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 **1DT0/1A**

Design and Technology

Component 1: Metals

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 0 6 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.

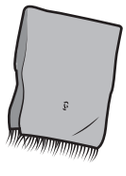
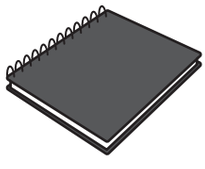
Picture of product	Material and product	Property
	Stainless steel spoon	Corrosion resistant
	Mahogany dining room chair	(1) (i) .....
	High Impact Polystyrene (HIPS) drinking cup	(1) (ii) .....
	Wool scarf	(1) (iii) .....
	Cartridge paper sketch book	(1) (iv) .....

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.

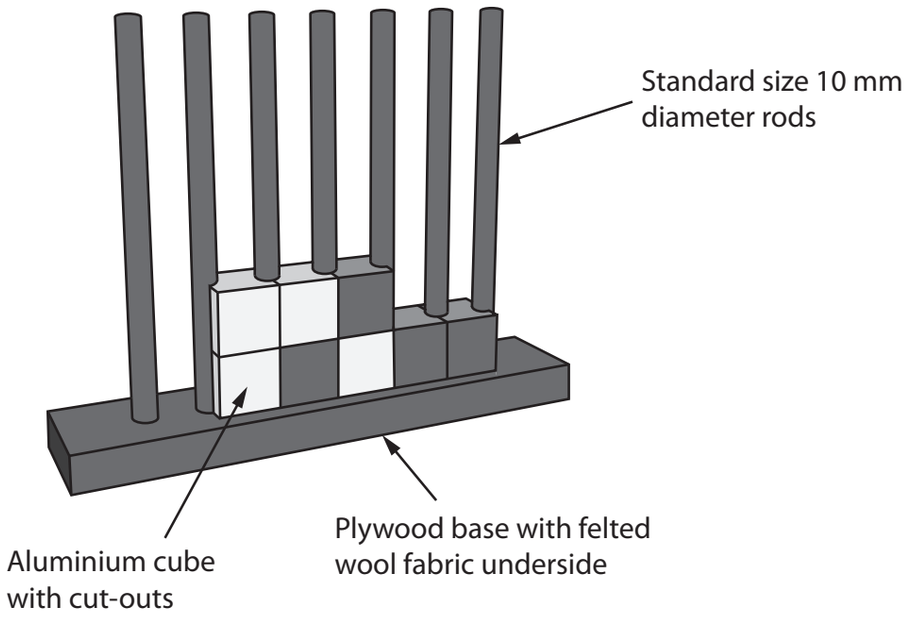

Figure 3

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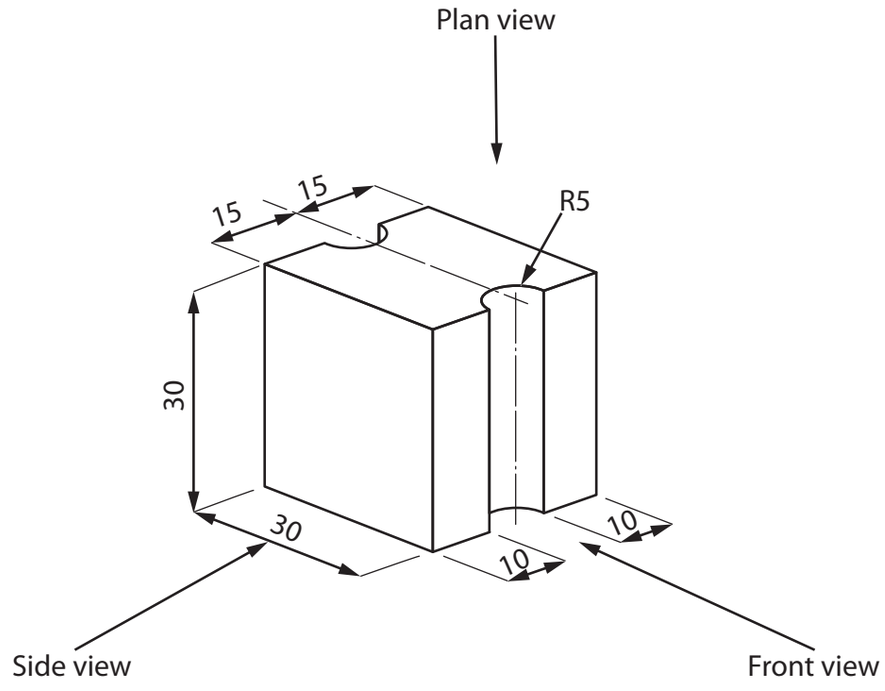
Figure 4 shows a dimensioned isometric drawing of one of the metal cubes with cut-outs.



