Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9–1)

Centre Number | | | | | |

Candidate Number | | | | |

Time 1 hour 45 minutes

Paper reference **1DT0/1C**

Design and Technology

COMPONENT 1: Polymers

You must have:
calculator, ruler, HB pencil, protractor, compass

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **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.*
- Calculators may be used.
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.
- 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 100.
- 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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P 6 5 4 2 9 A 0 1 2 8

Pearson

SECTION A

Core

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

1 (a) The materials that products are made from are chosen because of their properties.

Figure 1 shows a table of products.

For each of the products shown, give a property of the material it is made from that makes the material suitable for the product.

The first one has been done for you.

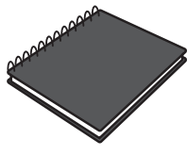
Picture of product	Material and product	Property
	Stainless steel spoon	Corrosion resistant
	Mahogany dining room chair	(1) (i) .....
	High Impact Polystyrene (HIPS) drinking cup	(1) (ii) .....
	Wool scarf	(1) (iii) .....
	Cartridge paper sketch book	(1) (iv) .....

Figure 1

(b) Explain **one** advantage of using wind to generate energy.

(2)

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As wind turbines get bigger and taller they produce more power.

(c) Figure 2 shows a table of information about two different wind turbines.

	Wind Turbine A	**Wind Turbine B**
Power (kW)	500	800

Figure 2

Calculate how much more power wind turbine B produces in comparison to wind turbine A as a percentage.

(2)

Answer ..... %

(Total for Question 1 = 8 marks)

2 Figure 3 shows a game.

The two sets of cubes are made from contrasting coloured non-ferrous metals.

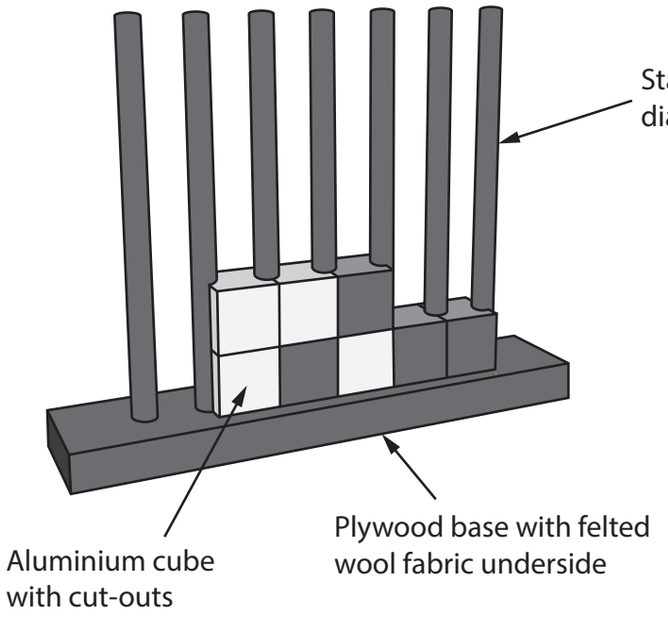

Figure 3

Aluminium is used to manufacture one set of the coloured cubes.

(a) Name **one** other appropriate non-ferrous metal that could be used to make the other set of coloured cubes.

(1)

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(b) Explain **one** reason for using standard sized 10 mm diameter rods.

(2)

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(c) Explain **one** property of felted wool fabric that makes it an appropriate choice of material for gluing to the underside of the plywood base.

(2)

