



Please write clearly, in block capitals

Centre number _____

Candidate number _____

Surname _____

Forenames(s) _____

Candidate's signature _____

GCSE Design and Technology

Date of Exam _____

Time allowed: 2 hours

Materials

For this paper you must have:

- normal writing and drawing instruments
- a calculator
- a protractor

Instructions

- Use black ink or black ball-point pen. Use pencil only for drawing
- Fill in the information at the top of this page
- 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 that you do not want to be marked

Information

- The marks for questions are shown in brackets
- The maximum mark for this paper is 100
- There are 20 marks for Section A, 30 marks for Section B and 50 marks for Section C



SECTION A - Core Technical Principles

Questions 1-10 are multiple choice questions. For multiple choice questions you should shade in one lozenge. If you make a mistake, cross through the incorrect answer and shade the correct response.

1: Which of the following is a synthetic fibre? [1 mark]

- ◇ Cotton
- ◇ Nylon
- ◇ Silk
- ◇ Wool

2: **Figure 1** shows a length of rope being pulled from either end.



Figure 1

When the ends of the rope are being pulled in opposite directions, what is the main force acting on the rope? [1 mark]

- ◇ Centrifugal
- ◇ Shear
- ◇ Tension
- ◇ Torsion

3: Shape memory alloy reacts to which **one** of the following stimuli? [1 mark]

- ◇ Heat
- ◇ Moisture
- ◇ Pressure
- ◇ UV light



- 4: Which **one** of the following best describes a thermistor? [1 mark]
- ◇ An input component
 - ◇ An output component
 - ◇ A power source
 - ◇ A process component
- 5: Which **one** of the types of followers named below creates the least friction? [1 mark]
- ◇ Curved
 - ◇ Flat
 - ◇ Knife
 - ◇ Roller
- 6: Which of the following is a softwood? [1 mark]
- ◇ Ash
 - ◇ Mahogany
 - ◇ Oak
 - ◇ Spruce
- 7: Which **one** of the following linkages can turn rotary motion into reciprocating motion? [1 mark]
- ◇ Crank and slider
 - ◇ Parallel motion
 - ◇ Reverse motion
 - ◇ Treadle
- 8: State the most appropriate type of paper or board to be used for sketching, drawing and water colour painting? [1 mark]
- ◇ Cartridge paper
 - ◇ Foil lined board
 - ◇ Grid paper
 - ◇ Tracing paper



- 9: Which sentence best describes an electronic input or output that has 'polarity'?

[1 mark]

That it:

- ◇ can be positioned any way round in a circuit
- ◇ does matter which way round it is positioned in a circuit
- ◇ is a digital component
- ◇ must only operate on 4.5 to 5 volts

- 10: A book display stand requires an acrylic book holder to be bent to the specific angle shown in **figure 2**. What is the angle?

[1 mark]

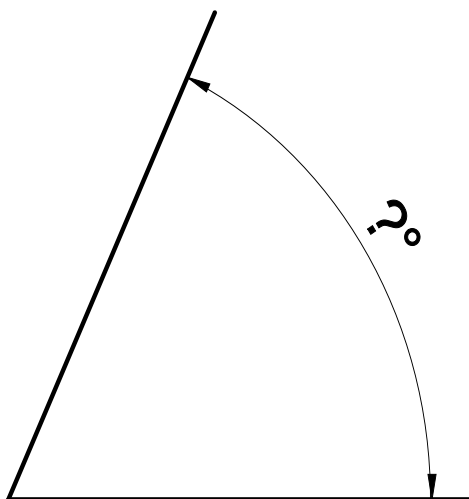


Figure 2

- ◇ 45 degrees
- ◇ 55 degrees
- ◇ 65 degrees
- ◇ 75 degrees

- 11: State **two** properties or characteristics that make aluminium suitable for use as a bicycle frame.

[2 marks]

1. _____
- _____
2. _____
- _____



12: State **two** reasons why gears are used on a bicycle [2 marks]

1. _____

2. _____

13.1: The Health and Safety Executive (HSE) state that the number of self-reported non-fatal workplace injuries has fallen by 50% since 2000.

Give **two** reasons why there has been a continued drop in workplace injuries. [2 marks]

1. _____

2. _____

13.2: Slips, trips and falls are the most common kinds of accidents, which represent 29% of the total reported accidents. Explain how appropriate signage and training can help to reduce the number of accidents in this category. [2 marks]

13.3: In 2016/2017 there were 609,000 self-reported non-fatal injuries. Of that number, 22% were from the lifting and handling category. Calculate the number of people who reported an injury in this category?