All dimensions in mm

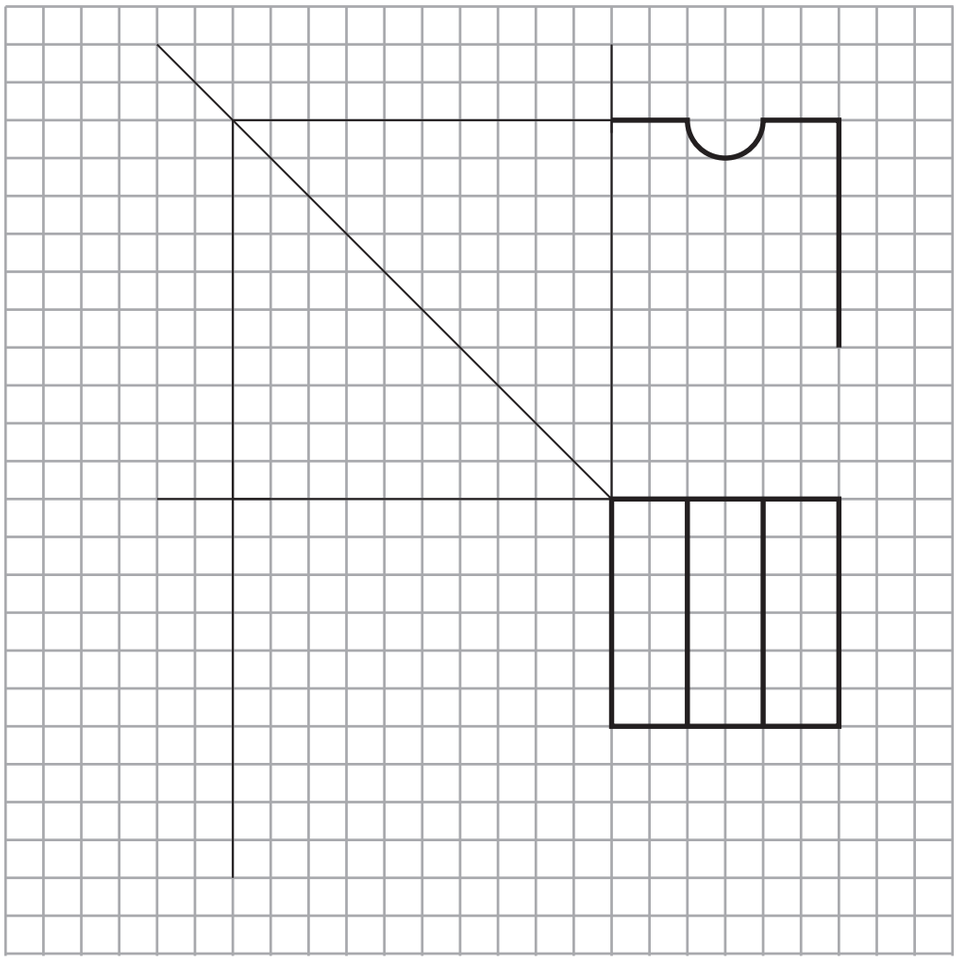
Diagram not to scale

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.

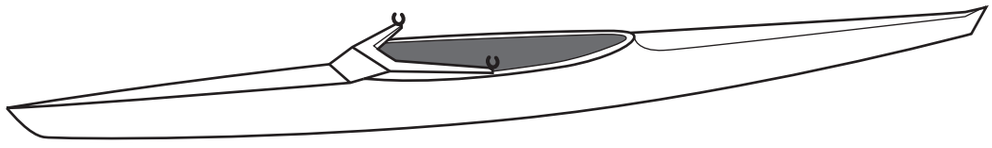


Figure 5

(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.

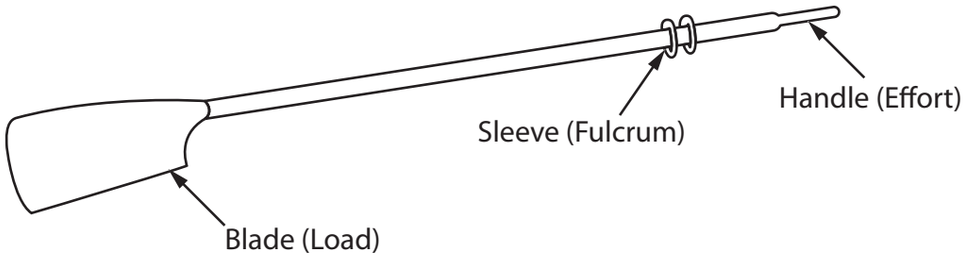

Figure 6

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.