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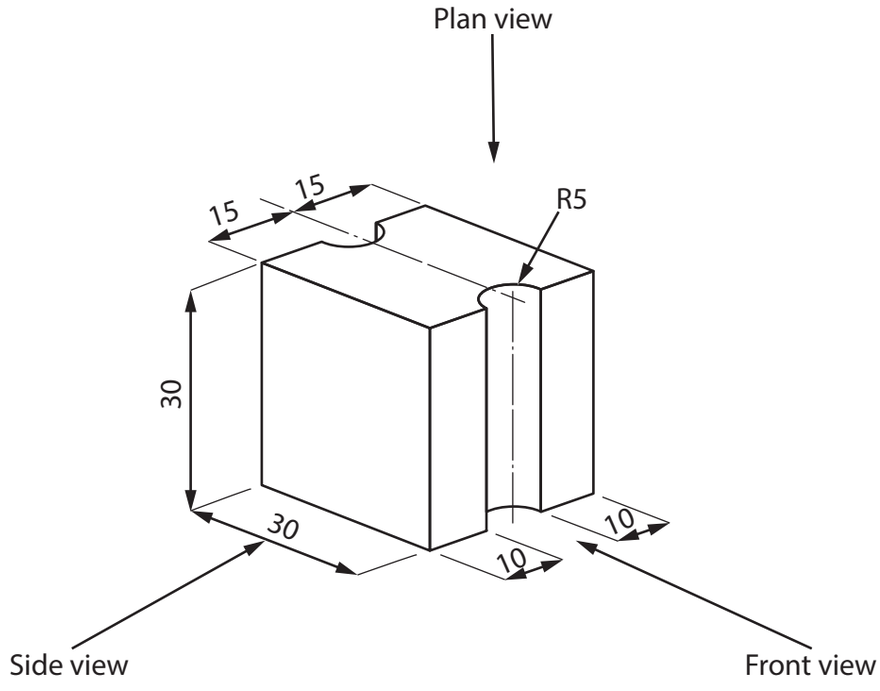
Figure 4 shows a dimensioned isometric drawing of one of the metal cubes with cut-outs.



All dimensions in mm

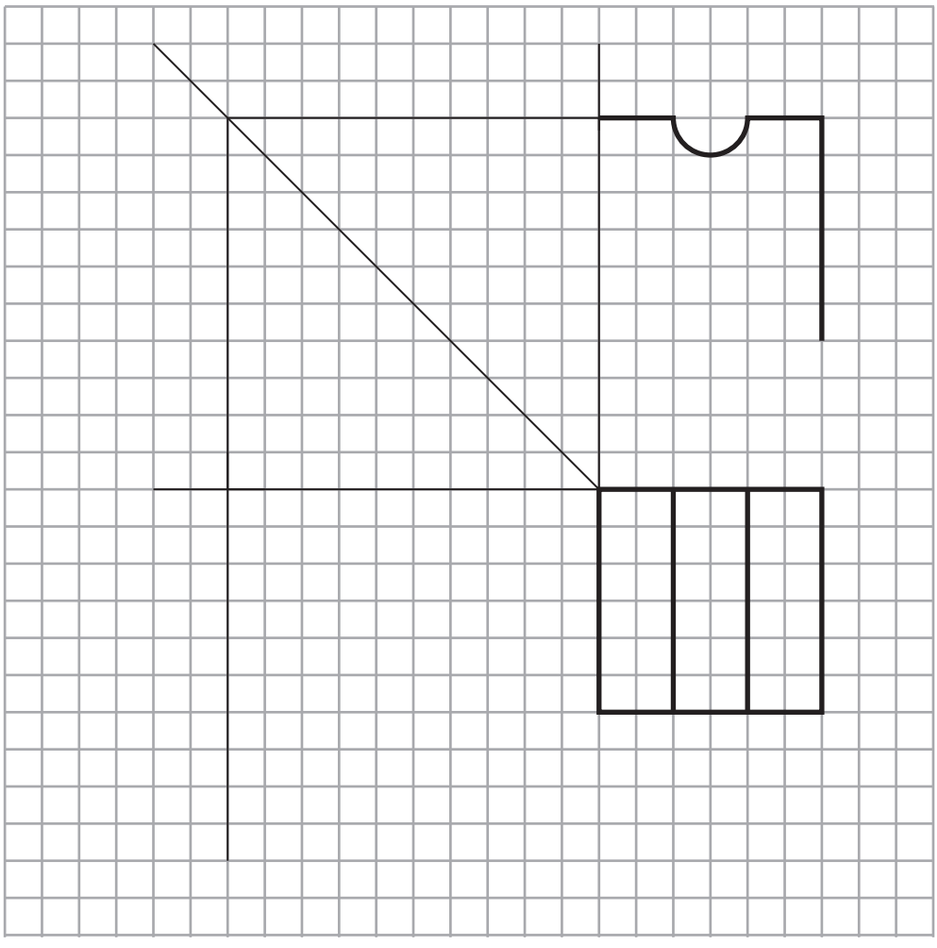
Diagram not to scale

Figure 4

(d) Complete a full-sized orthographic drawing of the metal cube shown in Figure 4 on the 5 mm orthographic grid on the opposite page.

