



Surname _____

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For Examiner's Use

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I declare this is my own work.

A-level

**DESIGN AND TECHNOLOGY:
PRODUCT DESIGN**

7552/1

Paper 1 Technical Principles

Friday 5 June 2020 Morning

Time allowed: 2 hours 30 minutes

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]



J U N 2 0 7 5 5 2 1 0 1

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.**
- **Answer ALL questions.**
- **You must answer the questions in the spaces provided. Do not write on blank pages.**
- **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 maximum mark for this paper is 120.

**DO NOT TURN OVER UNTIL TOLD
TO DO SO**



Answer ALL questions in the spaces provided.

0	1
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Give THREE reasons why polymorph may be used in the modelling of an ergonomic grip. [3 marks]

1 _____

2

3

[Turn over]



0	2
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Define the following material properties:

- **malleability**
- **elasticity.**

[2 marks]

Malleability

Elasticity



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0	3
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State THREE ways that manufacturers are improving sustainability throughout product manufacture. [3 marks]

1

2

3

[Turn over]

0	4
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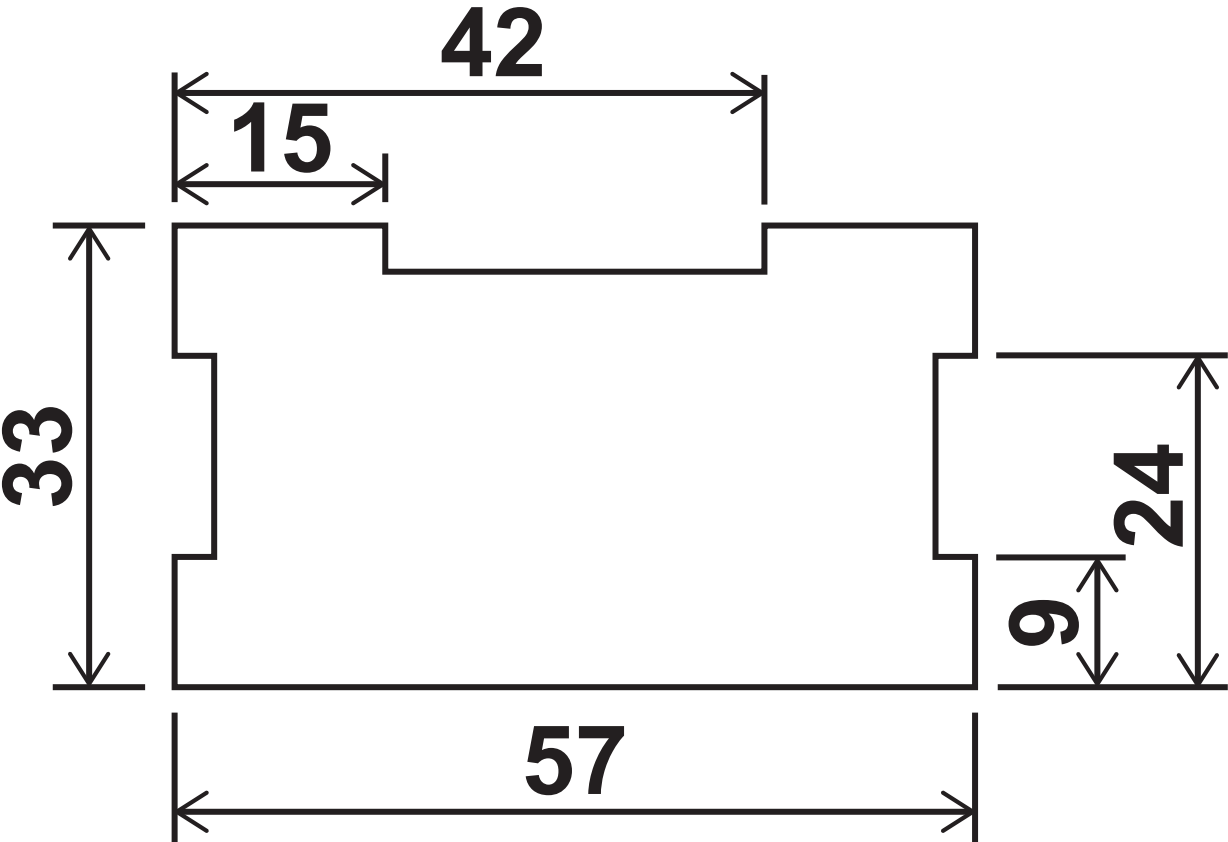
Explain why high speed steel would be a suitable material for a metal drill bit.
[6 marks]

