



**Surname** \_\_\_\_\_

**Forename(s)** \_\_\_\_\_

**Centre Number** \_\_\_\_\_

**Candidate Number** \_\_\_\_\_

**Candidate Signature** \_\_\_\_\_

**I declare this is my own work.**

**GCSE**

**ENGINEERING**

**Unit 1 Written Paper**

**8852/W**

**Tuesday 20 June 2023**

**Morning**

**Time allowed: 2 hours**

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

**[Turn over]**



## **MATERIALS**

**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.**

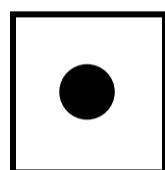
**DO NOT TURN OVER UNTIL TOLD TO DO SO**



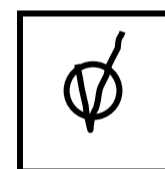
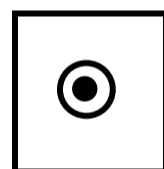
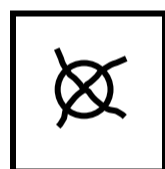
**Answer ALL questions in the spaces provided.**

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

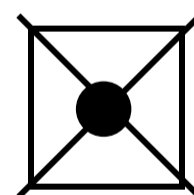
**CORRECT METHOD**



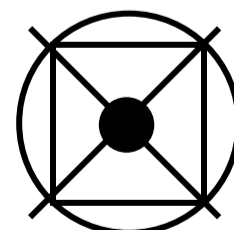
**WRONG METHODS**



**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.**



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**Which ONE of the following properties allows a material to resist wear and abrasion? [1 mark]**

**A Ductility**

**B Hardness**

**C Malleability**

**D Toughness**

**[Turn over]**



**01.2**

**Which ONE of the following metals is an alloy? [1 mark]**

**A Brass****B Copper****C Iron****D Zinc**

01.3

**Which of the stock forms listed below does NOT apply to metal? [1 mark]**

**A Bar**

**B Board**

**C Rod**

**D Sheet**

**[Turn over]**



**01.4**

**Which one of the following properties could be used to describe Lead?  
[1 mark]**

**A Brittle****B Highly conductive****C Malleable****D Tough**



**01.5**

**What type of electronic device is a comparator? [1 mark]**

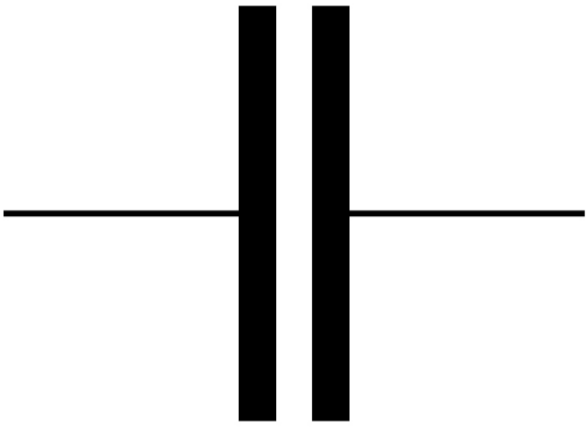
- A Input**
- B Output**
- C Process**
- D Programmable**

**[Turn over]**



01.6

Name the circuit symbol shown below.  
[1 mark]



**A Battery**

**B Capacitor**

**C Diode**

**D Switch**



**01.7**

**Fibre reinforced polymer (FRP) is an example of which type of material?  
[1 mark]**

**A Alloy****B Composite****C Textile****D Timber**

**[Turn over]**



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**Use the word bank provided, on the opposite page, to complete the following statements. [3 marks]**

**There are two types of polymers, thermoplastics and \_\_\_\_\_ polymers.**

**When thermoplastics are heated, they become soft and \_\_\_\_\_, allowing them to be formed into a range of products.**

**Thermoplastic products can be easily \_\_\_\_\_ at the end of their lifecycle.**



## WORD BANK

- burnt
- disposed of
- flexible
- hard
- recycled
- shaped
- thermoforming
- thermosetting

[Turn over]

10



**02.1**

**FIGURE 1 shows a castor wheel with a steel fixing plate.**

**FIGURE 1**

**Steel  
fixing  
plate**



**The fixing plate has been press formed. Using notes and sketches, describe the press forming process in the space on the opposite page. [6 marks]**



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**[Turn over]**



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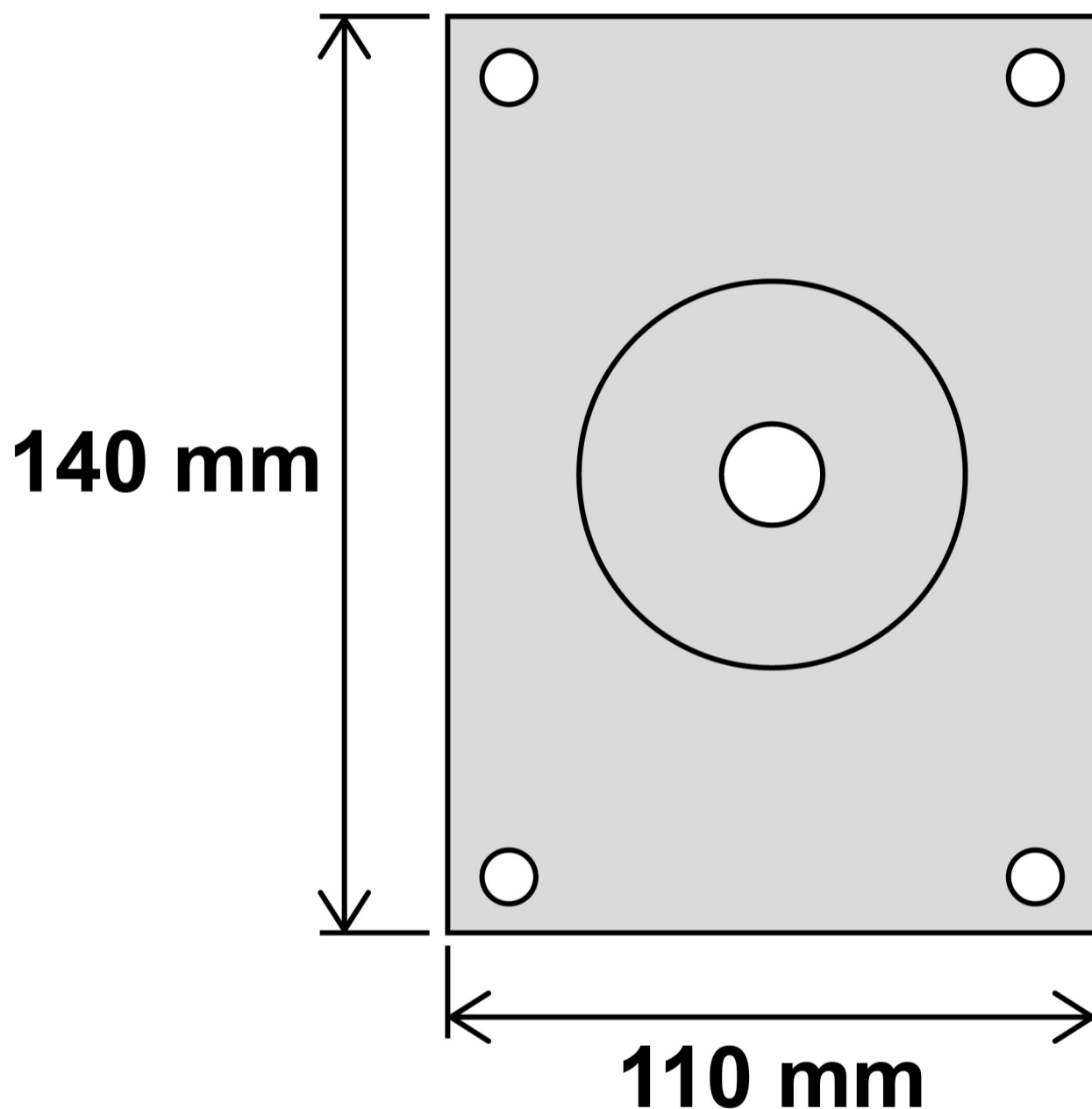
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**[Turn over]**