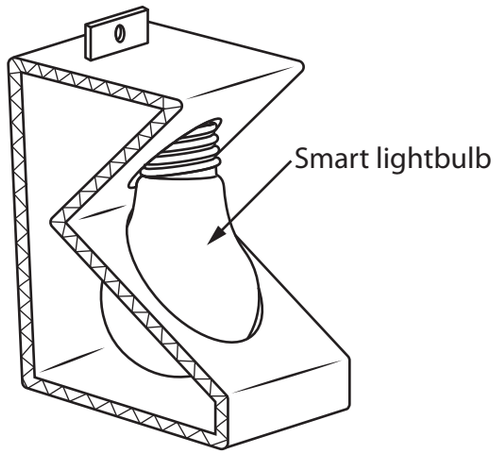

Figure 7

(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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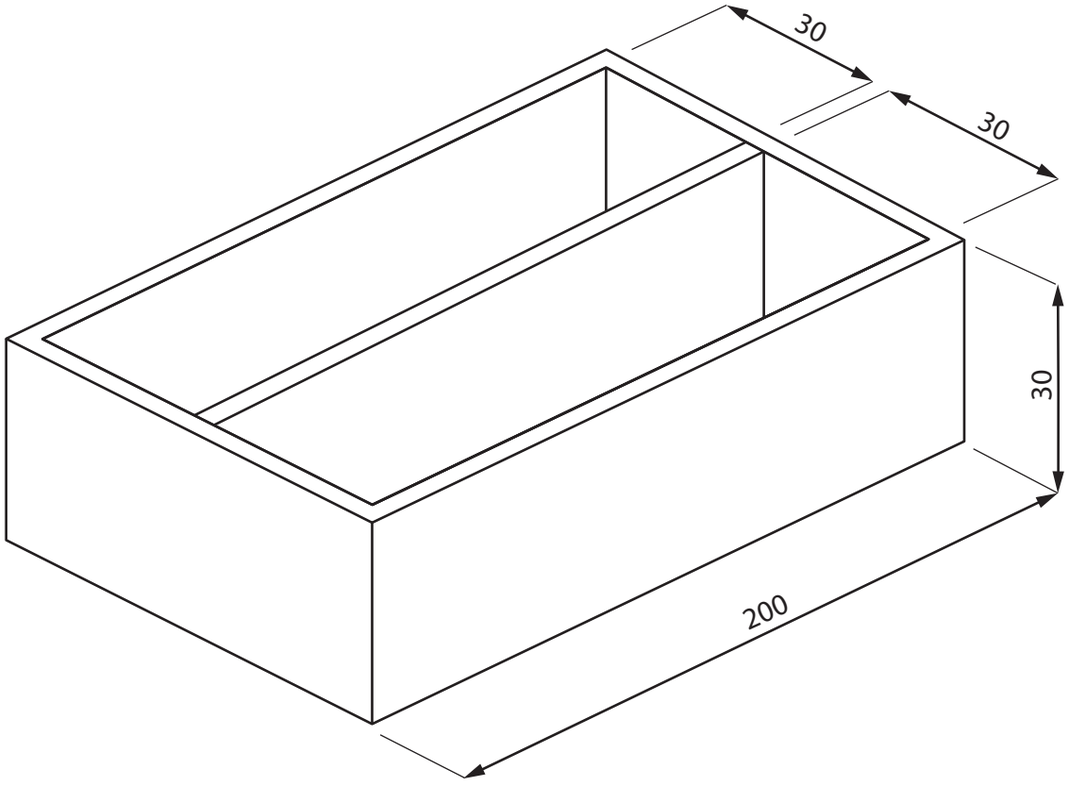
SECTION B BEGINS ON THE NEXT PAGE