The front view and part of the plan view have already been done for you.

(4)



5mm orthographic grid

(Total for Question 2 = 9 marks)

3 Figure 5 shows a sports rowing boat manufactured from fibreglass, which is a composite material.

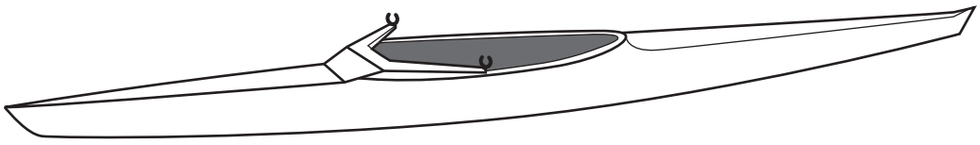


Figure 5

(a) Name **one** composite material other than fibreglass.

(1)

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(b) Explain **one** reason for manufacturing the sports rowing boat from fibreglass.

(2)

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(c) When manufacturing fibreglass, the glass fibre matting is coated with a mixture of resin and a catalyst.

The resin and catalyst are mixed in the ratio of 100 g resin to 2 ml of catalyst.

Calculate how much catalyst would be added to 650 g of resin.

(2)

Answer ..... ml

(d) The sports rowing boat oar shown in Figure 6 is a lever.

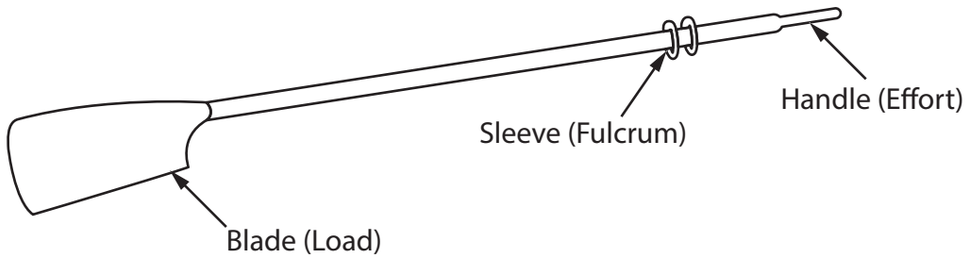

Figure 6

Analyse the boat oar.

(i) Name the lever classification for the sports rowing boat oar.

(1)

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(ii) State the type of movement shown by the sports rowing boat oar handle when in use.

(1)

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(e) Explain **two** benefits of sports textiles for athletes.

(4)

1 .....

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2 .....

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(Total for Question 3 = 11 marks)

4 Figure 7 shows a one piece corrugated board package for a smart lightbulb.

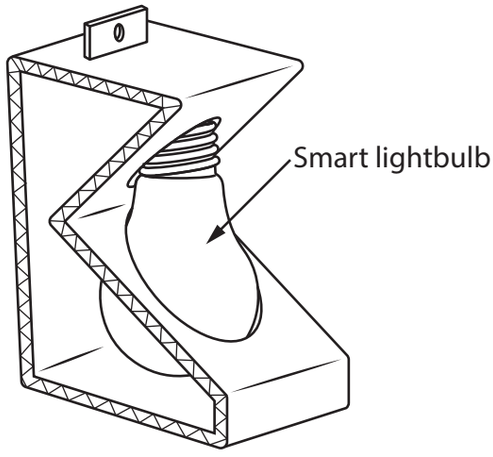

Figure 7

(a) Explain **one** working property of corrugated board that makes it an appropriate choice of material to make the lightbulb package.

(2)

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(b) Explain **one** way that the cost of materials has been kept to a minimum for the lightbulb package.

(2)

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(c) The net for the package measures 40 cm long by 8 cm wide.

The designer needs to increase the surface area of the package by 1/8th for greater protection of the lightbulb.

Calculate the new surface area of material required for the package.

(2)

Answer ..... cm^2

The smart lightbulb can be connected to the internet.

(d) Discuss how the Internet of Things (IoT) has led to greater independence for older people living on their own in their homes.

