



General Certificate of Secondary Education  
2024

Centre Number

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Candidate Number

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## Technology and Design

Unit 2

Option C:  
Product Design

**MV18**

**[GTY23]**

**WEDNESDAY 12 JUNE, MORNING**

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### **Time**

1 hour 30 minutes, plus your additional time allowance.

### **Instructions to Candidates**

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

**You must answer the questions in the spaces provided.**

**Do not write on blank pages.**

Questions which require drawing or sketching should be completed using an H.B. pencil.

All other questions must be completed using black ink only.

Answer **all** questions.

### **Information for Candidates**

The total mark for this paper is 100.

Quality of written communication will be assessed in Question 8.

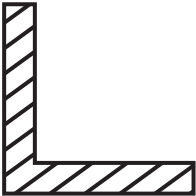
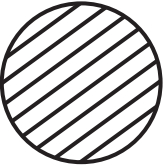
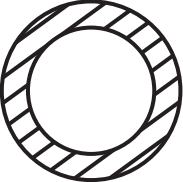
Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.

Answer **all** questions

- 1 (a) Lengths of plastic material are available in a range of common shapes.

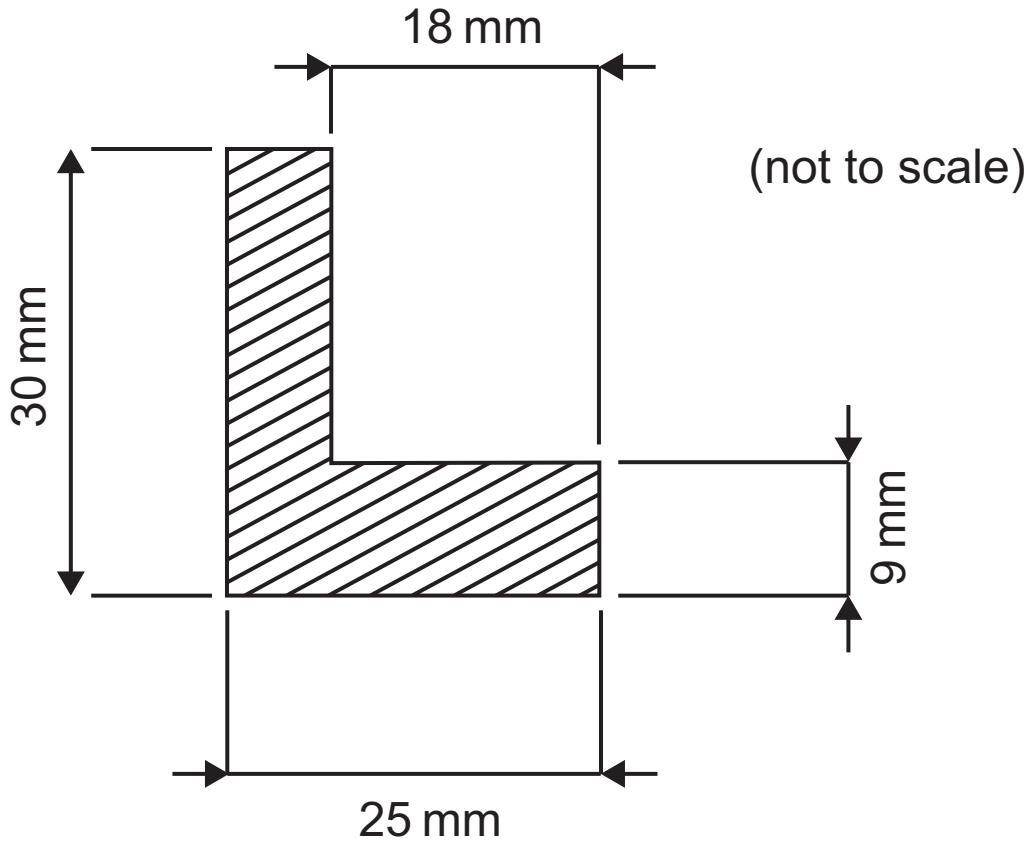
Using the first row as a guide, complete **Table 1**.  
[5 marks]

**Table 1**

Cross section profile	Cross section name
	Angle
	
	I-shaped section
	Sheet
	
	U-shaped channel

- (b) (i) Calculate the cross-sectional area of the angle section shown in **Fig. 1**. [3 marks]

**Fig. 1**



Candidates need to show their working out in the space below.

