



3310U60-1

WEDNESDAY, 7 JUNE 2023 – MORNING

MATHEMATICS – NUMERACY

UNIT 2: CALCULATOR – ALLOWED

HIGHER TIER

1 hour 45 minutes plus your additional time allowance

**A CALCULATOR WILL BE REQUIRED
FOR THIS PAPER**

Surname: _____

First name(s): _____

Centre Number: _____

Candidate Number: **0** _____

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	7	
2.	7	
3.	4	
4.	13	
5.	7	
6.	4	
7.	6	
8.	6	
9.	6	
10.	20	
Total	80	

(Turn over)

ADDITIONAL MATERIALS

A ruler, a protractor and a pair of compasses may be required.

ITEMS INCLUDED WITH QUESTION PAPER

A separate Formula Booklet.

A separate Diagram Booklet.

Models for Question 5, Question 10 (b) and Question 10 (b) (ii).

The Diagram Booklet MUST be handed in to the invigilators and sent for marking.

INSTRUCTIONS TO CANDIDATES

Use black ink, black ball – point pen, black felt tip or your usual method.

Write your name, centre number and candidate number in the spaces on the front cover.

Answer ALL questions.

Write your answers in the spaces provided.

If you run out of space, use the additional page(s) at the back of the booklet.

Question numbers must be given for the work written on the additional page(s).

Take π as **3.14** or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part – question.

In question 1, the assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing.

- 1. IN THIS QUESTION, YOU WILL BE ASSESSED ON THE QUALITY OF YOUR ORGANISATION, COMMUNICATION AND ACCURACY IN WRITING.**

Southend Pier is the longest pleasure pier in the world.

It is 1.34 miles long.

Gareth walks at a steady pace along Southend Pier.

He walks 84 metres every minute.

He starts walking along the length of the pier at 2 p.m.

At what time does Gareth reach the end of the pier?

Give your time correct to the nearest minute.

You must show all your working.

[5 marks + 2 marks OCW]

(Turn over)

- 2. Look at the table for Question 2
in the separate Diagram Booklet.**

**The table gives the heights of the 27
musicians in the Camwen Youth Orchestra.**

- (a) (i) In which group does the median
height of a musician lie?
You must give a reason for your
answer.**

Group: _____

Reason: _____

[2 marks]

continued on the next page . . .

(Turn over)

Question 2 (a) continued

2. (a) (ii) Is it certain that there is at least one musician in the orchestra who is less than **154 cm** tall?

Give a reason for your answer.

Yes

☐

No

☐

[1 mark]

continued on the next page . . .

(Turn over)

Question 2 continued

- 2. (b) Calculate an estimate of the mean height of a musician in the Camwen Youth Orchestra.**

[4 marks]

(Turn over)

3. Layla has been set a target by her fitness trainer.

Every day, Layla has to increase the number of steps she does.

Today, Layla did **1800** steps.

**Layla's target for the number
of steps per day:**

**Increase by 2% every day for
the next 28 days**

Calculate the number of steps Layla's trainer is expecting her to do on the last of these **28** days.

11

[4 marks]

(Turn over)

4. Paper comes in standard sizes.

**Look at the table for Question 4
in the separate Diagram Booklet.**

**(a) Which paper size has an area of
approximately 500 000 mm² ?**

Circle your answer.

A0	A1	A2	A3	A4
-----------	-----------	-----------	-----------	-----------

[1 mark]

continued on the next page . . .

(Turn over)

Question 4 continued

4. (b) The mass of paper is measured in grams.
The quality of paper is given by its mass
per square metre of paper.

The quality of a sheet of **A2** paper used
for printing is stated as **120 g/m²**

Complete the following statement.

**‘This sheet of A2 paper has a
mass of _____ g.’**

[4 marks]

continued on the next page . . .

(Turn over)

Question 4 continued

4. (c) Look at the diagram for Question 4 (c) in the separate Diagram Booklet.
The diagram is NOT drawn to scale.

Sheets of A4 and A5 paper are mathematically similar.

Calculate the length of the DIAGONAL of a sheet of A5 paper.

You must show all your working.

[5 marks]

continued on the next page . . .

(Turn over)

Question 4 continued

4. (d) The measurements for the **A1** sheet of paper in the table are correct to the nearest **mm**.

