

# A-level DESIGN AND TECHNOLOGY (PRODUCT DESIGN)

## Paper 1 Technical Principles

Specimen 2016

Morning

Time allowed: 2 hours 30 minutes

### Materials

For this paper 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.
- Fill in the boxes at the bottom of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided/
- Do all rough work in this book. Cross through any work that you do not want to be marked.

### Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 120.

Please write clearly, in block capitals, to allow character computer recognition.

Centre number

Candidate number

Surname

Forename(s)

Candidate signature \_\_\_\_\_

The photograph below shows a kitchen sink that has been manufactured from stainless steel.

This source has been removed due to third-party copyright restrictions.

**1**

Give **two** physical and **two** mechanical properties of the metal used for the kitchen sink. In each case, state why the property is suitable for this product.

**[8 marks]**

Physical  
Property 1

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Physical  
Property 2

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Mechanical  
Property 1

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Mechanical  
Property 2

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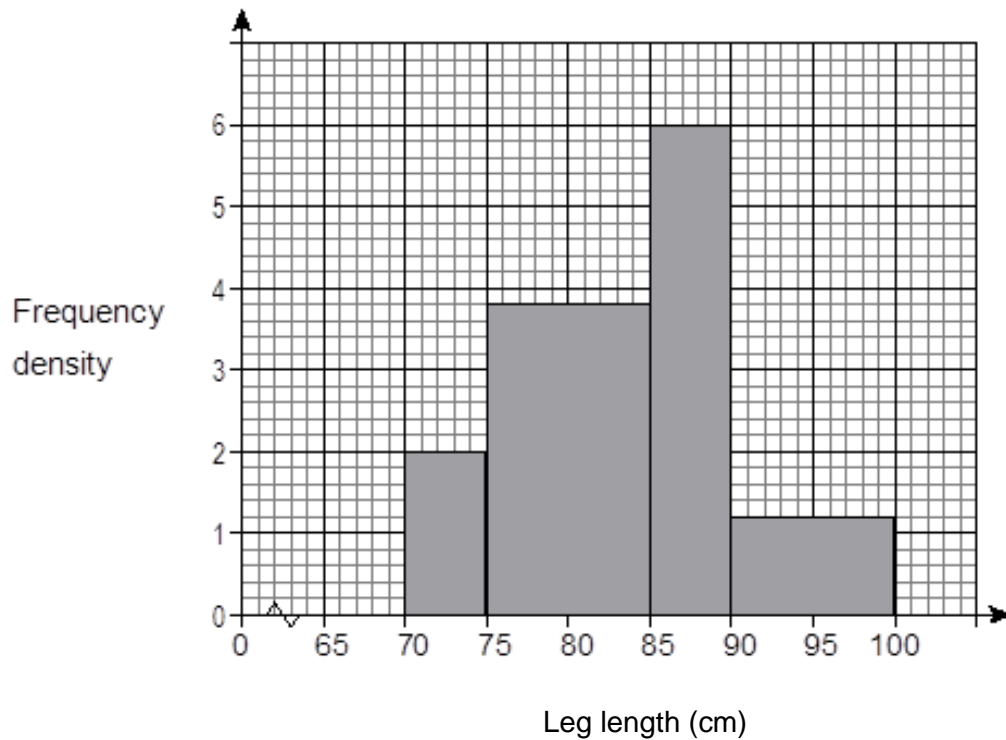
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2

A manufacturer of kitchen furniture wishes to design a range of kitchen high stools. The histogram below shows the leg length of a sample group of potential users.



Calculate the total number of users in the sample group and which of the four bars represents the greatest number of potential users

[4 marks]

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**3**

Explain the meaning of the term 'fabrication process' and give an appropriate example.

**[2 marks]**

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**Figure 2**

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**Figure 3**

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**Manufactured from thermoplastic using polymer redistribution process**

**Manufactured from hardwood using fabrication process**

**4**

Compare the two types of chair shown in **Figure 2** and **Figure 3**. Evaluate their suitability for long term use in an outdoor environment.

