

Please check the examination details below before entering your candidate information

Candidate surname

Other names

**Pearson Edexcel
Level 3 GCE**

Centre Number

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Candidate Number

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Time 2 hours 30 minutes

**Paper
reference**

9DT0/01

**Design and Technology
(Product Design)**

**Advanced
COMPONENT 1**

You must have:
a calculator and a 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.*
- 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.
- Good luck with your examination.

Turn over ►

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Pearson

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

1 Figure 1 shows a virtual architectural model of a building.

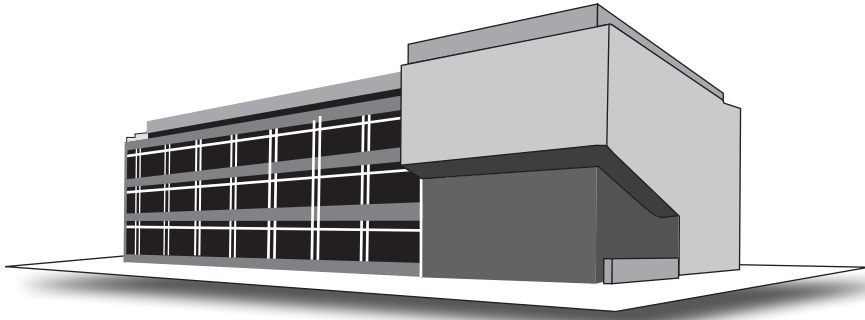


Figure 1

(a) Give **two** benefits of producing a virtual architectural model.

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A physical architectural model of the building is needed to display the design at an exhibition.

(b) Jelutong, which is relatively inexpensive and readily available, will be used to make the model of the building.

Explain **two** properties of jelutong that make it a suitable material for the architectural model.

(4)

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(c) The base of the architectural model will be made out of Medium Density Fibre Board (MDF).

Explain **one** reason why MDF will be used for the base of the architectural model.

(3)

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(Total for Question 1 = 9 marks)



2 Sustainability is a key consideration in the manufacture of all consumer products including clothing.

(a) State **two** textile raw materials that can be considered as environmentally sustainable.

(2)

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(b) A steel manufacturer owns a quarry and is currently able to extract ore to meet its production needs.

- Ore reserves available from the quarry – 650,100 tonnes
- Daily ore consumption in the steel manufacturing process – 300 tonnes per day
- The steel manufacturing process operates 7 days per week.

Calculate how long the ore reserves will meet the needs of the steel manufacturer.

Show all of your workings.

Give your answer in weeks and days.

(5)

Answer weeks days

(Total for Question 2 = 7 marks)



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3 Figure 2 shows a children's toy car that has been rotationally moulded from polyvinyl chloride (PVC).



(Source: © Gabe Ginsberg/Getty Images)

Figure 2

(a) Explain **one** working property of polyvinyl chloride (PVC) that makes the toy car durable during play activities.

(2)

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(b) Describe, using annotated sketches, the rotational moulding process.

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(c) Explain **two** benefits of rotational moulding the parts of the children's toy car.

(6)

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(Total for Question 3 = 12 marks)

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4 Figure 3 shows a prototype of a cast aluminium clamping bracket which will be used on specialist commercial vehicles.

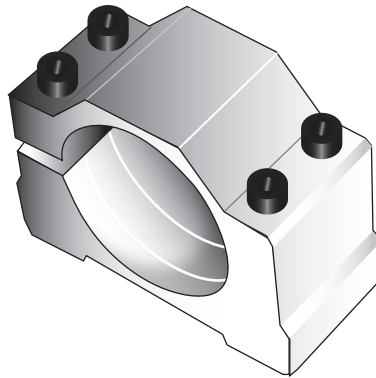


Figure 3

(a) Give **three** properties of aluminium.

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(b) The prototype of the clamping bracket will be sand cast.

Outline how the mould is prepared for the casting of the prototype clamping bracket.

