

Please write clearly, in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

A-LEVEL DESIGN AND TECHNOLOGY PRODUCT DESIGN

Paper 1 Technical Principles

Additional specimen

Morning Time allowed: 2 hours 30 minutes

Materials

You must have:

- normal writing and drawing instruments
- a scientific calculator

Instructions

- Use black ink or black ball-point pen. Use pencil only for drawing.
- Answer **all** questions.
- You must answer the questions in the spaces provided
- Do all rough work in this book.
- Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
 - The total number of marks available for this paper is 120.
-

0 1

State what is meant by the term **hardness**.

[1 mark]

0 2

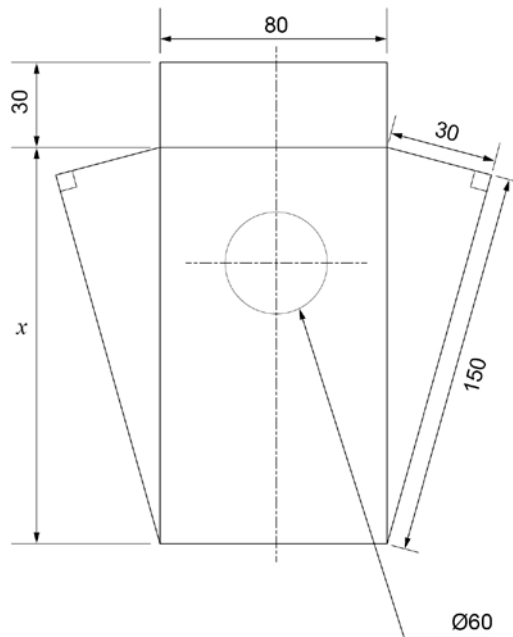
Figure 1 shows an image of a ceiling light.

Figure 2 shows the aluminium sheet net made for this light.

Figure 1



Figure 2



All dimensions in mm
Not to scale

0 2 . **1** Calculate the length of side X.

Show your answer to two decimal places.

[2 marks]

0 2 . **2** Calculate the surface area of the net shown in Figure 2, with the circular hole removed.

Show your answer to two decimal places.

[3 marks]

0 2 . **3** Calculate the percentage reduction in surface area caused when the circular hole was cut out.

Show your answer to two decimal places.

[2 marks]

0 3

Explain the reasons why a CNC laser cutter may be used to cut sheet acrylic rather than a coping saw.

[6 marks]

0 4

State three specific methods companies use to raise awareness of their brand.

[3 marks]

1:

2:

3:

0	5
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Figure 3 shows a plywood balance bike.

Figure 4 shows a tubular aluminium balance bike.

Analyse and evaluate the two balance bikes in terms of their:

- suitability for mass production
- suitability of materials

[12 marks]

Figure 3



Figure 4



0 6

Figure 5 shows a disposable sauce container made from polypropylene (PP).

Analyse and evaluate the positive and negative implications of manufacturing the container from a biodegradable polymer instead of polypropylene.

[12 marks]

Figure 5



0	8
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Give three reasons why QRM (Quick Response Manufacturing) is used in the design and manufacture of products.

[3 marks]

1.

2.

3.

0 9

CNC coordinates have been used to create the program required to laser cut a part from sheet aluminium.

Plot the coordinates on the grid below and use this to calculate the total area of the part.

[5 marks]

CNC coordinates:

(30,20)

(80,20)

(80,70)

