



General Certificate of Secondary Education
2024

Centre Number

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Candidate Number

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Physics

Unit 3 Practical Skills

Booklet B

Foundation Tier

MV18

[GPY32]

MONDAY 24 JUNE, MORNING

Time

1 hour, plus your additional time allowance

Instructions to Candidates

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer the questions in the spaces provided.

Do not write on blank pages.

Complete in black ink only.

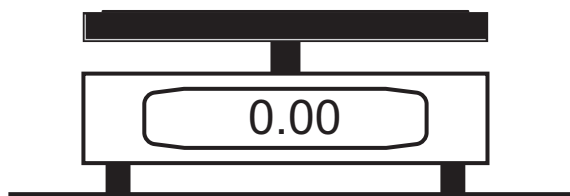
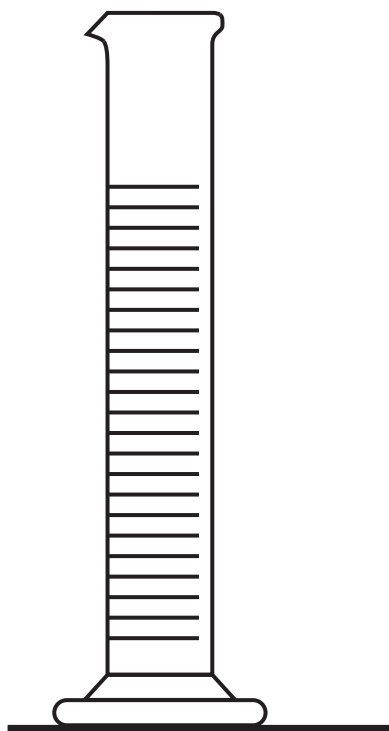
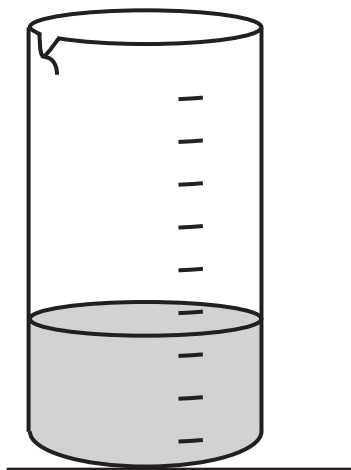
Answer **all** questions.

Information for Candidates

The total mark for this paper is 70.

Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.

- 1 (a) The apparatus below can be used to investigate how the mass of a liquid depends on its volume.



- (i) Name the apparatus that is used to measure **accurately** the volume of the liquid. [1 mark]

(ii) The liquid is poured into this piece of apparatus and the volume is measured. State how to ensure an accurate reading. [1 mark]

(b) In this investigation the volume of liquid was increased and the corresponding mass of liquid was measured.

(i) Identify the variable type by placing a tick (✓) in the appropriate box below. [3 marks]

Quantity	Dependent	Independent	Controlled
Mass of liquid			
Volume of liquid			
Type of liquid			

The measurements recorded during this investigation are shown in the table below.

Volume of liquid/cm ³	Mass of measuring cylinder and liquid/g
10	48
20	56
30	64
40	72
50	80

(ii) On the grid opposite, plot a graph of the volume of liquid (x-axis) and mass of measuring cylinder and liquid (y-axis).

Label each axis with the quantity and its unit.

Mark each point clearly using × or ⊙.