(6)

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(Total for Question 4 = 12 marks)

TOTAL FOR SECTION A = 40 MARKS

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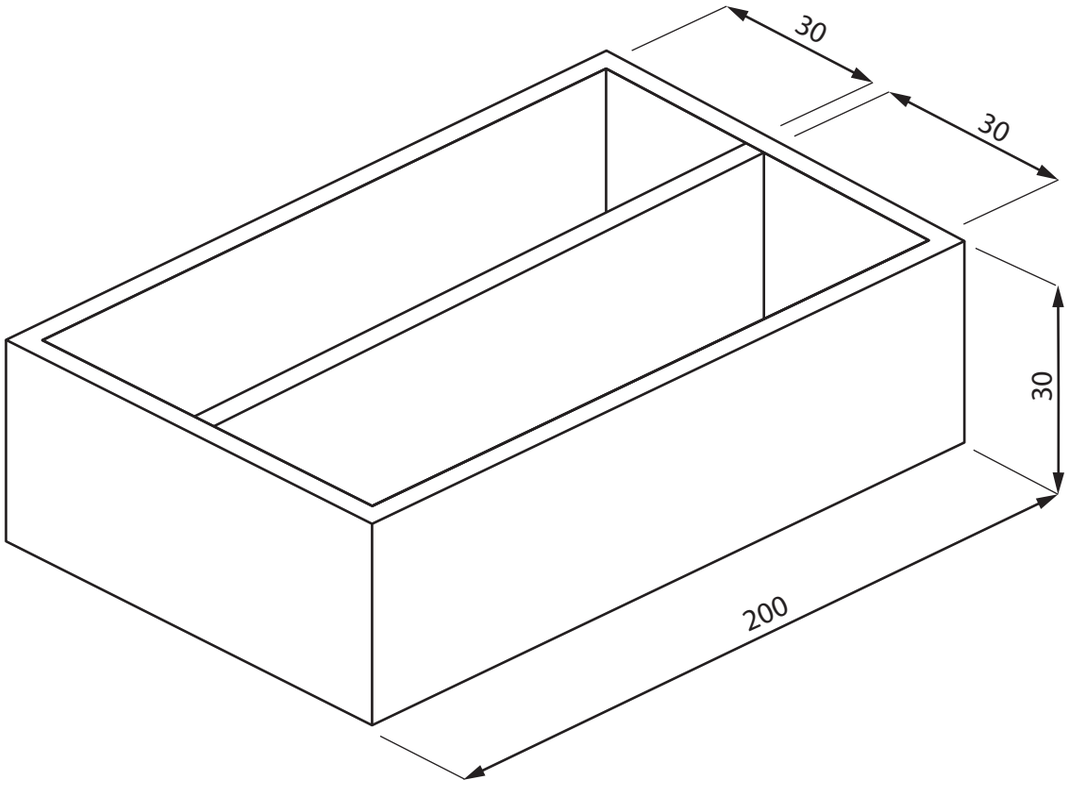
SECTION B BEGINS ON THE NEXT PAGE.

SECTION B – POLYMERS

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

5 Figure 8 shows a design solution for a nuts and bolts tidy case together with some additional information.



Additional information

Maximum dimensions of the boxes of nuts and bolts

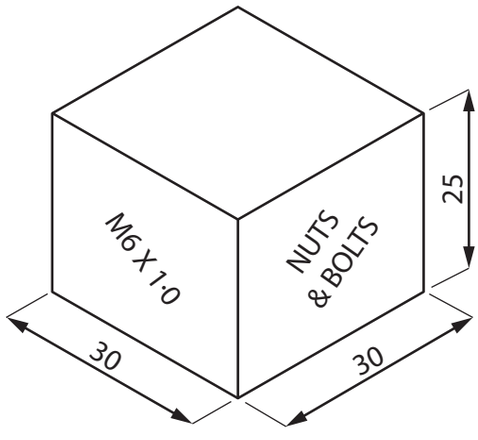


Figure 8

All dimensions in mm

(a) The nuts and bolts tidy case needs to be improved to include the following specification points.