**02.2**

**FIGURE 2** shows a drawing of the steel fixing plate.

**FIGURE 2**

**Work out the maximum number of whole fixing plates that could be made from a sheet of steel measuring 0.5 m × 0.5 m.**

**Show your working. [4 marks]**



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**Answer** \_\_\_\_\_

**[Turn over]**



**02.3**

**In a pneumatic press forming system, the output cylinder has a radius of 32 mm.**

**Calculate the air pressure necessary for the cylinder to deliver a force of 15 605 newtons.**

**Use the equation  $P = F/A$**

**Show your working. [4 marks]**

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**Answer** \_\_\_\_\_ **N/m<sup>2</sup>**

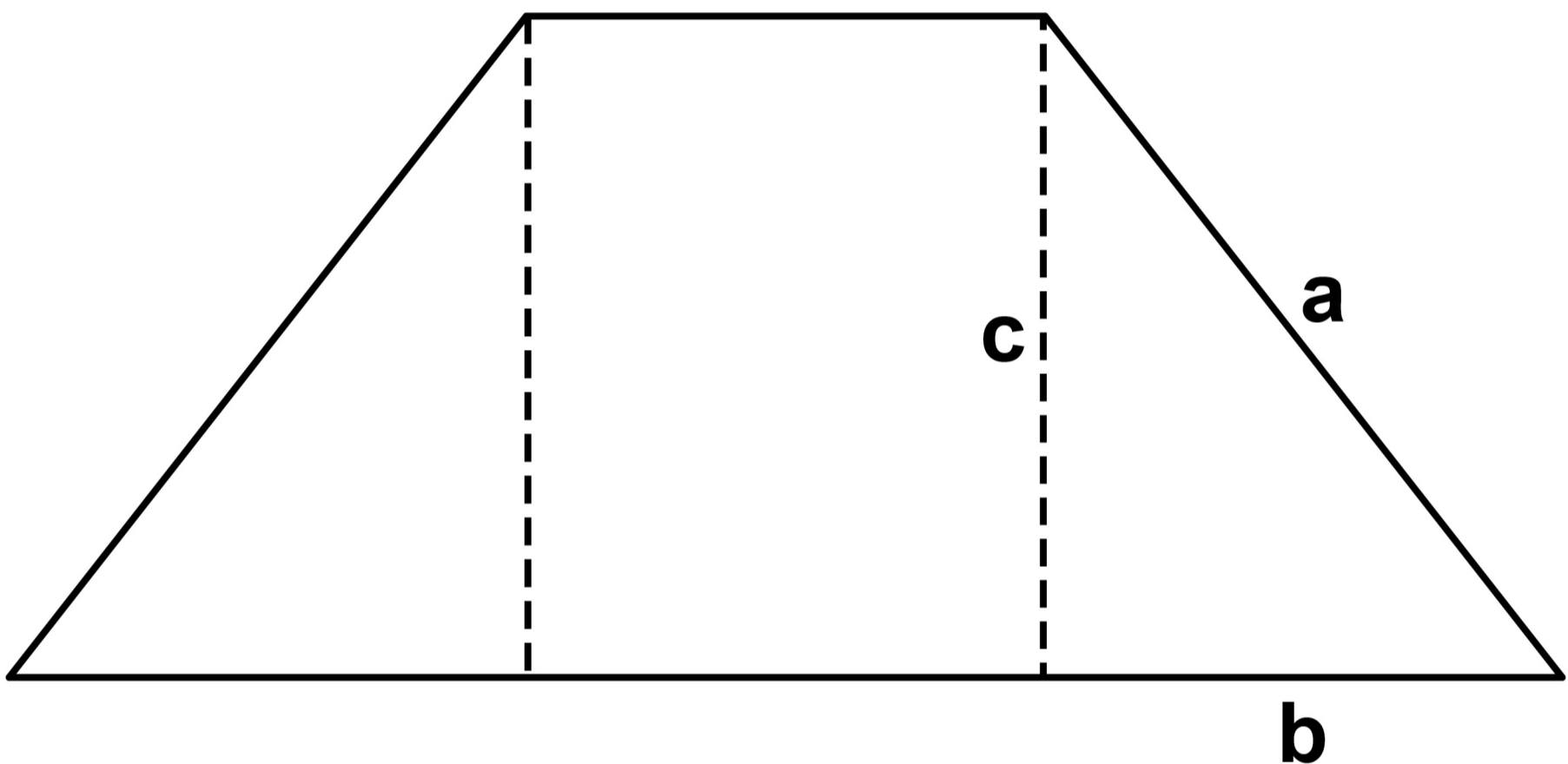
**[Turn over]**



**0 2 . 4**

**FIGURE 3** shows a castor wheel housing as a development (net).

**FIGURE 3**



**Calculate the length of the side shown at  
a.**

$$b = 135 \text{ mm}$$

$$c = 156 \text{ mm}$$

**Use the formula  $a^2 = b^2 + c^2$   
[4 marks]**

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**Answer a = \_\_\_\_\_ mm**

**[Turn over]**



**02.5**

**The manufacturer has decided that the castor wheel housing needs to have a surface finish applied. The manufacturer can choose painting or dip coating.**

**Evaluate the advantages and disadvantages of each method.**

**[8 marks]**

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Lined writing area consisting of 20 horizontal black lines.