**[6 marks]**

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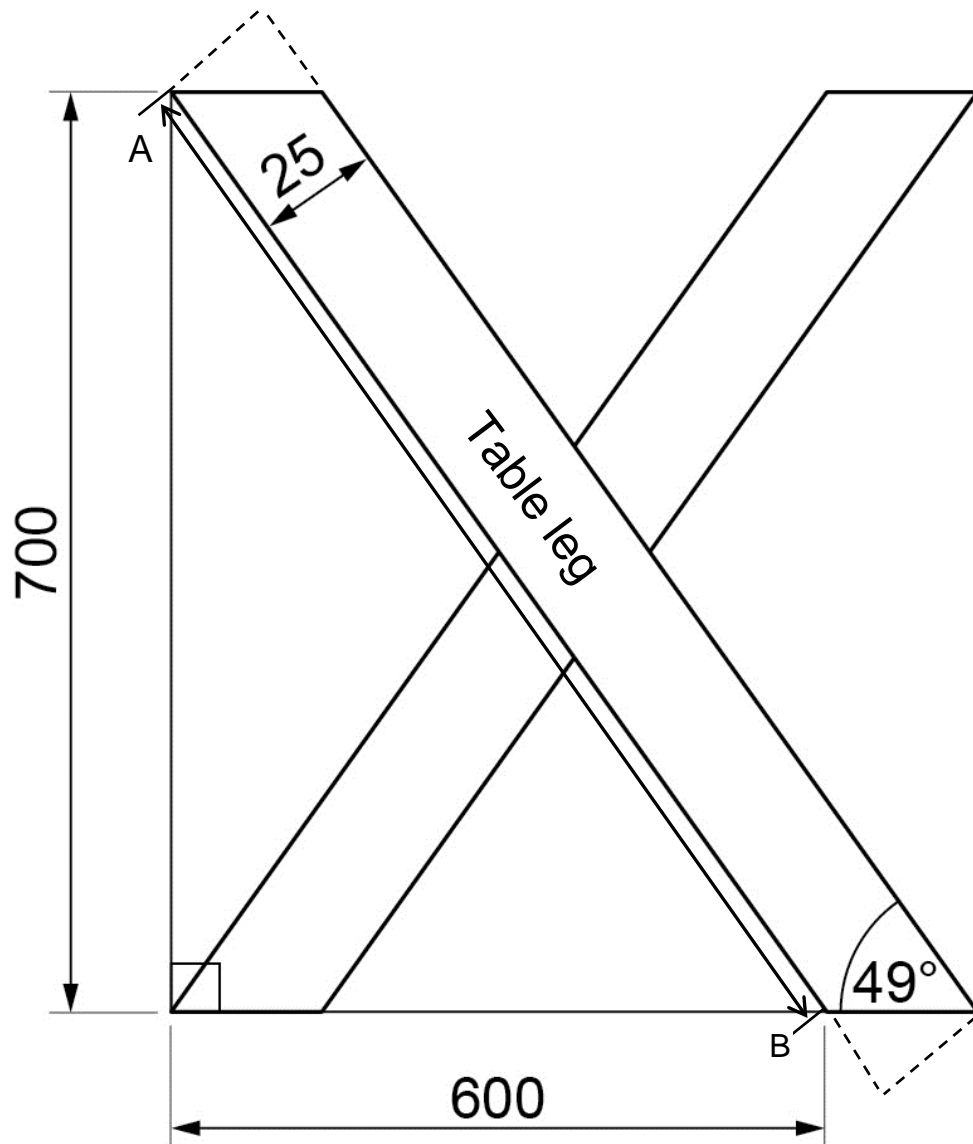
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5

A dining table has been manufactured from lengths of wood. **Figure 4** shows a cross sectional view of two of the table legs.



All dimensions in millimetres

**Figure 4**

Cross sectional view of two of the table legs





**6**

The photograph below shows a domestic bathroom shower. The shower tray is made from Acrylonitrile Butadiene Styrene (ABS) and has been manufactured using a vacuum forming process.

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Name three key features of a successful vacuum forming mould.

**[3 marks]**

Feature 1

Feature 2

Feature 3



8 . 1

Figure 5 shows a CAD drawing of a lamp produced by a designer.



Figure 5

The aluminium lamp base is to be cast with the dimensions shown in Figure 6.

