A

AQA

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

For Examiner's Use

Candidate Signature _____

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

For this paper you must have:
- **normal writing and drawing instruments**
- **a scientific calculator.**

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

[Turn over]

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

1 _____

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0 2 **Define the following material properties:**

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

[2 marks]

Malleability _____

_____

_____

_____

_____

Elasticity _____

_____

_____

_____

_____

[Turn over]

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

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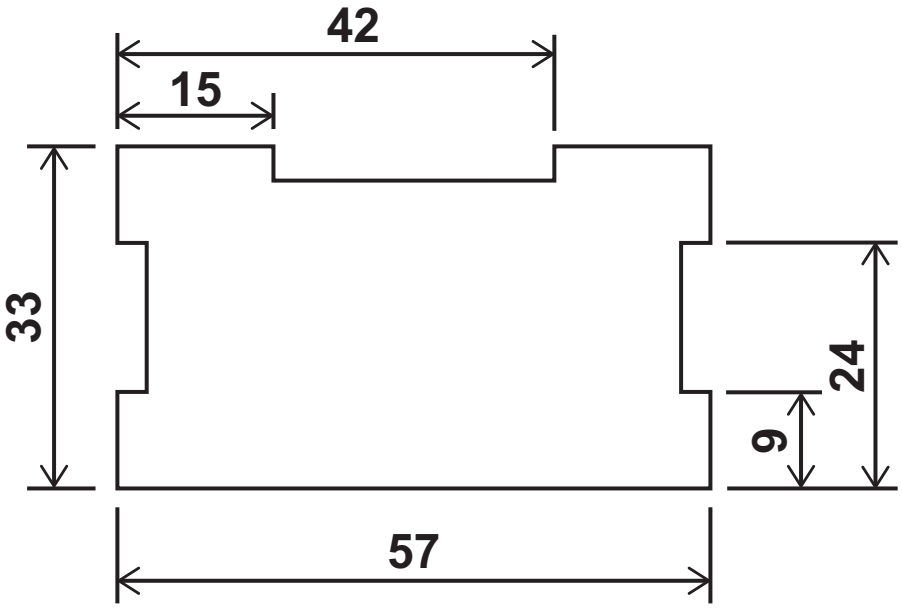
0 4 **Explain why high speed steel would be a suitable material for a metal drill bit. [6 marks]**