**[Turn over]**



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**Name ONE suitable finish for the castor wheel housing other than painting or dip coating. [1 mark]**

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27



03.1

**Name ONE renewable form of energy production. [1 mark]**

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**[Turn over]**

**03.2**

**Nuclear energy and fossil fuels are two methods of non-renewable energy production.**

**Compare the two energy production methods. Discuss the following aspects in your answer:**

- advantages and disadvantages**
- impact on the environment.**

**[8 marks]**

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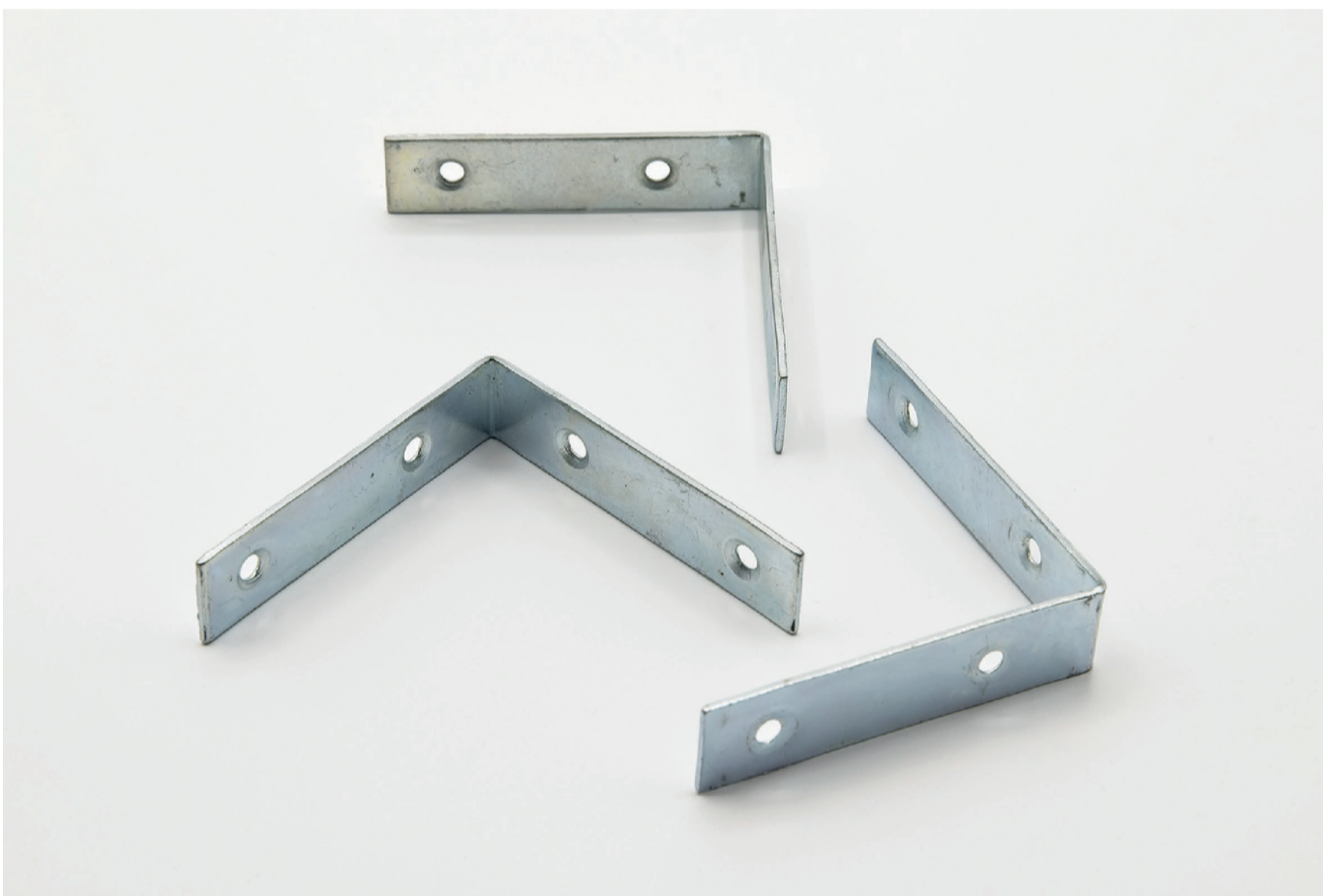
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**04.1**

**FIGURE 4 shows a corner bracket manufactured from low carbon steel.**

**FIGURE 4**



**One bracket will 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]**



<b>STAGE</b>	<b>TOOL/EQUIPMENT</b>
<b>Mark out the size and the position of the holes</b>	
<b>Cut the metal to size</b>	
<b>Finish the cut edges</b>	
<b>Make the holes</b>	
<b>Bend the metal shape to 90 degrees</b>	

