



Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

**GCSE
ENGINEERING**

Unit 1 Written Paper

8852/W

Wednesday 20 May 2020

Morning

Time allowed: 2 hours

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

[Turn over]



For this paper you must have:

- normal writing and drawing instruments
- a 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).
- Some questions will require you to shade a circle. If you make a mistake cross through the incorrect answer.
- 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.**
- **You are reminded of the need for good English and clear presentation in your answers.**

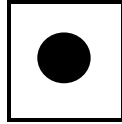
DO NOT TURN OVER UNTIL TOLD TO DO SO



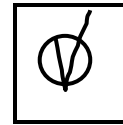
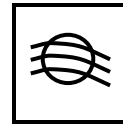
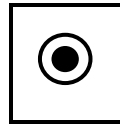
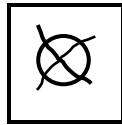
Answer ALL questions in the spaces provided.

For each question completely fill in the circle alongside the appropriate answer.

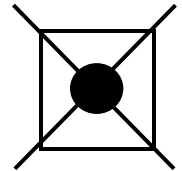
CORRECT METHOD



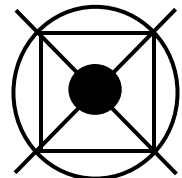
WRONG METHODS



If you want to change your answer you must cross out your original answer as shown.



If you wish to return to an answer previously crossed out, ring the answer you now wish to select as shown.



0 1 . 1 Which ONE of the following properties describes the ability of a material to withstand wear and abrasion? [1 mark]

A Ductility

B Hardness

C Stiffness

D Toughness

[Turn over]



0 1 . 2 The list below shows a range of different polymers. Shade **TWO** circles to identify the **THERMOSETTING POLYMERS**. [2 marks]

A Acrylic

B Epoxy

C Melamine

D Nylon

E Polycarbonate

F Polystyrene



01.3 Which ONE of the following materials is manufactured from layers of timber, bonded together with an adhesive? [1 mark]

A Ceramic

B Medium Density Fibre board

C Nylon

D Plywood

[Turn over]



01.4 What is the name of the force that opposes the forward motion of an aircraft through the air?
[1 mark]

A Drag

B Lift

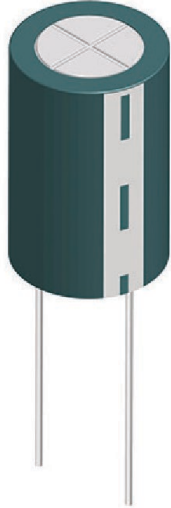
C Pitch

D Thrust



01.5 FIGURE 1 shows a component used in circuits.

FIGURE 1



**What is the name of the component?
[1 mark]**

A Capacitor

B Diode

C Resistor

D Transistor

[Turn over]



01.6 Shade ONE circle that gives the name of the process described below.

High pressure and temperature are used to make products from metal powder. [1 mark]

A Die casting

B Etching

C Fused deposition

D Sintering



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[Turn over]



01.7 FIGURE 2 shows a mass-produced aluminium tray.

FIGURE 2



**Complete the following statement, on the opposite page, using the word bank below.
[3 marks]**

WORD BANK

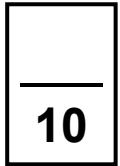
- Bending
- Brass
- Copper
- Ductile
- Folding
- Hard
- High carbon steel
- Malleable
- Press forming



The tray in FIGURE 2 has been made using a
_____ process.

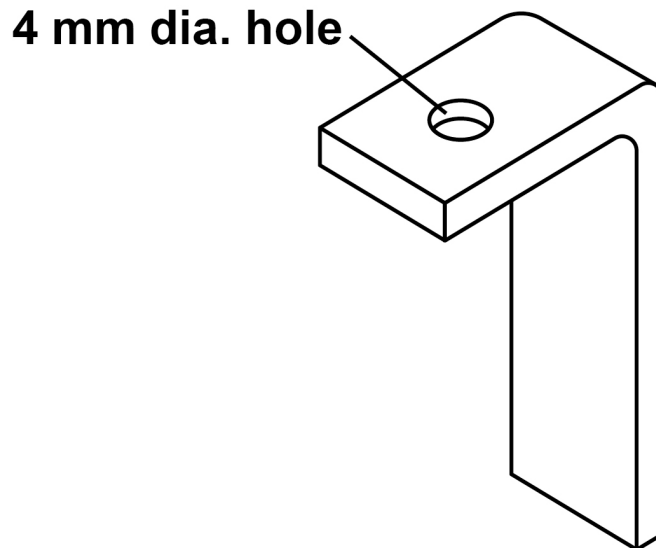
The moulds used in the process are usually
made from _____ because
the mould material needs to be very
_____.

