



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]

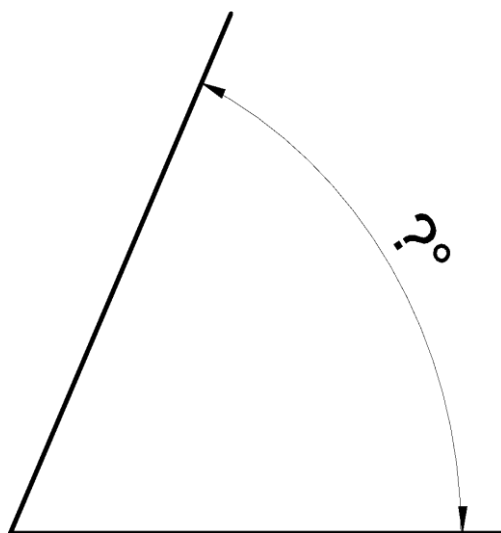


Figure 2

- ◇ 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]

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]

1. _____

2. _____

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: _____

[illegible]

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

All dimensions are in millimetres.

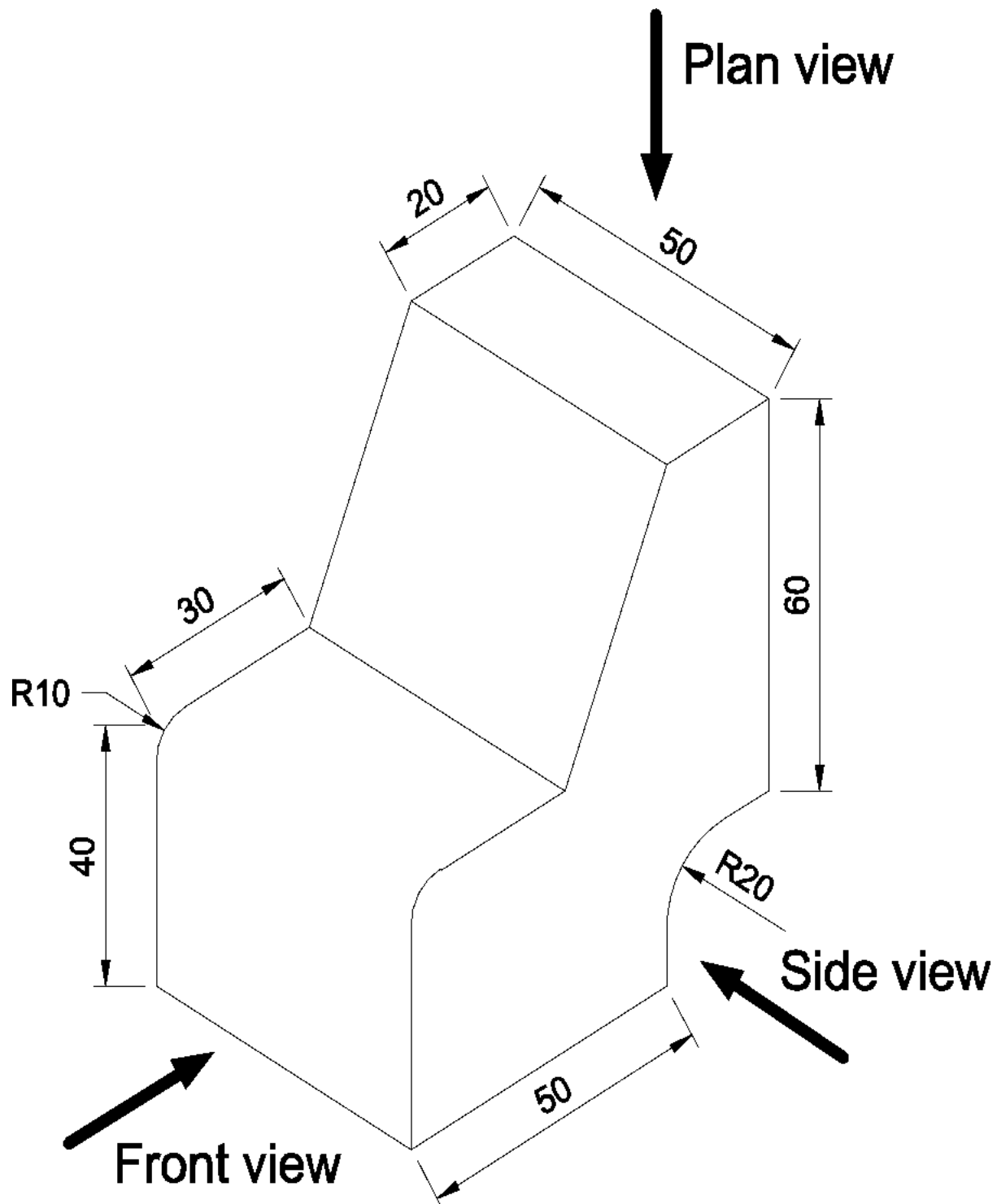
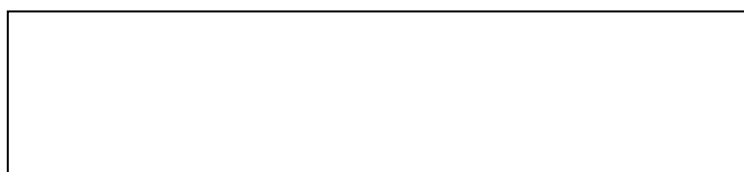