Calculate the greatest possible perimeter of an **A1** sheet of paper.

[3 marks]

(Turn over)

- 5. Look at the table for Question 5 in the separate Diagram Booklet.**

The cost of sending a package depends on its volume. This is shown in the table.

Ask for the model for Question 5.

The model is NOT made to scale.

The model represents a package.

Look at the diagram for Question 5 in the separate Diagram Booklet.

The diagram is NOT drawn to scale.

The diagram shows the front face of the package.

A rectangular 'HANDLE WITH CARE' label is stuck on this package.

The label measures 17.5 cm by 11.1 cm.

The package is a cuboid with height 19 cm and width 6.7 cm.

Each vertex of the label touches an edge of the front face of the package.

continued on the next page . . .

(Turn over)

Question 5 continued

Calculate the volume of the package and hence find the cost of sending this package. You must show all your working.

[illegible]

(Turn over)

The volume of the package is _____

The cost of sending this package is

[7 marks]

(Turn over)

6. Delta Metals makes aluminium chimneys in the shape of open cylinders.

Each chimney has a height of **2.5 m**.

The external diameter of each chimney is **0.18 m**.

Calculate the external curved surface area of one of these chimneys.

Give your answer correct to **3** significant figures.

[4 marks]

(Turn over)

- 7. Look at the table for Question 7 in the separate Diagram Booklet.**

The frequency table shows the monthly rainfall in Porthislwyn for the 5 – year period from January 2010 to December 2014.

- (a) Complete the table and the histogram provided for Question 7 in the separate Diagram Booklet to illustrate this data.**

[3 marks]

- (b) A wet month is classified as one where the monthly rainfall is greater than 60 mm.**

Calculate an estimate for the percentage of wet months in Porthislwyn in this 5 – year period.

You must show all your working.

(Turn over)

[3 marks]

8. Look at Diagram 1 and Diagram 2 for Question 8 in the separate Diagram Booklet. The diagrams are NOT drawn to scale.

Central Pivot Irrigation is a method of watering crops.

Diagram 1 is a side view.

Diagram 2 is a plan view.

The diagrams represent the sprinkler arm supported by four wheeled towers, labelled 1, 2, 3 and 4.

Tower number 4 is the outer tower.

The sprinkler arm rotates around a central pivot.

For each complete rotation, the watered region forms a circle as shown in the diagram.

A typical Central Pivot Irrigation system waters a circular region of radius 400 m.

The sprinkler arm rotates through an angle of 30° per hour.

continued on the next page . . .

(Turn over)

Question 8 continued

- 8. (a) Calculate the area of the region that is watered in one hour.**

[2 marks]

continued on the next page . . .

(Turn over)

Question 8 continued

- 8. (b) The outer tower is 400 m from the pivot.
During one watering session, the outer
tower moves 1067.6 m.
Calculate the angle the sprinkler arm
has turned through.**

[3 marks]

continued on the next page . . .

(Turn over)

Question 8 continued

- 8. (c) The part of the sprinkler arm furthest away from the pivot delivers water at a faster rate than the part of the sprinkler arm closest to the pivot.**

Give one reason why the system has been designed in this way.

[1 mark]

(Turn over)

9. (a) On 1st April 2023, Caitlin invested **£10 000** into a savings account.

The account had a nominal annual interest rate of **3%**, with interest paid on the last day of every month.

Caitlin did not plan to make any further payments into the account or make any withdrawals.

Calculate the date when Caitlin will first have over **£10 500** in her account.

Date when Caitlin will first have over £10 500

in her account is _____

[4 marks]

continued on the next page . . .

(Turn over)

Question 9 continued

- 9. (b) Calculate the AER for Caitlin's savings account.**

**Give your answer as a percentage,
correct to 2 decimal places.**

[2 marks]

(Turn over)

10. (a) Look at the diagram for Question 10 (a) in the separate Diagram Booklet.

The diagram is NOT drawn to scale.

The diagram shows triangle ***ABC***.

Evan's room, in the roof space of his house, has a uniform triangular cross – section.

The uniform cross – section is shown as triangle ***ABC***.

In the diagram,

$$CB = 6.2 \text{ m}$$

$$\text{Angle } ACB = 35^\circ$$

$$\text{Angle } ABC = 50^\circ$$

The room is 8 m long.

Calculate the volume of the room.

continued on the next page . . .