Show your working out in your answer. [2 marks]



SECTION B - Specialist Technical Principles

Additive techniques

Specialist additive techniques include:

Soldering	Printing technique	Batik
3D printing	Bonding technique	Welding

14.1: Choose **one** specialist additive technique from the list above.

Name of chosen specialist technique _____

Give **one** reason why the technique is used. [1 mark]

14.2: In the box below, use notes and sketches to explain how your chosen technique from **14.1** is performed using an appropriate material(s) of your choice. [4 marks]



- 15: Manufacturing techniques have greatly improved with the introduction of robotic production lines and higher levels of automation. Describe **one** way in which automation has affected the following factors.

Give examples in your answers.

a) Environmental concerns.

[2 marks]

b) Social concerns.

[2 marks]

16.1: Choose **one** product in **figure 3** and describe **two** features or reasons that make it suitable for batch production.

		
Children's fashion clothes	Golf clubs	Child's beach set
		
Wooden door	Card display stand	Wind up lantern

Figure 3

Name of chosen product _____

Feature 1 [2 marks]

Feature 2 [2 marks]



16.2: Choose **one** specialist process that is commonly found in batch production that uses either a die, pattern, mould, former or jig. This may have been used on your chosen product in **16.1** or it may be another process that you are familiar with.

- a. Name **one** specialist process _____ [1 mark]
- b. In the box below, use notes and sketches to explain the process in detail. [4 marks]



17: Circle **one** of the following and give **two** reasons why its characteristics or physical properties are suited for the intended use.

- **Polyethylene terephthalate (PET)** – for a single use fizzy drinks bottles
- **Foil lined board** – for the lid of a take away container
- **Copper** – for plumbing a central heating system
- **Oak** – for a kitchen table
- **Polycotton** – for a work shirt
- **Light emitting diode (LED)** – for use in a portable road safety device

1. [2 marks]

2. [2 marks]



18. An increasing number of companies are becoming aware of the social footprint that they are creating. A social footprint is created as a result of the policies that a company has in relation to their employees, partners, subcontractors and the wider community.

Example policy areas include: flexible working hours for parents, thorough and ongoing provision of training for staff and contributing to the local and wider community.

Explain what factors create a social footprint and evaluate how it can be as important as its ecological footprint. [8 marks]

[illegible]

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

SECTION C – Designing and Making Principles

Figure 4 shows a removable child seat designed for safe transportation of young children on an adult bicycle.



Figure 4

Specification

- Lightweight
- Provides protection for the child
- Adjustable leg strap and safety harness positions for different sizes and ages
- Easy to fit to, and remove from the bike with a quick release system
- Comfortable for the child

Evaluate the production and the use of the child's seat in terms of the following points.

19.1: Suitability for the users; the adult and the child.

[4 marks]



19.2: Environmental and social factors.

[4 marks]

20: Designers use various methods of market research to help bring a product to market.

20.1: Give **two** examples of why designers should consider market research before deciding whether to design and make a product. Justify your answers.

1. [2 marks]

2. [2 marks]

20.2 Using an example, explain why designers use scale models to test designs. [3 marks]

21. Study **figure 5** showing images of broken and worn products:



Figure 5

Designers make models and prototypes to test their designs before they are manufactured.



21.1: Select **one** of the products pictured in **figure 5** and describe **two** different tests that could be performed on a prototype of the product, explaining why it would help to find out if it is fit for purpose.

Chosen product from **figure 5**: _____

Test 1. [2 marks]

Test 2. [2 marks]

21.2: Suggest **one** modification that could be performed on **one** chosen product from **figure 5** and explain why it would reduce the chance of the same fault happening again. [3 marks]

Chosen product from **figure 5**: _____



22: Designers commonly use a variety of drawing methods throughout the design process.

22.1: Justify **one** reason why designers often use freehand sketching when coming up with initial ideas. [2 marks]

22.2 Explain why designers may use exploded drawings as part of the instruction manual for products that need assembling at home. [2 marks]

23: Designers can use a number of different design strategies when designing products. **Iterative design** is one strategy that is commonly used.

23.1: Name **two** other design strategies that designers could use. [2 marks]

23.2: Choose any **one** design strategy and evaluate the benefits and any drawbacks it has, giving examples in your answer. [4 marks]

Name of chosen design strategy: _____

- 24: Design movements and design based companies have played a major role in influencing the style, form and function of many elements of our modern society.