**[Turn over]**



04.2

**Describe the difference between brazing and welding. [2 marks]**

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**[Turn over]**



**04.3**

**FIGURE 5 shows cylindrical aluminium components.**

**FIGURE 5**



**Name ONE process that can be used to produce these aluminium components.  
[1 mark]**

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**[Turn over]**

8



**05.1**

**A new engineering company is setting up in a local community.**

**Discuss the advantages and disadvantages of the engineering company for the local community.**

**Include in your answer:**

- impact on society**
- impact on the local economy.**

**[6 marks]**

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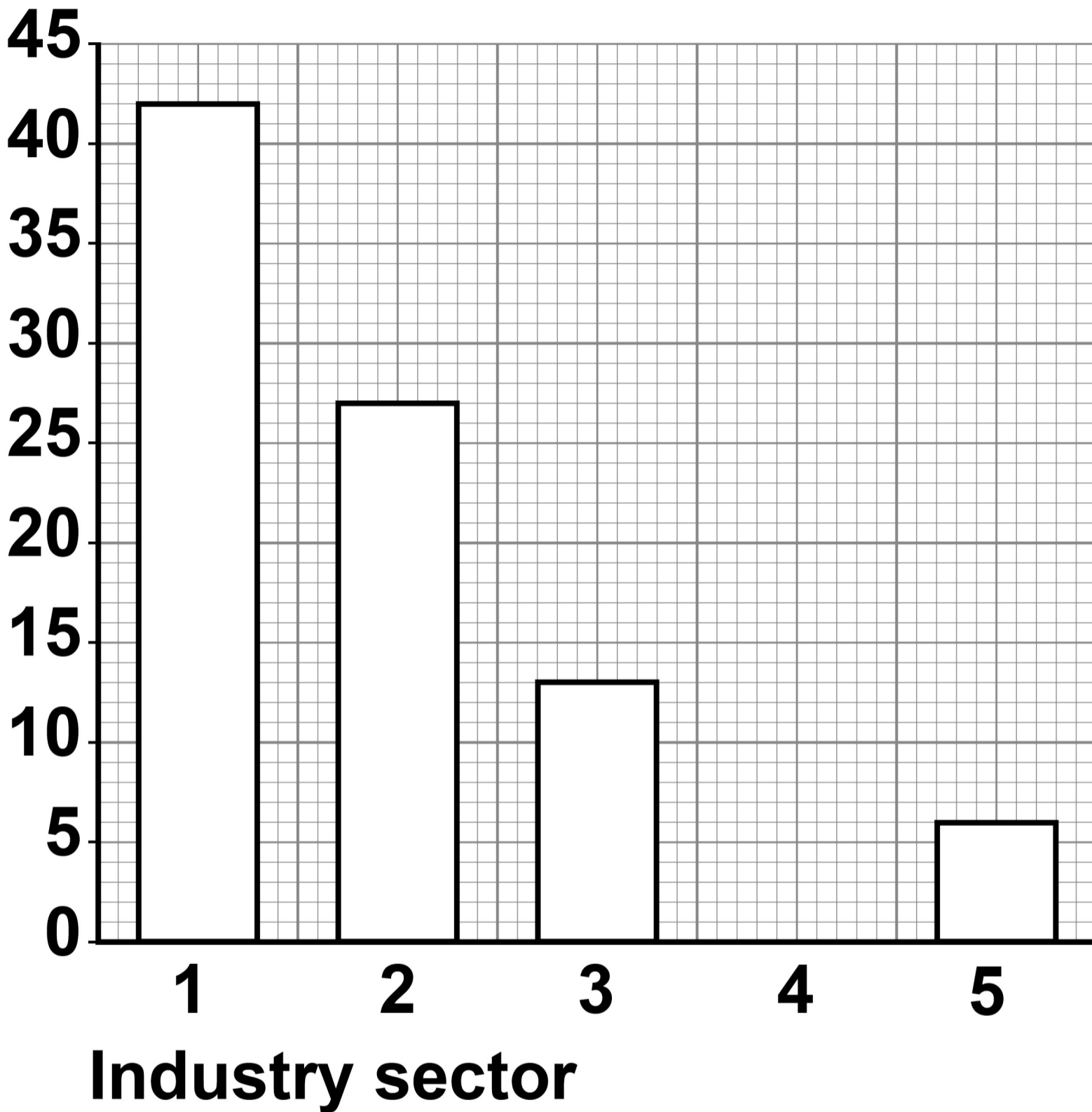
**The engineering company has collected data on industry sectors that buy their products. FIGURE 6, on page 40, shows an incomplete bar chart with the results.**

**[Turn over]**



**FIGURE 6**

**Percentage (%)**



**KEY**

**1 Automotive**

**2 Construction**

**3 Fabrication**

**4 Aerospace**

**5 Other**





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**Aerospace is missing from the bar chart.**

**Calculate the percentage for the Aerospace industry.**

**Show your working. [2 marks]**

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**Aerospace industry % = \_\_\_\_\_**

0	5	.	3
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**Complete the graph, on page 40, by adding the Aerospace bar. [1 mark]**

**[Turn over]**



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0 5 . 4

The total value of all sales is £18 million.

Calculate the value of Construction industry sales.

Show your working. [2 marks]