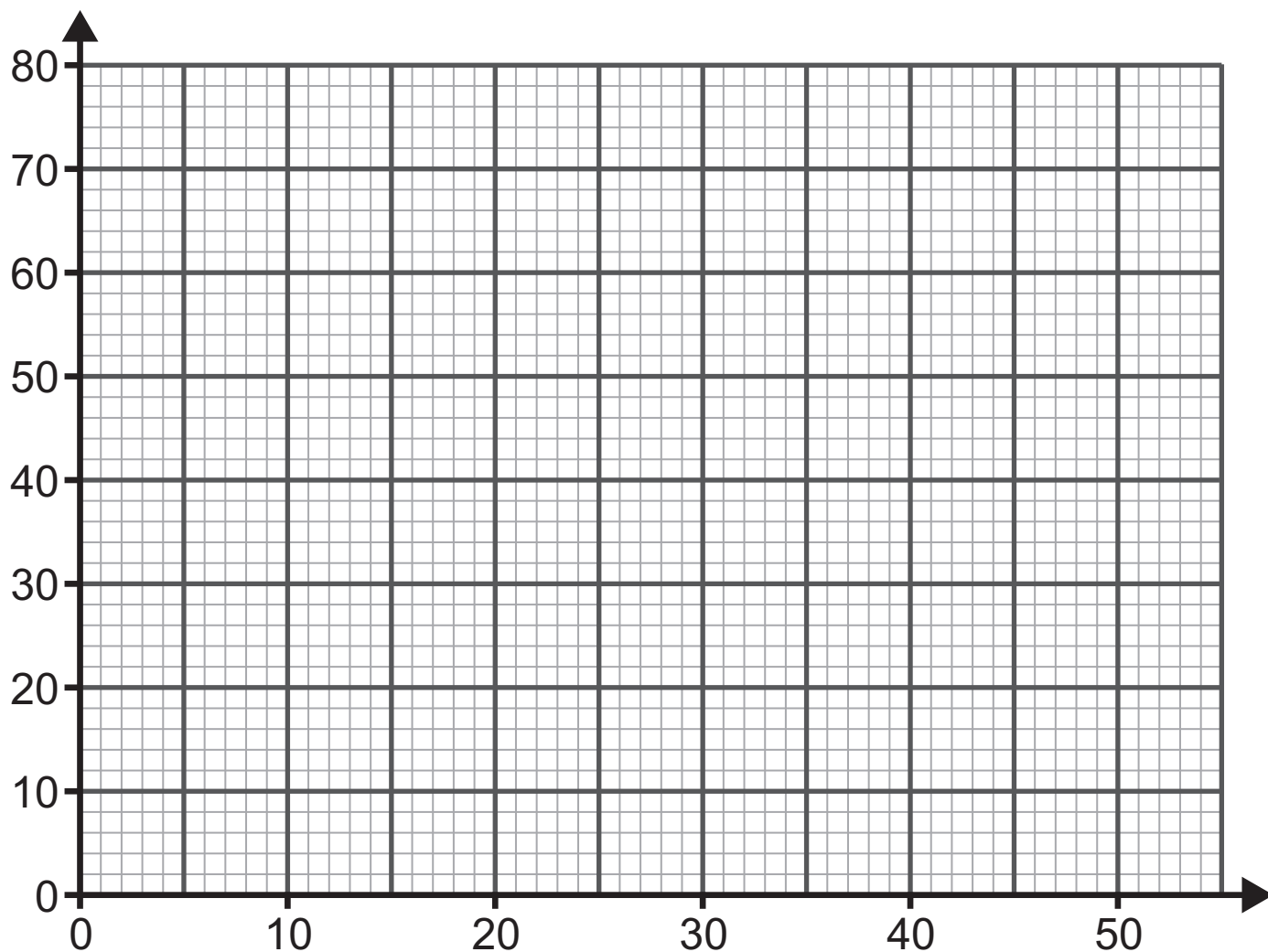
Draw the best fit straight line through the points.

[5 marks]

(iii) Using your line of best fit through the points, determine the mass of the measuring cylinder.

[2 marks]

Mass of measuring cylinder = _____ g

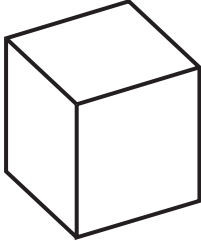


(iv) Using your answer to part **(iii)** and values from the table, calculate the density of the liquid. [4 marks]
Show clearly how you get your answer.

Density of liquid = _____ g/cm³

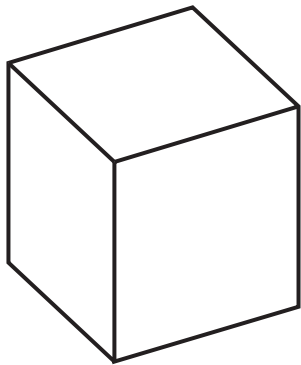
(c) In another experiment the mass and volume of three different sized lead blocks is found. The values are shown in the diagram below.

lead block 1



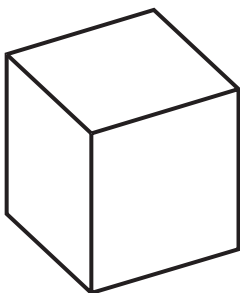
Mass 228g
Volume 20cm³

lead block 2



Mass 570g
Volume 50cm³

lead block 3



Mass 342g
Volume = ?cm³

- (i) The lead blocks are regular cuboids as shown opposite.
State how their volume is calculated. [1 mark]
-

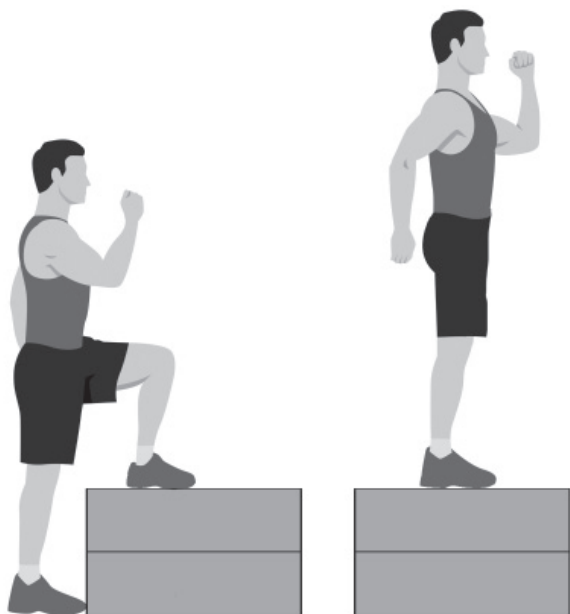
- (ii) Calculate the density of lead using the information shown for block 2 in the diagram opposite.
[2 marks]
Show clearly how you get your answer, starting with the equation you plan to use.

Density = _____ g/cm³

- (iii) Using your answer to part (ii), calculate the volume of block 3. [3 marks]
Show clearly how you get your answer, starting with the equation you plan to use.