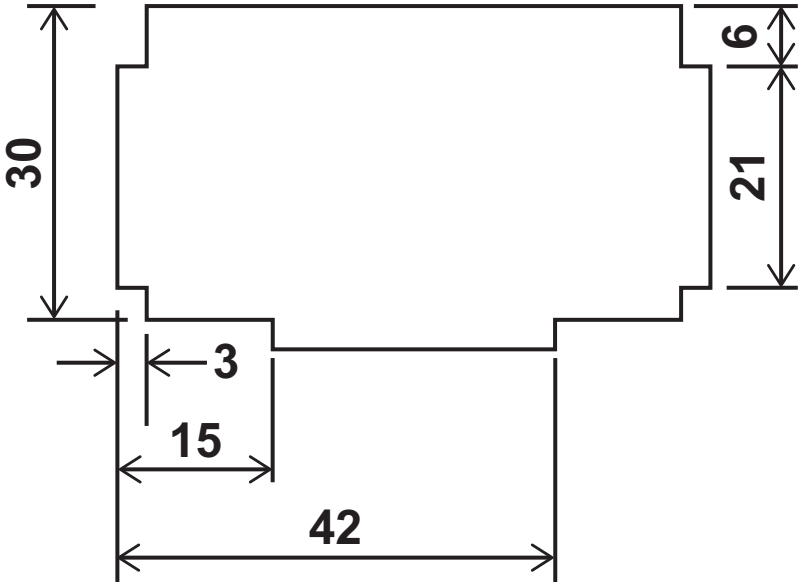
14

0 5 **FIGURE 1**

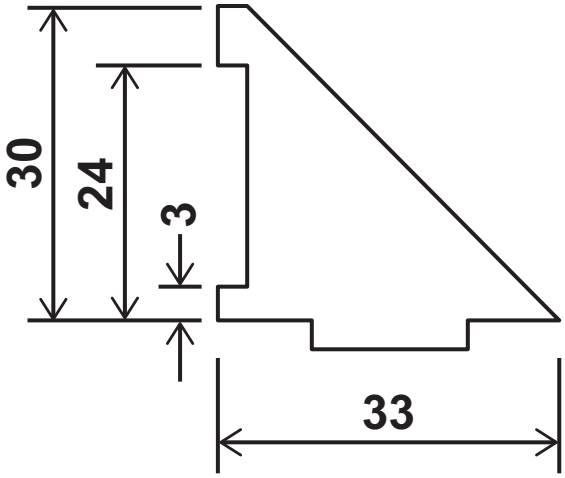
COMPONENT A



COMPONENT B



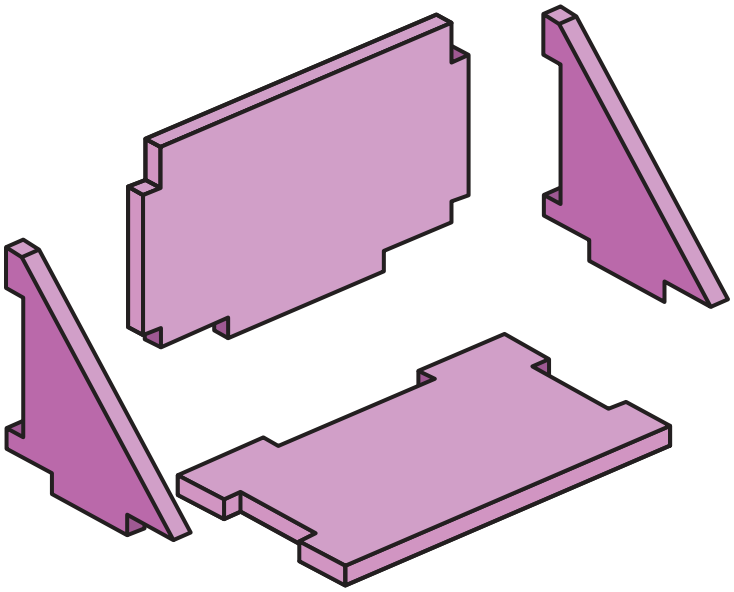
COMPONENT C



Not drawn to scale. All dimensions in mm.

FIGURE 2

Fabricated Acrylic component



0 5 . 1 **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.

Show your working. [4 marks]

Percentage (%) of waste = _____

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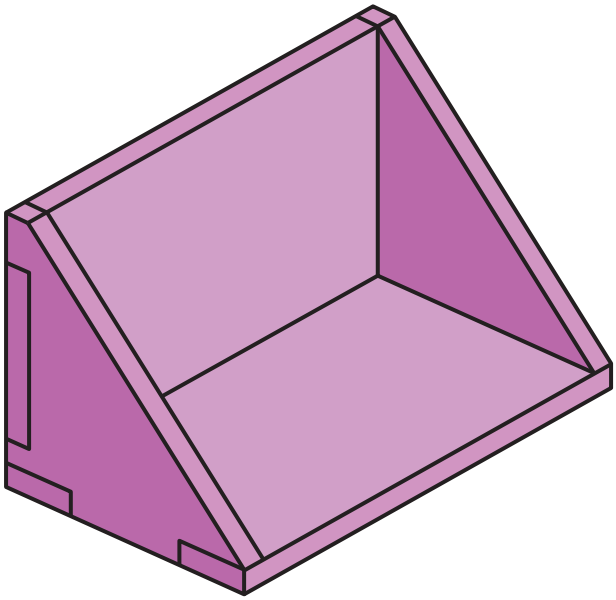
[Turn over]

0 5 . 2 **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]

10

[Turn over]

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

6

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

6

0 8

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]

6

[Turn over]

0 9 **Analyse and evaluate the suitability of phosphorescent pigment for use in indoor emergency signage. [6 marks]**

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

12

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[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]