[Turn over]

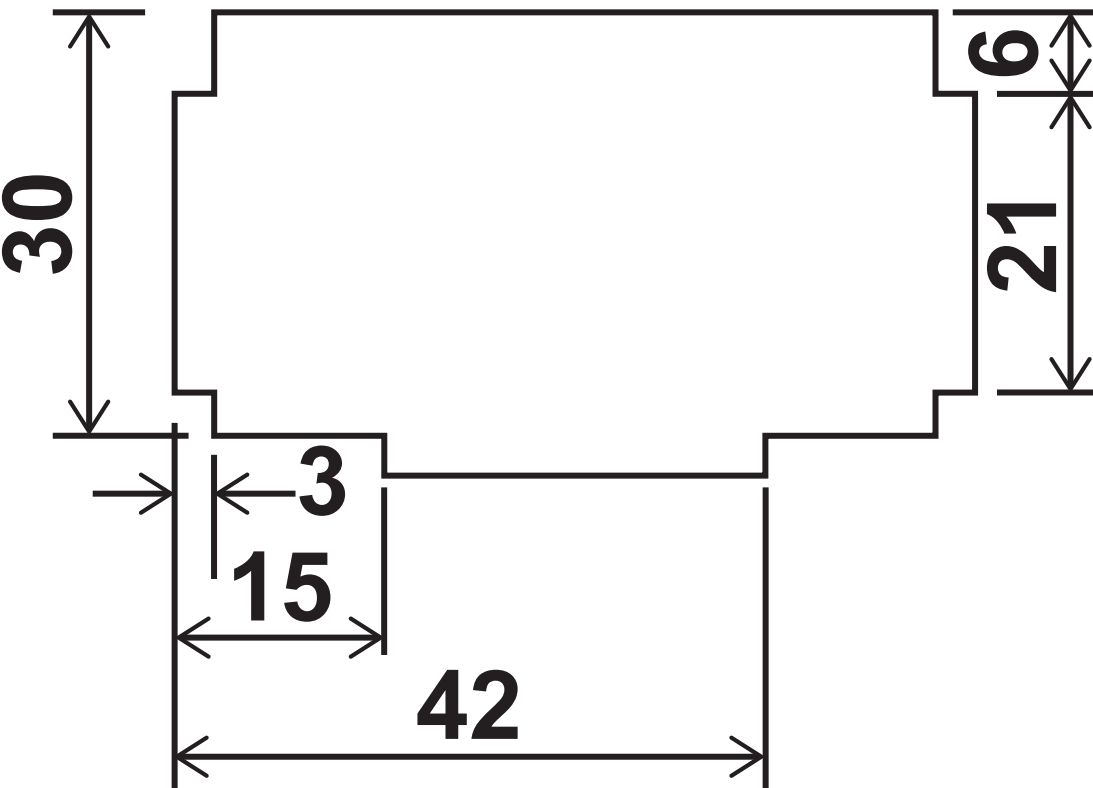


FIGURE 1

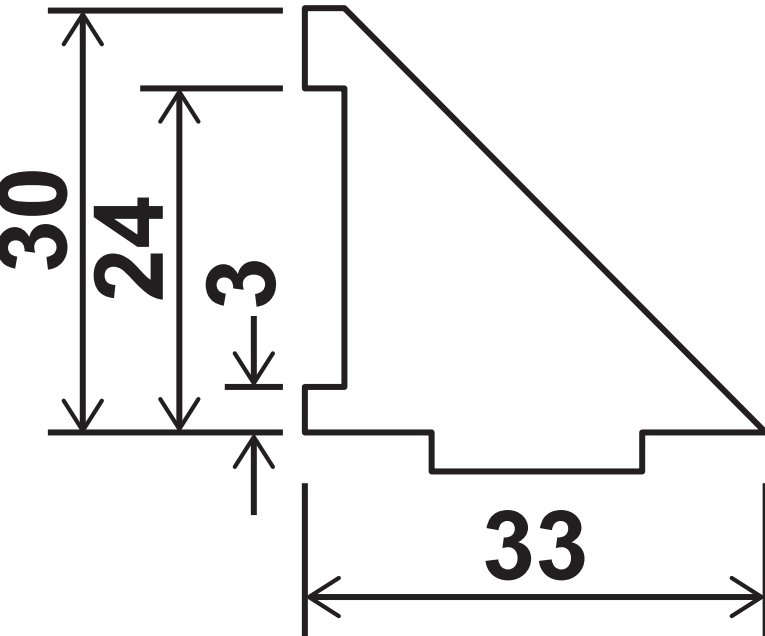
COMPONENT
A



COMPONENT
B



COMPONENT
C

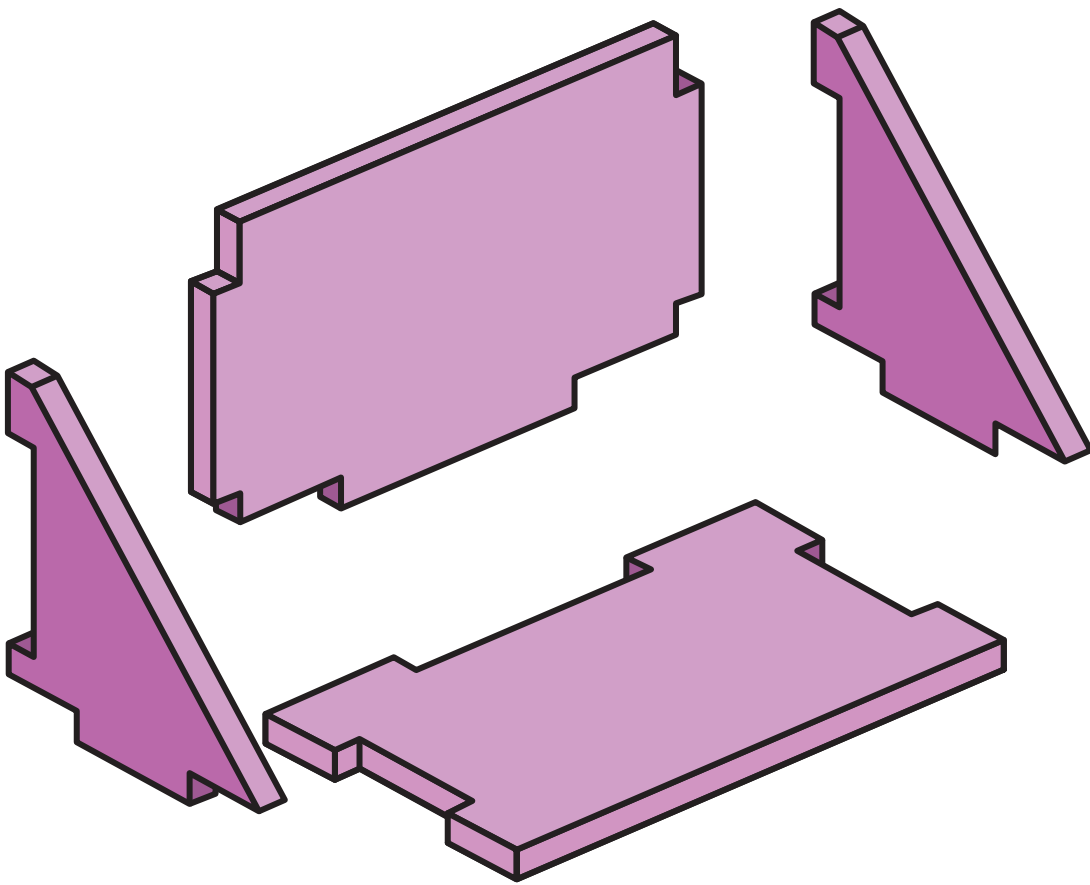


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[Turn over]



FIGURE 2**Fabricated Acrylic component**

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FIGURE 1 shows the dimensions of the components required to produce FIGURE 2.

The component parts are cut from a 90 mm × 70 mm × 3 mm sheet of acrylic.