(Turn over)

Question 10 continued

10. (b) Ask for the model for Question 10 (b).

The model is NOT made to scale.

Evan decides to add a symmetrical roof structure to bring light into the room.

The model represents a simple design for this roof structure.

On the model,

$$AB = 3 \text{ m},$$

$$DC = EF = 2 \text{ m and}$$

$$ED = FC = 2.4 \text{ m.}$$

Look at the diagram for Question 10 (b) in the separate Diagram Booklet.

The diagram is NOT drawn to scale.

The diagram shows the front view of the roof structure.

The width of the structure is 2.4 m
and the vertical height from ED to A
is 0.7 m.

continued on the next page . . .

(Turn over)

Question 10 (b) continued

- 10. (b) (i) Evan will need to put strips of lead from B to C and from B to F .**

This is to ensure rainwater does not enter the room.

Calculate the total length of lead that Evan will need.

[illegible]

(Turn over)

[5 marks]

continued on the next page . . .

(Turn over)

Question 10 (b) continued

**10. (b) (ii) Ask for the model for
Question 10 (b) (ii).**

The model is NOT made to scale.

**The model represents a half – round
clay tile.**

The roof of the structure is to be tiled.

**For the top edge, Evan has chosen
to use these half – round clay tiles.**

The thickness of the tile is 1.2 cm.

**Look at the diagram for
Question 10 (b) (ii) in the separate
Diagram Booklet.**

The diagram is NOT drawn to scale.

**The cross – section of a tile is shown
in the diagram.**

continued on the next page . . .

Question 10 (b) (ii) continued

The length of each tile is 30 cm.

**XY is a semi – circular arc of
radius 8 cm.**

**Each tile has a uniform thickness
of 1.2 cm.**

**The tile manufacturer covers
all 6 surfaces of each tile with a
protective glaze.**

**Calculate the total surface area
of ONE tile that is glazed.**

[5 marks]

continued on the next page . . .

(Turn over)

Question 10 continued

- 10. (c) Evan has bought roof tiles for the structure from Tuff Tiles.**

Tuff Tiles makes 2000 of these roof tiles every hour.

They randomly sample some of these 2000 tiles to check their quality.

Use the following list of random numbers to select the first 7 TILES for the sample.

You must start with the first number in the list, explaining clearly how you are using the numbers to select the sample.

3205	2002	1924	1521	2735	1205
0114	9533	9507	3969	4941	1521
8377	1098	3473	0769	1003	5421
5533	4788	1003	6432	5630	2483

The tiles selected will be

_____	_____	_____
_____	_____	_____

[3 marks]

END OF PAPER

TOTAL 80 MARKS

(Turn over)

Question number	Additional pages, if required. Write the question number(s) in the left - hand margin.

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GCSE

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MATHEMATICS – NUMERACY

UNIT 2: CALCULATOR – ALLOWED

HIGHER TIER

**The Diagram Booklet MUST be handed in
to the invigilators and sent for marking.**

Diagram Booklet

Surname: _____

First name(s): _____

Centre Number: _____

Candidate Number: 0 _____

Question 2

Table

Height, h cm	Frequency
$150 \leq h < 158$	3
$158 \leq h < 166$	10
$166 \leq h < 174$	9
$174 \leq h < 182$	4
$182 \leq h < 190$	0
$190 \leq h < 198$	1

