

Please check the examination details below before entering your candidate information

Candidate surname					Other names				
Centre Number					Candidate Number				
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<b>Pearson Edexcel Level 3 GCE</b>									
<b>Wednesday 5 June 2024</b>									
Afternoon (Time: 2 hours 30 minutes)					Paper reference		<b>9DT0/01</b>		
<b>Design and Technology</b> <b>(Product Design)</b> <b>Advanced</b> <b>COMPONENT 1</b>									
<b>You must have:</b> Calculator, ruler								Total Marks	

## 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.*

## 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.*
- For questions requiring mathematics, you must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

## 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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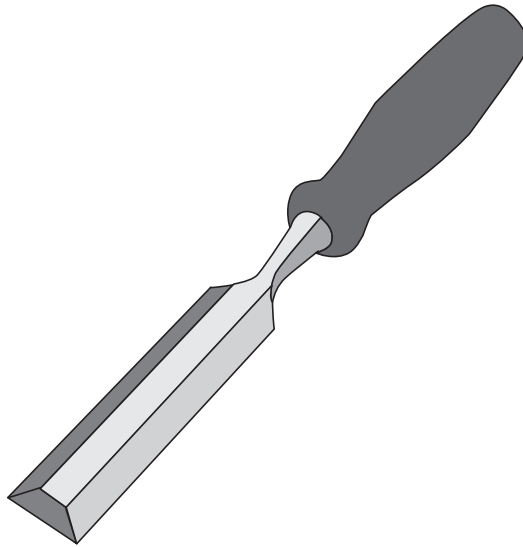
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Pearson

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

- 1** Figure 1 shows a chisel. The chisel blade is manufactured from carbon steel.



**Figure 1**

- (a) During manufacture the chisel blade becomes work hardened.

Name **two** heat treatment processes that are used to restore the metal's mechanical properties making it tougher and less brittle.

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2 Figure 2 shows a hot melt glue gun.



**Figure 2**

Hot melt glue is widely used in furniture manufacturing and packaging.

(a) Give **two** benefits of using hot melt glue.

(2)

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

- (b) A manufacturer currently uses 500 glue sticks per week but is planning to increase production by 30%.

Cost of glue sticks: £9.44 per pack of 16

Percentage of waste glue: 12%

Calculate the annual cost of waste glue over a 52 week period at the increased level of production.

Give your answer in pounds to 2 decimal places.

Show all of your workings.

(5)

Answer £ .....

**(Total for Question 2 = 7 marks)**



- 3 Figure 3 shows a table leg that has been turned from a square section of mahogany on a wood lathe.

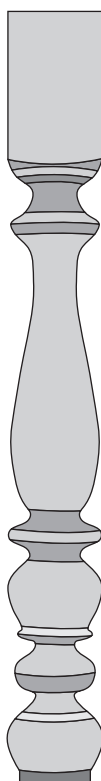


Figure 3

- (a) Explain **one** property of mahogany that makes it a suitable material for turning on a wood lathe.

(2)

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- (b) Describe, using labelled sketches, how a square section of mahogany would be prepared and then turned into a cylinder, using a wood lathe.

(4)



(c) Explain **two** reasons why mahogany might **not** be considered a sustainable material.

(6)