[Turn over]



- 02.1** FIGURE 3 shows a right-angled bracket manufactured from 4 mm thick mild steel bar.

FIGURE 3



ONE bracket is to be made in a school workshop.

**Complete the production plan, on the opposite page, by giving the names of tools or equipment to be used for each stage.
[5 marks]**



STAGE	TOOL / EQUIPMENT
Cut bar to length	
Finish the cut edges of the bar	
Mark the position of the hole	
Make 4 mm diameter hole	
Bend bar to a right angle	

0 2 . 2 The steel bracket is to be used in a garden.

Name a suitable surface finish that could be applied to the bracket. [1 mark]

[Turn over]



0 2 . 3 Give **THREE** reasons why a surface finish might be applied to the bracket. **[3 marks]**

Reason 1 _____

Reason 2 _____

Reason 3 _____



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[Turn over]

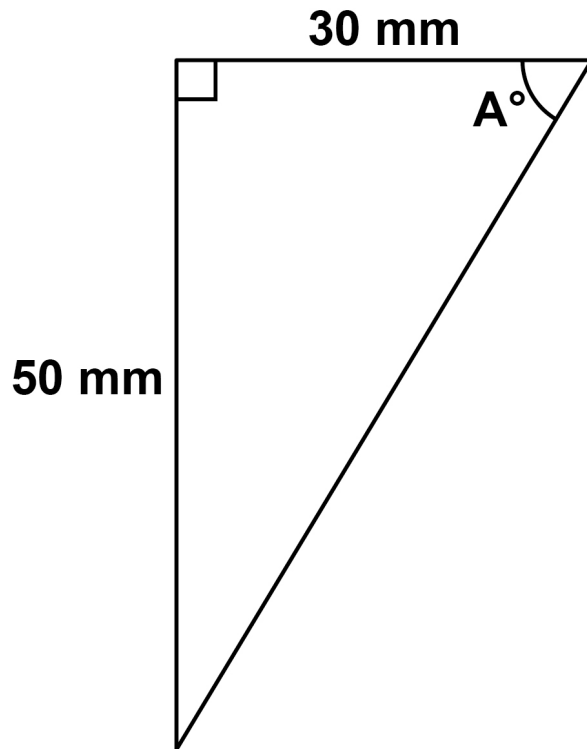


[Turn over]



02.5 FIGURE 4 shows a support plate used to strengthen the bracket.

FIGURE 4



To make the bracket, angle A° needs to be calculated.

Calculate angle A° using the formula
 $\text{Tan } A = \text{Opposite/Adjacent}$.

Show your working. [3 marks]

Answer _____

[Turn over]

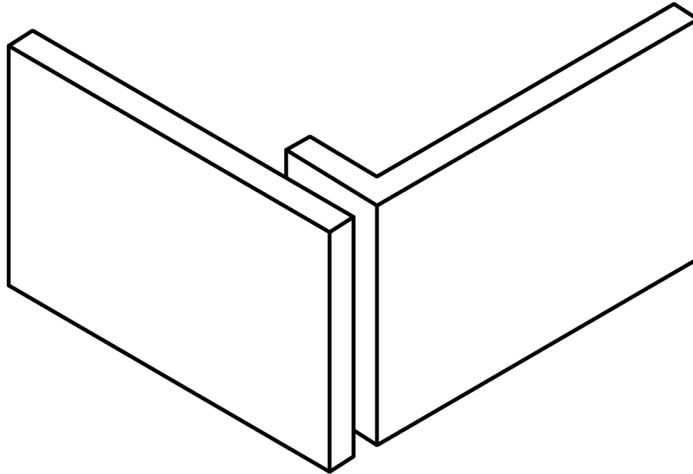
16



03

FIGURE 5 shows two pieces of a metal tray that are to be joined together.