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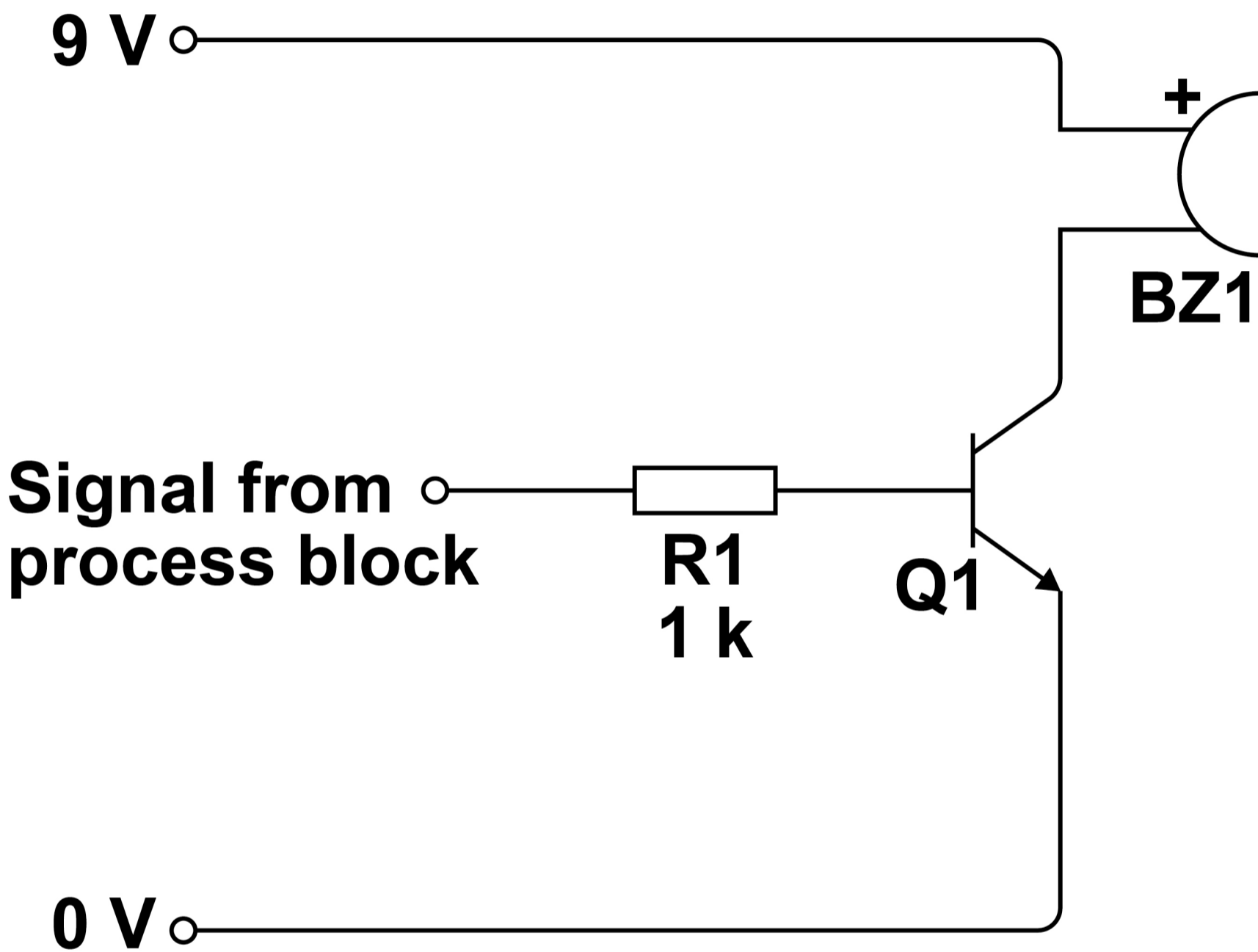
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Answer £ \_\_\_\_\_

11

[Turn over]



**0 6 . 1****FIGURE 7 shows a simple buzzer circuit.****FIGURE 7**

**State the function of the transistor within the circuit. [1 mark]**

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**06.2**

**Name ONE audible output device that could be used instead of the buzzer. [1 mark]**

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**[Turn over]**

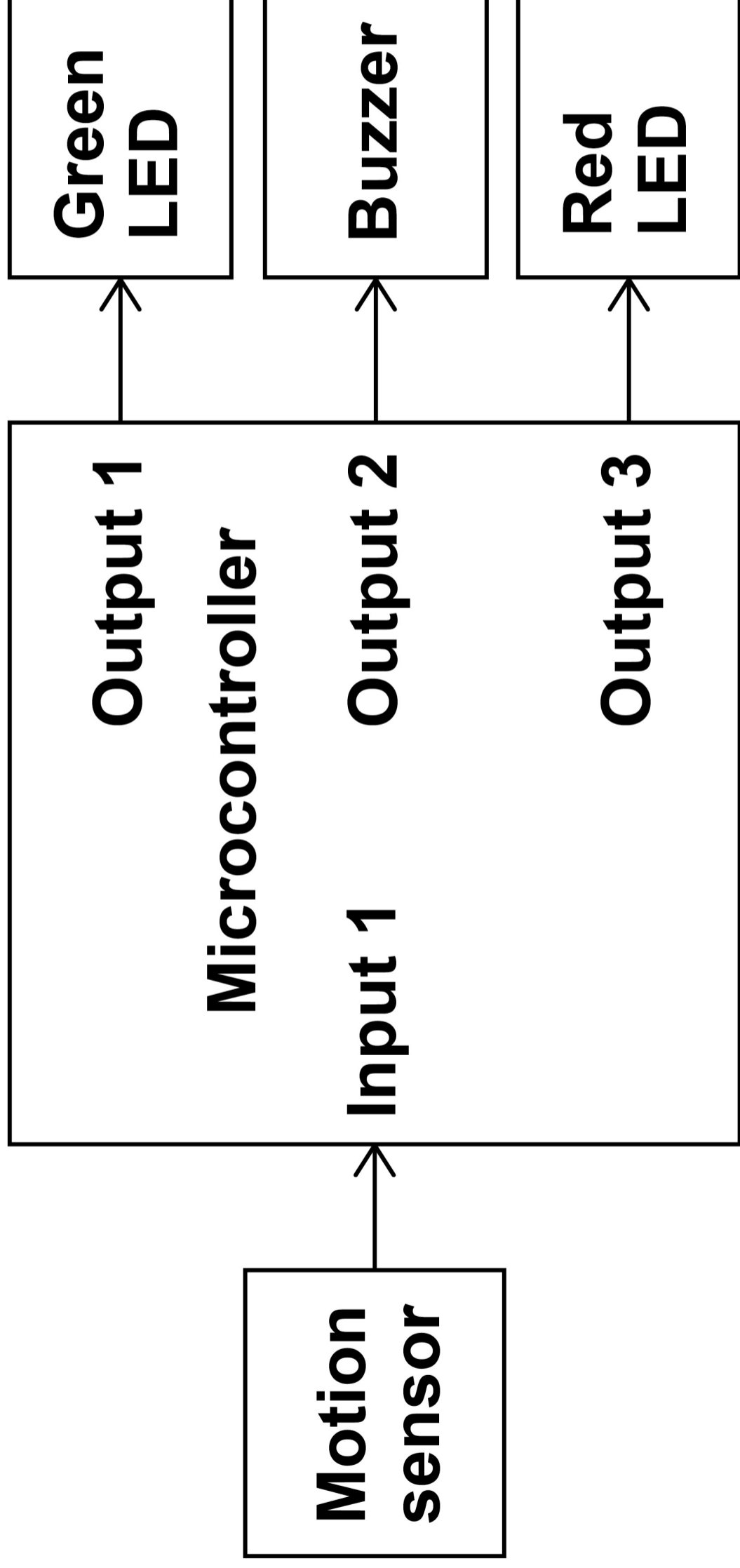




06.3

The buzzer will be used in an alarm system. **FIGURE 8** shows the system diagram for the alarm system.

