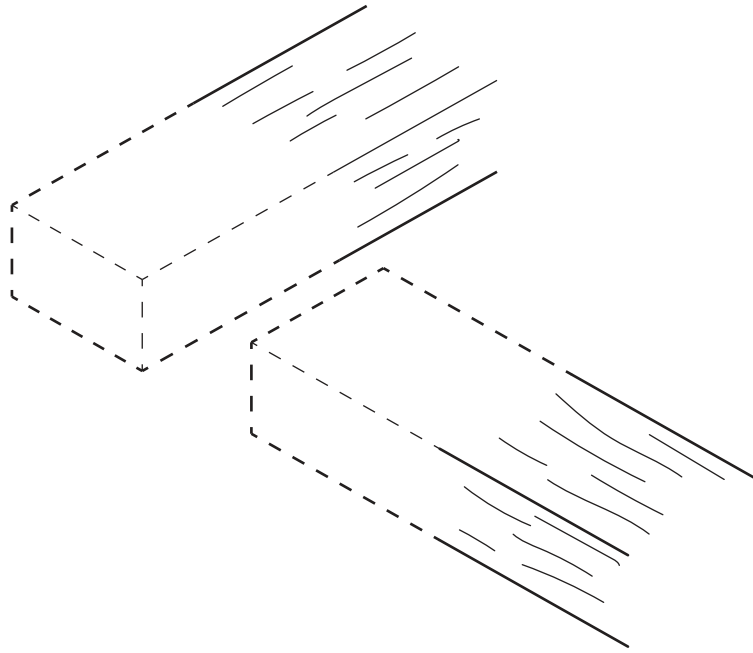
**thermochromic**

**laser**

The battery tester is an example of ..... technology.

[1]

9 Complete the drawing below to show an exploded view of a corner bridle joint.



[3]

10 Fig. 8 shows plastic cutlery used in fast food restaurants. The cutlery is produced by the injection moulding process.



Fig. 8

(a) Explain why the injection moulding process is only suitable for mass production.

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

(b) Explain why the use of plastic cutlery in fast food restaurants could be harmful to the environment.

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

## Section B

Answer **one** question from this section.

- 11 Fig. 9 shows an incomplete design for a floor standing bathroom storage unit made mainly from softwood. The storage unit will be batch produced and the parts delivered to customers for self-assembly.