Question 4

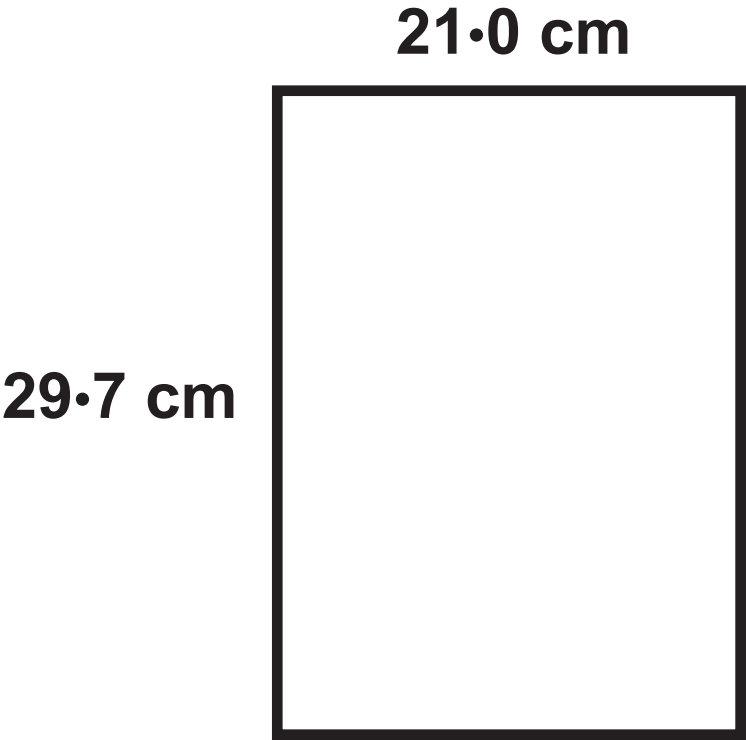
Table

Paper size		A0	A1	A2	A3	A4
Dimensions:	Length (cm)	118.9	84.1	59.4	42.0	29.7
	Width (cm)	84.1	59.4	42.0	29.7	21.0

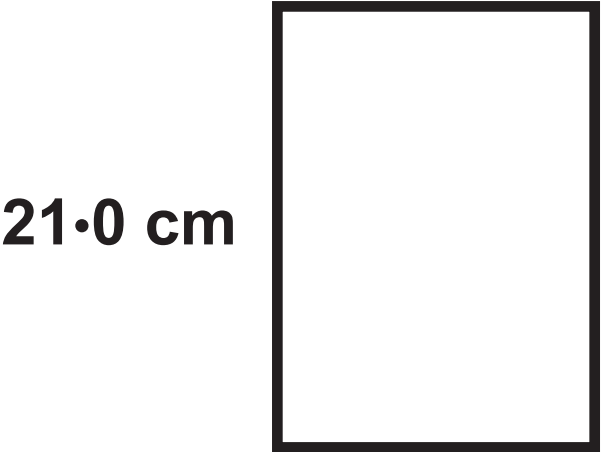
Question 4 (c)