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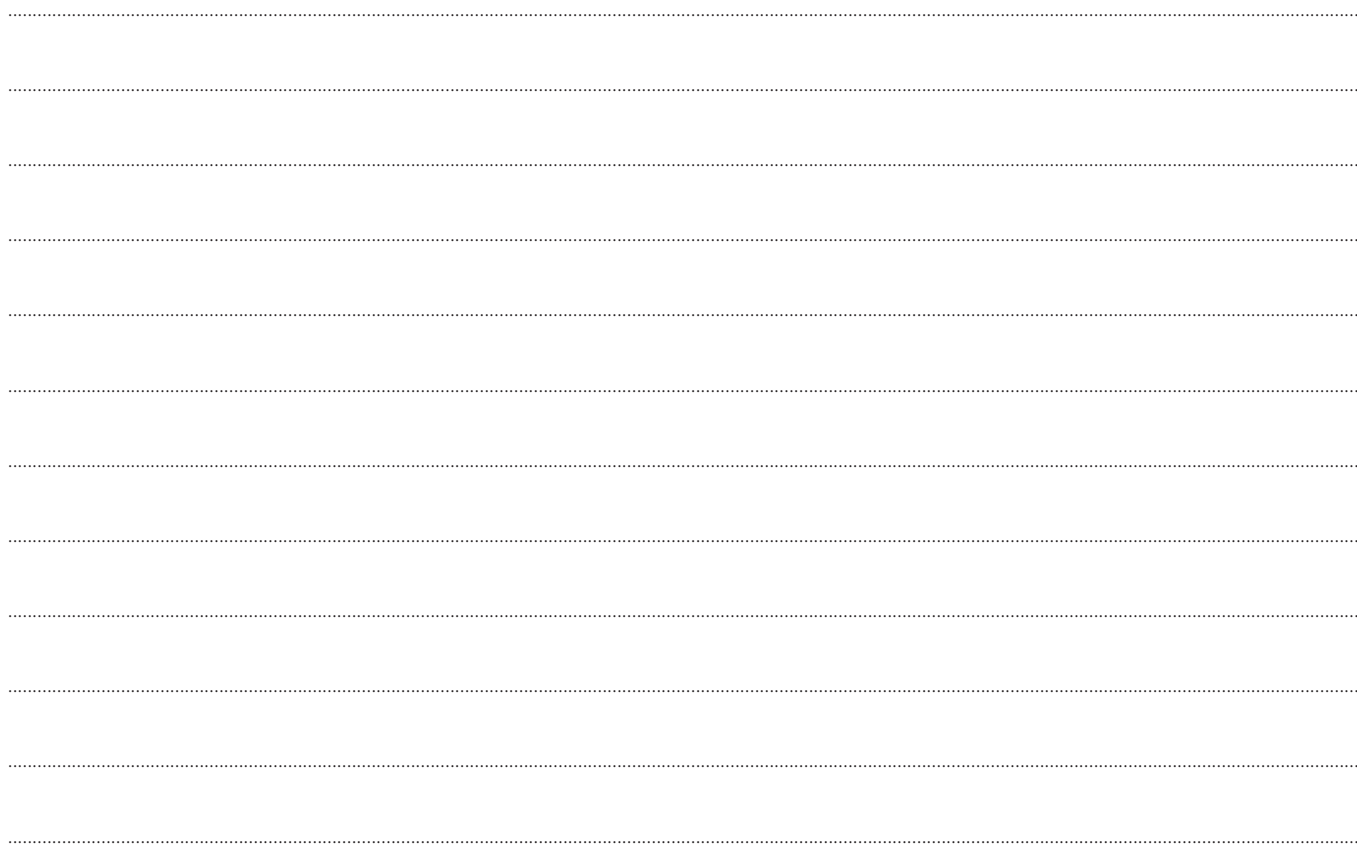
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(Total for Question 3 = 12 marks)







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- (c) Six Sigma is used in manufacturing to identify and remove the causes of defects.

Reducing costs is one of the five value targets used in Six Sigma.

Give **two** other value targets used in Six Sigma.

(2)

- (d) Discuss how a circular economy will reduce the impact of manufacturing activity on the environment and promote sustainability.

(9)



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(Total for Question 4 = 20 marks)

Blank area for writing the answer to Question 4.



- 5 A contractor has been asked to paint the floor of a design and technology workshop.

Figure 4 shows the floor plan of the design and technology workshop.

All dimensions are in metres (m)