Figure 6



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

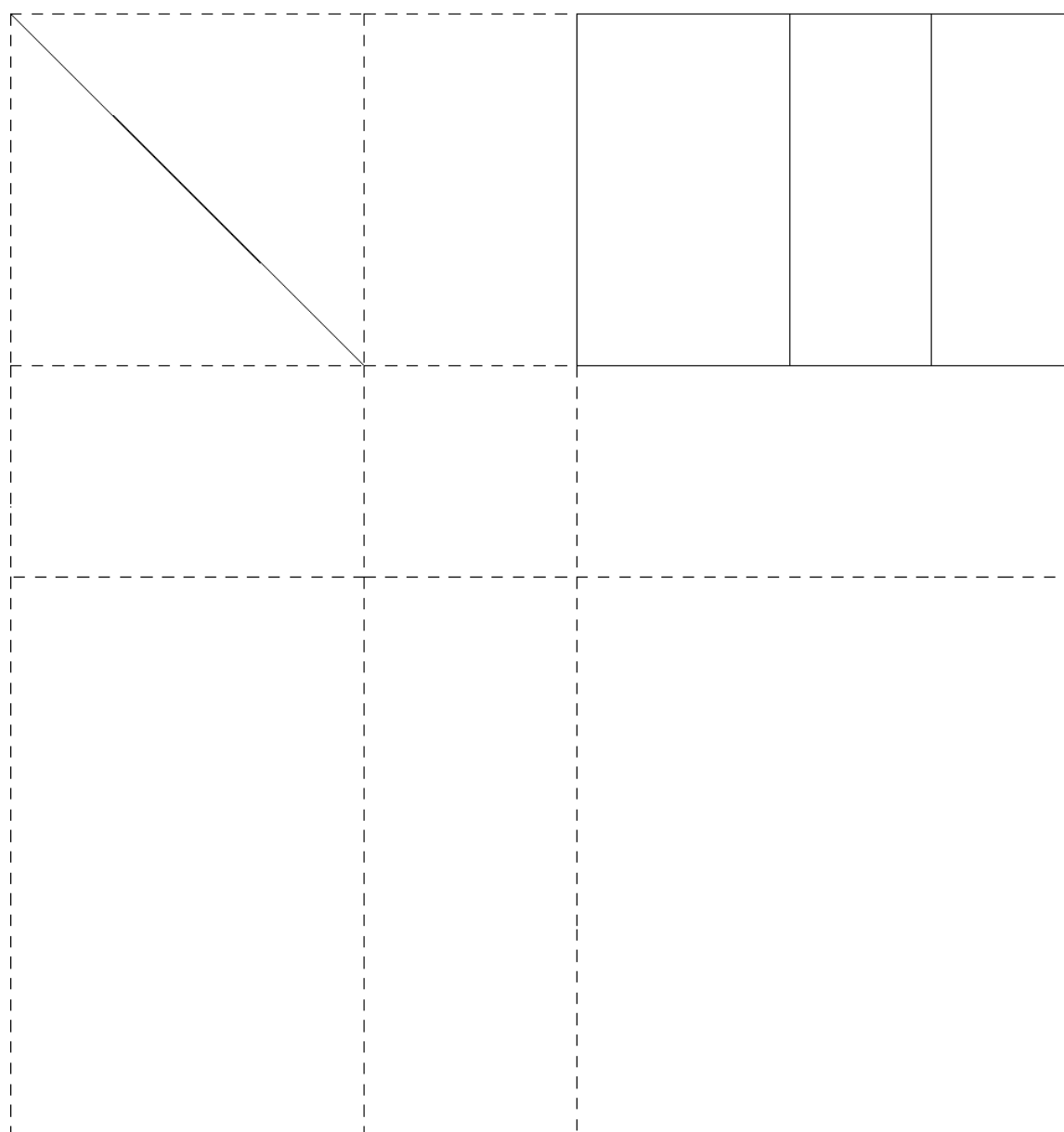
[2 marks]



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