Volume of block 3 = _____ cm³

- 2 A student is planning to carry out an experiment to determine his personal power.
His plan is to perform a number of step-ups to a platform.

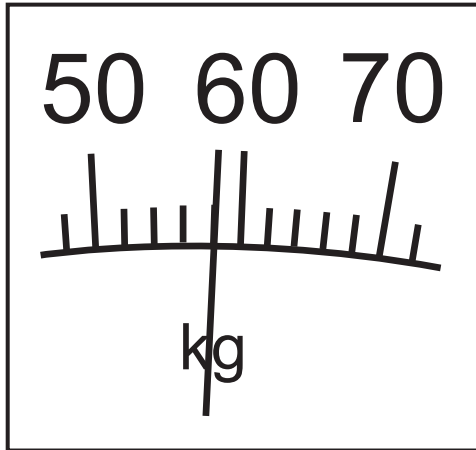


- (a) Name the piece of apparatus required to measure
[2 marks]

the height of the platform _____

his body mass _____

(b) The diagram below shows the student's mass in kg.



- (i) Using the information shown in the image above, calculate the **weight** of the student. [4 marks]
Remember to give the unit for weight in your answer.

Weight = _____

Unit of weight = _____

- (ii) The platform consists of two blocks each **125 mm** high, one placed on top of the other.
Calculate the height of the platform. Give your answer in metres. [2 marks]

Height = _____

(iii) Using the equation below and your answer to parts (i) and (ii), calculate how much work the student does doing **one** step-up. [2 marks]

$$\text{Work} = \text{Force} \times \text{Distance}$$

Work done doing **one** step up = _____ J

(iv) The student does 50 step-ups.
Calculate the total work done. [2 marks]

Total work done = _____ J

(v) He does the 50 step-ups in 25 seconds.
Calculate the student's personal power, using the equation below. [3 marks]
Include the unit for power with your answer.