**FIGURE 8**





- **Output 1, the green LED is on.**
- **When the motion sensor is activated, the green LED goes off, a red LED comes on for 30 seconds and the buzzer sounds for 30 seconds.**
- **The red LED turns off, the green LED turns back on and the buzzer stops.**
- **The system works whenever the motion sensor is activated.**

**47**

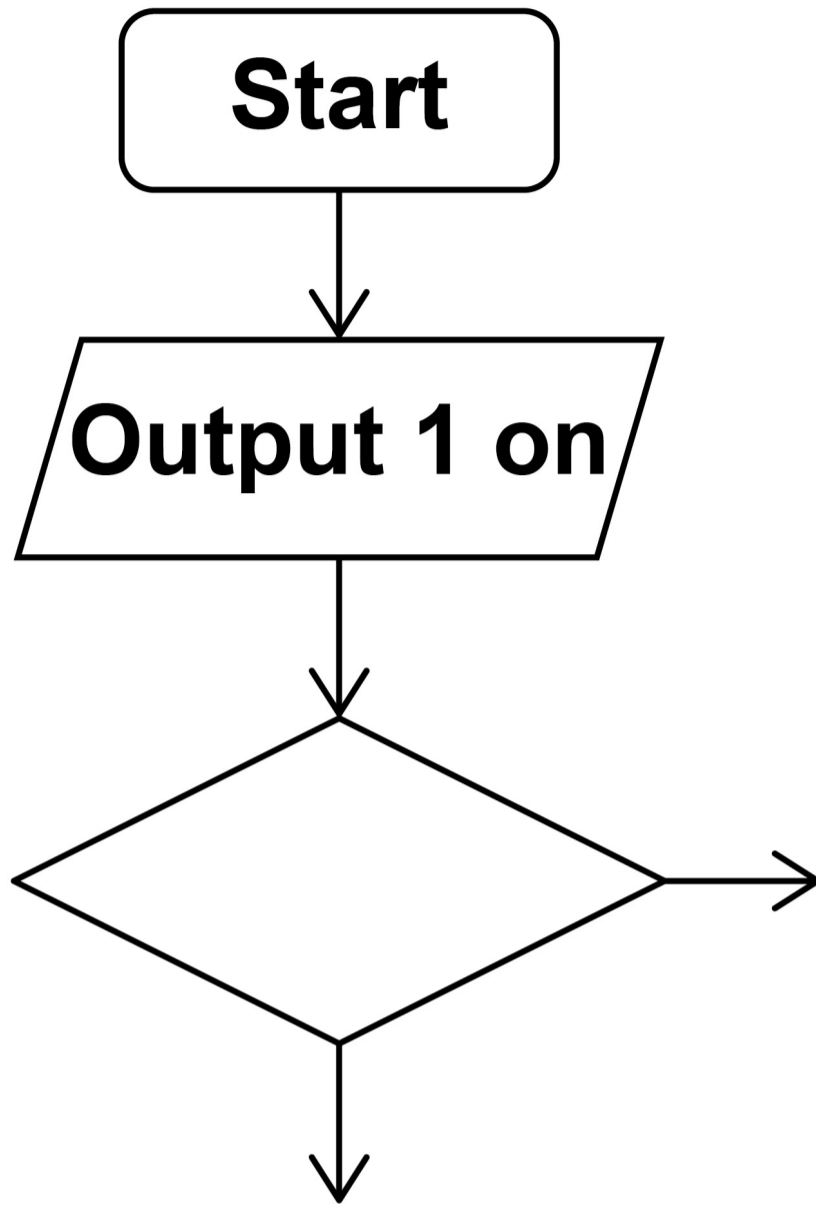
**Complete the flowchart in the space, on page 49, so that the system works as stated. [6 marks]**

**[Turn over]**

**BLANK PAGE**







**[Turn over]**



06.4

**Give TWO advantages of writing an electronic program as a flowchart.  
[2 marks]**

**Advantage 1** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Advantage 2** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

0	6	.	5
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**Explain the difference between an AC and DC power supply. Use notes and/or sketches in your answer. [2 marks]**

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**[Turn over]**



06.6

**Name TWO advantages of using batteries as a power supply rather than mains electricity. [2 marks]**

**Advantage 1** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Advantage 2** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