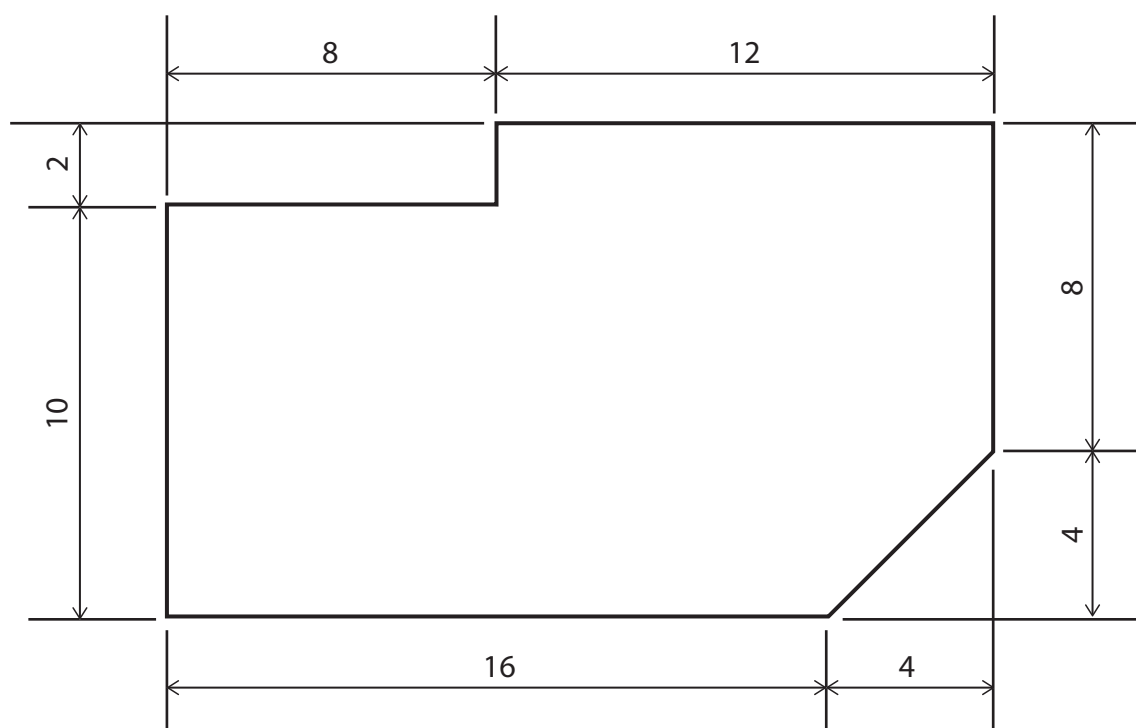


Figure 4

- (a) Calculate the area of the design and technology workshop floor.

Give your answer to **one decimal place**.

(5)

Answer ..... m<sup>2</sup>

(b) The floor paint is only supplied in 5 litre cans.

A 5 litre can costs £48.00.

One litre of paint will cover  $12 \text{ m}^2$  for each coat.

Two coats are required.

Calculate the overall cost of the cans of paint required to complete the painting of the floor.

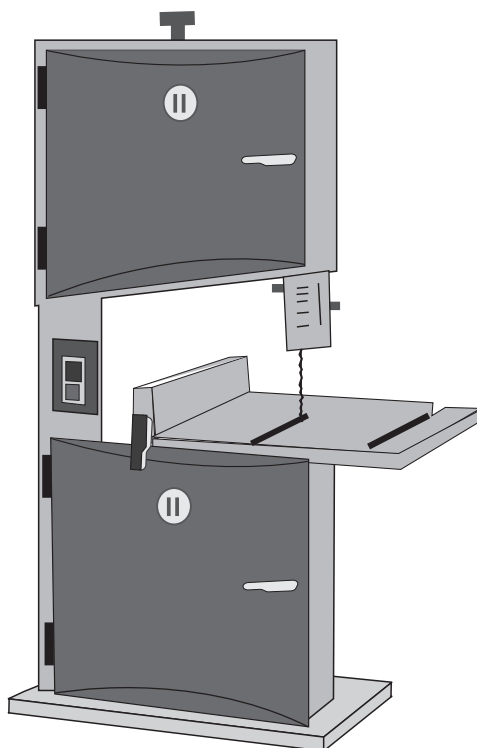
(3)

Answer £ .....

**(Total for Question 5 = 8 marks)**



- 6 Figure 5 shows a bandsaw used by a manufacturer of consumer products.



**Figure 5**

- (a) One safe working practice when operating a bandsaw would be to wear personal protective equipment (PPE).

Give **two** other safe working practices when operating a bandsaw.

(2)

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

- (b) The manufacturer embraces user centred design when developing new products.

User centred design considers user needs, wants and values.

Explain **two** other considerations of user centred design that help to ensure that products are fit for purpose.

(6)

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- (c) Manufacturing companies comply with a wide range of health and safety legislation and regulations to protect workers.

Discuss the consequences for a company of non-compliance with health and safety legislation and regulations.

(6)





(d) The level of risk, including severity and likelihood, is one part of a risk assessment.

Give **two** other parts of a risk assessment.

(2)

1 .....

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2 .....

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(e) The table below shows the total budget spent on various aspects of Health and Safety by a manufacturing company.

Training	Signage	Risk assessment	PPE	Safety equipment
£27,000.00	£8,260.00	£15,500.00	£18,375.00	£42,000.00

The cost of PPE is increasing by 12%.

Calculate what percentage of the Health & Safety budget is spent on PPE after the increase is applied.