Diagram NOT drawn to scale

A4 PAPER



A5 PAPER



Question 5

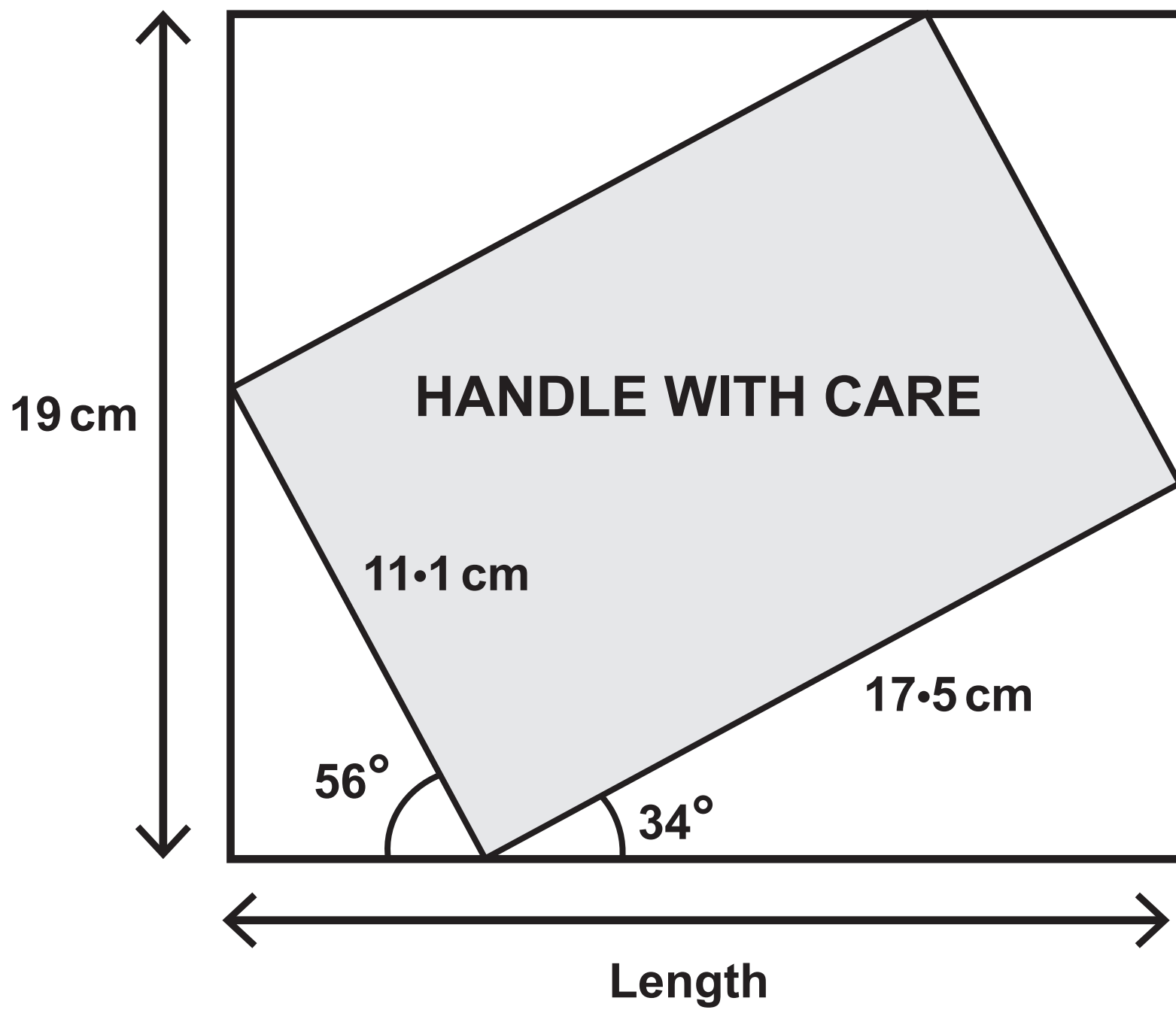
Table

VOLUME (cm ³)	COST
0 to 1000	£12.55
greater than 1000, up to 2000	£13.60
greater than 2000, up to 4000	£14.85
greater than 4000, up to 10 000	£16.25
Parcels with volume greater than 10 000 cm ³ are not accepted	