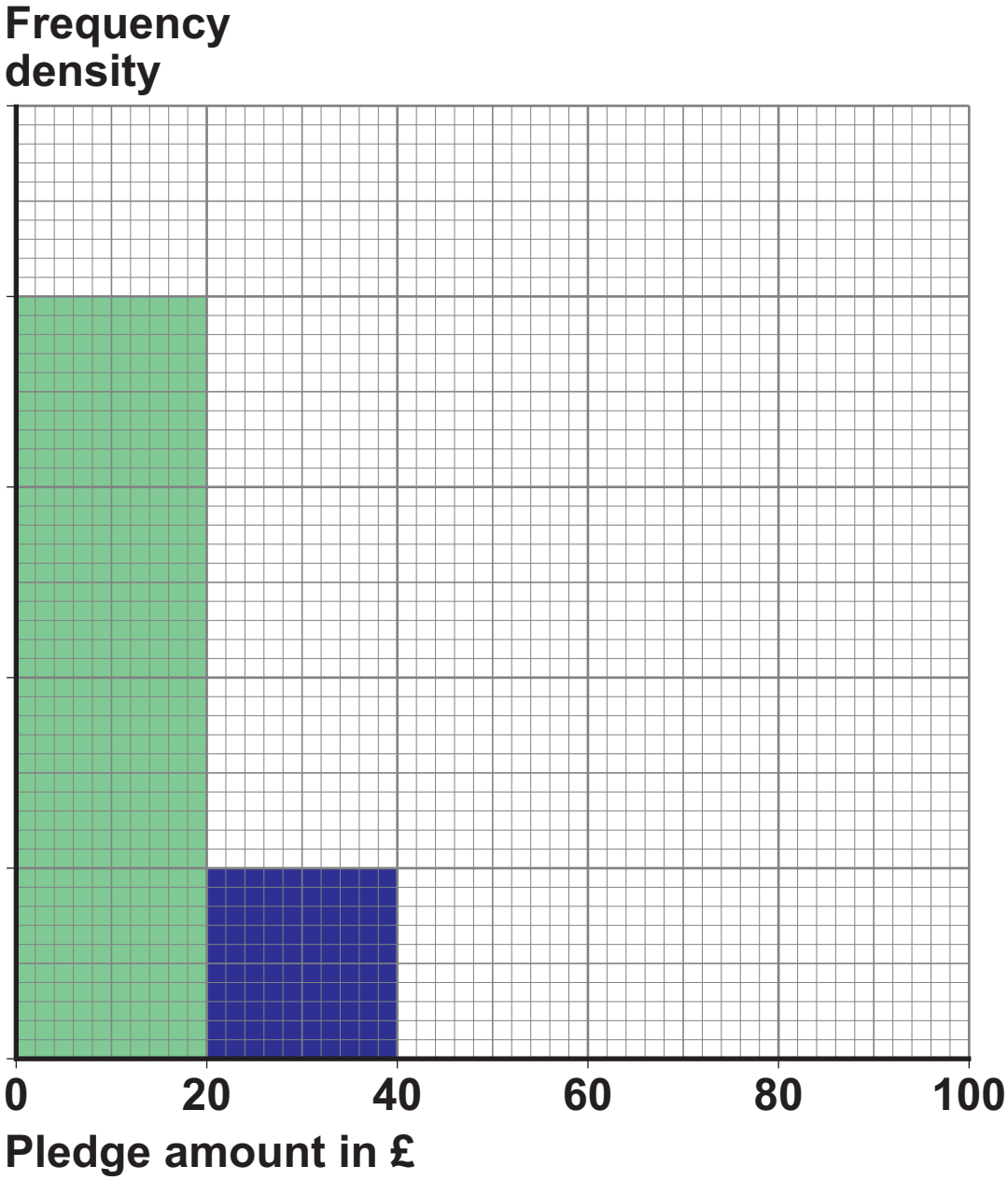
6

[Turn over]

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



1 2 . 1 **TABLE 1, on page 24, 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, on page 24. [4 marks]

1 2 . 2 **Calculate the percentage (%) of people who supported the campaign with a pledge of £20 or less. [2 marks]**

_____

_____

_____

_____

_____

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_____

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_____

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**

1 4 **State TWO reasons why Danish oil is used as a surface finish for timber. [2 marks]**

1 _____

_____

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2 _____

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_____ **2**

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[Turn over]

1 5 **Describe how physical and virtual prototypes can be used during the development of a product.**

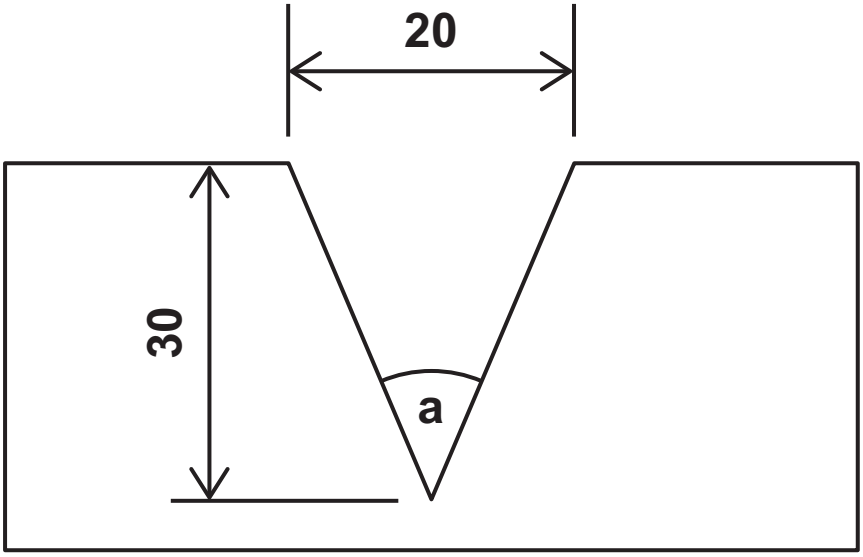
Include the benefits of each kind of prototype to the designer in your answer. [9 marks]