$$\text{Power} = \frac{\text{work done}}{\text{time taken}}$$

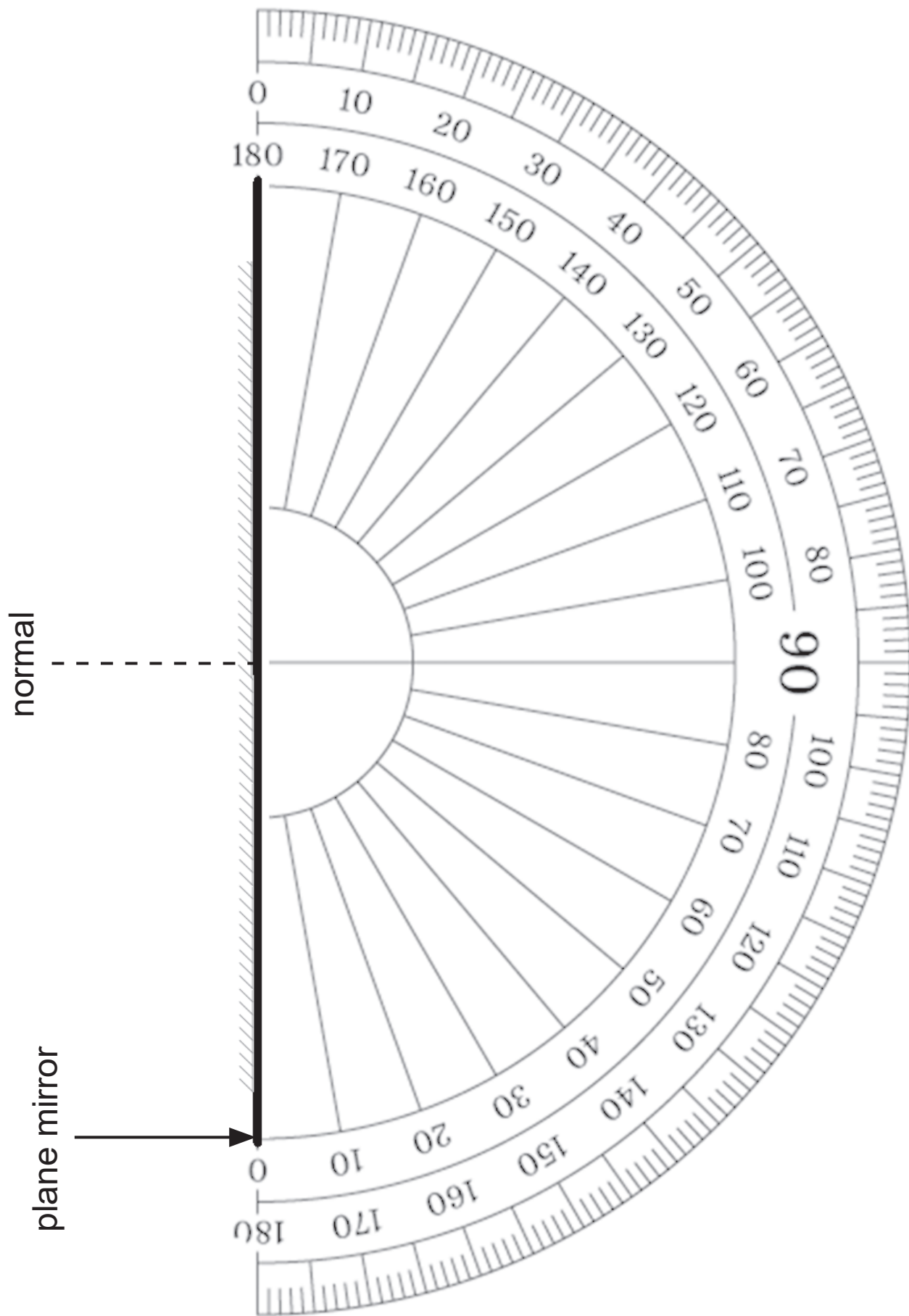
Personal power = _____

Unit of power = _____

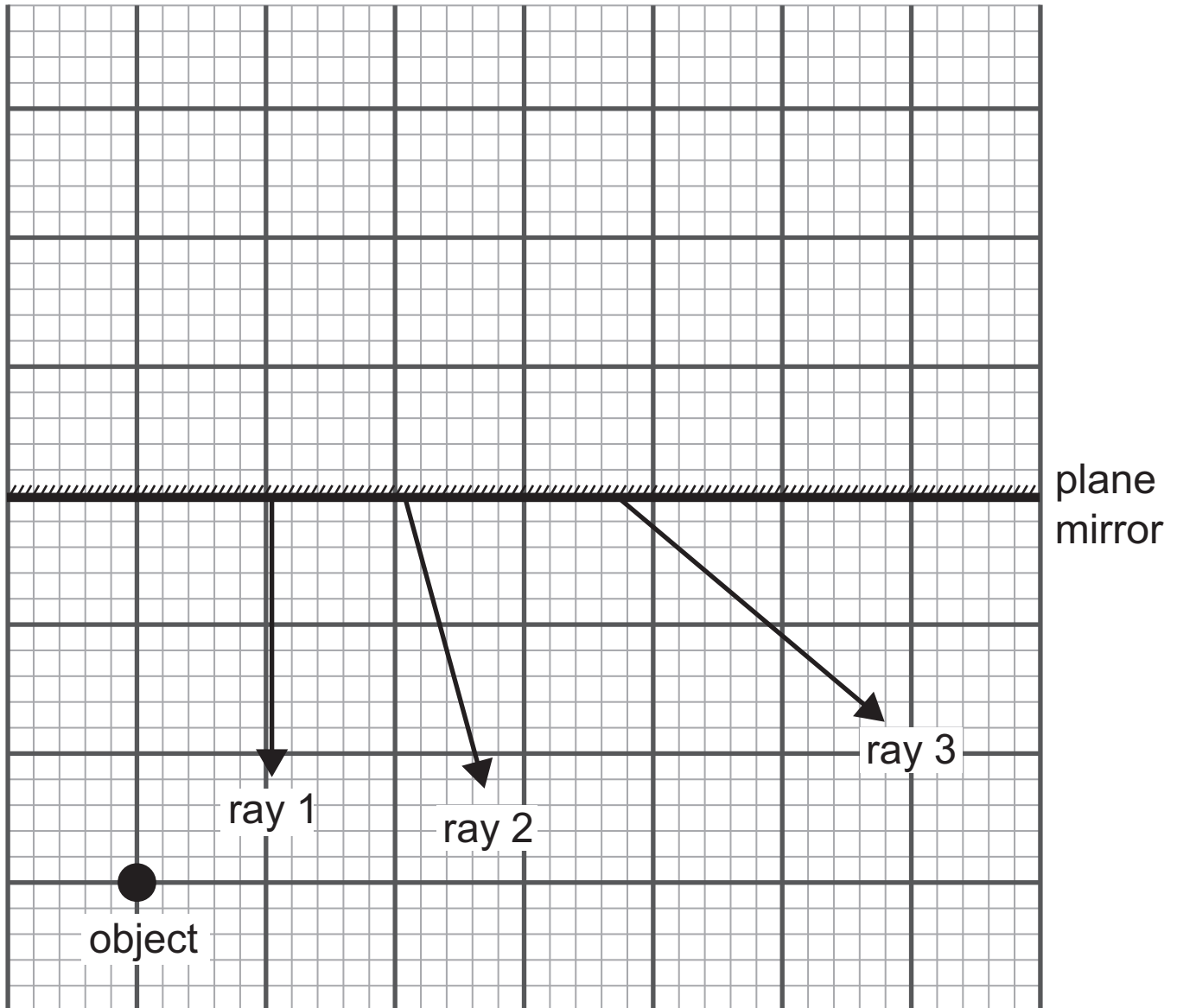
(c) How could the result be made **more** reliable? [1 mark]

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(Questions continue overleaf)

- 3 (a) (i)** The diagram opposite shows a plane mirror. Using the protractor on the diagram, draw a ray of light with an angle of incidence of 30° . Place an arrow on your ray to show its direction. [2 marks]
- (ii)** Using the protractor opposite, carefully draw on the diagram the ray reflected from the plane mirror. Place an arrow on your ray to show its direction. [2 marks]
- (b) (i)** A person looking into a plane mirror sees their image. The image is described as virtual. Explain what this means. [1 mark]