Question 5

Diagram NOT drawn to scale

Front face of the package

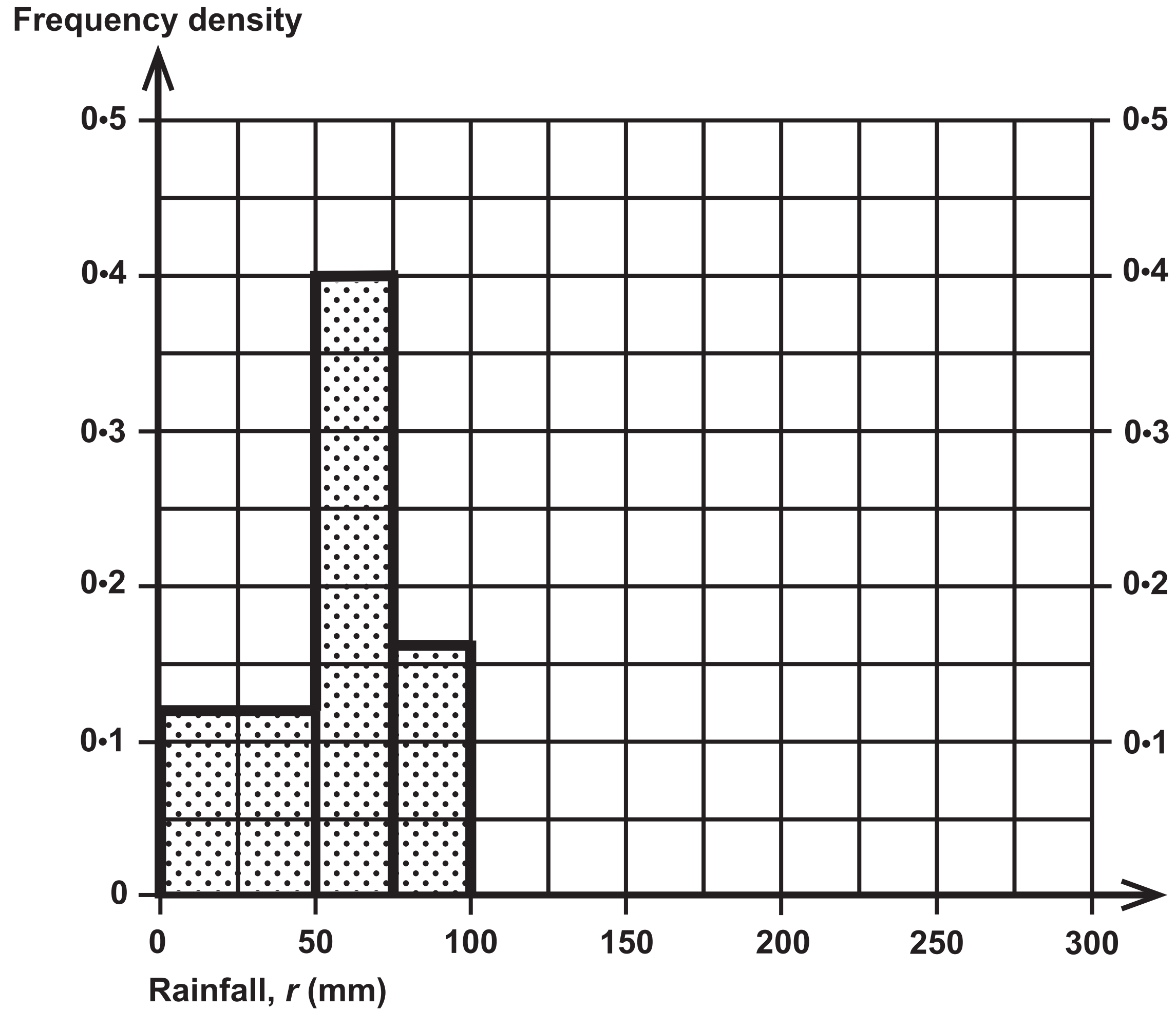


Question 7

Table

Rainfall, r (mm)	Number of months	Frequency density
$0 \leq r < 50$	6	0.12
$50 \leq r < 75$	10	0.4
$75 \leq r < 100$	4	0.16
$100 \leq r < 125$	5	
$125 \leq r < 150$	10	
$150 \leq r < 200$	15	
$200 \leq r < 300$	10	

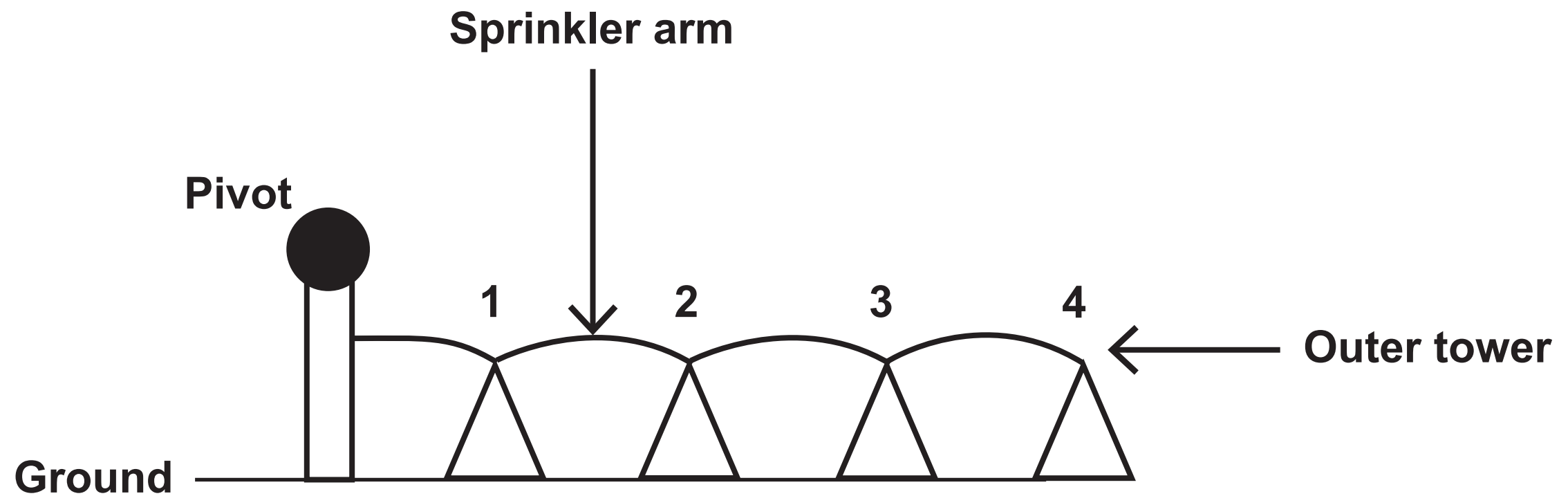
Question 7 (a)