SECTION B

Metals

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

5 Figure 8 shows a design solution for a case to hold boxes of nuts together with some additional information.



Additional information

Maximum dimensions of the boxes of nuts

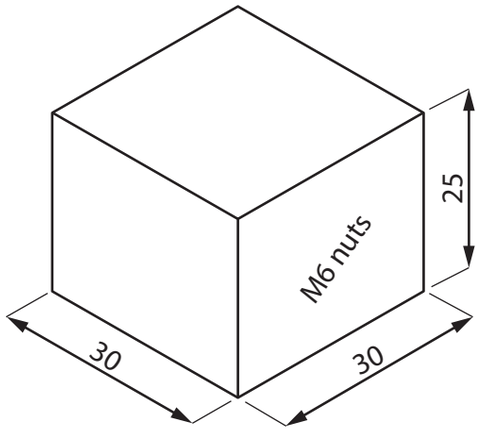


Figure 8

All dimensions in mm

(a) The case to hold boxes of nuts needs to be improved to include the following specification points.

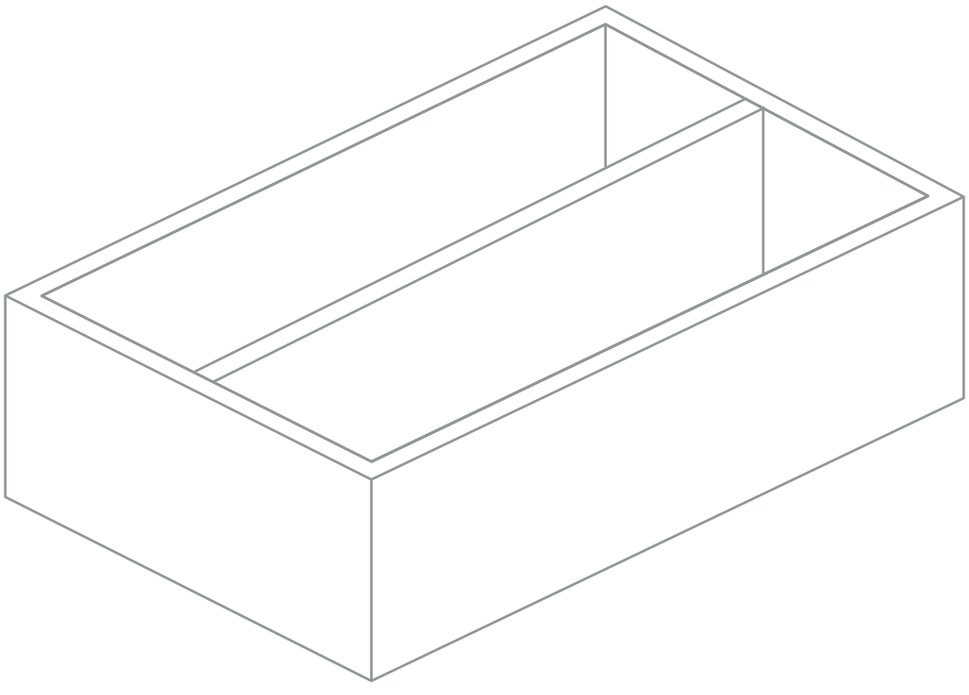
The case to hold boxes of nuts must:

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

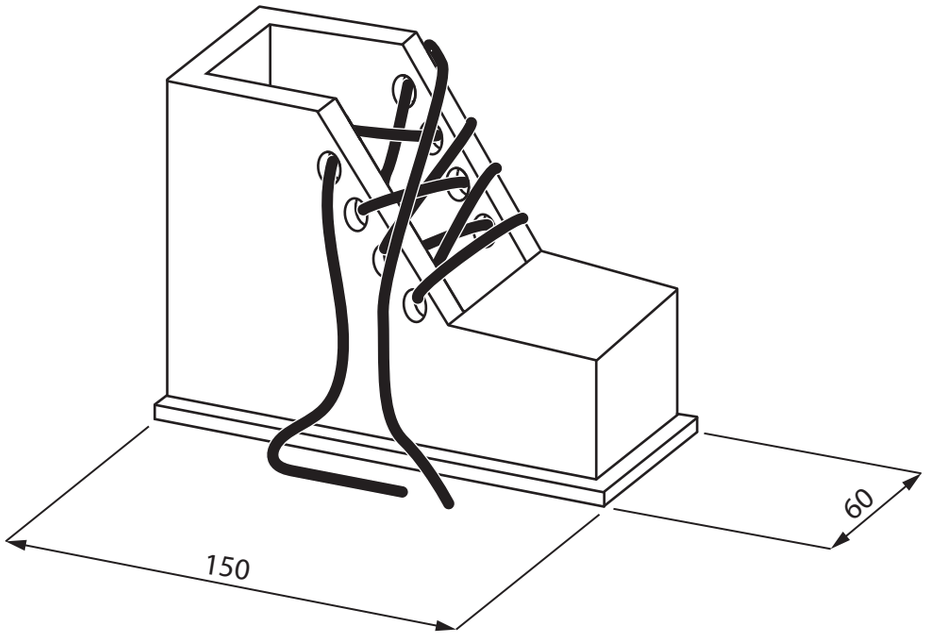
Use notes and sketches, on the outline below, to show how the case to hold boxes of nuts could be modified to include these three specification points.