Select **one** design company from the grid below. Use aspects of their work to answer the question.

Apple	Gap
Alessi	Primark
Dyson	Under Armour
Braun	Zara

Name of chosen design company: _____

Explain how your chosen design company has influenced the area(s) of design that they are known for. Where possible, reference their products, their style and their business philosophy, and other factors to substantiate your opinions. [6 marks]

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



25. Study the isometric image from **figure 6**:

All dimensions are in millimetres.

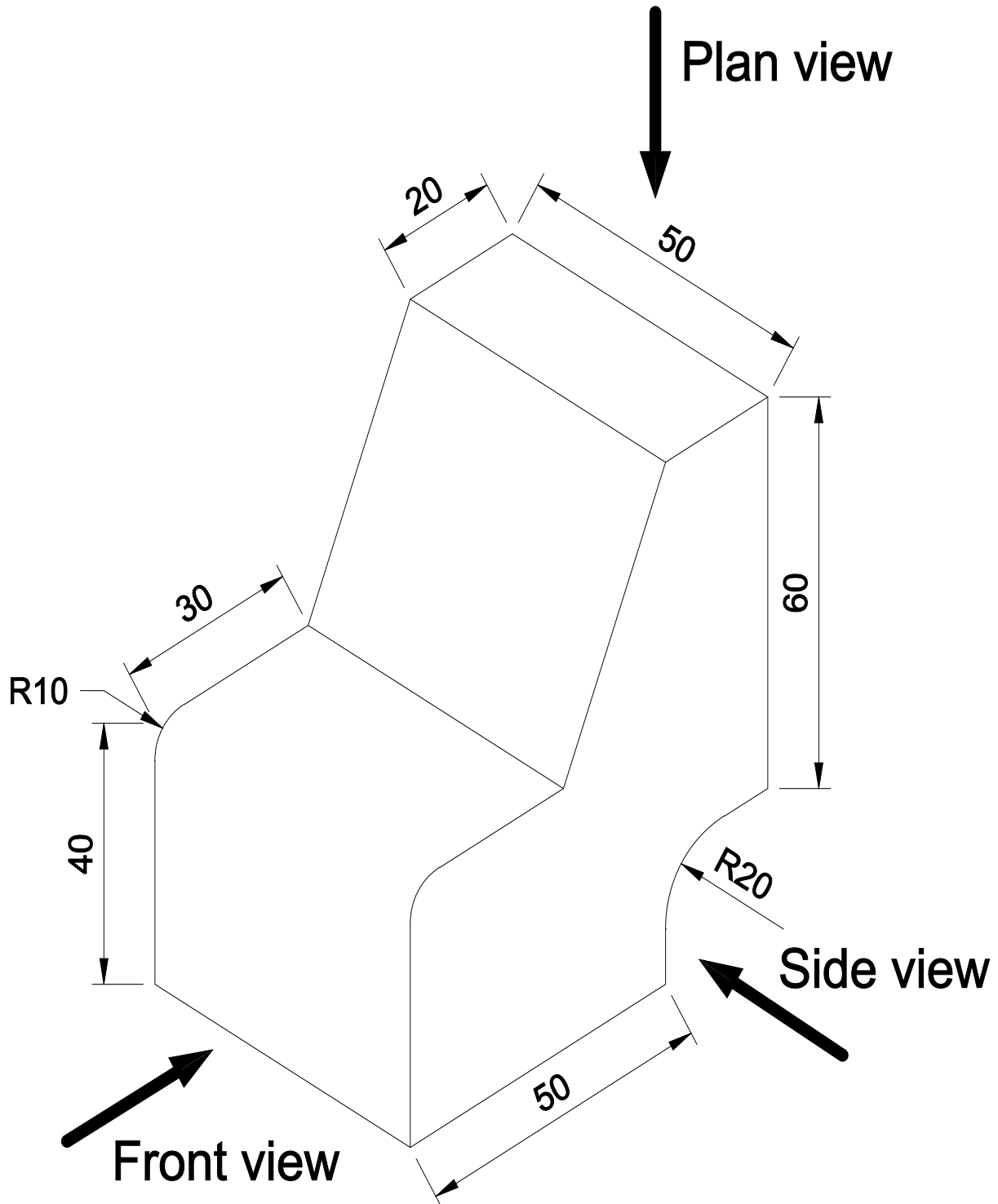


Figure 6



25.1: In the box below, draw a third angle orthographic projection symbol.