FIGURE 5

**03****1**

Give TWO advantages of using threaded fastenings, such as nuts and bolts, to join the pieces. [2 marks]

Advantage 1 _____



Advantage 2

[Turn over]



03.2 Give TWO advantages of HARD SOLDERING the pieces together. [2 marks]

Advantage 1 _____

Advantage 2 _____



03.3 Name TWO OTHER processes that use heat, and can be used to join the pieces together. [2 marks]

Process 1 _____

Process 2 _____

[Turn over]

6



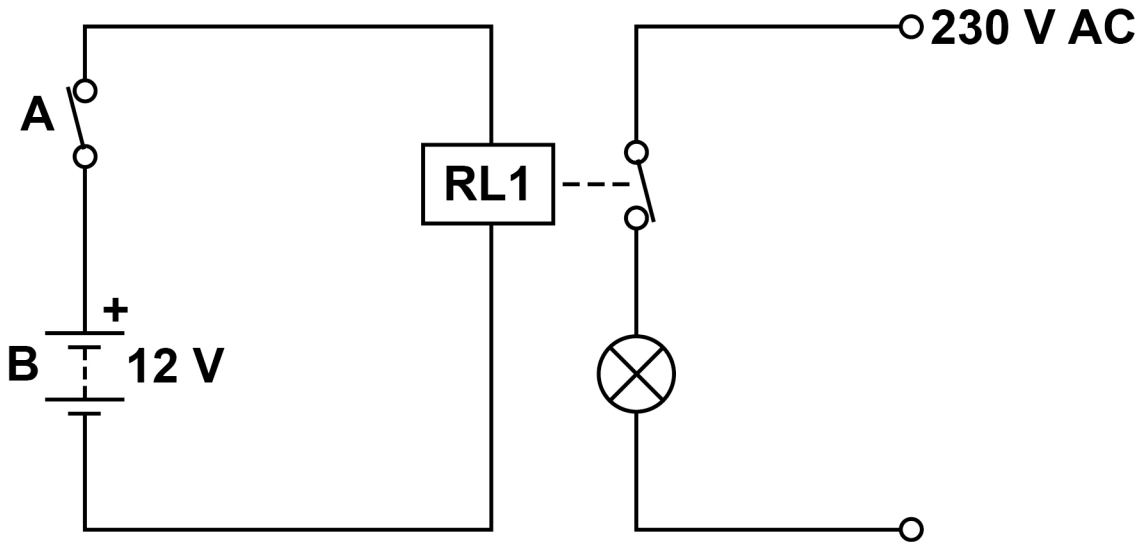
- 04.2** Use notes and/or sketches to explain the difference between an alternating current (AC) and a direct current (DC) power supply.
[3 marks]

[Turn over]



- 04.3** A circuit diagram for a lighting circuit is shown in FIGURE 6.

FIGURE 6



Name the components labelled A and B in FIGURE 6. [2 marks]

Component A _____

Component B _____



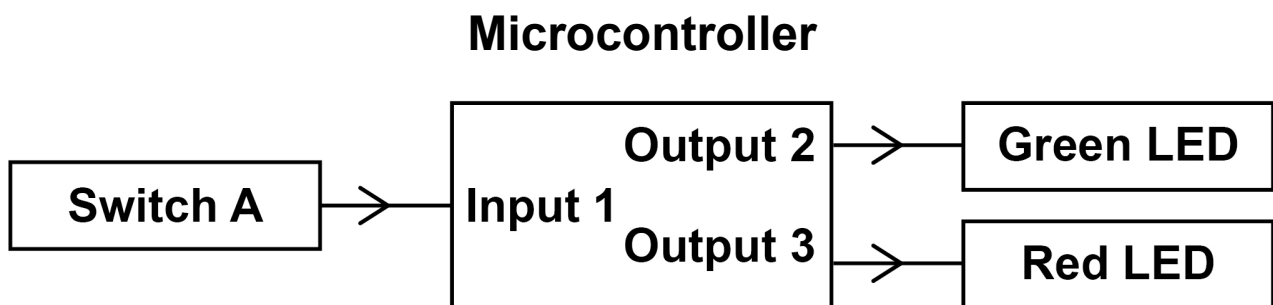
0 4 . 4 Explain the function of the relay RL1 in the lighting circuit shown in FIGURE 6. [2 marks]