Calculate the percentage (%) of waste from the acrylic sheet.



15

Show your working. [4 marks]

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Percentage (%) of waste = _____

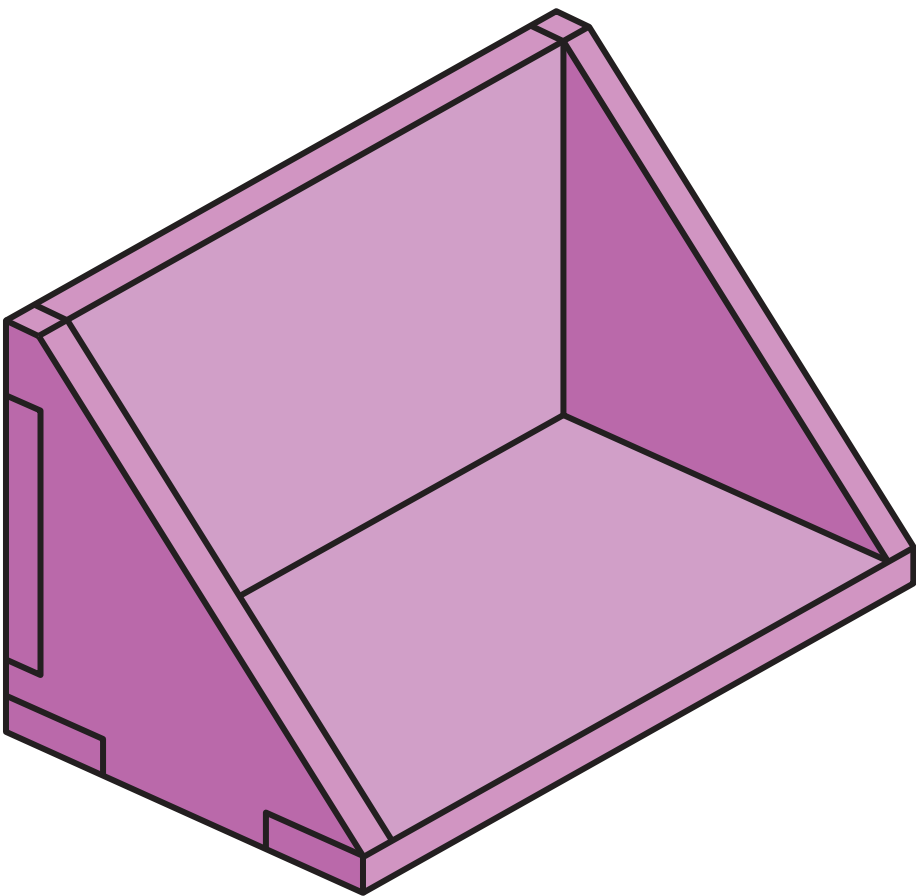
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0	5	.	2
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The product shown in FIGURE 3 has been laser cut and fabricated. An alternative method is to form it in one piece using injection moulding.

FIGURE 3



Compare and evaluate the suitability of each manufacturing method for this product. [6 marks]



[illegible]

[Turn over]





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[Turn over]



0	6
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Describe the main stages in the process of soft soldering. [6 marks]

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6

[Turn over]



0	7
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Explain how the data gained from Electronic Point Of Sale (EPOS) systems can be used. [6 marks]

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[Turn over]



0	8
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FIGURE 4**Silicone oven mitt**

Explain why silicone is an appropriate material for the manufacture of the oven mitt shown in FIGURE 4. [6 marks]

25

[illegible]

[Turn over]



2 5

0	9
---	---

Analyse and evaluate the suitability of phosphorescent pigment for use in indoor emergency signage. [6 marks]

[Turn over]



1	0
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Describe the purpose of risk assessment in a manufacturing environment.
[6 marks]

[Turn over]