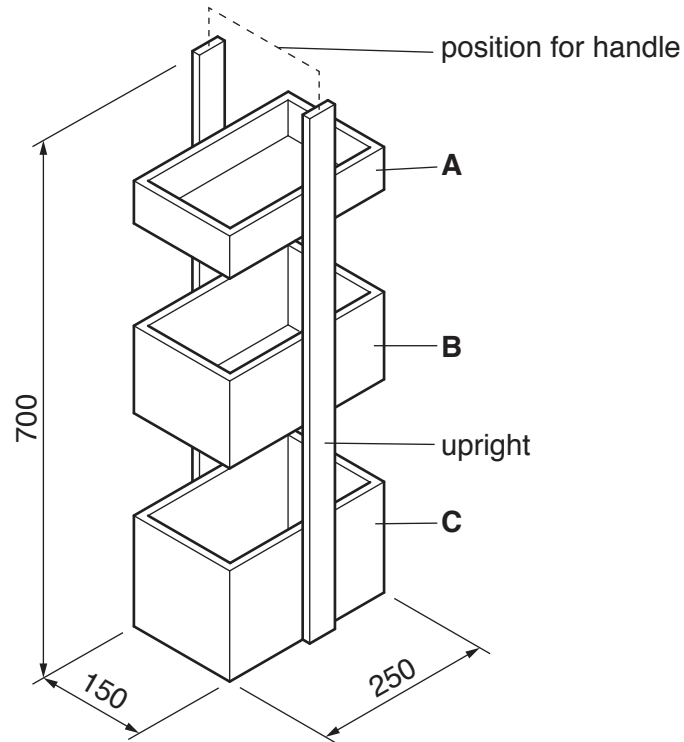


Fig. 9

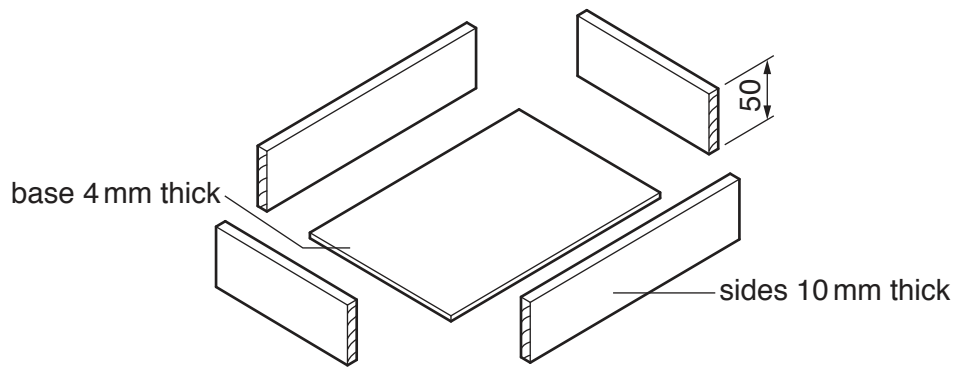
- (a) (i) Name a suitable softwood for the storage unit.

.....[1]

- (ii) Give **one** reason why the choice of materials is important when designing products for use in a bathroom.

.....[1]

(b) Fig. 10 shows an exploded view of box **A**.



**Fig. 10**

(i) Sketch and name a suitable construction that could be used at each corner of the box.

[4]

(ii) Use sketches and notes to show how the base could be fitted **inside** the box so that the edges of the base cannot be seen.

[3]



- (c) Use sketches and notes to show a design for a handle that could be fitted in the position shown in Fig. 9.

[3]

- (d) Use sketches and notes to design a jig or device that could be used to speed up batch production of **one** part of the storage unit.  
State clearly which part of the storage unit is to be batch produced.

Part to be batch produced .....

[5]

- (e) Each of the boxes will be fitted to the uprights by customers using only screws.  
Use sketches and notes to show customers how **one** box will be fitted to an upright.

[3]

(f) Use sketches and notes to show **one** functional improvement to the design of the storage unit.

[3]

(g) Give **two** reasons why self-assembly products are popular with customers.

1 .....

2 ..... [2]

12 Fig. 11 shows views of a wall-mounted coat rack. Coats are hung on the front pegs and coat hangers can be hooked over the pegs behind the front of the coat rack.

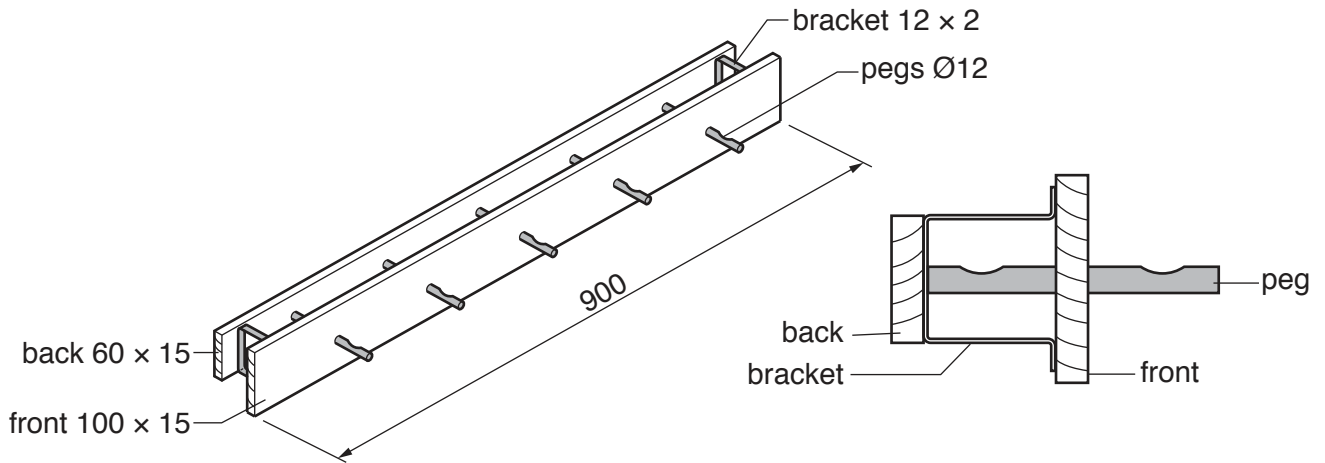


Fig. 11

- (a) Name a suitable hardwood for the front and back of the coat rack.  
 .....[1]
- (b) Stainless steel will be used to make the brackets and pegs.  
 Give **two** reasons for using stainless steel.
- 1 .....  
 2 .....[2]
- (c) (i) Five holes  $\text{Ø}12$  will be drilled in the front and back of the coat rack.  
 Name **two** bits that could be used to drill the holes.
- 1 .....  
 2 .....[2]
- (ii) Explain how you could prevent the wood from splintering at the back of the hardwood when holes are drilled.  
 .....  
 .....  
 .....[2]