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

(6)



(b) Figure 9 shows a metal 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 metal 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 teaching aid is manufactured from aluminium.

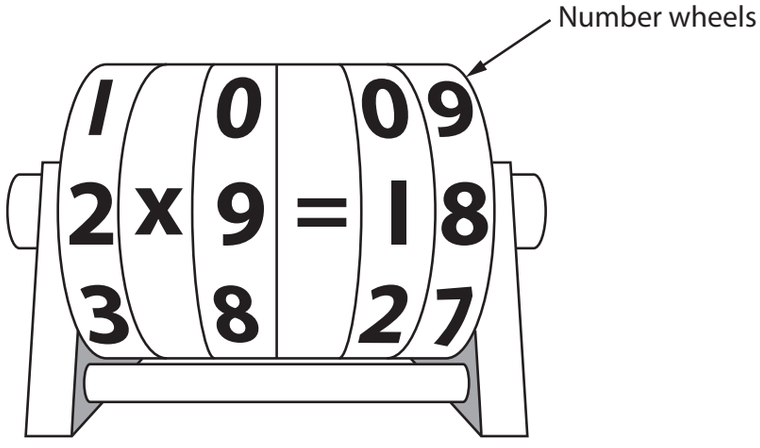

Figure 10

(a) Explain **two** physical characteristics of aluminium that make it an ideal material from which to make the teaching aid.

(4)

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2 .....

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(b) The number wheels have a 10 mm hole through the centre.

They are made from a round piece of bar measuring 100 mm diameter × 15 mm thick.

Use notes and sketches, in the space below, to show how a 10 mm hole would be drilled through the centre of one of the number wheels using a pillar drilling machine.

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 applied to the aluminium 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 metal shelving unit that was delivered in a flat pack and a component that was used during the assembly of it.

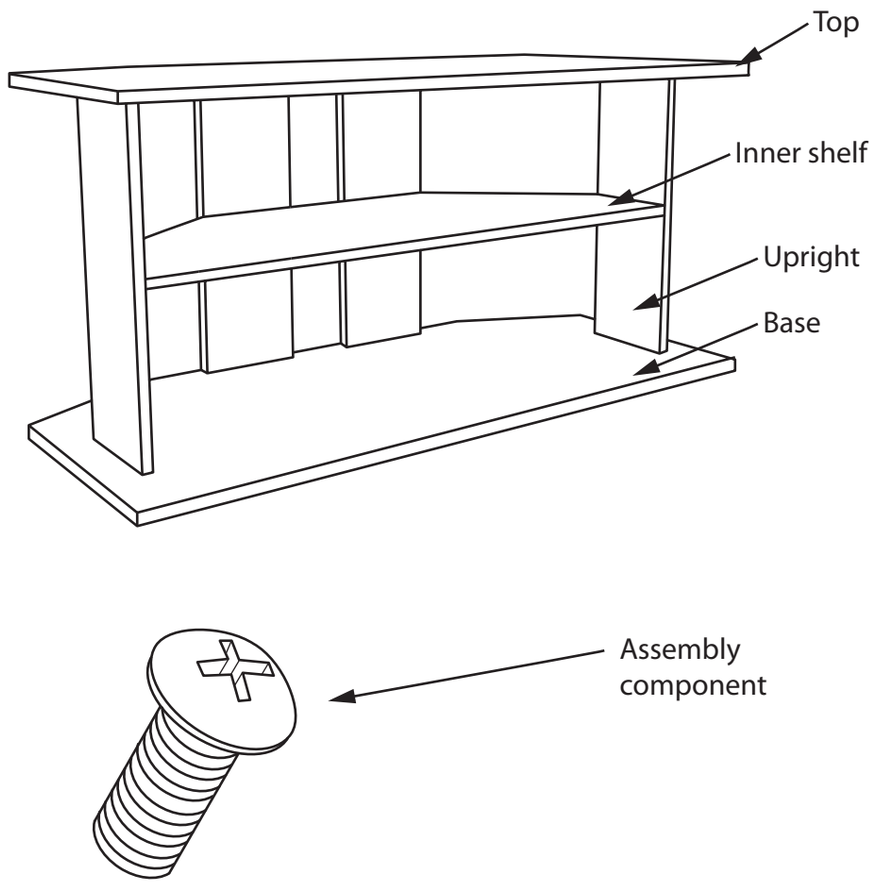

Figure 11

(a) Name the type of assembly component shown in Figure 11.