1	1
---	---

FIGURE 5

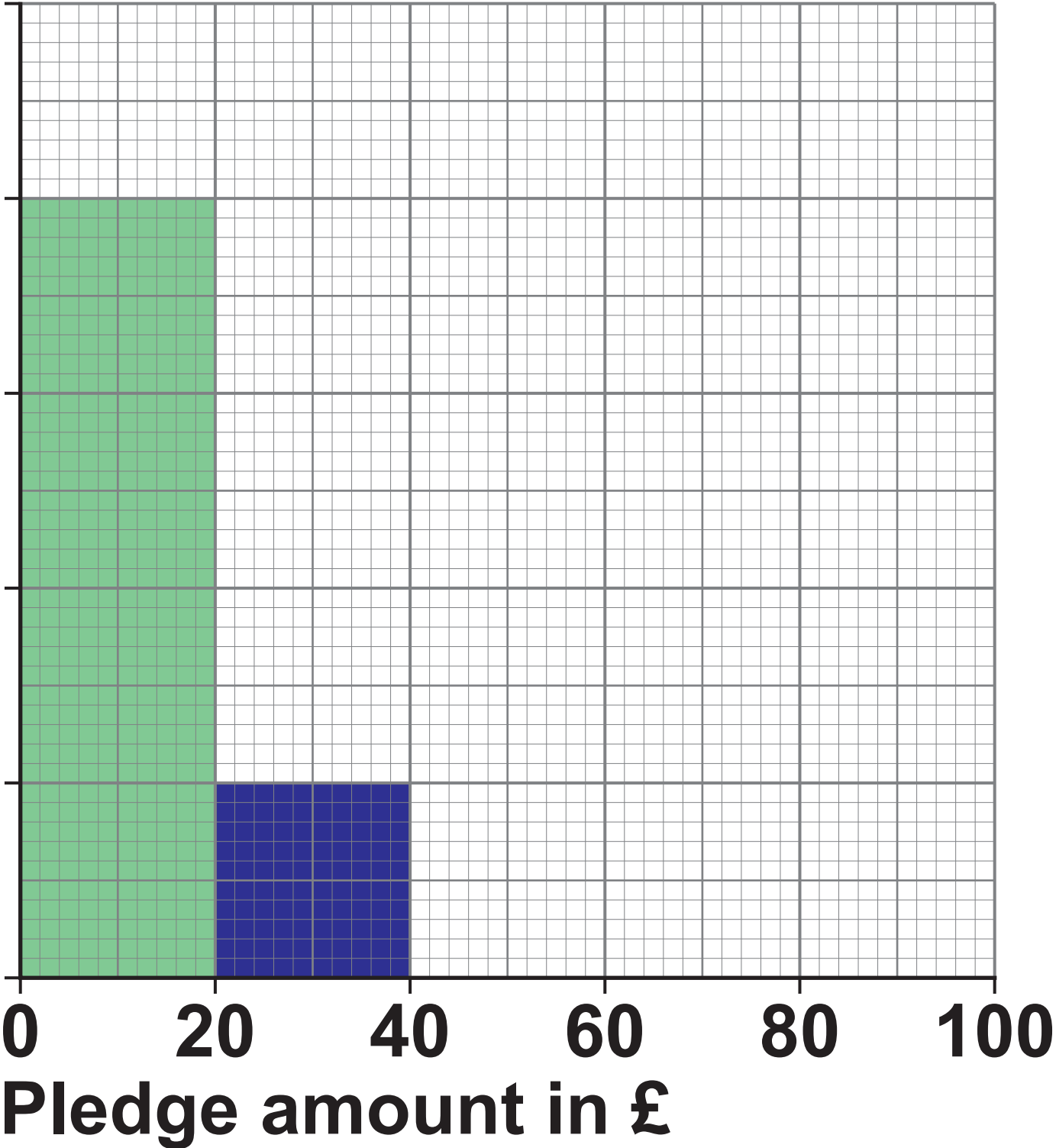
Concrete table tennis table

Explain why concrete is a suitable material for the manufacture of the outdoor table tennis table shown in FIGURE 5. [6 marks]

TABLE 1

Backer's pledge (£p)	Number of backers
$0 < x \leq 20$	
$20 < x \leq 40$	20
$40 < x \leq 60$	16
$60 < x \leq 100$	20

FIGURE 6
Frequency density



1 2 . 1

TABLE 1, on page 32, shows information on the number of pledges and funds raised by a crowd-funding campaign for a new product.