(6)

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- (c) The prototype clamping bracket is to be produced and the designer has asked a supplier for an estimated cost.

Calculate the cost of the prototype aluminium bracket.

- 1 m³ of aluminium weighs: 2.7 tonnes
- Price of aluminium: £1700 per tonne
- Volume of aluminium required: 500 cm³
- Wastage allowance: 7.5%
- Cost of tooling, patterns and equipment use: £75.00
- Labour time to complete: 2 hours
- Hourly labour rate: £18.25 per hour
- Addition for supplier's profit: 25%

Show all of your workings.

Give your answer to **two** decimal places.

(8)

Answer £



Safe working practices are an essential part of modern manufacturing and risk assessments are carried out for all manufacturing operations and processes.

(d) Give **two** control measures, other than personal protective equipment (PPE), used during the pouring of an aluminium sand casting in the school workshop.

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The manufacturer of the specialist commercial vehicles uses quick response manufacturing (QRM) techniques.

- (e) Evaluate why the manufacturer of specialist commercial vehicles may choose to use quick response manufacturing (QRM) techniques.

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(Total for Question 4 = 28 marks)



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5 Figure 4 shows a children's bath toy.



(Source: © ajt/Shutterstock)

Figure 4

(a) Give **two** benefits of using a thermo-chromic material for the bath toy.

(2)

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(b) Explain **two** reasons why a high-volume production method is used for the manufacturing of the bath toy.

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(c) Polymers are often used to make children's toys.

Discuss the suitability of polymer-based materials for children's toys during play activities.

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The children's bath toy will be packaged for sale.

(d) Name **two** paper and board finishing processes that could be used to improve the aesthetics of the packaging.

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(e) The packaging passes through two quality control checks.

- 98.5% of the packages pass the test for dimensional tolerance
- 98% of the packages pass the test for print quality.

Calculate the probability of one package failing both tests.

Show all of your workings.

(3)

Answer



(f) Figure 5 shows the packaging that has been chosen for the bath toy.