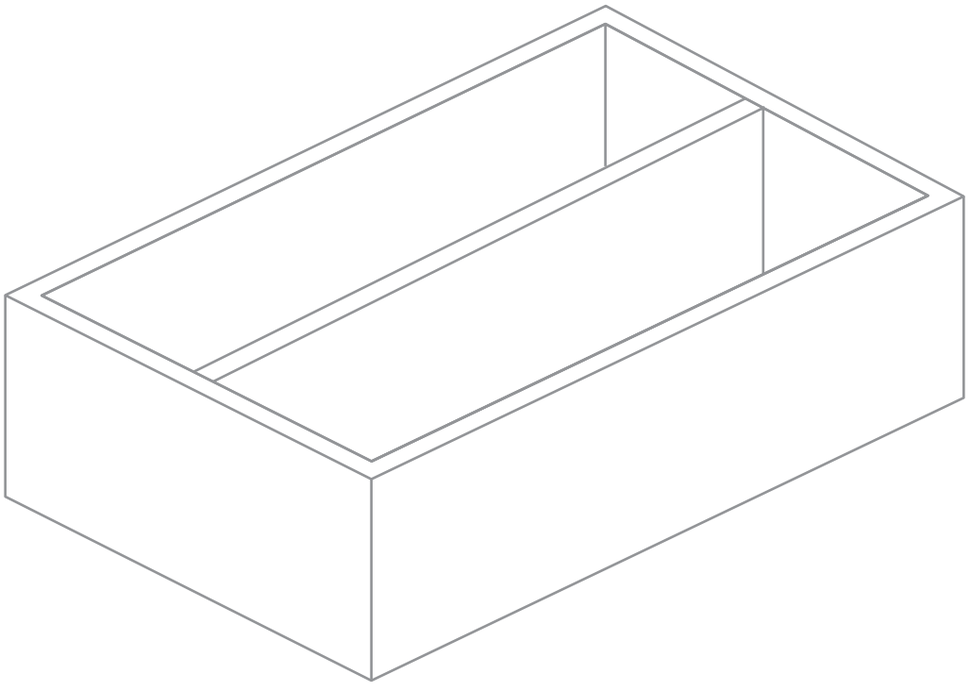
The nuts and bolts tidy case must:

- provide separate storage spaces for different sized boxes of nuts and bolts and allow the size of the nuts and bolts to be seen
- be portable when two nuts and bolts tidy cases are securely fixed on top of each other
- include a lockable method that will stop the boxes of nuts and bolts from falling out.

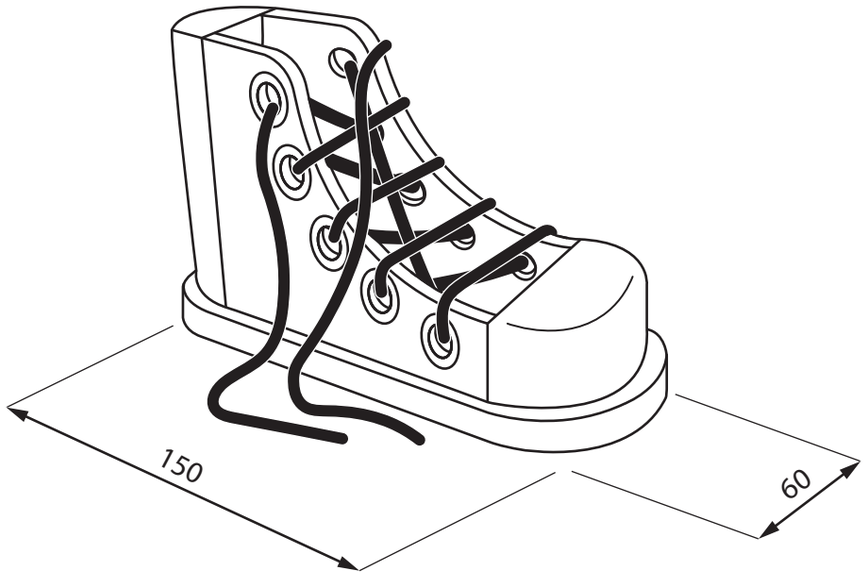
Use notes and sketches, on the outline below, to show how the nuts and bolts tidy case could be modified to include these three specification points.

You will be marked on how you apply your understanding of design and technology, not your graphical skills.

(6)



(b) Figure 9 shows a polymer boot that is used to help young children learn how to tie their own shoelaces.



All dimensions in mm

Figure 9

Explain **two** ways that the polymer boot meets, or fails to meet, the criteria of providing a method to help young children learn how to tie their own shoelaces.