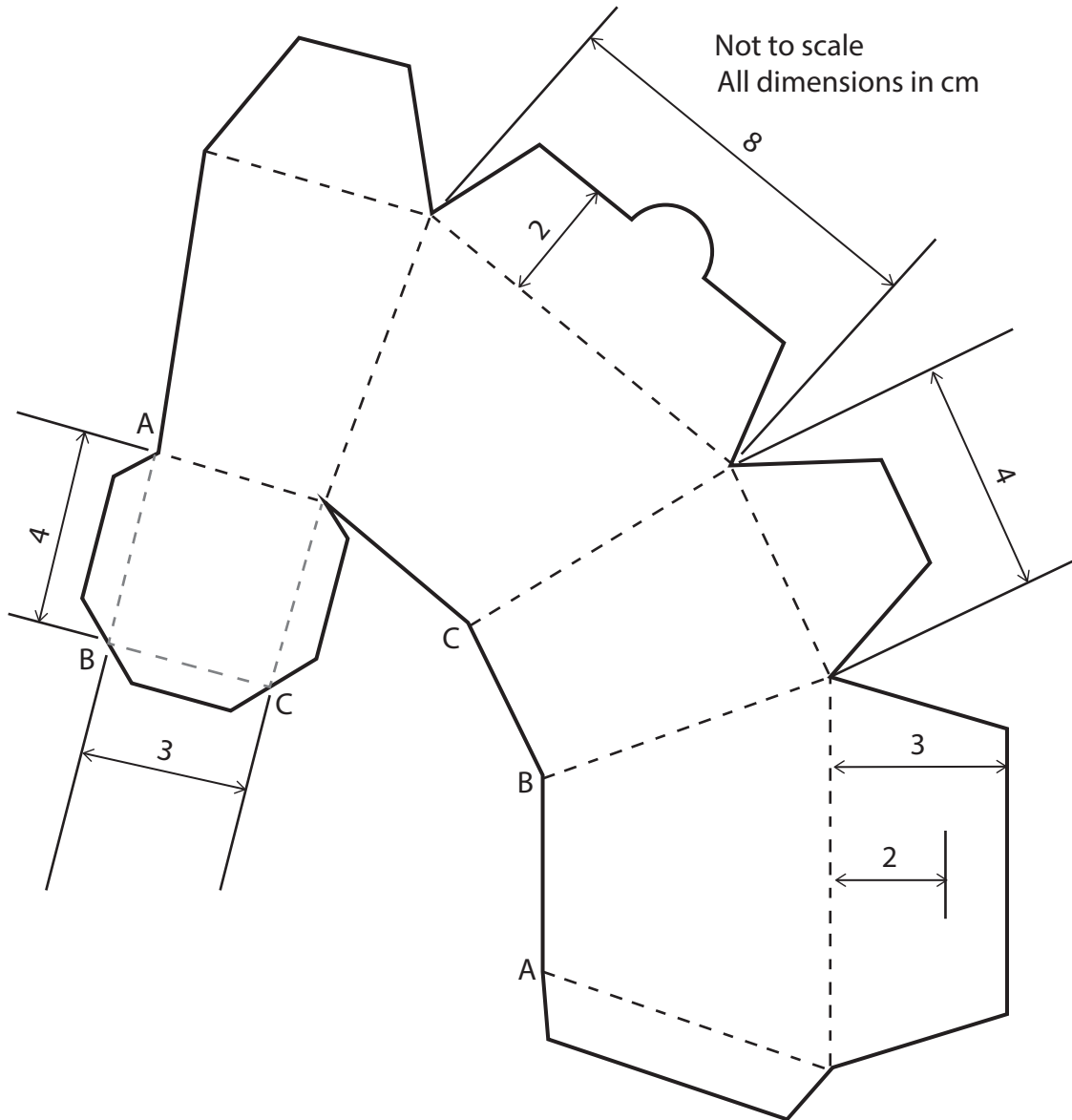
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Answer ..... %

(Total for Question 6 = 19 marks)



7 Figure 6 shows the net (development) for a chocolate box.



**Figure 6**

Draw an accurate isometric projection of the chocolate box.

Use the isometric grid provided Starting with Lines A–B and B–C as your baselines.

Each segment of the grid equals 1 cm.

The height of the assembled box is 10 cm.

