A

AQA

Surname _____

Forename(s) _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

A-level

DESIGN AND TECHNOLOGY: PRODUCT DESIGN

Paper 2 Designing and Making Principles

7552/2

Friday 16 June 2023 Morning

Time allowed: 1 hour 30 minutes

At the top of the page, write your surname and forename(s), your centre number, your candidate number and add your signature.

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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.**
- **Answer ALL questions.**
- **You must answer the questions in the spaces provided. Do not write on blank pages.**
- **If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).**
- **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 80.**
- **There are 30 marks for SECTION A and 50 marks for SECTION B.**

DO NOT TURN OVER UNTIL TOLD TO DO SO

SECTION A – PRODUCT ANALYSIS

Answer ALL questions in this section.

0 1

FIGURES 1 and 2 show two wheelbarrows.

FIGURE 1

FIGURE 2

	FIGURE 1	FIGURE 2
Wheel	Rotationally moulded hollow spherical HDPE tyre	Low carbon steel hub with rubber tyre
Bucket	Injection moulded HDPE	Press formed powder coated low carbon steel
Frame	Powder coated low carbon steel	Powder coated low carbon steel

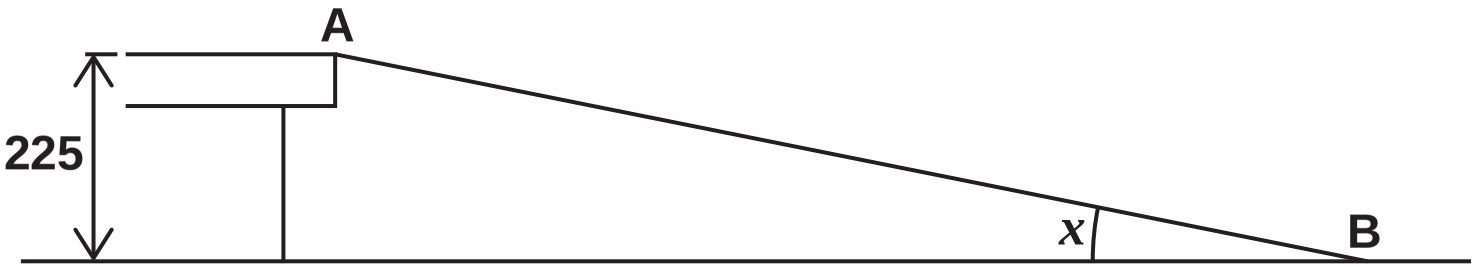
Compare the suitability of the two wheelbarrows shown for use on a building site. [6 marks]

6

0 2

FIGURE 3 shows a ramp for a wheelbarrow.

FIGURE 3



All dimensions in mm

The maximum angle (x) that a wheelbarrow can be safely pushed up is 20 degrees.

Calculate the length, AB, required to allow the wheelbarrow to be safely pushed up the ramp.

Give your answer to the nearest mm.

Show your working. [4 marks]

Answer _____ **mm**

4

[Turn over]

0 3

TABLE 1 shows the main stages involved in manufacturing a wheelbarrow.

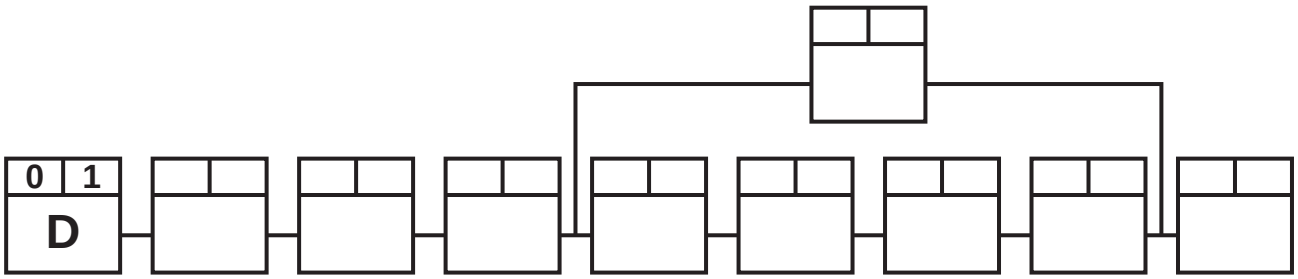
The stages are listed in alphabetical order.

