

Please check the examination details below before entering your candidate information

Candidate surname					Other names				
Centre Number					Candidate Number				
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Pearson Edexcel Level 3 GCE

Time 2 hours 30 minutes	Paper reference	9DT0/01
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**Design and Technology
(Product Design)**

**Advanced
COMPONENT 1**

You must have: a calculator and a ruler.	Total Marks
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Instructions

- Use **black** ink or ball-point pen (HB pencil may be used for questions that require drawing and sketching).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- For questions requiring mathematics, you must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

Information

- The total mark for this paper is 120.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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Answer ALL questions. Write your answers in the spaces provided.

- 1** Figure 1 shows a sink made from stainless steel.



Figure 1

- (a) Stainless steel is an alloy of iron, carbon and other metals.

Name **two** other metals that can be alloyed with iron and carbon to make stainless steel.

(2)

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(b) Stainless steel has been used because the sink needs to be strong and durable.

Explain **two** further working properties of stainless steel that make it a suitable material for the sink when used for food preparation and dishwashing.

(4)

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2

(c) Figure 2 shows a sink plug.

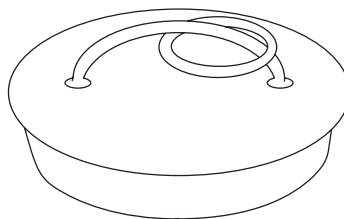


Figure 2

The sink plug is made out of rubber.

Explain **one** reason why rubber is a suitable material for the sink plug.

(3)

(Total for Question 1 = 9 marks)

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QUESTION 2 BEGINS ON THE NEXT PAGE.

- 2 Figure 3 shows a drawing of a component that is to be manufactured for use in a consumer product. The component is to be milled from a solid block of aluminium.