(1)

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

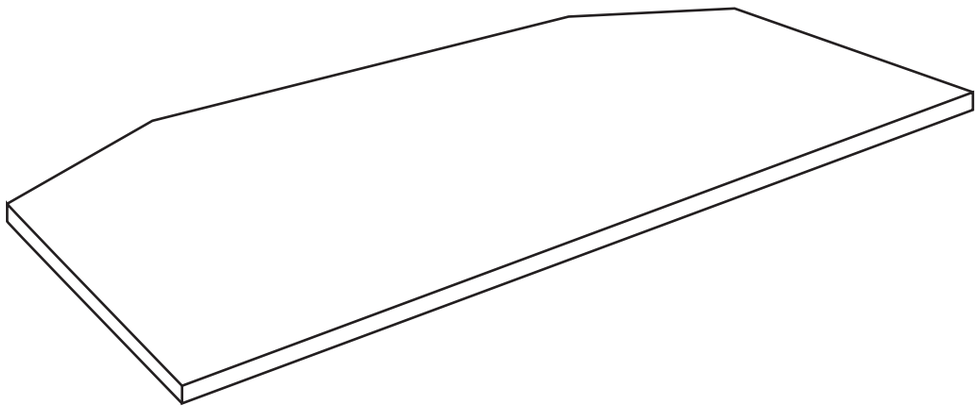

Figure 12

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

(4)

1 .....

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2 .....

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

The material is 4 mm thick steel which costs £64 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	1.0	0.45	0.45	2	.....
Inner shelf	0.8	0.3	0.24	1	.....
Uprights	0.4	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 flat-packed 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 mild steel.

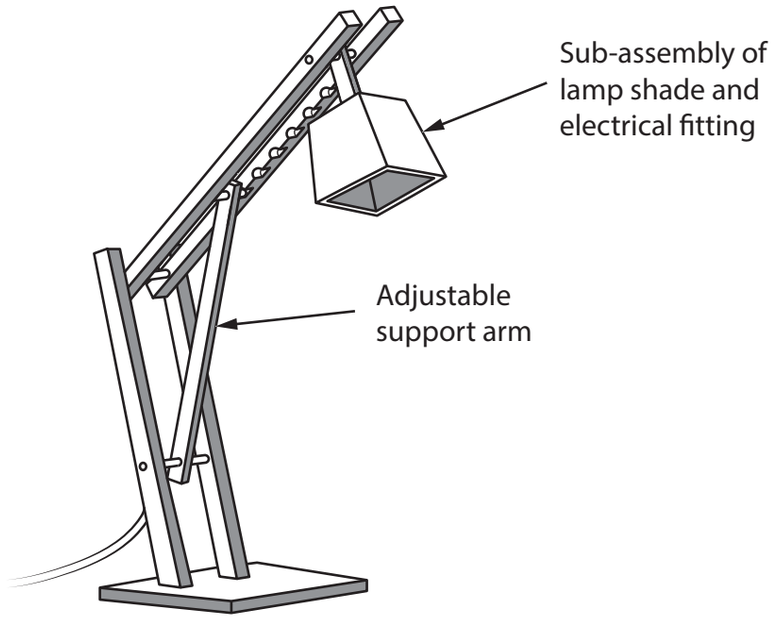

Figure 14

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 lamp shade and electrical fitting are manufactured as a sub-assembly for the desk lamp.

(b) Explain **one** advantage of manufacturing the lamp shade and electrical fitting as a sub-assembly.

(3)

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The iron ore for the mild steel desk lamp is sourced from Russia.

(c) Explain **two** effects on the landscape of extracting iron ore for the mild steel.

(4)

1 .....

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2 .....

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(d) The desk lamp is manufactured from mild steel, a ferrous metal.

Figure 15 shows information about the desk lamp.

Material	Mild steel
Source of material	Russia
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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