\_\_\_\_\_ mm<sup>2</sup>

(ii) Name the manufacturing process used to produce the angle section shown in **Fig. 1**. [1 mark]

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(c) (i) The manufacturer requires the angle section to be made to 0.05 mm tolerance. State what is meant by the term tolerance. [1 mark]

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(ii) To test the tolerance of the angle section, the manufacturer uses sample testing. Explain what sample testing is and how it provides quality assurance for the angle section. [2 marks]

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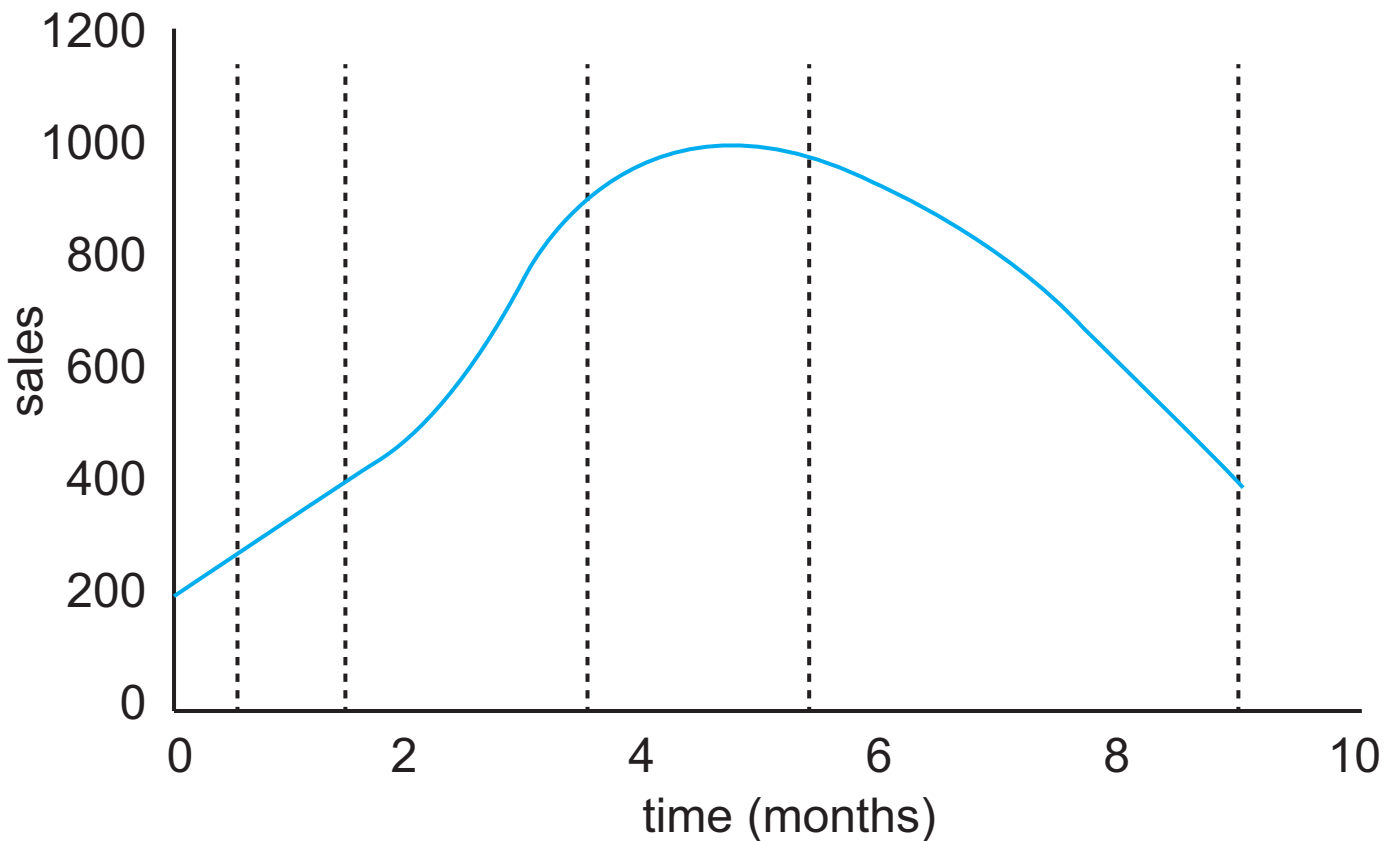
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**(Questions continue overleaf)**

2 **Fig. 2** shows a graph plotting sales over time for a child's toy. This is a visual method to show the product life cycle of the toy.

**Fig. 2**



(a) (i) The toy's product life cycle has **five** main stages.

One of the stages of the product life cycle is maturity.