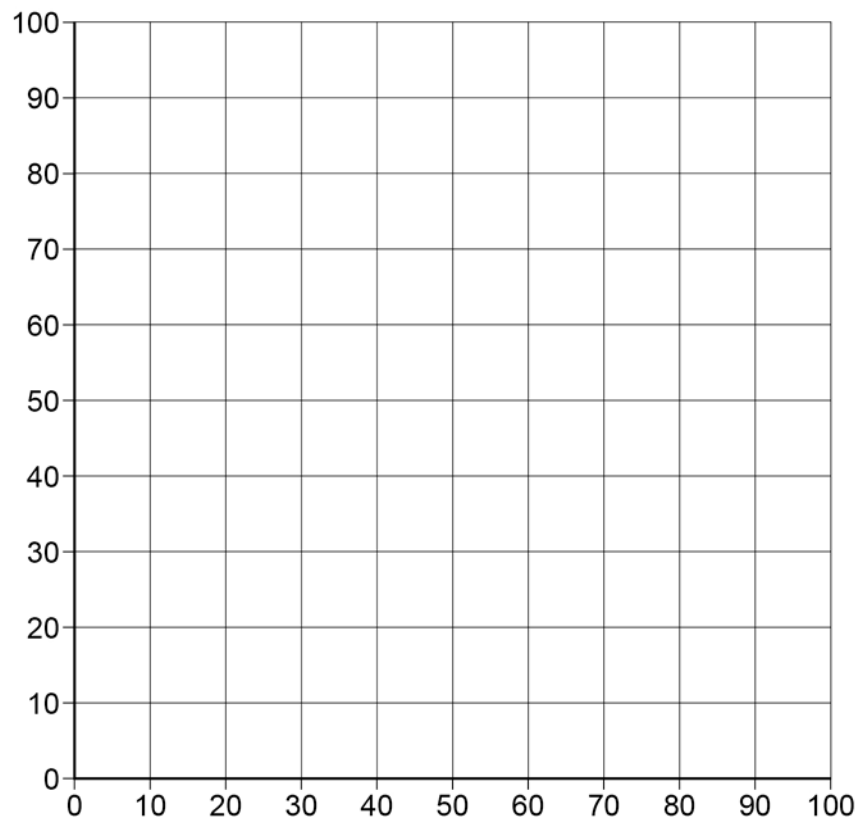
(60,70)

(40,50)

(20,50)

(30,20)

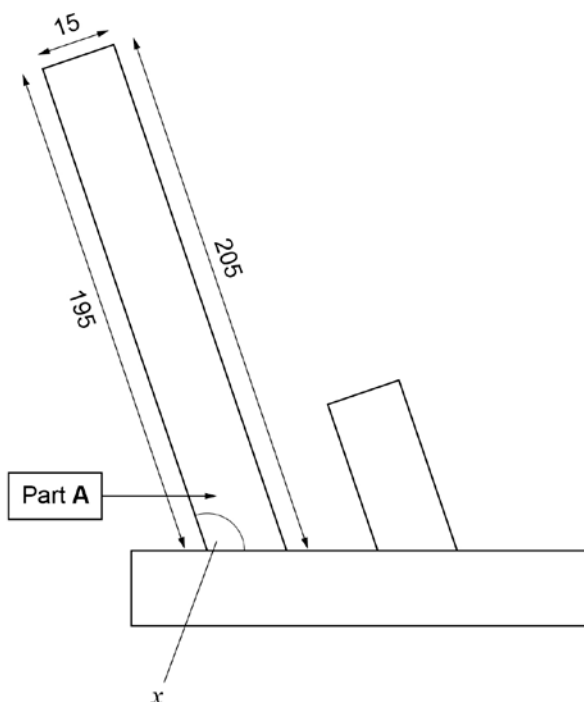
All dimensions in mm



1 0

Figure 7 shows a dimensioned side view of a prototype for a menu holder.

Using the information provided, calculate the angle of x

[4 marks]**Figure 7**

All dimensions in mm.

Not to scale.

1 1

A manufacturer of garden sheds produces 80 sheds per month at a cost of £218.75 per shed.

The costs involved are:

- 60% fixed costs (such as wages, heating and insurance)
- 40% material costs.

The manufacturer intends to increase production to 150 sheds per month, with no change to their fixed costs.

Calculate the new cost per shed.

[4 marks]

1 2

Figure 8 shows a tankard (drinking vessel) made from pewter.

Evaluate the suitability of pewter for the tankard.

[6 marks]

Figure 8



1 **5**

Explain the benefits to designers of using rapid prototyping.

[9 marks]

1 | 6

Explain how and why sub-assembly would be used in the manufacture of a bicycle.

[6 marks]

1 7

Explain why UV varnishing would be used as a finish on a magazine cover.

[4 marks]

1 8

Explain why electroluminescent wires are suitable for use in shop signs.

[4 marks]

1 9

Give three ways that products can be designed and manufactured for disassembly.
[3 marks]

2 **0**

Describe the concept of 'open design' and how this allows the development of products for the common good of society.

Provide clear examples in your answer.

[6 marks]

2	1
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Describe how PPC (production, planning and control) networking systems are used in the manufacture of products.

[6 marks]

Turn over for the next question

2	2
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State two safety precautions required when joining acrylic using Tensol cement.

[2 marks]

END OF QUESTIONS

There are no questions printed on this page

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