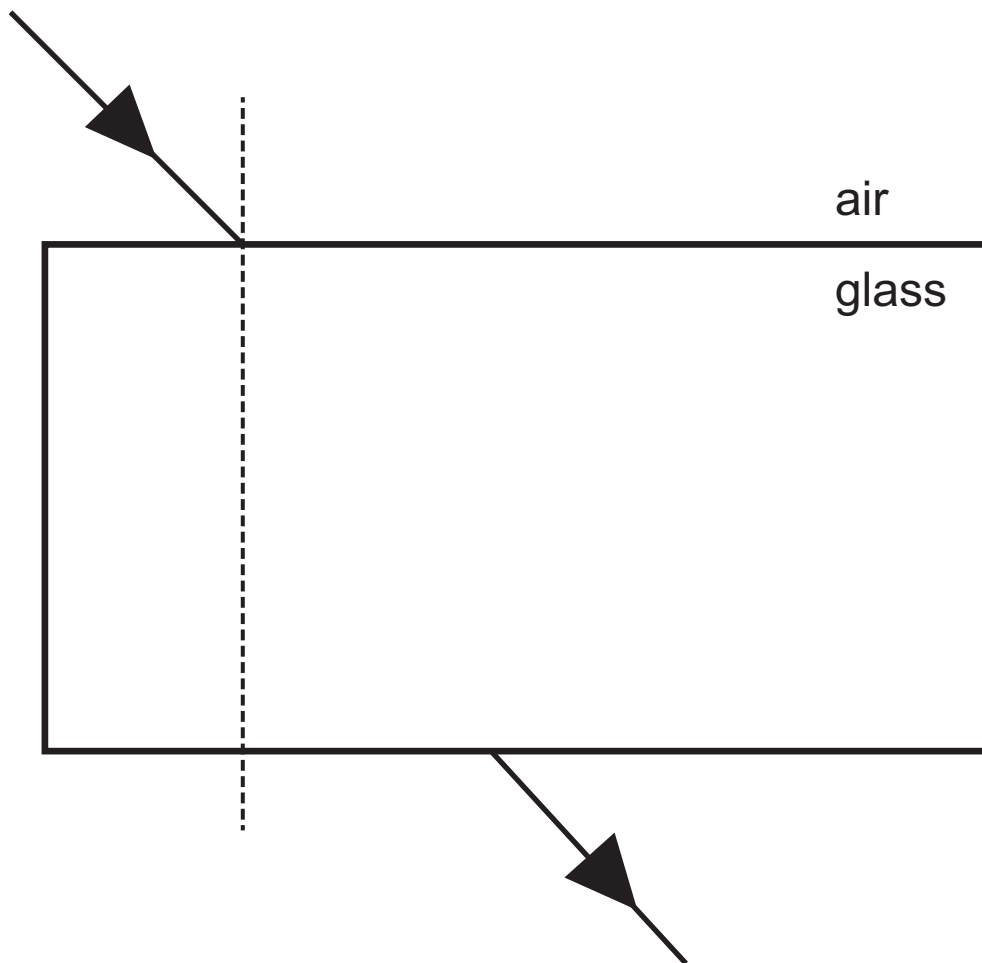
- (ii) The diagram below shows an object in front of a plane mirror.
On the diagram mark with a cross (x) the position of the virtual image of the object. [2 marks]



- (iii) The diagram also shows three rays of light.
Using your answer to part (ii), decide which ray is the one correctly reflected by the plane mirror.
[2 marks]
Show clearly on the diagram how you obtained your answer.