Mark the maturity stage on **Fig. 2**. [1 mark]

(ii) Name the other **four** stages of the product life cycle.  
[4 marks]

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(b) Describe what is happening to toy sales during the maturity stage of the product life cycle. [2 marks]

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(c) Outline **three** strategies the toy company could use to extend the length of the maturity stage of the product life cycle. [1 mark for each]

1. \_\_\_\_\_

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2. \_\_\_\_\_

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3. \_\_\_\_\_

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**(d)** The toy company has sealed the battery compartment of the toy. This contributes to built-in obsolescence. Define what is meant by the term built-in obsolescence and explain why the toy company uses this within their product.

[1 mark for definition, 2 marks for explanation]

Definition \_\_\_\_\_

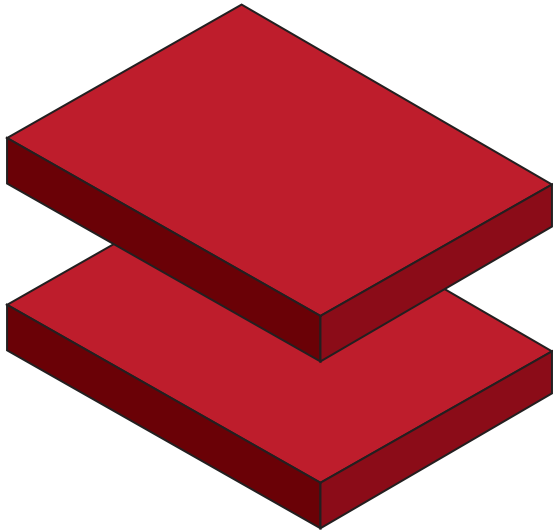
\_\_\_\_\_

Explanation \_\_\_\_\_

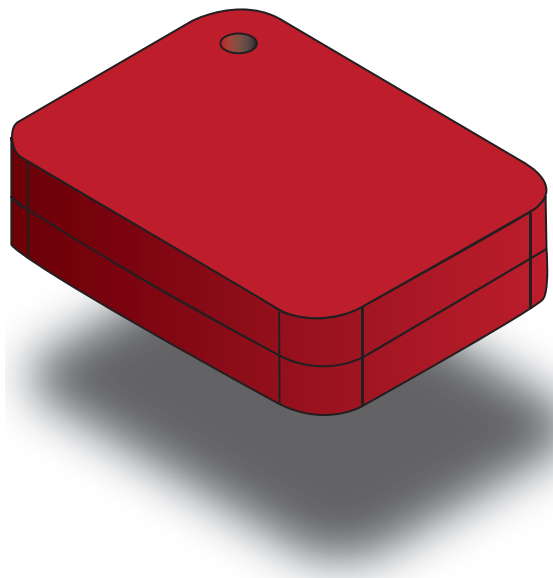
\_\_\_\_\_

- 3 **Fig. 3** shows two pieces of acrylic. They are to be used to make the key fob shown in **Fig. 4**.

**Fig. 3**



**Fig. 4**



(a) (i) **Table 2** shows the tasks involved in making the key fob and the time taken for each task. The tasks are not listed in the correct sequence. Complete the table. Use of wet and dry abrasive takes twice as long as polishing. [1 mark]

**Table 2**

Task	Time (minutes)
Polishing	5
Marking out and gluing	5
Wet and dry abrasive	
Filing and drilling	15

(ii) Using the correct sequence and assuming one person makes the key fob, complete the Gantt chart. [5 marks]

Task \ Time (minutes)	5	10	15	20	25	30	35
Polishing							
Marking out and gluing							
Wet and dry abrasive							
Filing and drilling							

**(b)** List **two** tools used to mark out the key fob. [2 marks]

1. \_\_\_\_\_

2. \_\_\_\_\_

4 Fig. 5 shows a range of stainless steel dental care tools.

Fig. 5



(a) Give **two** reasons why stainless steel is an appropriate material for the tools. [2 marks]

1. \_\_\_\_\_

2. \_\_\_\_\_

(b) (i) The designer of the dental tools considered anthropometric data in the development of the design. Define what is meant by the term anthropometric data. [1 mark]

\_\_\_\_\_  
\_\_\_\_\_

(ii) Considering the tools in **Fig. 5**, briefly explain **two** ergonomic features of their design. [2 marks]

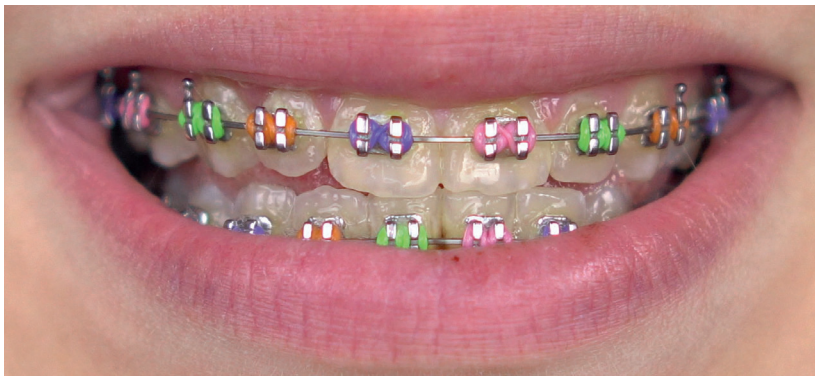
1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