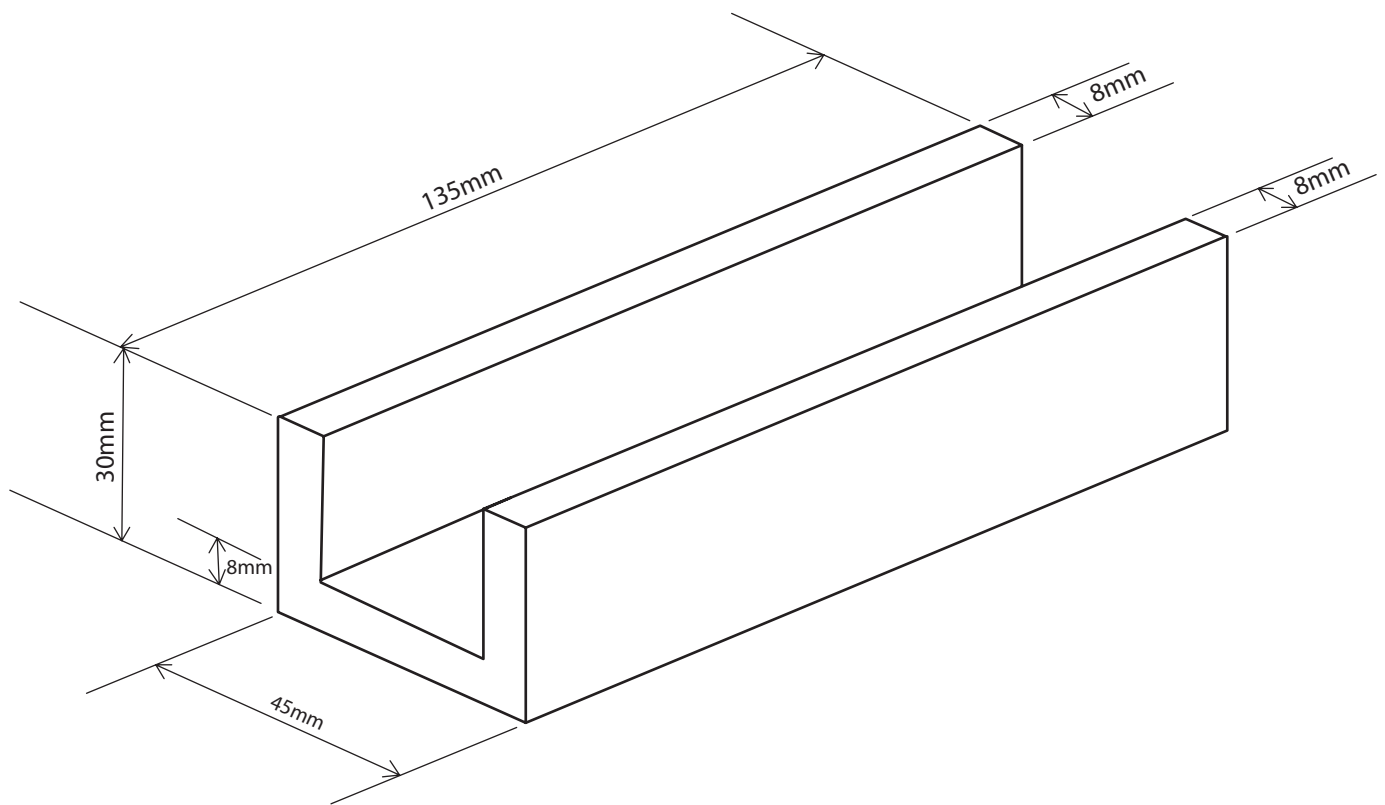


Figure 3

- (a) State **two** other methods for producing the component from aluminium.

(2)

1

2

- (b) The original solid block of aluminium was 135mm x 30mm x 45mm and had a mass of 492g.

Calculate the mass of the finished milled component.

Give your answer in grammes (g) to 1 decimal place.

Show all of your workings.

(5)

Answer g

(Total for Question 2 = 7 marks)

- 3 Figure 4 shows a fizzy drinks bottle manufactured from polyethylene terephthalate (PET).



Figure 4

Polyethylene terephthalate (PET) can be blow moulded.

- (a) Explain **one** other property of polyethylene terephthalate (PET) that makes it suitable for the fizzy drinks bottle.

(2)

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(b) Describe, using labelled sketches, the blow moulding process used to produce the bottle.

(4)

(c) Explain **two** reasons why blow moulding has been used for the production of the bottle.

(6)

1

2

(Total for Question 3 = 12 marks)

- 4 A manufacturer of consumer goods is considering replacing some of its products with new and repurposed designs. This requires a lot of planning, preparation and evaluation.

(a) Critical path analysis is a planning method.

Give **three** features of critical path analysis.

(3)

1

2

3

(b) Manufacturers need to undertake financial forecasts which include the preparation of budgets.

Outline considerations that need to be taken into account when preparing budgets.

(6)

- (c) A trademark allows a manufacturer to provide easy identification of their genuine products.

Give **two** forms a trademark may take to identify the genuine product.

(2)

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- (d) Discuss cost, sales, profit and market implications to the manufacturer during the various stages of a product's life cycle.

(9)

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(Total for Question 4 = 20 marks)

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QUESTION 5 BEGINS ON THE NEXT PAGE.

- 5 A manufacturer has been commissioned to produce a solid sphere with a volume of 10 litres. The volume of a sphere can be calculated using the following formula:

$$V = (4\pi r^3)/3$$

- (a) Calculate the radius of the sphere.

$$1 \text{ litre} = 1000 \text{ cm}^3$$

Give your answer in cm to 2 decimal places.

(5)

Answer cm

- (b) The sphere is to be made from aluminium which has a density of 2.7 tonnes per m³.

Calculate the mass of the 10 litre sphere in kilogrammes (kg).

$$1 \text{ tonne} = 1000 \text{ kilogrammes (kg)}$$

Use mass (M) = volume (V) × density (d)

(3)

Answer kg

(Total for Question 5 = 8 marks)

- 6 Figure 5 shows a wood joint that is to be used on a single piece of furniture. The joint will be positioned and marked out using a pencil and other marking out tools.