(d) Fig. 12 shows a strip of stainless steel marked out ready to be bent to the shape of the bracket.

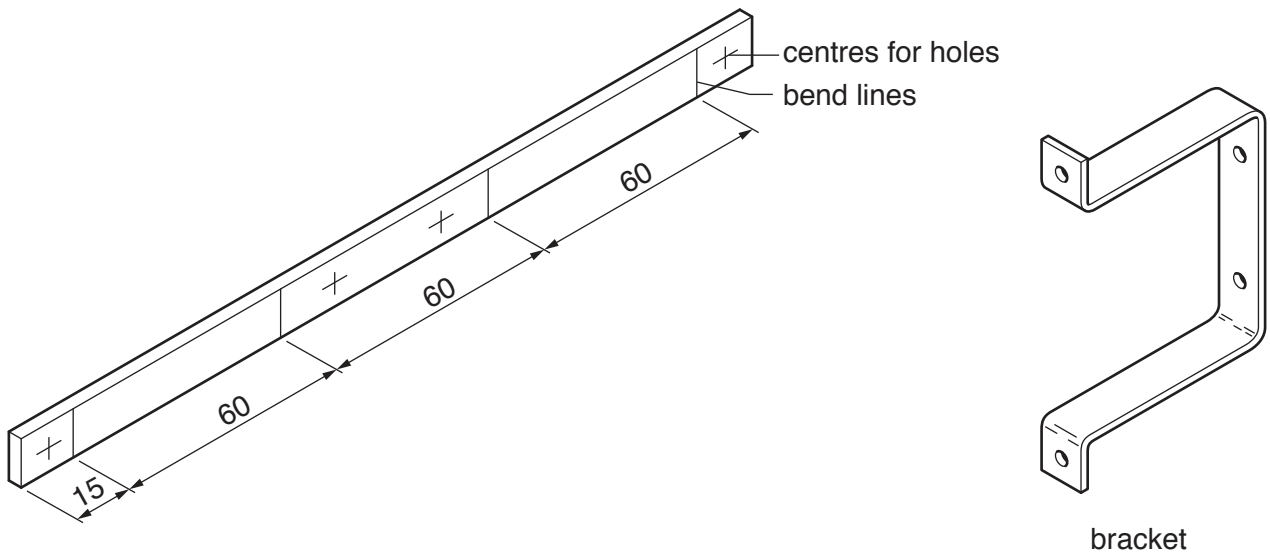


Fig. 12

(i) Name **two** marking out tools that could be used to show the bend lines.

1.....

2.....[2]

(ii) Explain the purpose of a centre punch when marking the centres of holes to be drilled.

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

(iii) Use sketches and notes to show how the 2 mm thick stainless steel strip could be bent to the shape of the bracket.

- Describe the order in which the bends will be made.
- Name all the tools and equipment used.

[6]

(e) Explain why it is sometimes necessary to anneal metals.

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

(f) The purpose of the bracket shown in Fig. 11 is to join the front to the back of the coat rack. Use sketches and notes to show a different method using wood-based materials rather than stainless steel.

Include the following details:

- specific material/s
- constructions used
- **two** important sizes.

[6]

- 13 Fig. 13 shows a toy racing car made from softwood. Ten identical cars will be made in a school workshop.