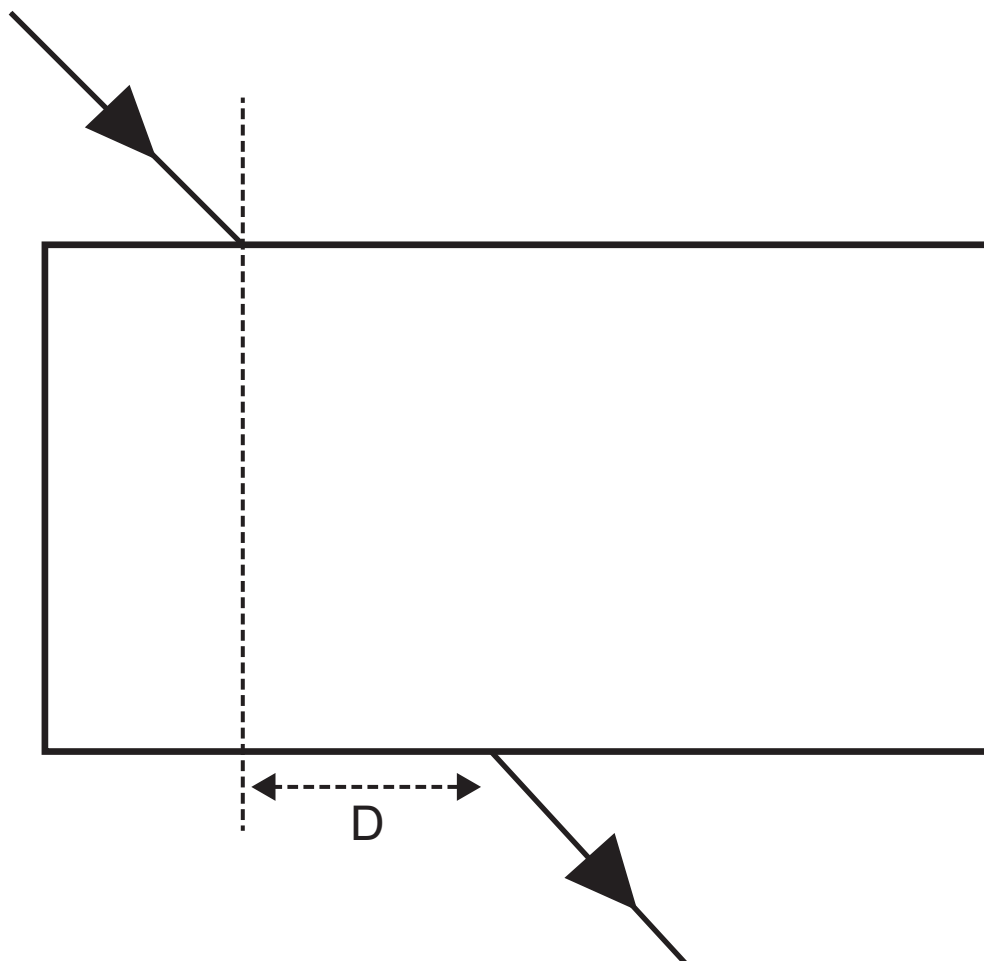
Ray _____

(c) The diagram below shows a ray of light as it passes from air into a rectangular glass block and out into air again.



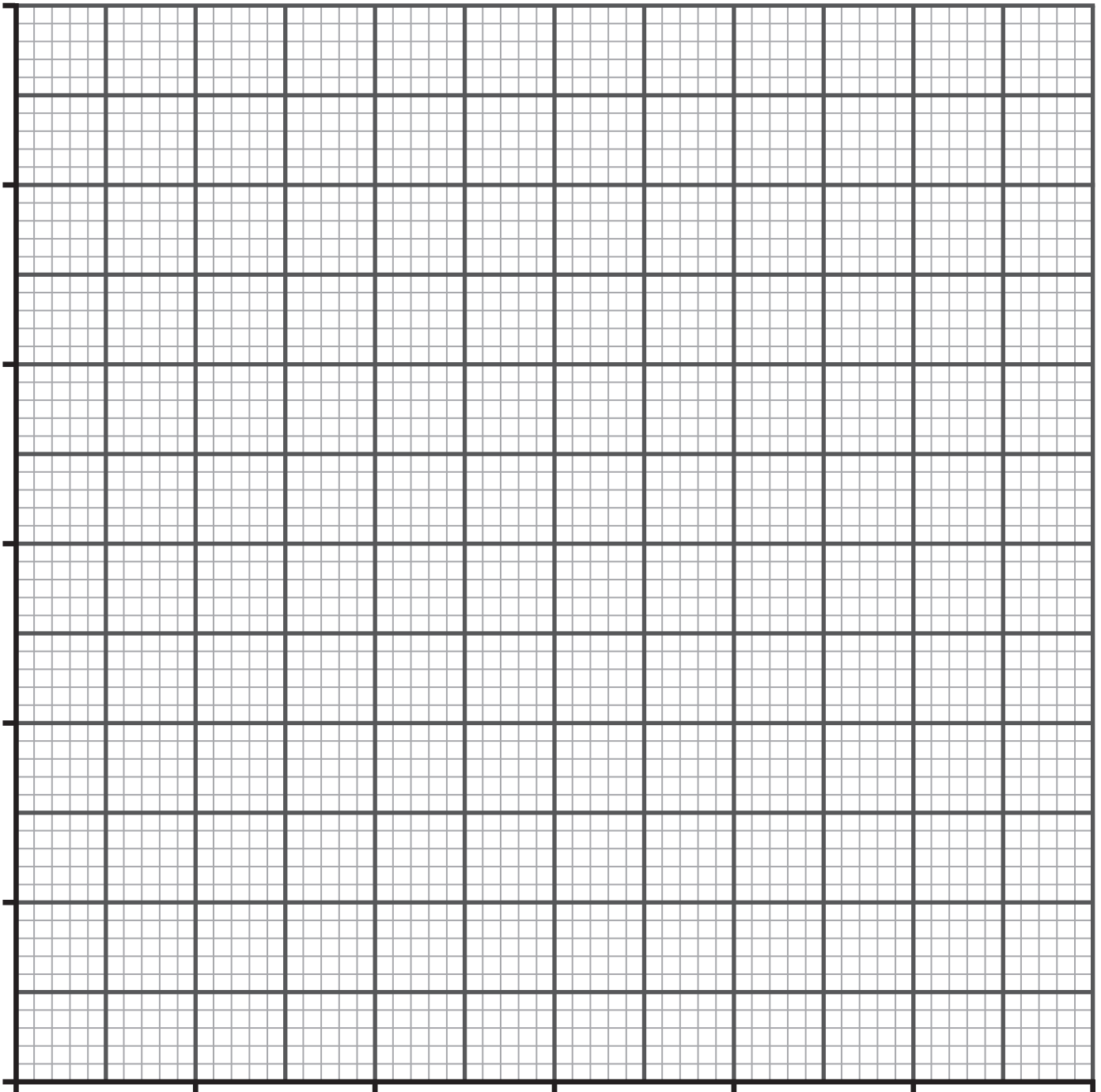
- (i) On the diagram, complete the path of the refracted ray through the glass block. [1 mark]
- (ii) On the diagram, mark with an i the angle of incidence and with an r the angle of refraction as the light enters the glass block. [2 mark]