(4)

1 .....

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2 .....

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(Total for Question 5 = 10 marks)

6 Figure 10 shows a teaching aid for use in schools.

The number wheels are manufactured from acrylonitrile-butadiene-styrene (ABS).

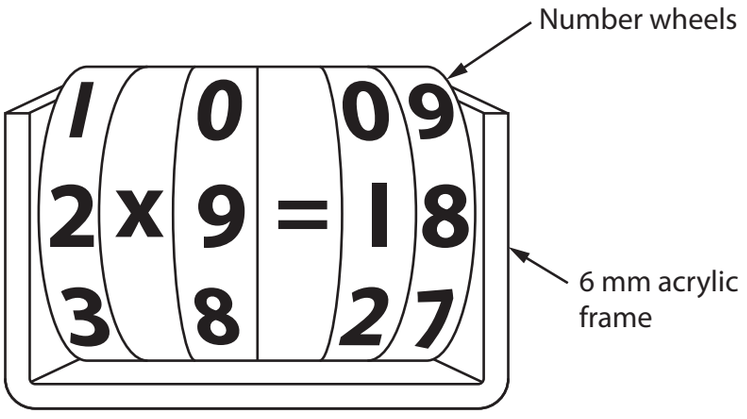

Figure 10

(a) Explain **two** working properties of ABS that make it an ideal material from which to make the number wheels.

(4)

1 .....

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2 .....

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(b) The frame is formed using a strip heater.

The frame is made from a rectangular piece of acrylic measuring 200 mm × 80 mm × 6 mm.

Use notes and sketches, in the space below, to show how the frame would be formed on a strip heater.

You will be marked on how you apply your understanding of design and technology, not your graphical skills.

(4)

(c) Explain **one** reason why the number wheels must be manufactured to a tolerance.

(2)

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(d) Give **two** different surface finishes or treatments that could be used to show the numbers on the ABS number wheels.

Explain **one** advantage of using each surface finish or treatment.

(6)

Surface finish or treatment 1

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Explanation

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Surface finish or treatment 2

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Explanation

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(Total for Question 6 = 16 marks)

7 Figure 11 shows a shelving unit for an office desk.

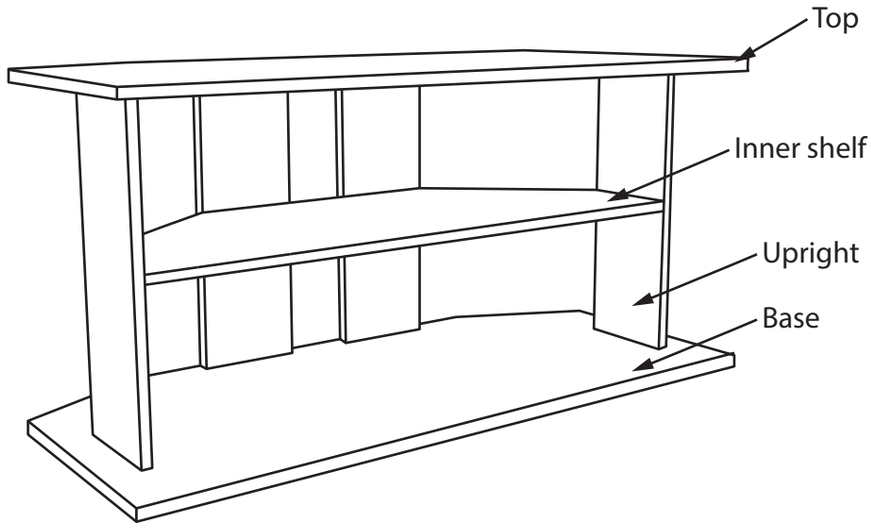

Figure 11

(a) Name the type of adhesive that would be used to join the pieces of acrylic together for the shelving unit.

(1)

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Figure 12 shows a panel for the base of the shelving unit which has been designed using computer-aided design (CAD).