9

[Turn over]

1 6 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]

_____

_____

_____

_____

_____

_____

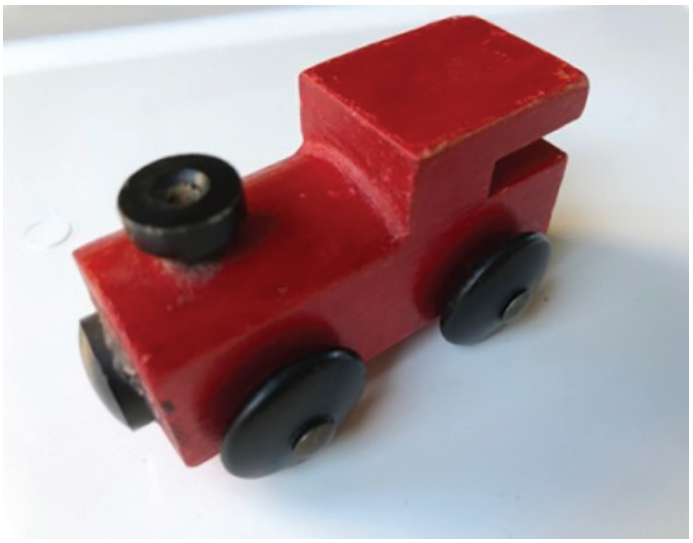
_____

Cutter angle = _____ degrees 4

[Turn over]

1 7 **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]

12

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[Turn over]

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

6

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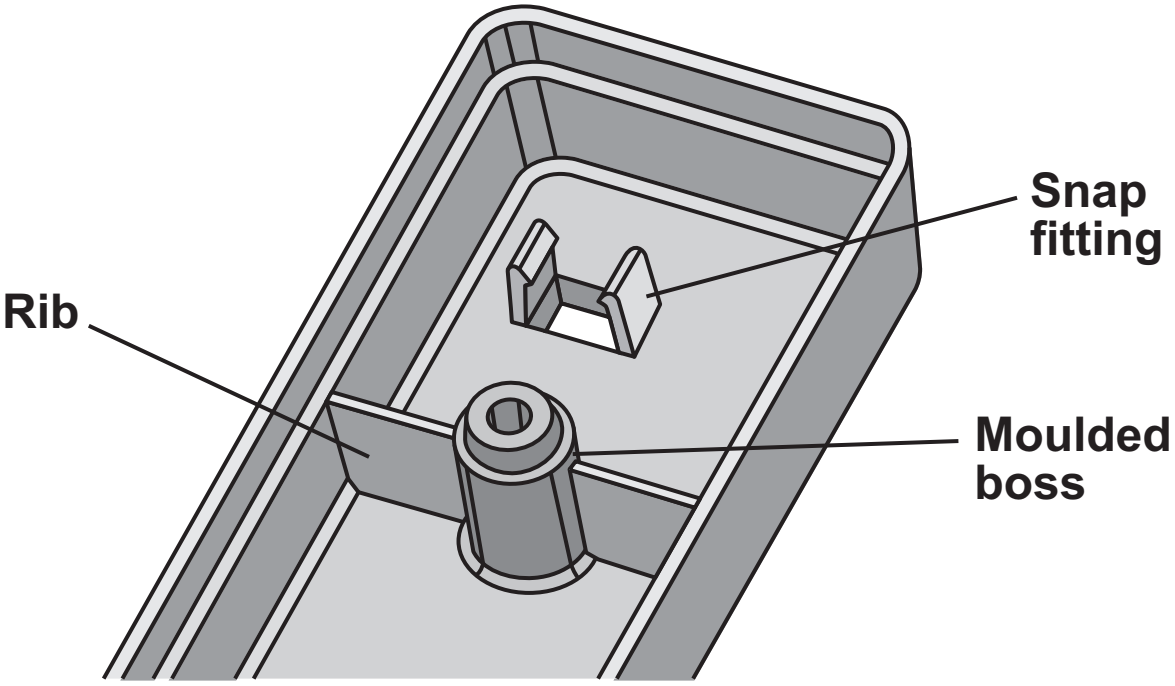
[Turn over]

1 9 **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 _____

_____

_____

_____

_____

3

[Turn over]

2 0 **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]

Percentage (%) increase in volume = _____

6

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[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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For Examiner's Use	
Question	Mark
1–4	
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21–22	
TOTAL	