**Fig. 6** shows a set of orthodontic braces that are made from shape memory alloy.



(c) (i) Name the material that is used to make shape memory alloy. [1 mark]

\_\_\_\_\_

(ii) Explain why shape memory alloy is suitable for the wire of the orthodontic braces. [2 marks]

\_\_\_\_\_

\_\_\_\_\_

- 5 **Fig. 7** shows a cedar barrel planter that may be used for plants and shrubs.

**Fig. 7**



**(a)** Is cedar a softwood or a hardwood? [1 mark]

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**(b)** A manufacturer employs 3 people to produce barrel planters and pays them £60 each per day.

**(i)** Calculate the labour costs for the company for a 5 day week. [2 marks]

Candidates need to show their working out in the space below.

£ \_\_\_\_\_

The manufacturer produces 16 barrel planters per day.  
The material costs £8 for one planter.

(ii) Calculate the direct costs for the company for each  
5 day week. [4 marks]

Candidates need to show their working out in the  
space below.

£ \_\_\_\_\_

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**(Questions continue overleaf)**

(c) The barrel planter needs to be moved to different locations.

Design a suitable device that the barrel planter could sit on to enable it to be moved easily. The device should securely support the weight of the barrel planter when filled with soil. The device should allow for water drainage from the barrel planter.

The diameter at the base of the barrel planter is 45 cm.

Using clear annotated sketches and details, produce a suitable design of a holder on the page opposite.

Your solution should: [10 marks]

- show how the barrel planter can be easily moved;
- show how the holder securely supports the weight of the barrel planter and its contents;
- show how the water can drain from the barrel when using the holder.



6 The global marketplace involves companies operating in many countries.

(a) Discuss **three** impacts that globalisation may have upon a company. [6 marks]

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(b) To support the increased demand for their products following globalisation, the company is reorganising its computer aided design (CAD) facilities.

State **three** technical reasons why the company would make these changes. [3 marks]

1. \_\_\_\_\_

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2. \_\_\_\_\_

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3. \_\_\_\_\_

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7 Fig. 8 and Fig. 9 show the 2012 London Olympic torch.

Fig. 8



(a) (i) The torch is manufactured from aluminium alloy with a gold effect finish. Suggest **two** properties that make aluminium alloy a suitable material for the torch. [2 marks]

1. \_\_\_\_\_
2. \_\_\_\_\_

(ii) Before shaping, the holes are cut from flat sheets of aluminium alloy.

Give **three** reasons why CAM is a suitable method for cutting the holes. [3 marks]

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

Fig. 9 shows the holes in the torch.

Fig. 9



(iii) The main structure of the torch is created by layering **two** of the flat sheets of aluminium alloy and shaping them to create the triangular shape of the torch. Suggest **two** reasons why the designers have produced holes in both sheets. [2 marks]

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

(iv) The flame was passed in the Olympic relay from person to person. State **two** design features of the torch that make it suitable for use in a relay by a large variety of people. [2 marks]

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

(b) (i) Name the designers of the London Olympic torch shown in **Fig. 8** and **Fig. 9**. [2 marks]

\_\_\_\_\_

(ii) List **two** other products that these designers are known for. [2 marks]

1. \_\_\_\_\_

2. \_\_\_\_\_

- 8 Using an annotated sketch or sketches, design a height adjustable music stand for sheet music. The stand should be easily moved. During use it should be freestanding on the floor. [20 marks]

The design solution should show evidence of the following features:

- Good quality annotated sketches giving consideration to line, shape, form and proportion.
- The height of the stand should be easily adjusted to suit the needs of the user.
- The sheet music should be securely supported and clearly visible when the stand is in use.
- The stand should be freestanding and stable, on the floor, when in use.
- Be aesthetically pleasing and have an appropriate surface finish.
- Identify and justify the selection and thickness of materials.
- Identify and justify the main manufacturing techniques used in the design's construction.
- Include three key dimensions.

Use pages 26 and 27 for your answer.

Quality of written communication will be assessed in this question.

Fig. 10







## SOURCES

All images © CCEA except where stated  
Figs. 5–6, 8–10 © Getty Images

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**This is the end of the question paper**

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For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
<b>Total Marks</b>	

Examiner Number

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