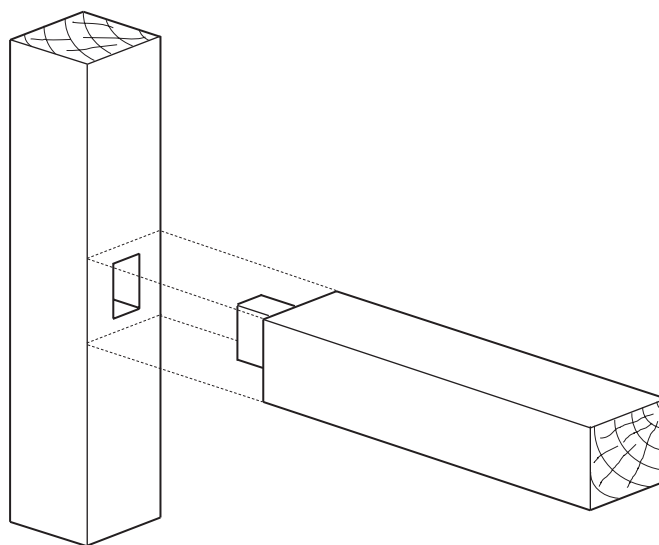


Figure 5

- (a) Name **two** other marking out tools used to position and mark out the joint accurately and efficiently.

(2)

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(b) The manufacturer has received an order for 50 identical pieces of furniture.

Explain **two** reasons why batch production would be used for the manufacturing of the furniture.

(6)

1

2

- (c) The furniture is manufactured and finished in a small workshop environment.

Discuss the significance of health and safety laws and regulations to the manufacturer of the furniture.

(6)

Each piece of furniture will be sold with separate padded cushions that have textile covers.

(d) Name **two** natural fibre textiles that could be used for the cushion covers.

(2)

1

2

(e) The textile fabric is in rolls 500m long by 1.3m wide. Each cushion cover requires a single piece of fabric 0.45m by 0.85m.

Calculate the maximum number of cushion covers that can be manufactured from one roll.

(3)

Answer

(Total for Question 6 = 19 marks)

- 7 Figure 6 shows a component drawn in 3rd angle orthographic projection (not to scale).