A student investigates how the distance D depends on the angle of incidence. The results are shown in the table below.



Angle of incidence/ $^{\circ}$	Distance D /cm
0	0
10	1.0
20	2.5
30	3.5
40	5.0
50	6.0

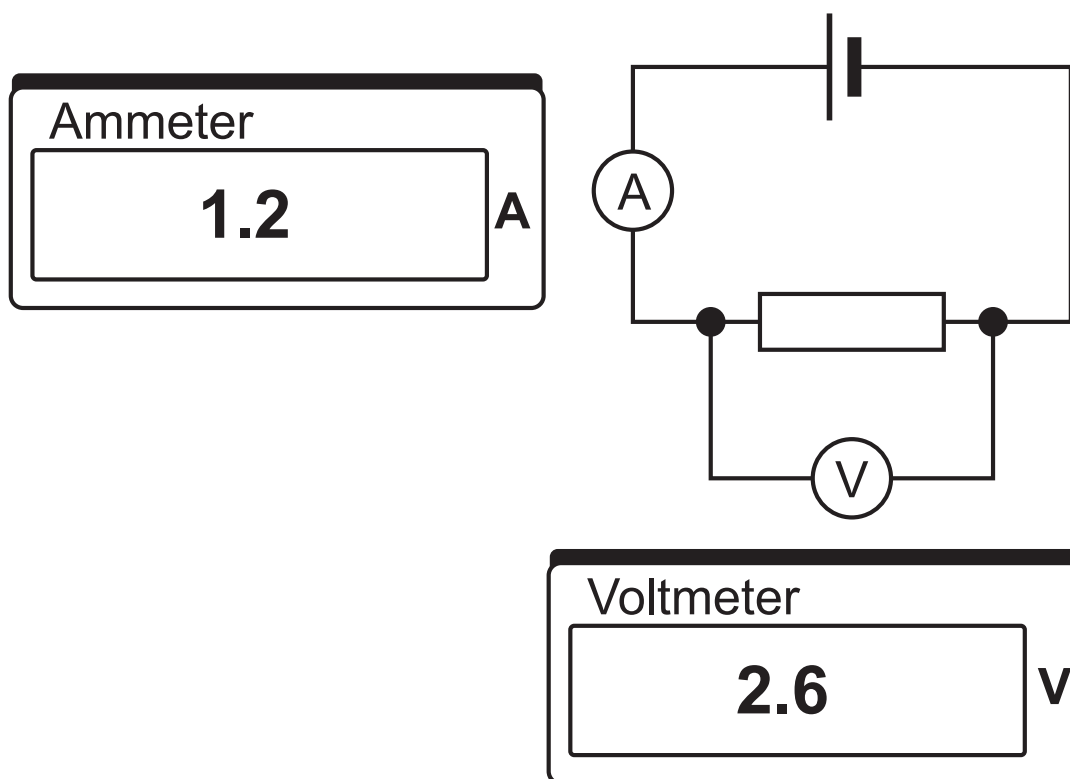
(iii) On the grid below, plot a graph to show how the distance D depends on the angle of incidence. Use the x -axis for the angle of incidence and the y -axis for the distance D . Label each axis with the quantity and its unit. Mark your points clearly using \times or \odot . Draw the best fit straight line through the points. [5 marks]



(iv) Is the distance D proportional to the angle of incidence?

Explain your answer. [2 marks]

- 4 (a) The circuit shown below was built to find the value of the resistance of a resistor. Readings on the ammeter and voltmeter are shown below.

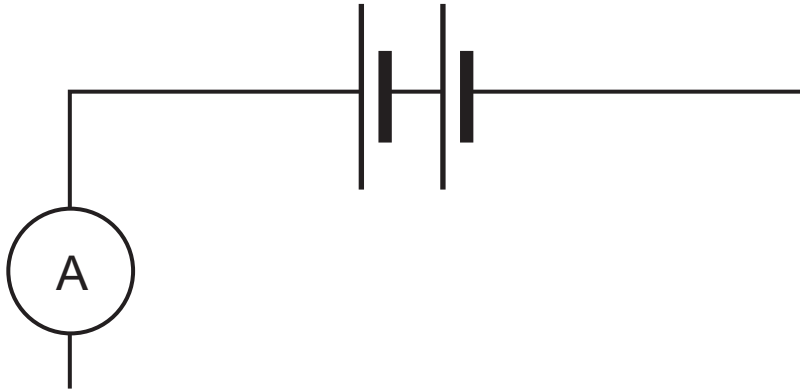


Using these readings, calculate the value of the resistance of the resistor. [3 marks]

Show clearly how you get your answer, starting with the equation you plan to use.