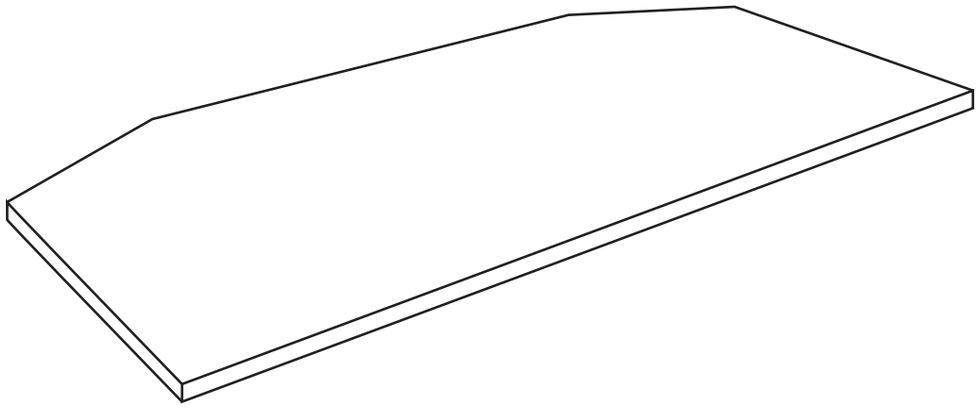

Figure 12

(b) Explain **two** advantages of using CAD when designing the shelving unit.

(4)

1 .....

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2 .....

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(c) Figure 13 shows a cutting list for the shelving unit.

The material is 6 mm acrylic which costs £11 m^2.

Complete the cutting list by calculating the missing information for each of the five empty boxes, including the total cost.

All dimensions are in metres.

(5)

Part	Length (m)	Width (m)	Area (m^2)	Number required	Cost (£)
Top / base	0.4	0.35	0.14	2	.....
Inner shelf	0.3	0.2	0.06	1	.....
Uprights	0.15	0.15	.....	4	.....
				Total cost (£)	.....

Figure 13

Working out space

Products are manufactured using different scales of production.

(d) Explain **two** reasons for manufacturing the shelving unit in batches.

(6)

1 .....

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2 .....

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(Total for Question 7 = 16 marks)

8 Figure 14 shows a desk lamp manufactured from urea formaldehyde.

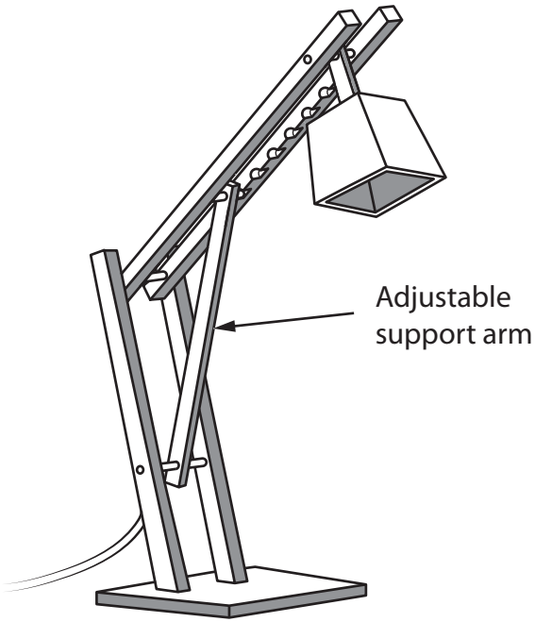

Figure 14

The adjustable support arm is in compression.

(a) Explain **one** possible effect of the compressive force acting upon the adjustable support arm.

(2)

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The adjustable support arm is held in a jig when the holes are being drilled in it.

(b) Explain **one** advantage of using a jig when drilling the holes in the adjustable support arm.

(3)

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The urea formaldehyde is produced from oil.

(c) Explain **two** effects of oil exploration and extraction on the ecological footprint of the area from which it is sourced.

(4)

1 .....

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2 .....

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(d) The desk lamp is manufactured from urea formaldehyde, a thermosetting polymer.

Figure 15 shows information about the desk lamp.

Material	Urea formaldehyde
Source of material	Saudi Arabia
Material size	Standard stock sized materials
Power source	Mains electric

Figure 15

Analyse the information in Figure 15.

Evaluate the desk lamp with reference to aesthetic and availability factors including:

- form
- colour
- sustainability.

(9)

(Total for Question 8 = 18 marks)

TOTAL FOR SECTION B = 60 MARKS
TOTAL FOR PAPER = 100 MARKS

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