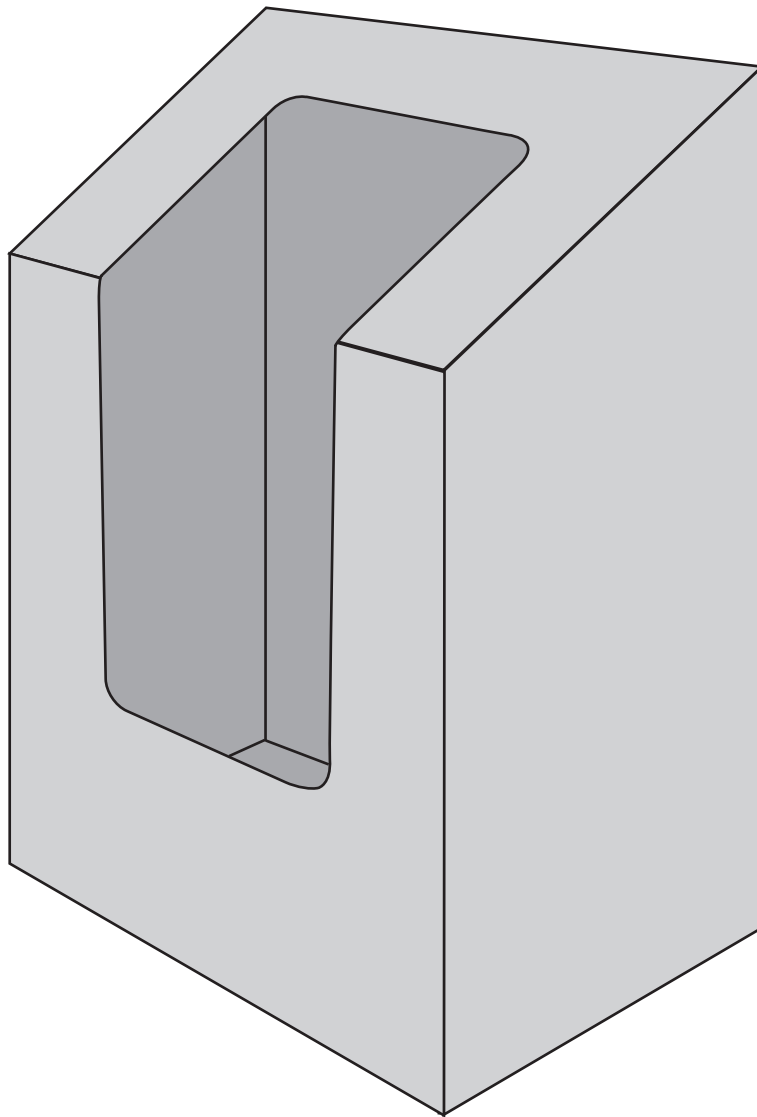


Figure 5

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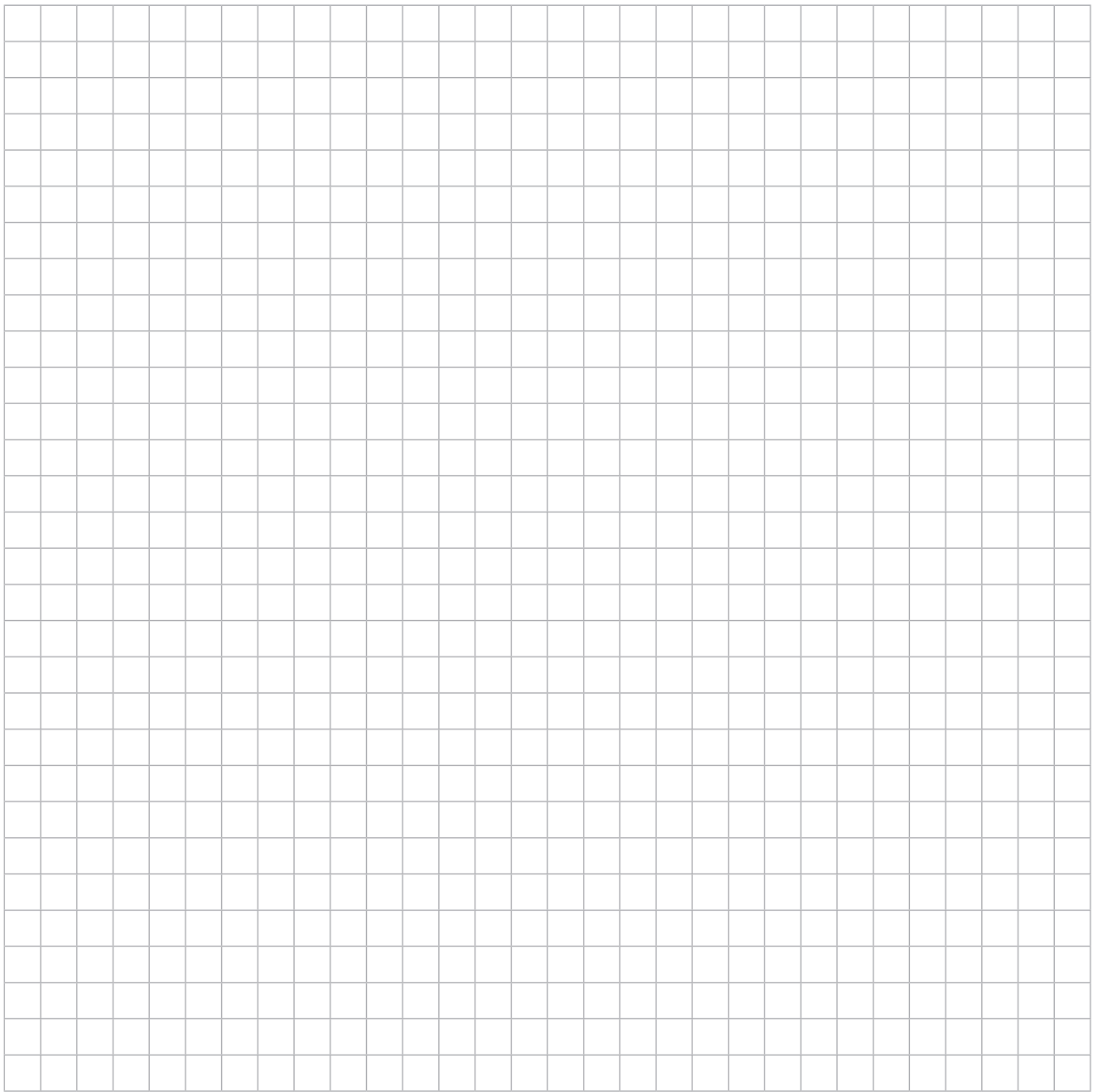
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Construct a net suitable for the packaging.