Using the data provided in TABLE 1, complete the histogram in FIGURE 6, also on page 32. [4 marks]

1 2 . 2

Calculate the percentage (%) of people who supported the campaign with a pledge of £20 or less. [2 marks]

[Turn over]



Percentage (%)
of people = _____

6



1	3
---	---

Explain why bio-batch may be added to a polymer used in the manufacture of single-use carrier bags. [2 marks]

2

[Turn over]



1	4
---	---

State TWO reasons why Danish oil is used as a surface finish for timber. [2 marks]

1

2



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[Turn over]



1	5
---	---

Describe how physical and virtual prototypes can be used during the development of a product.

**Include the benefits of each kind of prototype to the designer in your answer.
[9 marks]**







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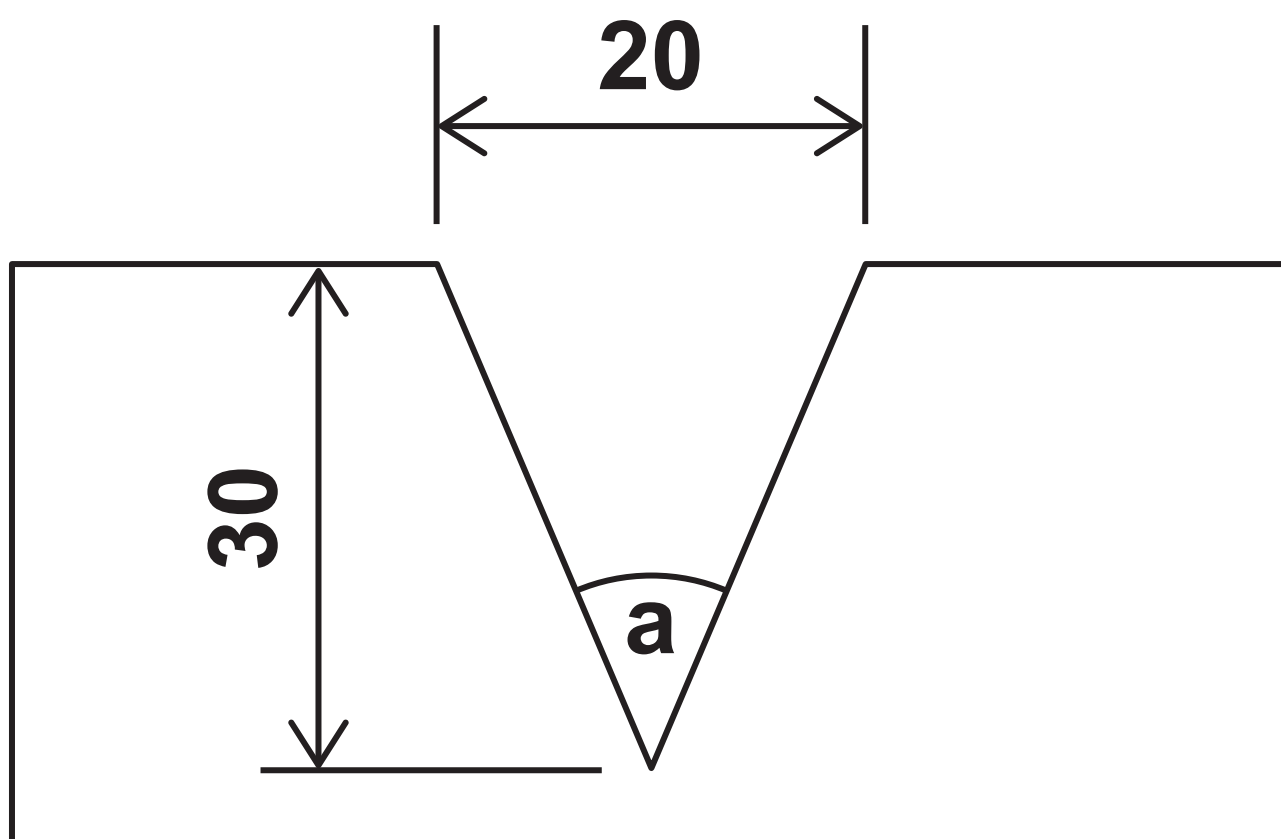
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1	6
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A student wishes to route a symmetrical V-shaped channel in a piece of timber to the dimensions provided in FIGURE 7.