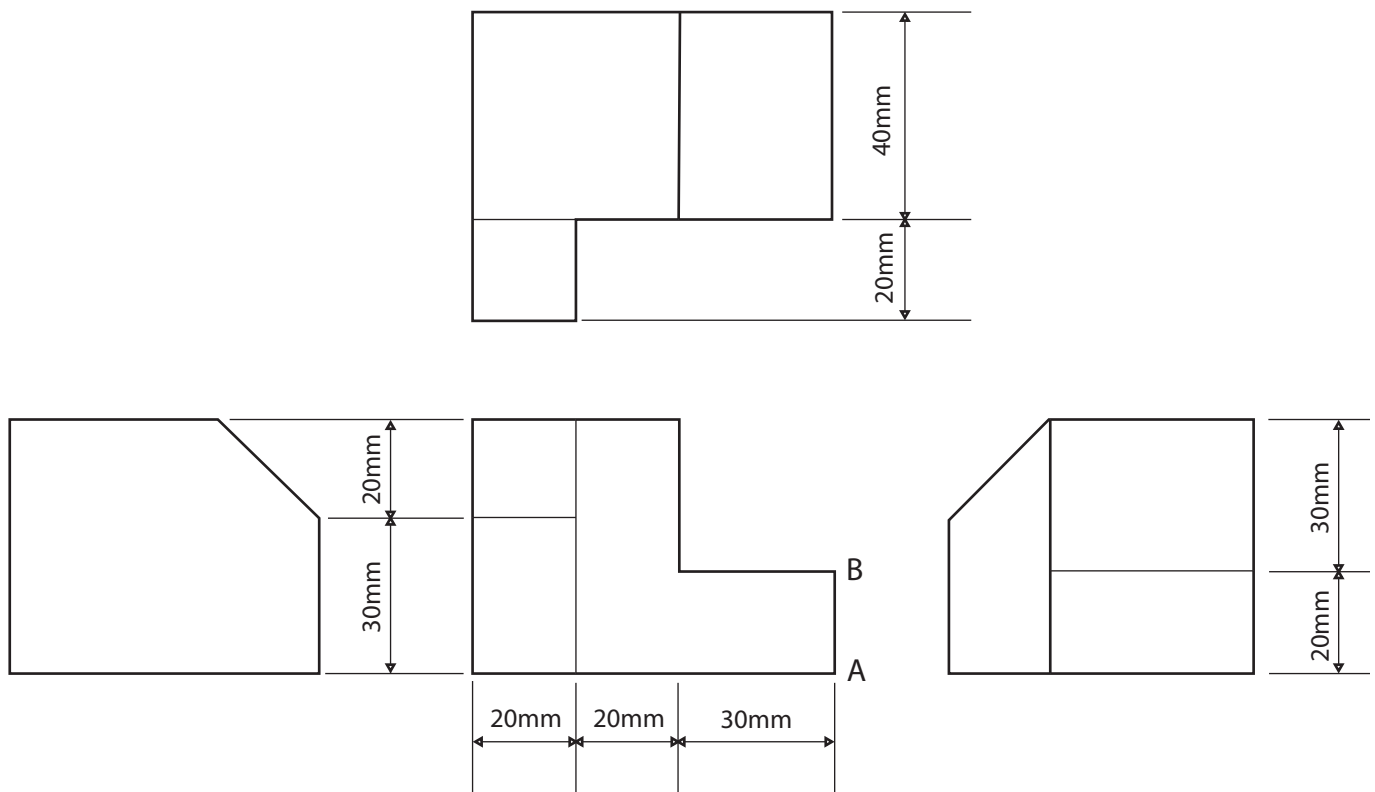


Figure 6

Designers use a range of different drawing techniques to convey their design ideas.

Draw an accurate isometric projection of the component.

Use the isometric grid provided, starting with line A-B as your front corner.

Each segment of the grid equals 10mm.