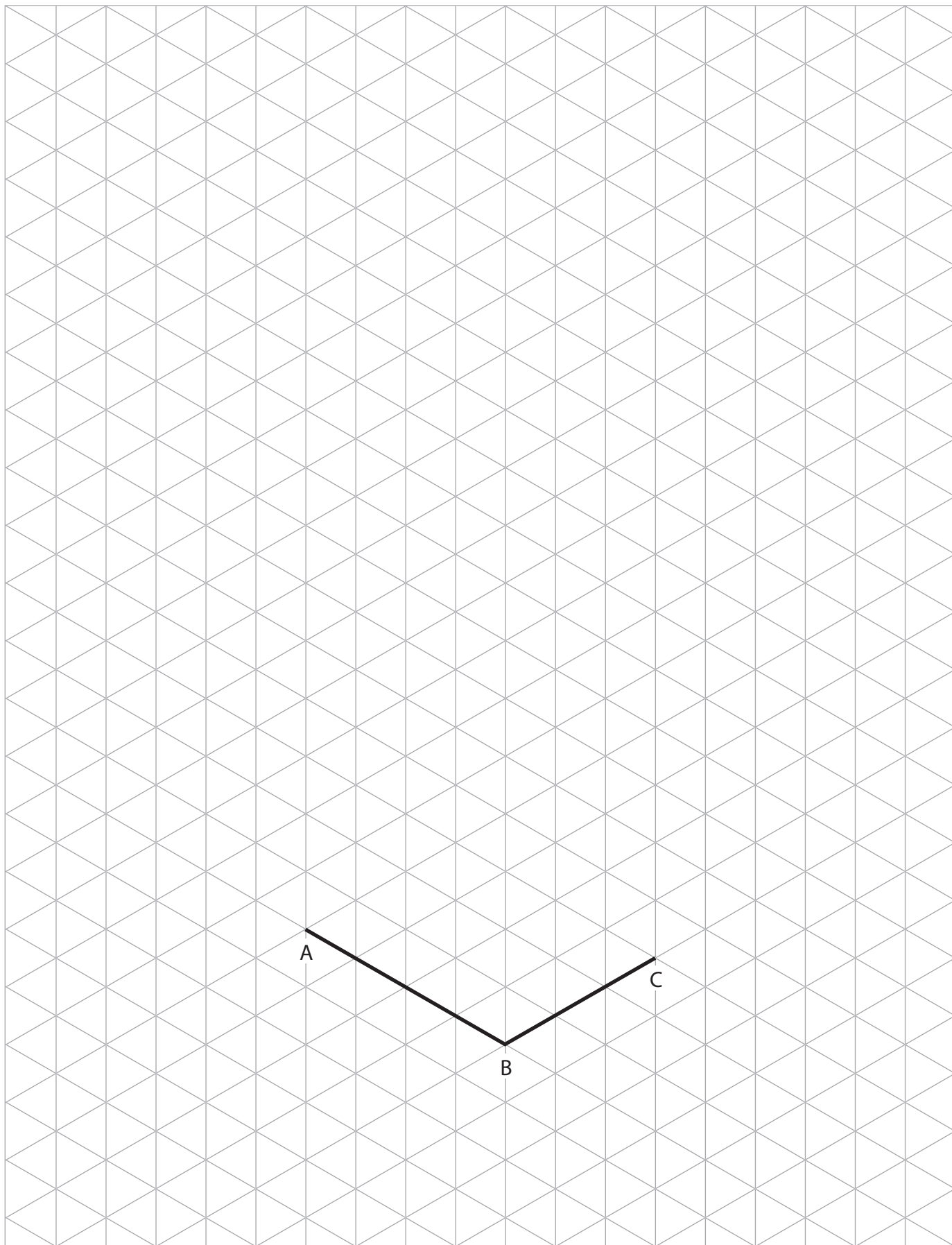
Dimensioning of the isometric projection is not required.

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(Total for Question 7 = 6 marks)



- 8 Figure 7 shows a hotel elevator lobby in a building designed and constructed during the Art Deco period.



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**Figure 7**

Discuss how the interior design of the hotel elevator lobby was influenced by Art Deco philosophies.

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**(Total for Question 8 = 9 marks)**

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9 Discuss how innovation management is used when developing and introducing new consumer products.

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(Total for Question 9 = 9 marks)

Blank area for the answer to Question 9.



**10** Photo-chromic glass is one type of smart material that reacts to ultraviolet (UV) light.

Reactive glass is another form of modern smart material.

Explain **two** benefits and **one** drawback of reactive glass.

Benefit 1 .....

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Benefit 2 .....

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Drawback 1 .....

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(Total for Question 10 = 9 marks)





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11 Figure 8 shows a 'spinning' bike used for indoor group exercise classes.



**Figure 8**

- Main frame in welded mild steel with a powder coated finish
- Four height adjustable feet at ground contact points
- Seat adjustable vertically and horizontally
- Handlebars adjustable for height
- Digital liquid crystal display showing revolutions per minute (RPM), power output in Watts, distance travelled, heart rate and effort level
- Tension/effort level adjustment
- Stainless steel flywheel – weight 22 kg
- Overall weight – 64 kg
- User height range 1.50 m to 1.95 m
- Maximum user weight – 135 kg
- Cost £1,150.00

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Evaluate how the designer of the 'spinning' bike has addressed ergonomics and user requirements for group exercise activities.

(12)

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(Total for Question 11 = 12 marks)

**TOTAL FOR PAPER = 120 MARKS**