06.7

**Name ONE type of logic gate. [1 mark]**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**0 6 . 8**

**Give the function of the logic gate you have named. [1 mark]**

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**[Turn over]**

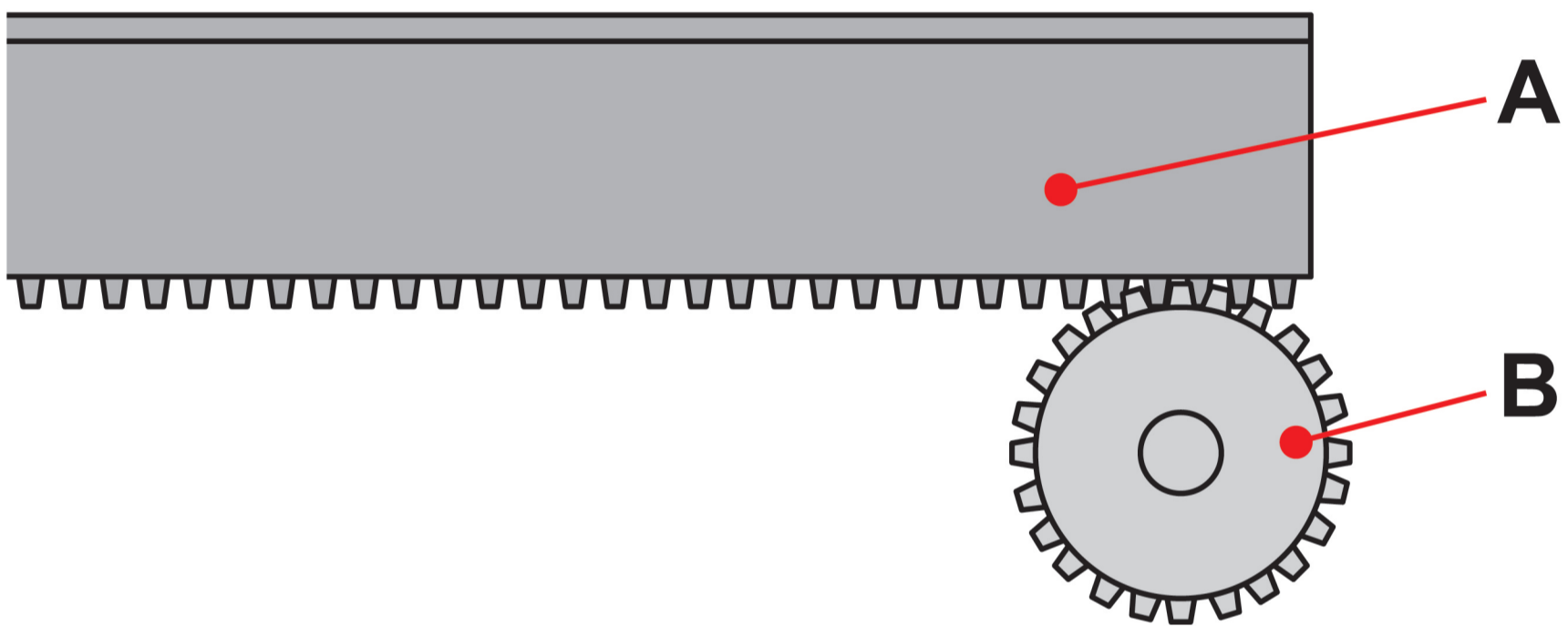
<b>16</b>



**07.1**

**FIGURE 9** shows a rack and pinion mechanism.

**FIGURE 9**



**Complete the sentences below.**  
**[2 marks]**

**The motion at point A is \_\_\_\_\_ .**

**This is converted to \_\_\_\_\_  
motion at point B.**



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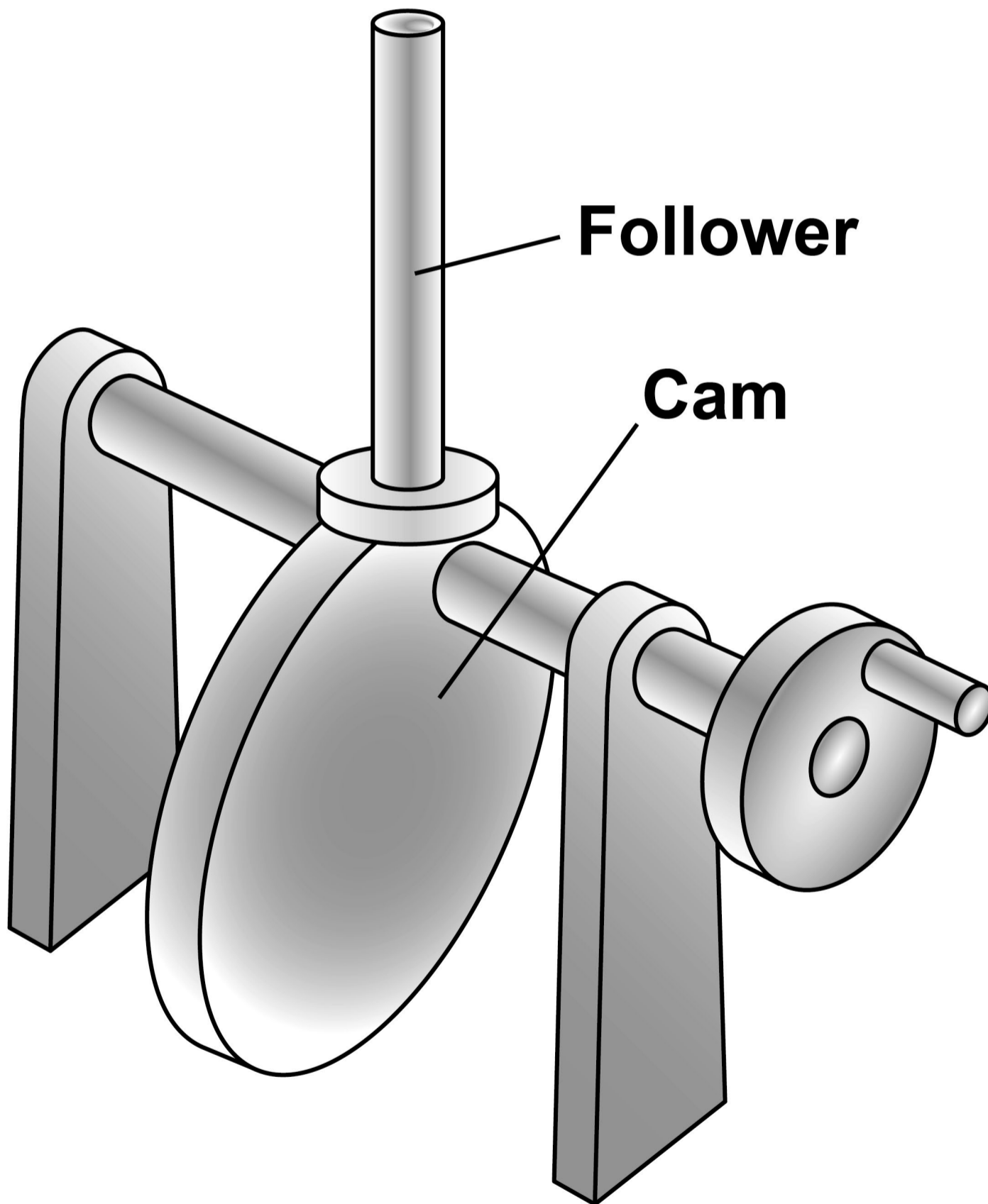
**[Turn over]**



**07.2**

**FIGURE 10** shows a simple cam and follower mechanism.

**FIGURE 10**





**Explain the function of the follower.  
[2 marks]**

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**[Turn over]**

07.3

**Give TWO reasons why machinery needs to be regularly maintained. [2 marks]**

**Reason 1** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Reason 2** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