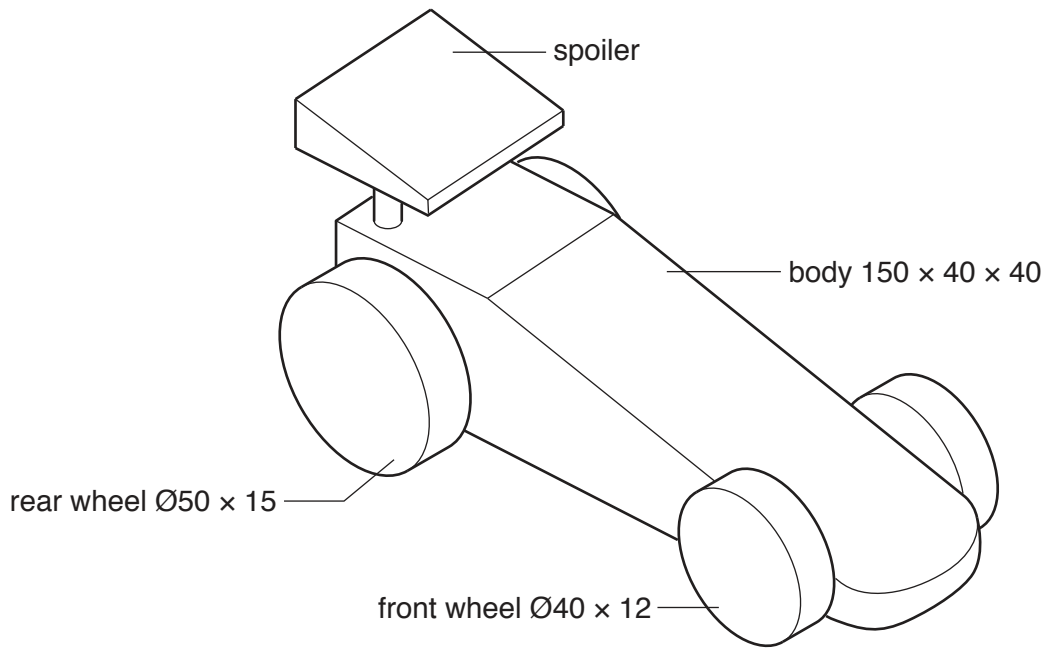


Fig. 13

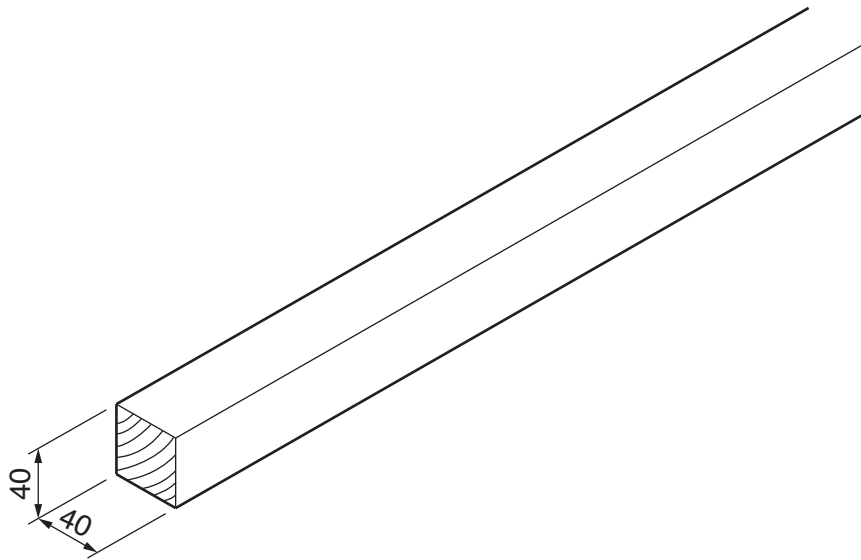
- (a) (i) Name a suitable softwood for the toy racing car.

.....[1]

- (ii) Give **one** reason, other than 'strength', for your choice of softwood.

.....[1]

(b) The 150 mm long car body will be cut from a length of softwood similar to that shown below.



Use sketches and notes to show a design for a sawing jig that would enable **ten** identical car bodies to be cut to length.

The sawing jig must:

- position the softwood length securely while it is sawn
- produce an accurate 150 mm length.

[4]

- (c) The front wheels will be produced by turning between centres on a woodturning lathe. Fig. 14 shows a length of softwood before it is set up on a woodturning lathe.