[Turn over]

- 04.5** A timer circuit is controlled by a microcontroller.

FIGURE 7 shows the system diagram for the timer circuit.

FIGURE 7

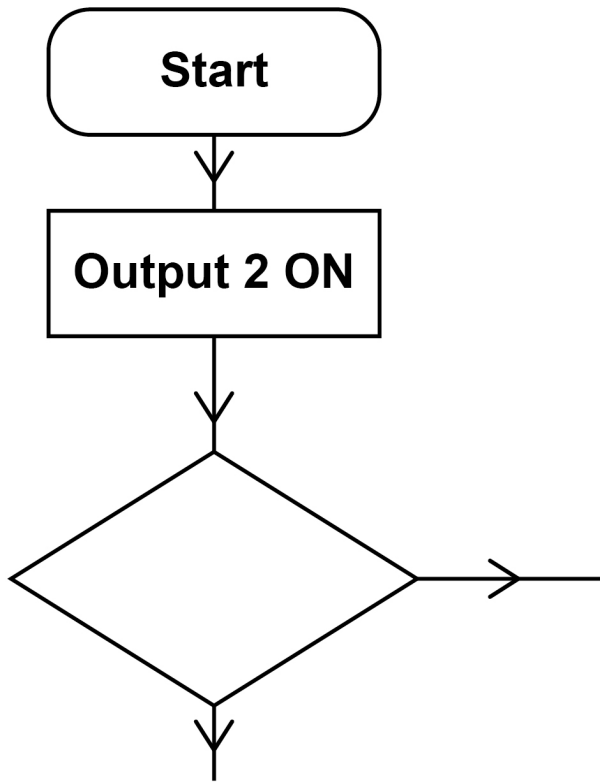


The system works as follows:

- the green LED is on
- when Switch A is pressed, the green LED turns off, and the red LED turns on for 10 seconds
- the red LED then turns off, and the green LED turns back on
- the sequence works continuously.

Complete the flowchart, on the opposite page, so that the system works as intended.
[6 marks]





[Turn over]



[Turn over]

23



05.1 Describe TWO safety hazards and suitable precautions when using powered machinery such as lathes and milling machines. [4 marks]

Hazard _____

Precaution _____

Hazard _____

Precaution _____



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[Turn over]

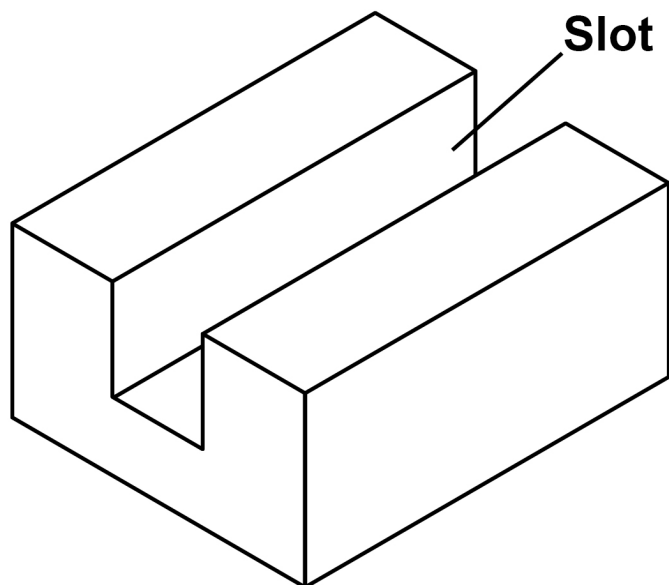


05.2 FIGURE 8 shows a steel component with a machined slot.

In the space on page 37, use notes and/or sketches to describe how the slot would be machined using a milling machine.