07.4

**Discuss TWO reasons why moving parts in machinery need to be lubricated.**

**[4 marks]**

**Reason 1** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Reason 2** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
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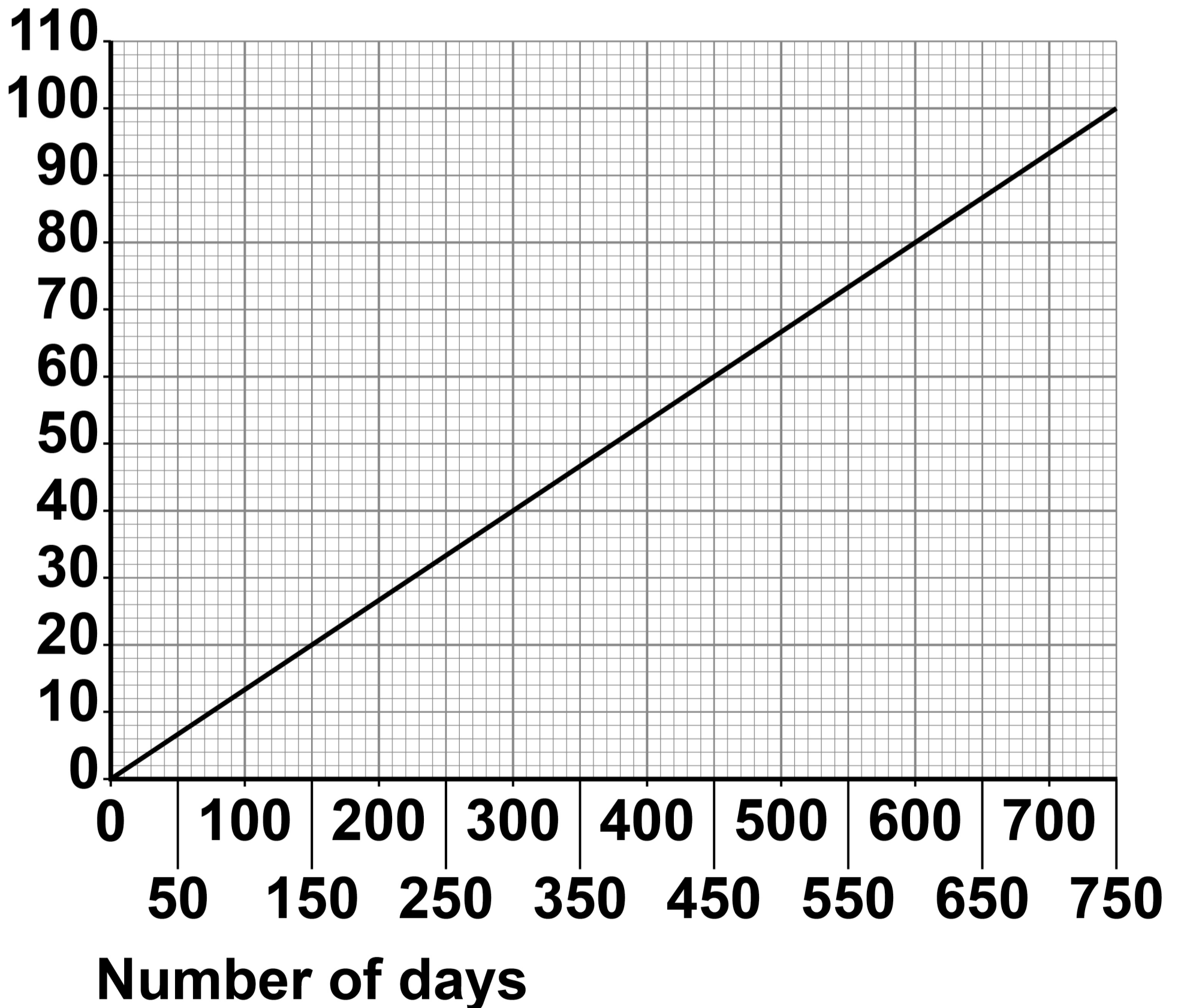
**[Turn over]**



**FIGURE 11** shows data the engineering company have collected on how long a machine part lasts before failing.

**FIGURE 11**

**Number of part failures**



0	7	.	5
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**Calculate the slope of the graph at 300 days.**

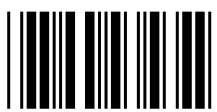
**Show your working. [2 marks]**

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**[Turn over]**



0	7	.	6
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**A mechanical component is shown in  
FIGURE 12.**

**FIGURE 12**



**Name the component. [1 mark]**

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07.7

**State the function of the component.**  
**[1 mark]**

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**[Turn over]**

14

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08.1

**A length of metal wire is 300 mm long.  
When a load is suspended from the wire,  
it stretches by 2.5 mm.**

**Calculate the strain in the wire.  
[3 marks]**

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**[Turn over]**



0	8	.	2
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**When a stress of  $2.2 \text{ N/mm}^2$  is applied to the metal wire, the strain produced is 0.019**

**Calculate the Young's modulus of the wire material.**

**Use the formula Young's modulus**  
 **$E = \text{Stress/strain}$  or  $E = \sigma/\epsilon$**

**Give your answer to one decimal place.**  
**[2 marks]**

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**Answer** \_\_\_\_\_  **$\text{N/mm}^2$**



08.3

**Name the type of strength the cable in a pulley system must have. [1 mark]**

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08.4

**Describe how the strength of the pulley cable could be tested. [2 marks]**

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**[Turn over]**



08.5

**State the TWO main functions of a pulley system. [2 marks]**

**Function 1** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Function 2** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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09.1

**Components can be manufactured using rapid prototyping (3D Printing) methods.**

**Analyse the advantages and disadvantages of using this method to manufacture components. [8 marks]**

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**[Turn over]**



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09.2

**Give TWO examples of how quality control methods could be applied to manufactured components. [4 marks]**

**Method 1** \_\_\_\_\_

**Used for** \_\_\_\_\_

**Method 2** \_\_\_\_\_

**Used for** \_\_\_\_\_

**[Turn over]**



**09.3**

**A component has a length of 150 mm.  
The length must be manufactured with a  
tolerance of  $\pm 2\%$ .**

**Calculate the maximum and minimum  
acceptable lengths.**

**Show your working. [3 marks]**

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**Minimum \_\_\_\_\_ mm**

**Maximum \_\_\_\_\_ mm**

**END OF QUESTIONS**

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<b>15</b>







**Additional page, if required.**

**Write the question numbers in the left-hand margin.**

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**Additional page, if required.**

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For Examiner's Use	
Question	Mark
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<b>TOTAL</b>	

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