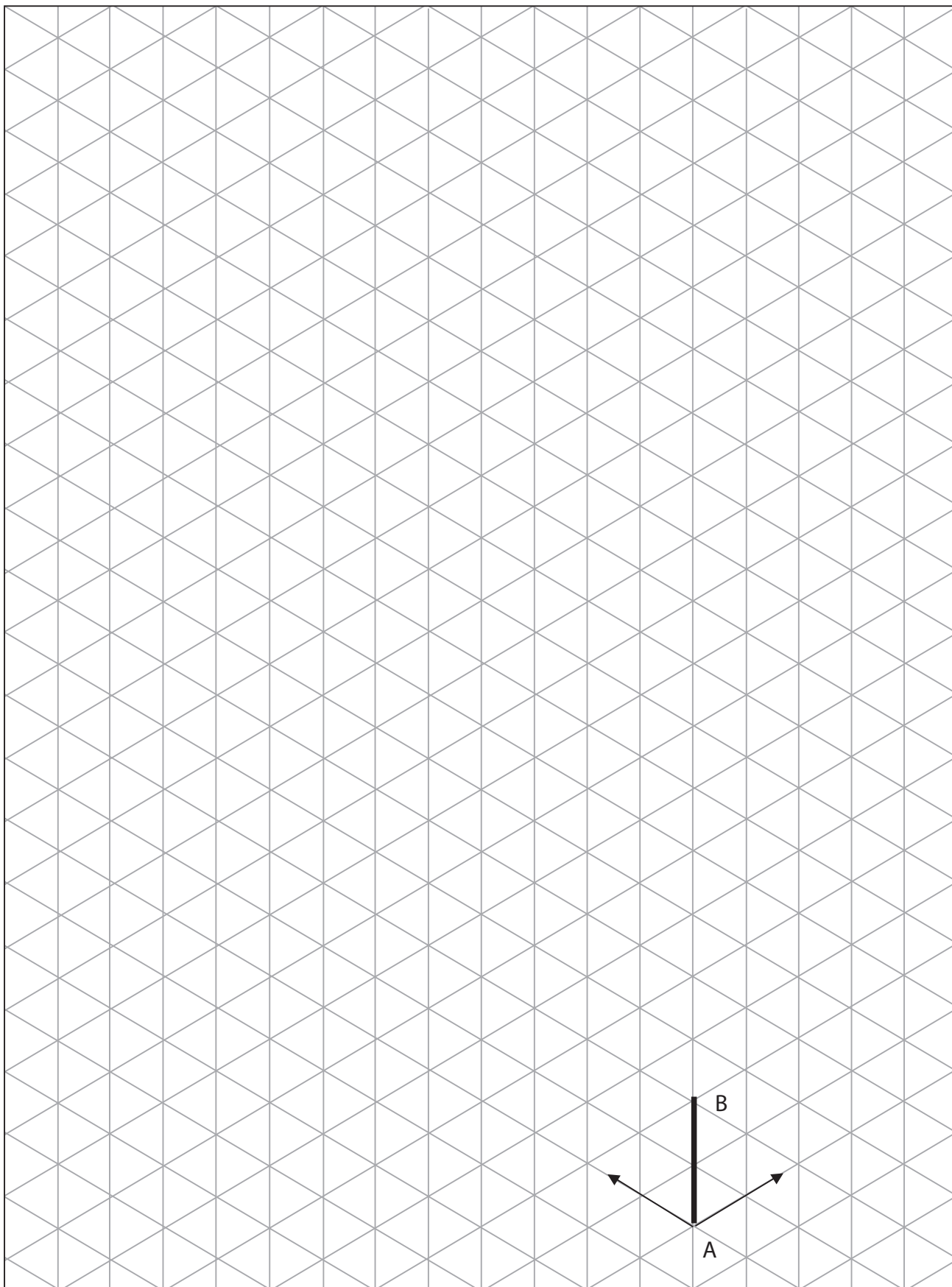
Dimensioning of the isometric projection is **not** required.

(6)

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(Total for Question 7 = 6 marks)

- 8 Figures 7 and 8 show external and internal views of The Red House which was the vision of William Morris and became the centre of his Arts and Crafts movement.



(Source: © StuartSmith/Shutterstock)

Figure 7 The Red House External View



(Source: © Richard Gardner/Shutterstock)

Figure 8 The Red House Internal View

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Discuss the style and design philosophy of the Arts and Crafts movement and how it may have influenced the house design shown in Figures 7 and 8.

(9)

(Total for Question 8 = 9 marks)

- 9 Figure 9 shows a modern smart watch that offers a wide range of functions such as fitness tracking, health monitoring, calendars and music.



Figure 9 Modern Smart Watch

Discuss how modern technology and miniaturisation of components have enabled the development of smart watches.

(9)

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(Total for Question 9 = 9 marks)

10 Photo-chromic lenses are becoming a popular choice for people who wear glasses to correct their eyesight.

Explain **three** advantages to the user of purchasing glasses with photo-chromic lenses rather than standard lenses.

(9)

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(Total for Question 10 = 9 marks)

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QUESTION 11 BEGINS ON THE NEXT PAGE.

11 Figure 10 shows a reclining armchair and footstool.



Recliner tension adjuster / lock

Circular rotating laminated
base made from beech



Shaped laminated support legs made
from beech

Figure 10

The chair has a steel frame and reclining mechanism, laminated beech base and legs, and flame resistant foam cushions that are covered in leather.

Evaluate the performance of the reclining armchair and footstool with reference to aesthetics and user requirements.

(12)

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(Total for Question 11 = 12 marks)

TOTAL FOR PAPER = 120 MARKS

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