TABLE 1

STAGE	DESCRIPTION	TIME REQUIRED (HOURS)
A	Attach wheel assembly	1
B	Attach wheel support brackets to frame	1
C	Bend tubular steel frame	2
D	Cut stock steel tube to length for tubular steel frame	1
E	Drill bucket using template	1
F	Drill securing holes in tubular steel frame	1
G	Form bucket from steel sheet	2
H	Produce bucket former	3
I	Send bucket for galvanising	6
J	Send frame for powder coating	15

Using the information from TABLE 1, complete the Critical Path Network (CPN) diagram in FIGURE 4 to show the correct order for completing the manufacture in the most time-efficient manner. [4 marks]

FIGURE 4



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0 4

FIGURE 5 shows a powder coated low carbon steel frame for a wheelbarrow.

FIGURE 5

Explain how jigs and templates may have been used to accurately produce multiple copies of the frame shown in FIGURE 5. [4 marks]

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4

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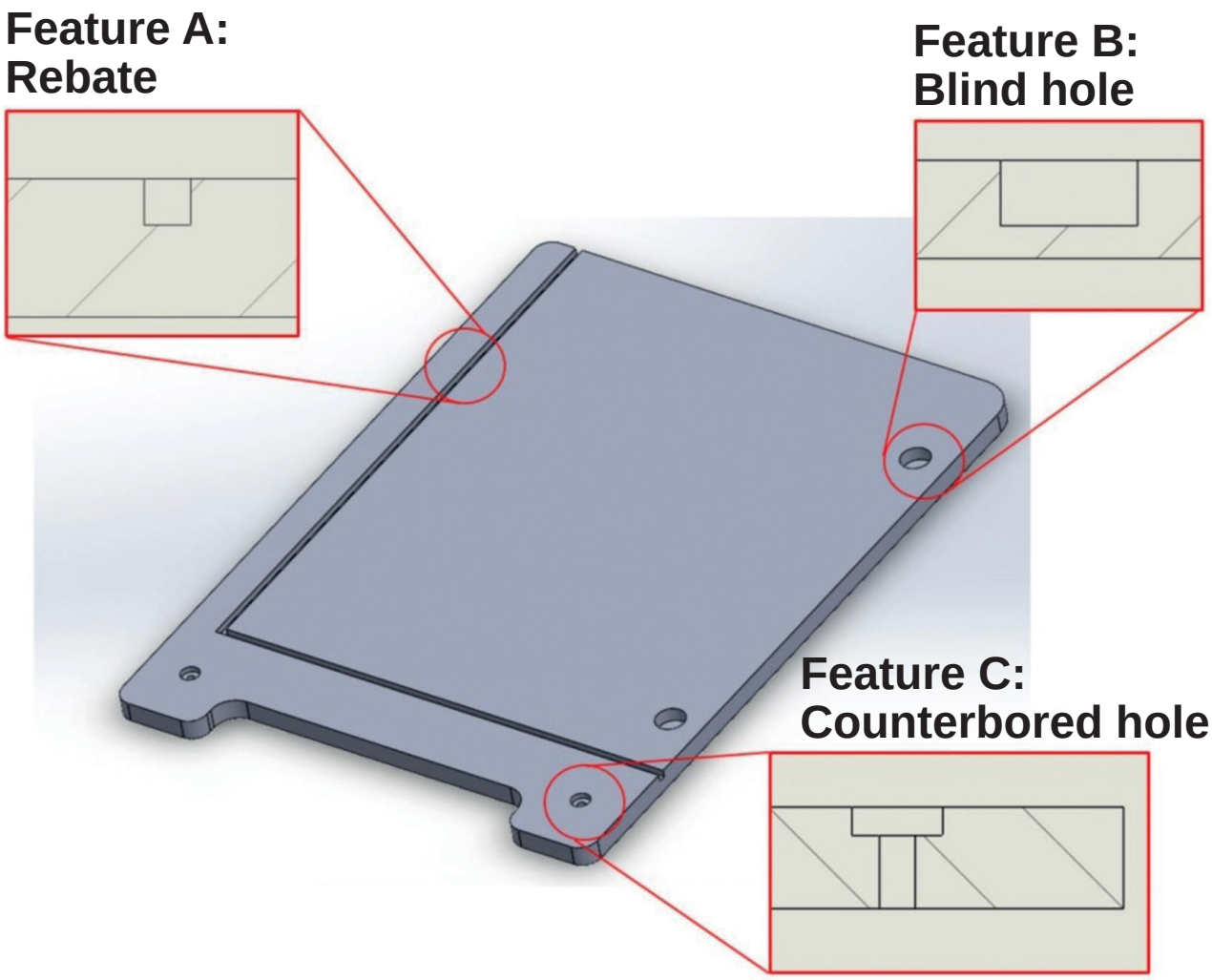
0 5

FIGURE 6 shows a CAD model of a component for a piece of flat pack furniture.