Include the names of tools and processes in your answer. [8 marks]

FIGURE 8



[Turn over]

12



06.1 A pulley system is designed to lift heavy loads.

The mechanical advantage of the pulley system is 3

Calculate the pulling effort needed to lift a load of 125 N. [3 marks]

Formula _____

Working _____

Answer with units _____



06.2 The cable used in a pulley system is 30 mm diameter.

Calculate the stress in the cable when a mass of 70 kg is lifted.

You should assume a value for gravity of 9.81
[4 marks]

Formula _____

Working _____

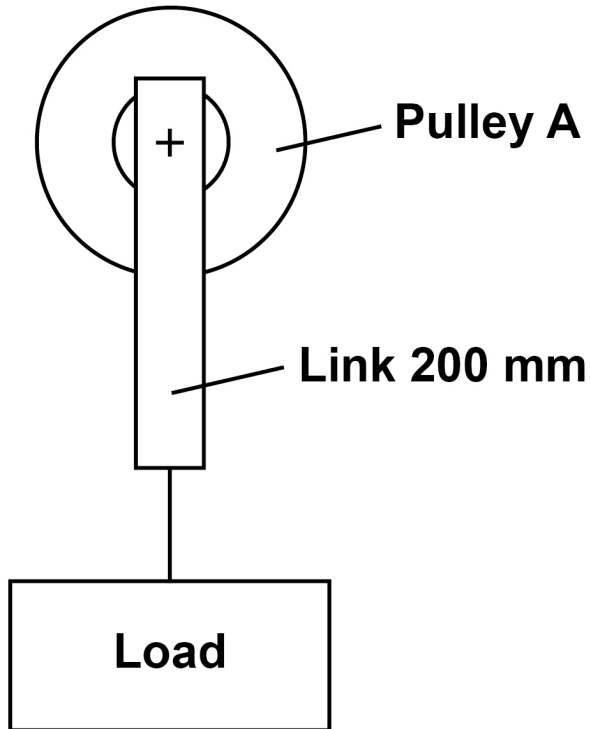
Answer _____

[Turn over]



- 06.3** In FIGURE 9 the link attached to pulley A is 200 mm long from top to bottom.

FIGURE 9



When a load is applied to the link, it stretches by 3 mm. Calculate the strain in the link. [3 marks]

Formula _____

Working _____



Answer _____

[Turn over]



06.4 When a stress of 1.8 N/mm^2 is applied to the link, the strain produced is 0.017

Calculate the Young's modulus of the link material.

Give your answer to ONE decimal place.
[4 marks]

Formula _____

Working _____

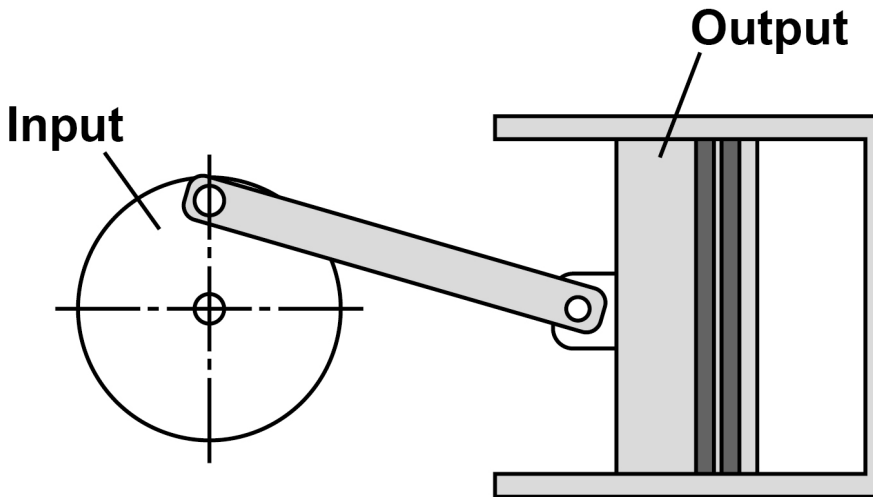
Answer with units _____

14



07.1 Study the mechanical system shown in **FIGURE 10**.

FIGURE 10



Complete the statement: [2 marks]

The system converts _____
motion into _____ motion.