You should show all fold lines, tabs and apertures.

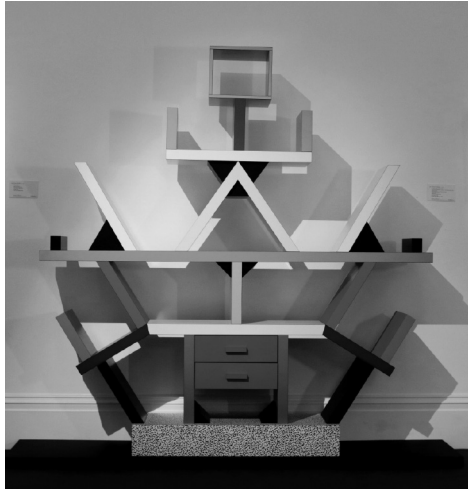
(6)



(Total for Question 5 = 25 marks)



- 6 Figure 6 shows the 'Carlton Bookcase' by Ettore Sottsass, who was a key member of the Memphis Design Movement.



(Source: © WENN Rights Ltd/Alamy Stock Photo)

Figure 6

Discuss how the Memphis Design Movement has influenced consumer choice and expectations.

(9)

A series of horizontal dotted lines provided for the student to write their answer to the question.

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(Total for Question 6 = 9 marks)



- 7 Figure 7 shows two pictures of a multi-purpose chair that can be used for children from birth to three years of age.

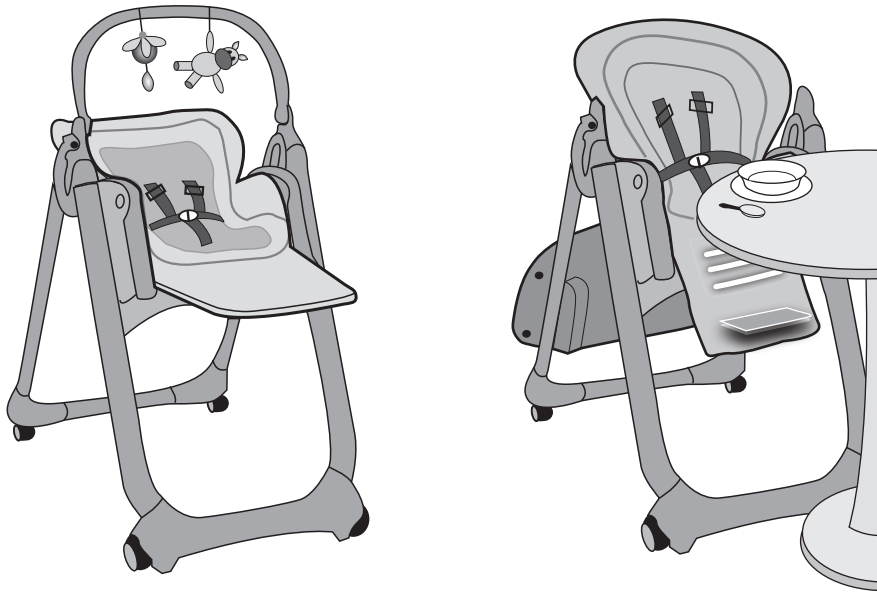


Figure 7

Key design features of the multi-purpose chair include:

- Folding frame with four lockable wheels
- Removable tray and removable activity centre
- Padded reducer to suit different ages / sizes of children
- 8 adjustable height positions
- Adjustable footrest positions
- Reversible padded seating
- Security harness.

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(a) Discuss how user centred design may have been used to ensure that the multi-purpose chair is fit-for-purpose for the target market group.

(9)

Dotted lines for writing.



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Handwriting practice area with 20 horizontal dotted lines.



(b) Explain **three** considerations the designer could take into account when designing the multi-purpose chair to reduce its lifetime impact on the environment.

(9)

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8 Figure 8 shows a jacket used by hill walkers.

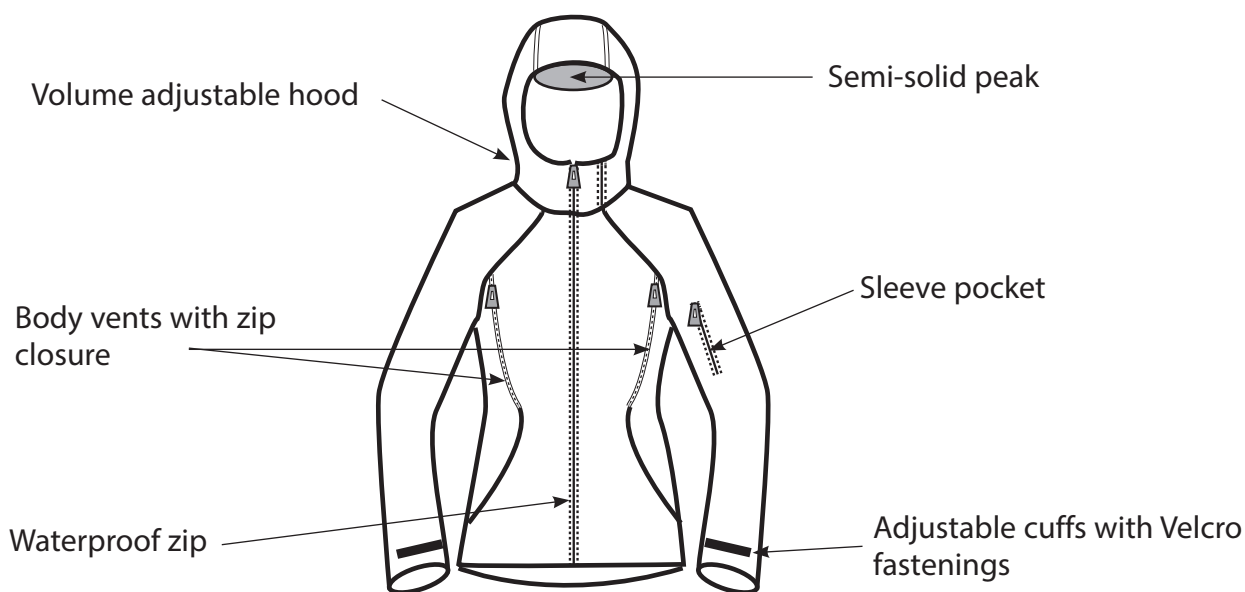


Figure 8

The jacket is manufactured from stretched polytetrafluoroethylene (PTFE) fabric often known by its trade name Gore-Tex®.

Evaluate the performance of the jacket with reference to inclement weather conditions and user comfort.

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TOTAL FOR PAPER = 120 MARKS



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