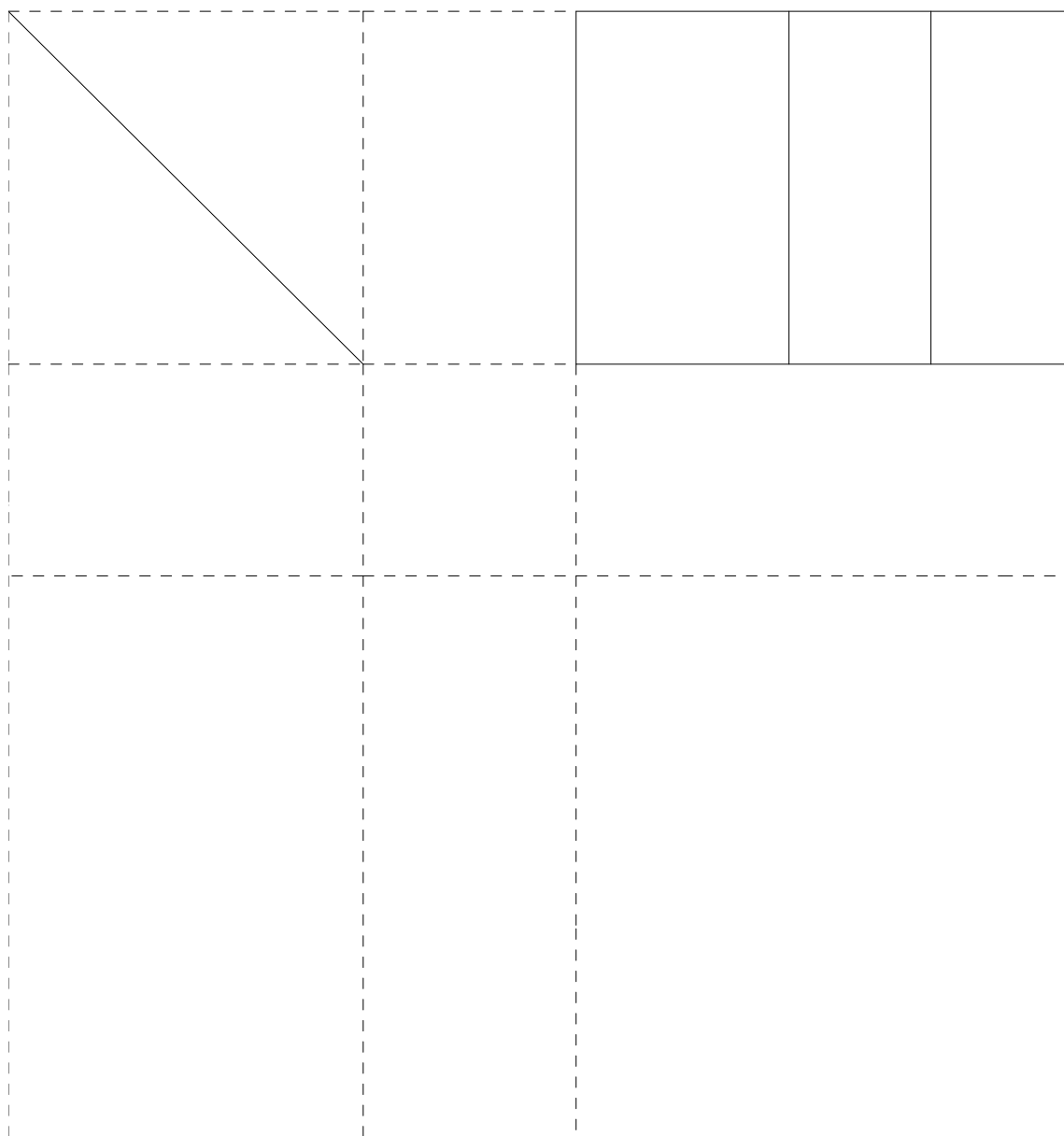
[2 marks]



25.2: On the grid paper below, **draw** and **label** the **two** missing views in third angle orthographic projection from the isometric image in **figure 6**.

[6 marks]

Plan view





26: Designers need to select materials and components based on many factors including functional need, cost and availability.

26.1: In your chosen specialism, name **two** components that are commonly bought in rather than being made in house. [2 marks]

1. _____

2. _____

26.2: Chose **one** of the components named in **26.1** and justify **one** reason why it is bought in rather than made in house. [2 marks]

END OF QUESTIONS