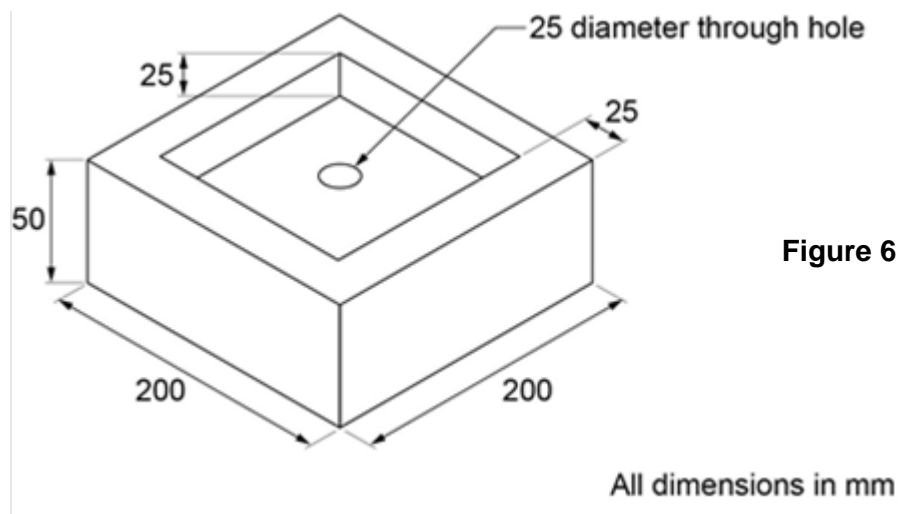


Figure 6

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Aluminium costs £1580 per m<sup>3</sup>.

Calculate the material cost for 150 of the lamp bases described in **Figure 6**.

**[4 marks]**

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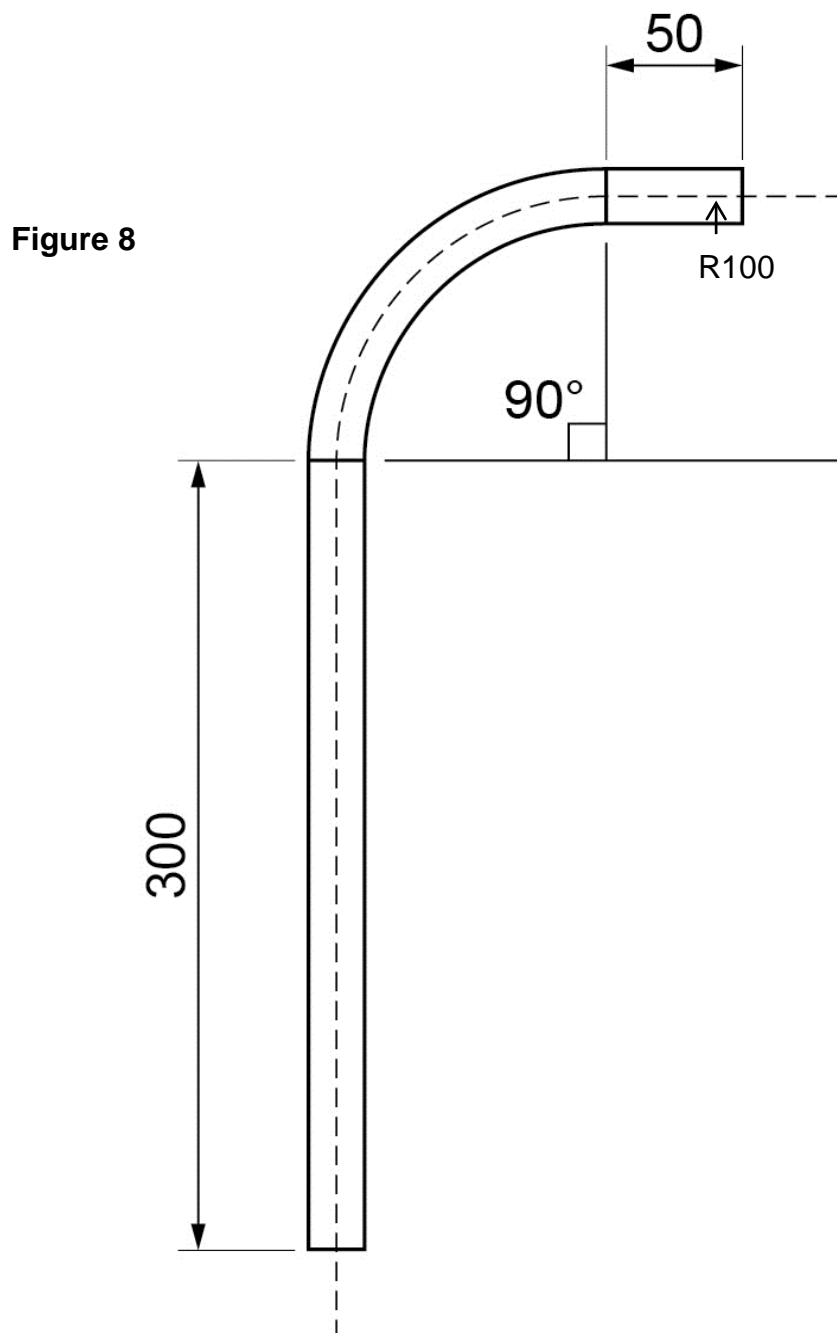
The stem of the lamp is bent from a single tube of mild steel with the dimensions shown in **Figure 7**.