[Turn over]



07.2 FIGURE 11 shows some internal parts of a car engine.

FIGURE 11



Discuss TWO reasons why car engines are lubricated. [4 marks]

1

2

[Turn over]



07.3 Explain the function of cams in a car engine.
[2 marks]

[Turn over]

17



08.1 Frames for racing bicycles are often made from carbon-fibre reinforced polymer (CRP).

Give THREE reasons why CRP is suitable for bicycle frames. [3 marks]

Reason 1 _____

Reason 2 _____

Reason 3 _____



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[Turn over]



08.2 To assemble a bicycle wheel, a manufacturer uses:

- one wheel rim
- one hub
- 28 spokes.

The cost of the materials is shown in TABLE 1.

TABLE 1

Item	Cost (each)
Wheel rim	£24.50
Hub	£5.60
Spoke	58p

The assembly process takes 40 minutes, and a worker is paid £12.60 per hour.

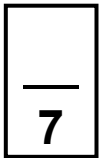
Calculate the cost of assembling ONE wheel.
Show your working. [4 marks]

Working _____



Answer _____

[Turn over]



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[Turn over]



- 09.2** Energy sources for electricity generation are shown in TABLE 2.

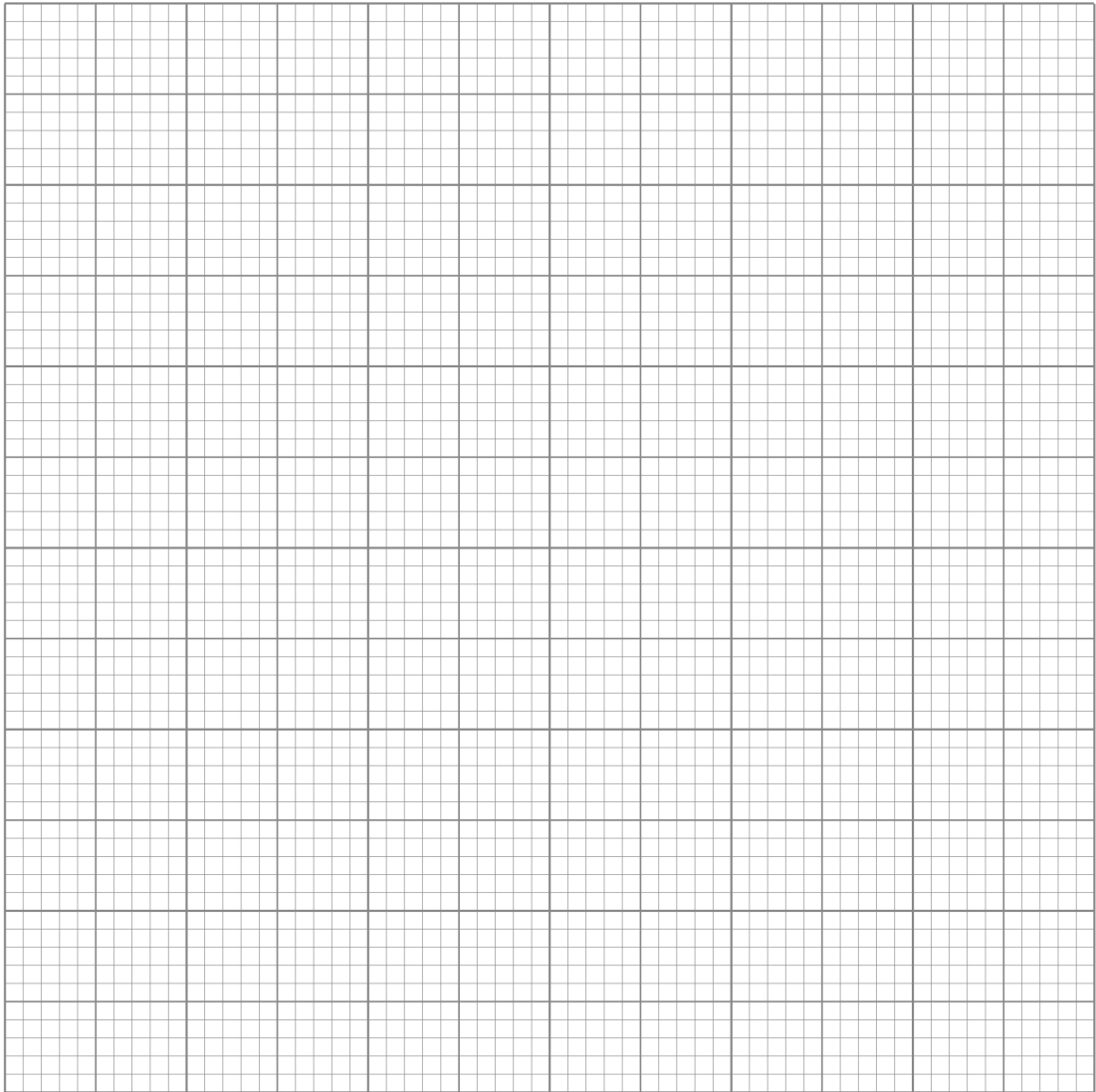
TABLE 2

Source	% of total
Coal	38
Gas	23
Renewables	25
Nuclear	10
Oil	4

On the grid opposite, and using the data given in TABLE 2, present the information in graphical form.

Marks will be awarded for labelling the axes clearly, and accurately drawing the graph.
[4 marks]





[Turn over]

6



10.1 Which is the correct formula for calculating series resistance? [1 mark]

A $R_t = R_1 + R_2$

B $R_t = R_1 - R_2$

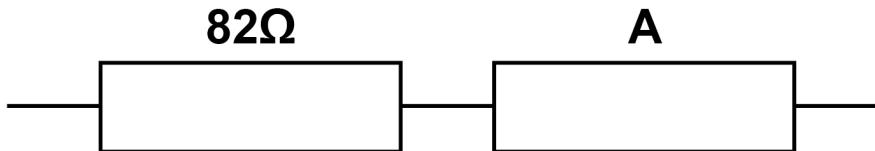
C $R_t = R_1 \times R_2$

D $R_t = R_1 \div R_2$



- 10.2** FIGURE 12 shows two resistors connected in series.

FIGURE 12



**Calculate the value of resistor A if the total resistance of the resistors is 100 Ohms.
[2 marks]**

Answer _____

[Turn over]

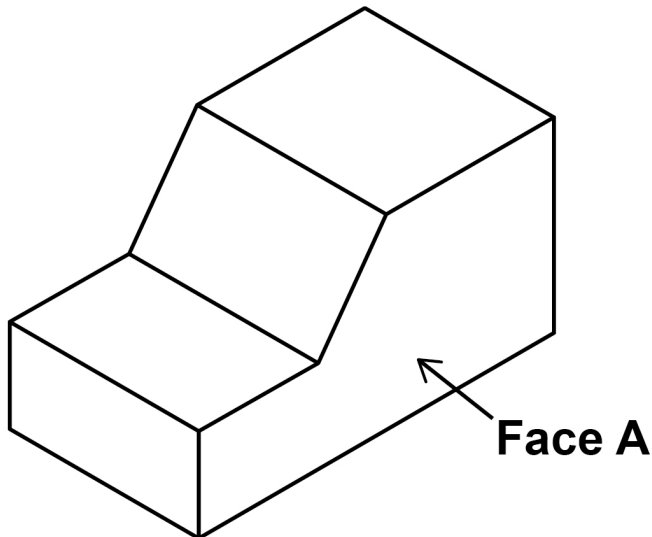
—
3



1	1
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Study the isometric drawing of the component shown in FIGURE 13.