FIGURE 7



Not drawn to scale

Cross section of timber
All dimensions in mm

Calculate cutter angle a .

Show your working. [4 marks]



Cutter angle = _____ degrees

4

[Turn over]



1	7
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FIGURE 8 and FIGURE 9 show children's toys.

FIGURE 8 Beech toy (hand shaped)

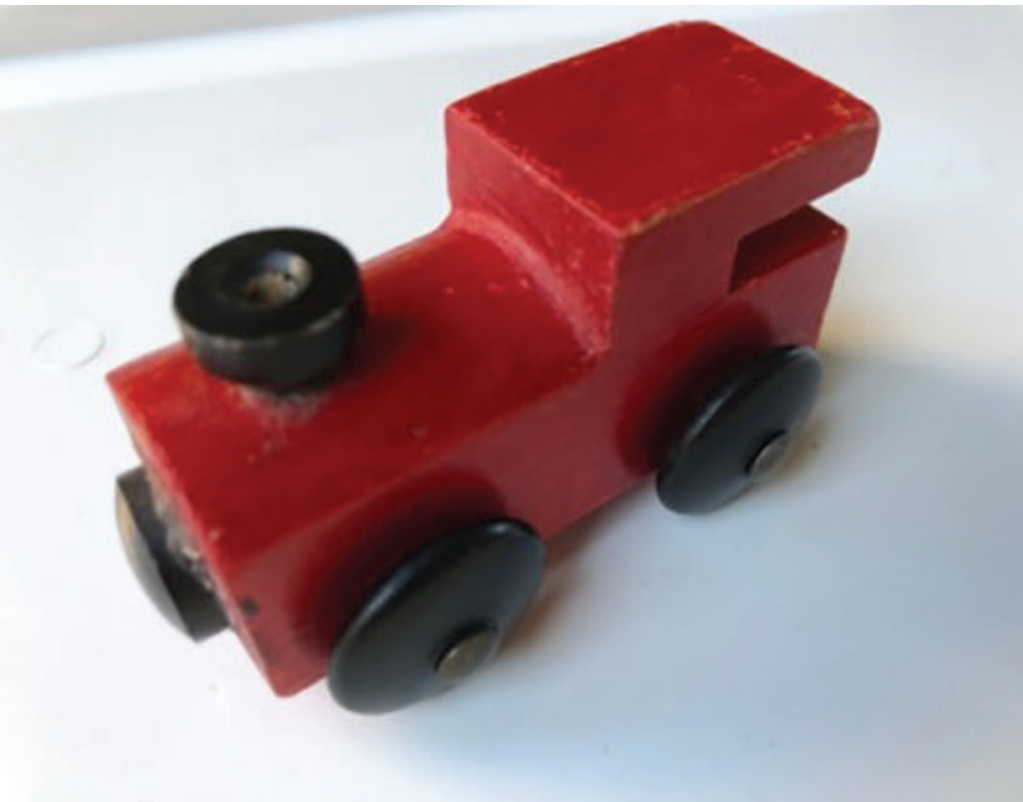


FIGURE 9 Acrylonitrile Butadiene Styrene (ABS) toy (injection moulded)



Analyse and evaluate the suitability of the materials and manufacturing methods used for each of the children's toys. [12 marks]

[Turn over]



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1	8
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Explain why polypropylene (PP) is an appropriate material for the manufacture of an ice cream container. [6 marks]