Describe how the tube could be formed.

In your answer you should:

- explain the forming process and refer to the tools used, and
- calculate the length of tube required to create the stem. Give your answer to the nearest mm.

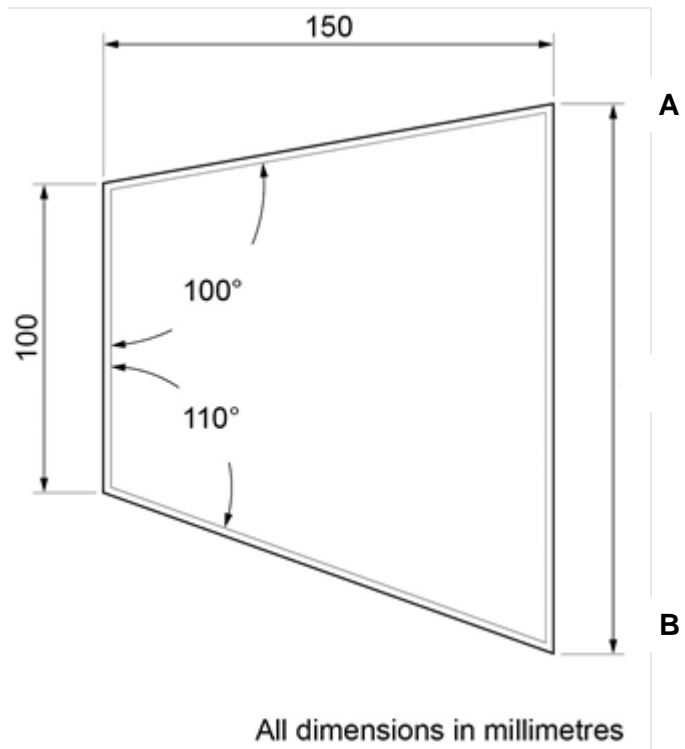
[6 marks]





**8 . 3**

The lamp shade is formed to the profile shown in **Figure 8**.



Calculate the width of the shade along line **AB**.

[3 marks]

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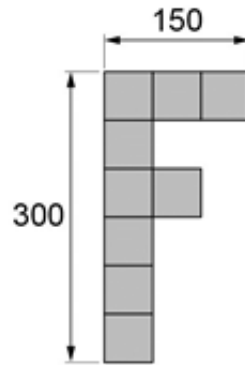
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**9**

It takes 5 minutes to cut out a single acrylic copy of the shape shown in **Figure 9**. Cutting in plywood takes 15% longer. Calculate the laser cutting speed for each of these materials in metres per second.

**[2 marks]****Figure 9**

All dimensions in mm

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**1 0**

Shown below are two types of packaging used to contain soup.

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Paper based soup carton

Metal soup can

Compare and evaluate the suitability of the two types of packaging used to contain soup. In your answer, you should make reference to:

- the materials used
- implications for the consumer.

**[12 marks]**

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The body of the racing car shown in is manufactured from a composite material.

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Explain the meaning of the term 'composite material'.

**[2 marks]**

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Name a suitable composite material for the body of the Formula 1 racing car shown in **Figure 9**.

**[1 mark]**

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1	7
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The body of the racing car has been manufactured using a lay-up method. Name 6 stages in the manufacturing process.

**[6 marks]**

Stage 1 \_\_\_\_\_  
\_\_\_\_\_

Stage 2 \_\_\_\_\_  
\_\_\_\_\_

Stage 3 \_\_\_\_\_  
\_\_\_\_\_

Stage 4 \_\_\_\_\_  
\_\_\_\_\_

Stage 5 \_\_\_\_\_  
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Stage 6 \_\_\_\_\_  
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