FIGURE 13

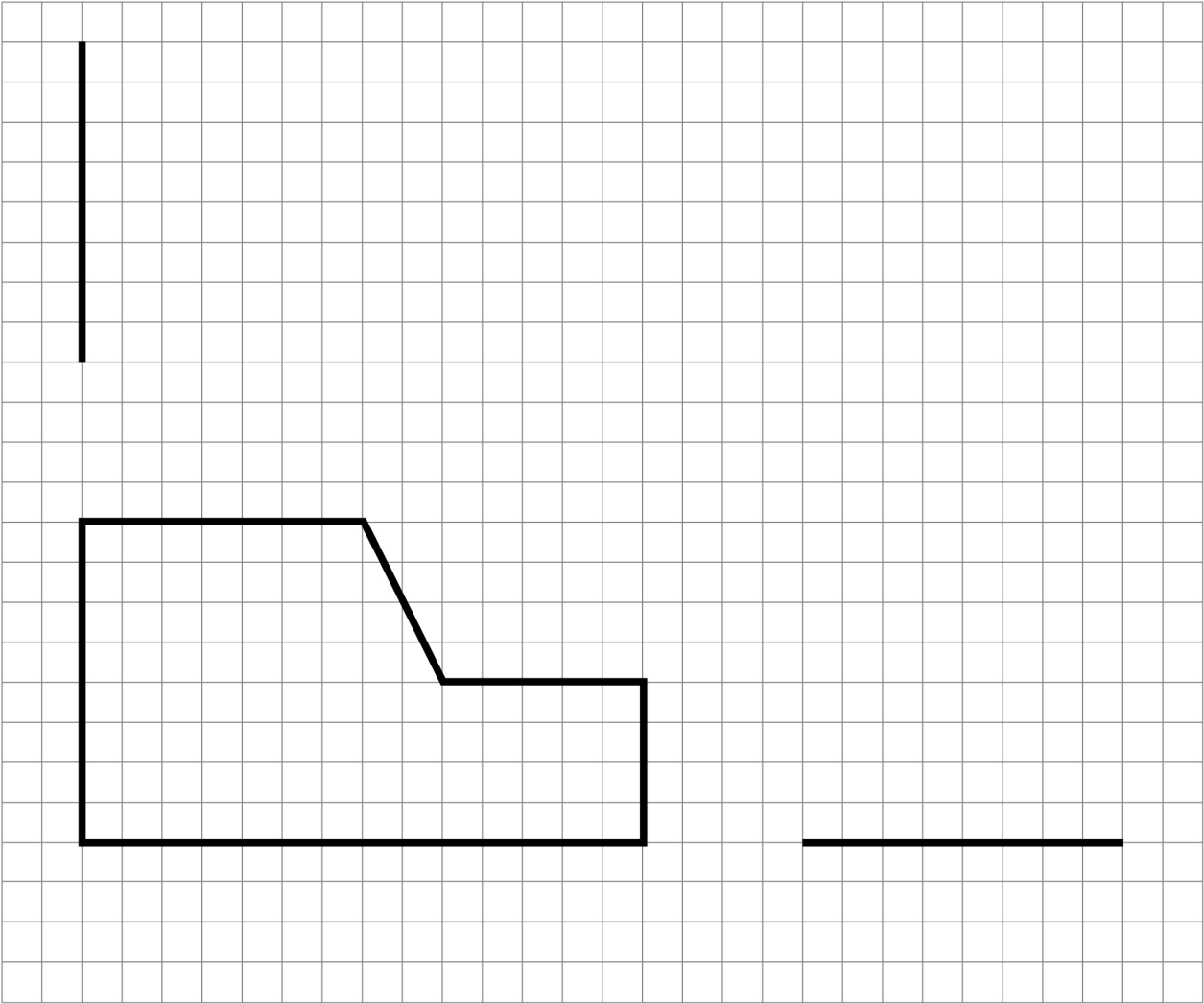


Complete the orthographic (3rd angle) drawing of the component below by:

- finishing the two incomplete views
- adding a dimension to show that Face A is 140 mm long
- naming the two views you have completed.

[6 marks]





END OF QUESTIONS

<hr/>
6



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For Examiner's Use	
Question	Mark
1	
2	
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TOTAL	

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