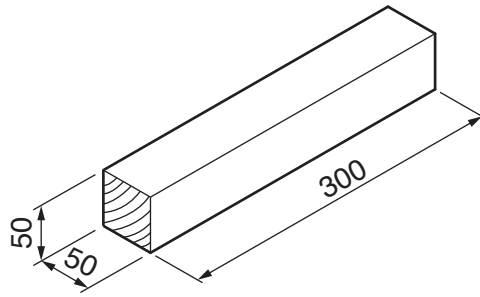


Fig. 14

- (i) Describe **two** processes that would be carried out to the length of softwood **before** it is set up on the woodturning lathe.

1 .....

2 ..... [2]

- (ii) Name a tool that could be used to check the diameter of the wheels when they are turned on the lathe.

..... [1]

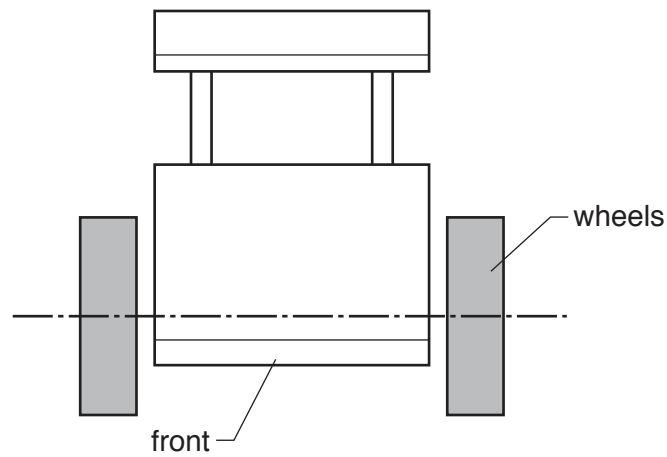
- (iii) Name **two** other tools or items of equipment that could be used when turning the wheels.

1 .....

2 ..... [2]



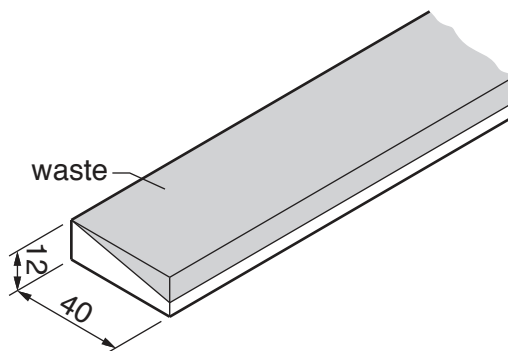
(d) Fig. 15 shows the front view of the toy racing car.



**Fig. 15**

Draw on Fig. 15 to show how the wheels could be attached to the body of the toy racing car while allowing them to move freely. [3]

(e) Fig. 16 shows part of a length of softwood from which the spoiler will be made.



**Fig. 16**

(i) Name a suitable plane that could be used to remove the waste wood.

..... [1]

(ii) Use sketches and notes to show how the length of softwood could be held against a bench stop when planing off the waste wood.

- (f) The body of the toy racing car could be used as a former to produce a vacuum formed plastic car body. Fig. 17 shows the car body made from softwood.

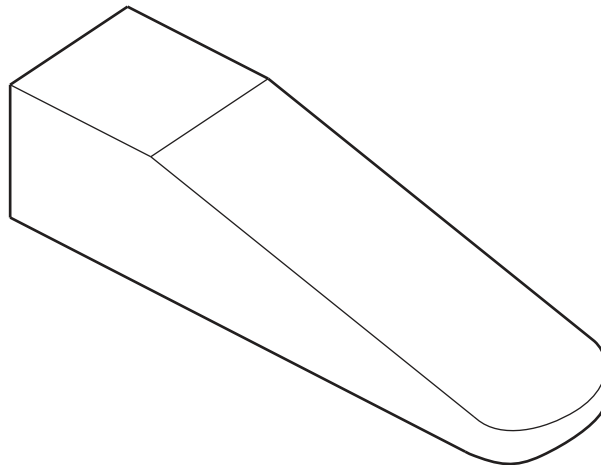


Fig. 17

- (i) Draw on Fig. 17 to show how it would need to be modified so that it could be used as a former to produce a vacuum formed plastic car body. [4]
- (ii) Name a suitable plastic that could be used to produce the car body.  
.....[1]
- (iii) Describe **two** checks that would need to be made during the vacuum forming process to make sure it was successful.
- 1 .....
- 2 .....[2]



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