The component could be produced on a CNC router or by using wood machine wasting processes.

FIGURE 6



Compare and evaluate BOTH manufacturing methods for the three features labelled. [6 marks]

Feature A _____

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[Turn over]

Feature B _____

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Feature C _____

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6

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0 6

FIGURES 7 and 8 show two welding masks.

FIGURE 7 Hand held mask

FIGURE 8 Head mounted mask

	FIGURE 7	FIGURE 8
Method of use	Held to face with hand	Mounted over head with adjustable strap
Screen	Translucent green polymer	Light-reactive SMART material

Compare the suitability of BOTH masks for use when welding. [6 marks]

6

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[Turn over]

SECTION B – COMMERCIAL MANUFACTURE

Answer ALL questions in this section.

0 7

Outline how designers make use of market research strategies when developing design concepts. [4 marks]

4

0 8

State FOUR safety precautions to be taken by the user when turning a wooden bowl on a wood lathe. [4 marks]

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3 _____

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4

[Turn over]

0 9

A turned metal component is to be manufactured on a manual lathe.

Outline the information required to ensure it is accurately produced. [6 marks]

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6

[Turn over]

1 0

A bracelet is made from resin where powder, liquid and pigment are mixed in the ratio of 2.5 : 4 : 1

The bracelet uses 28 grams less powder than liquid.

Calculate the total mass of the bracelet in grams.

Show your working. [3 marks]

Answer _____ **grams** **3**

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1 1

FIGURES 9, 10 and 11 show three coffee cups.

FIGURE 9

FIGURE 10

FIGURE 11

	FIGURE 9 Disposable coffee cup	FIGURE 10 Reusable thermoplastic cup	FIGURE 11 Reusable stainless steel cup
CUP material	Laminated card	Polypropylene (PP)	Stainless steel
CUP production method	Die cutting and fabrication	Polymer forming techniques	Metal forming techniques
LID material	High Impact Polystyrene (HIPS)	Silicone	Transparent thermoplastic with rubber seal
LID production method	Vacuum forming	Injection moulding	Injection moulding
Insulation SLEEVE material	Corrugated cardboard	Silicone	No sleeve

Analyse and evaluate the ENVIRONMENTAL IMPACT of all THREE cups.

In your answer you should refer to:

- **raw materials**
- **product manufacture**
- **disposal.**

[12 marks]

[Turn over]

12

1 2

Describe THREE key characteristics of an effective design specification. [3 marks]