Resistance = _____ Ω

- (b) (i) Complete the circuit diagram below, using the correct symbols, to show **two bulbs** connected in series. [2 marks]



The current was recorded as more bulbs were added in series up to 5 bulbs.

The measurements are shown on the graph opposite.

- (ii) Label each axis with the quantity and unit if appropriate. [2 marks]

- (iii) The current is **not proportional** to the number of bulbs connected in series.

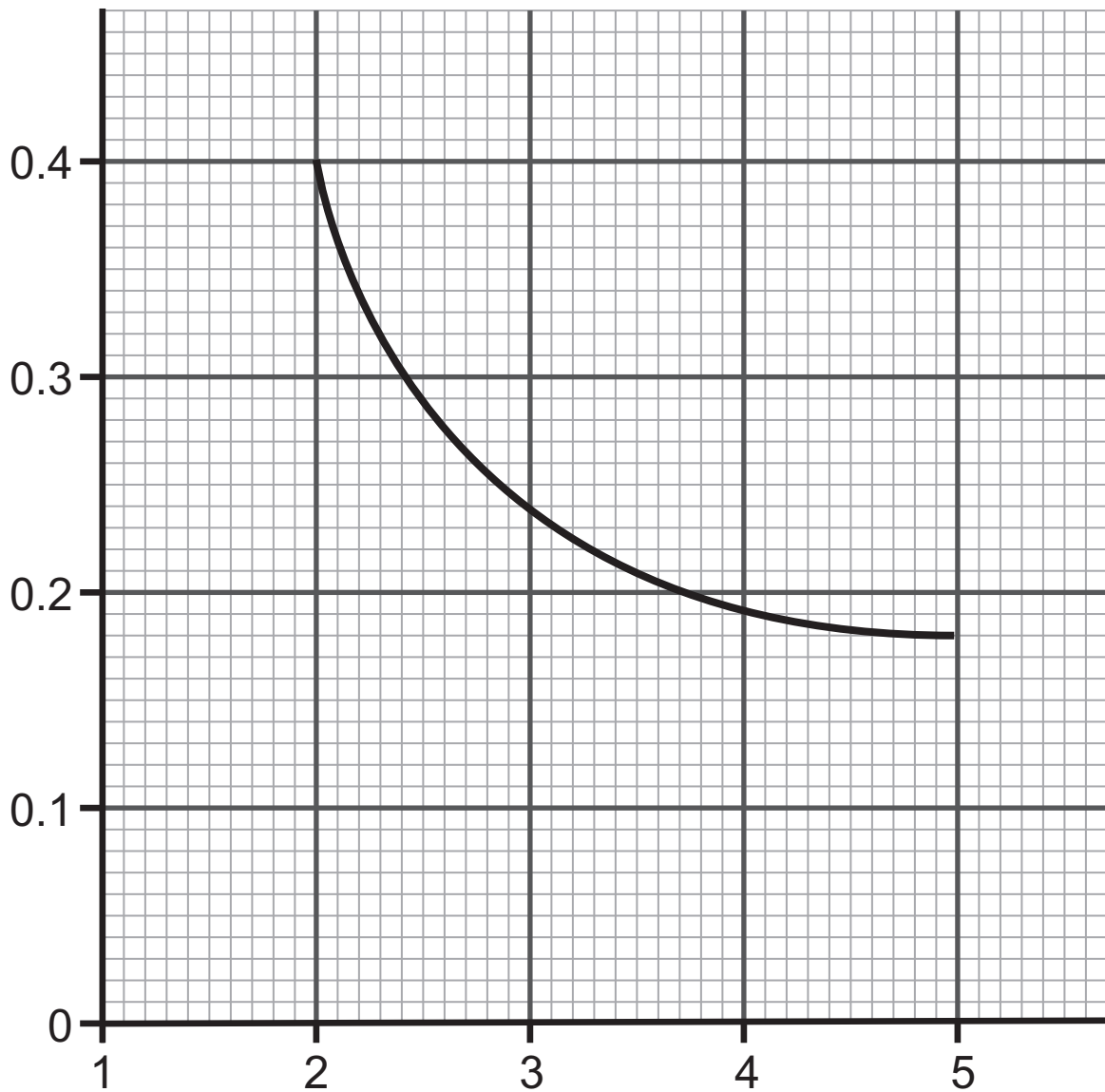
Explain why the graph supports this statement.

[1 mark]

- (iv) Using the graph, find the current in the circuit when **4 bulbs** are connected in series. [1 mark]

Give your answer to **one decimal place**.

Current = _____ A



- (v) The voltage across these 4 bulbs is 3.2V.
 Calculate the resistance of 4 bulbs in series.
 [2 marks]

Resistance of 4 bulbs = _____ Ω

(vi) Using your answer to part (v), calculate the resistance of one of these bulbs. [2 marks]

Resistance of one bulb = _____ Ω

This is the end of the question paper

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Question Number	Marks
1	
2	
3	
4	
Total Marks	

Examiner Number

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