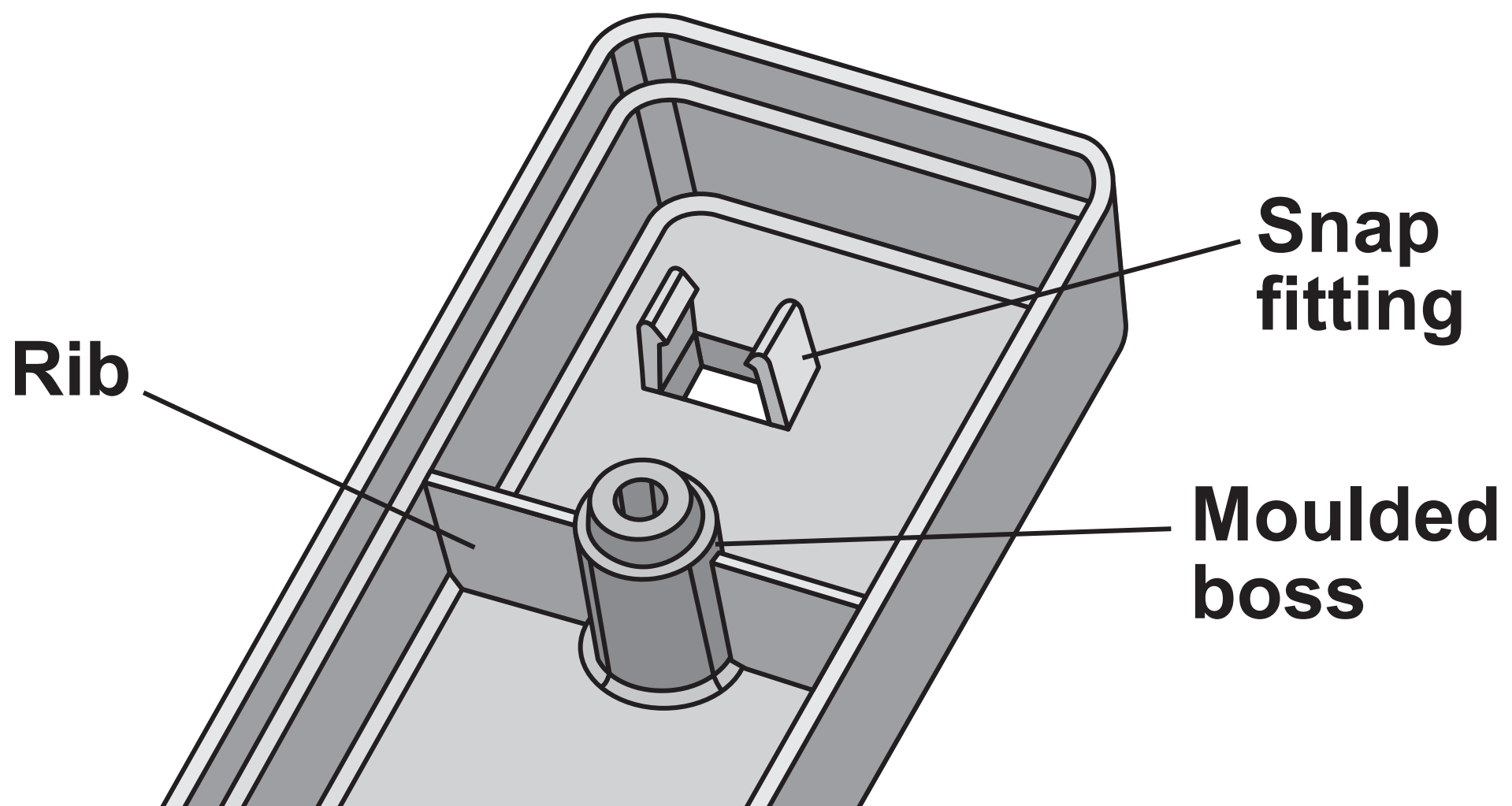
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1	9
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FIGURE 10 shows the internal view of an injection moulded component.

FIGURE 10



State the function of each of the labelled features. [3 marks]

Moulded boss _____

Rib

Snap fitting

[Turn over]



2	0
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FIGURE 11 shows a chocolate bar packaging. **FIGURE 12** shows a larger mathematically similar promotional version.

FIGURE 11



Not drawn to scale.
All dimensions in mm



FIGURE 12

**Not drawn to scale.
All dimensions in mm**

**Use the information on the diagrams to calculate the percentage (%) increase in volume of the new promotional packaging in FIGURE 12, from the original packaging in FIGURE 11.
[6 marks]**

[Turn over]



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Percentage (%)
increase in volume = _____

6

[Turn over]



2	1
---	---

Compare and contrast the suitability of producing vehicle signage using either a digital printed image or plotter cut vinyl.
[6 marks]

[Turn over]



2 2

Explain why foam board is a suitable material for the manufacture of an architectural model. [4 marks]

10

END OF QUESTIONS



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Question	Mark
1–4	
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21–22	
TOTAL	

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