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3 _____

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3

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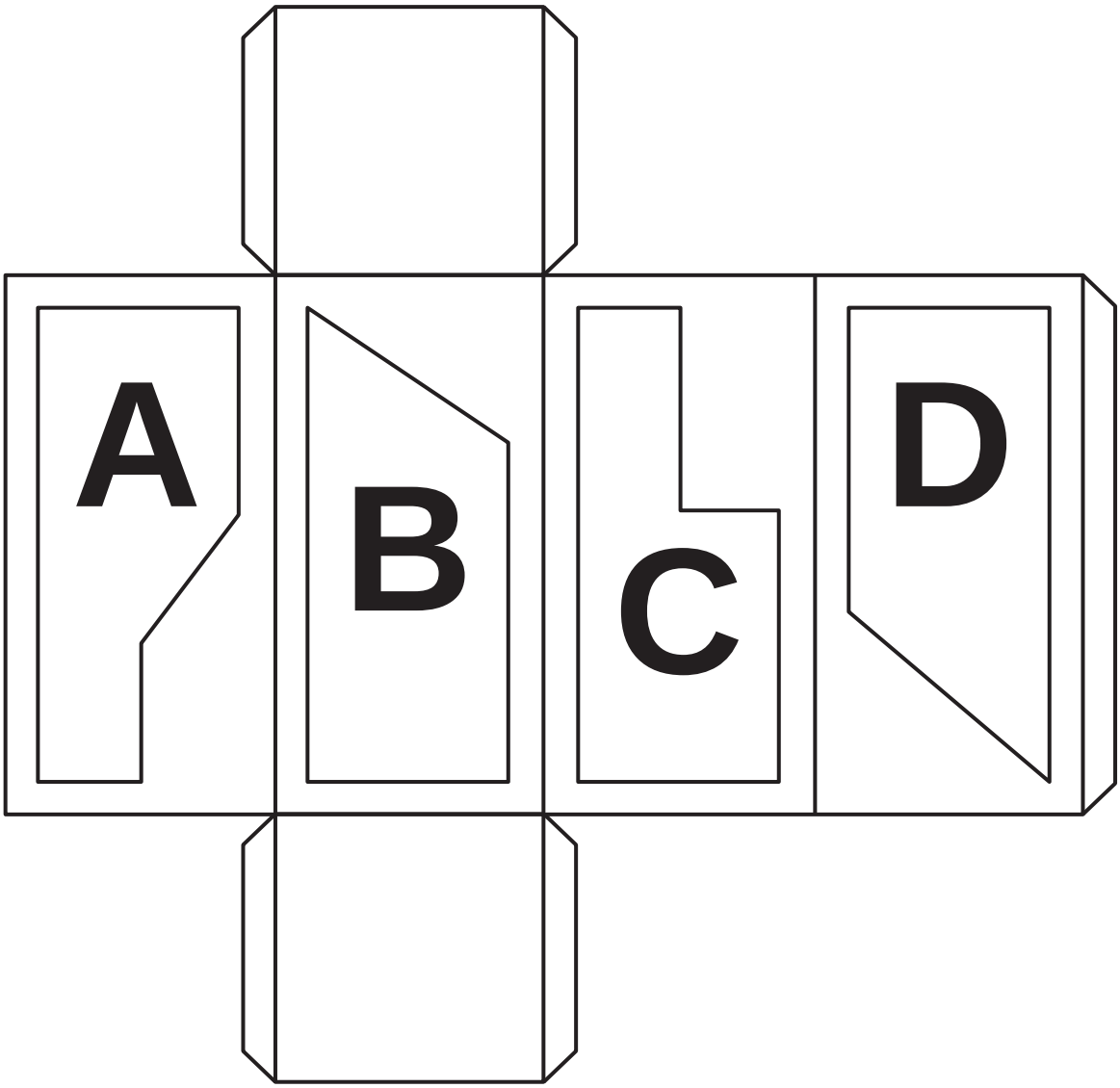
1 3 . 1

FIGURE 12 shows a packaging net.

FIGURE 12



The digital printing process means areas A, B, C and D can have a range of different designs applied independently.

AREA A: FIVE different designs

AREA B: SEVEN different designs

AREA C: FIVE different designs

AREA D: TWO different designs

Calculate the number of different design combinations possible.

Show your working. [2 marks]

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Answer _____

[Turn over]

1 3 . 2

A customer is collecting copies of each different package design and needs three more to complete the set.

Assume the design of AREA B is known.

Calculate the probability that the package they receive will be one of the specific design combinations they require.

Show your working. [2 marks]

Answer _____

4

1 4

Name TWO specific measuring devices that can be used to ensure components conform to acceptable tolerances. [2 marks]

1 _____

_____

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2 _____

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2

[Turn over]

1 5

FIGURE 13 shows a carbonated drinks bottle.

FIGURE 13

Identify and explain THREE specific dimensional quality control checks needed to ensure the carbonated drinks bottle can be filled and sealed correctly. [6 marks]

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6

[Turn over]

1 6 . 1

Define the terms ‘ergonomics’ and ‘anthropometrics’. [2 marks]

1 6 . 2

State ONE way that a product with good ergonomics can benefit the product user. [1 mark]

3

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[Turn over]

1 7

FIGURES 14 and 15 show two products designed by Dieter Rams.

FIGURE 14

FIGURE 15

Describe how the products shown in FIGURES 14 and 15, on page 40, conform to the principles of modernist design. [3 marks]

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END OF QUESTIONS

Additional page, if required.
Write the question numbers in the left-hand margin.

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For Examiner's Use	
Question	Mark
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