Question 8

Diagram 1

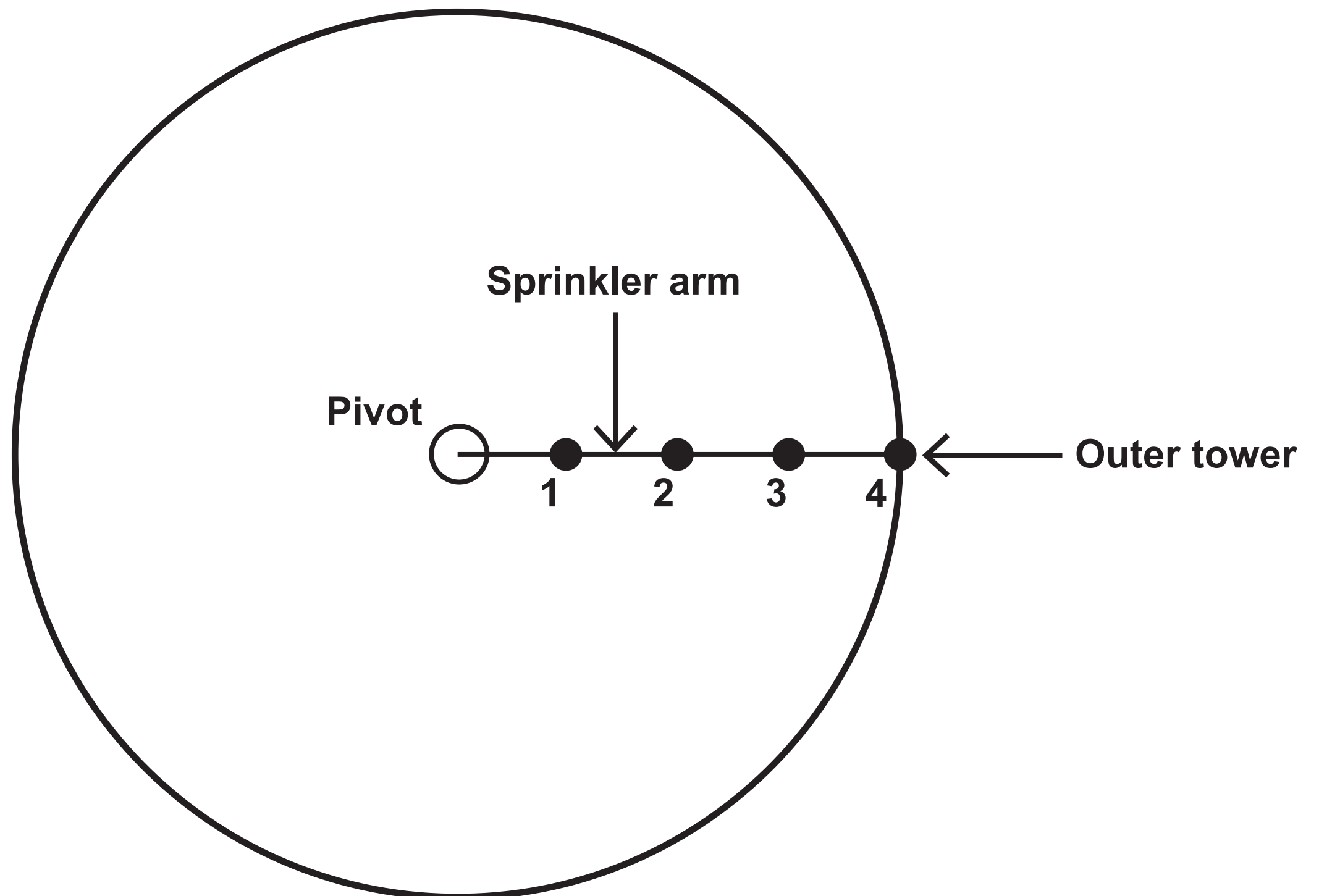
Diagram NOT drawn to scale



Question 8

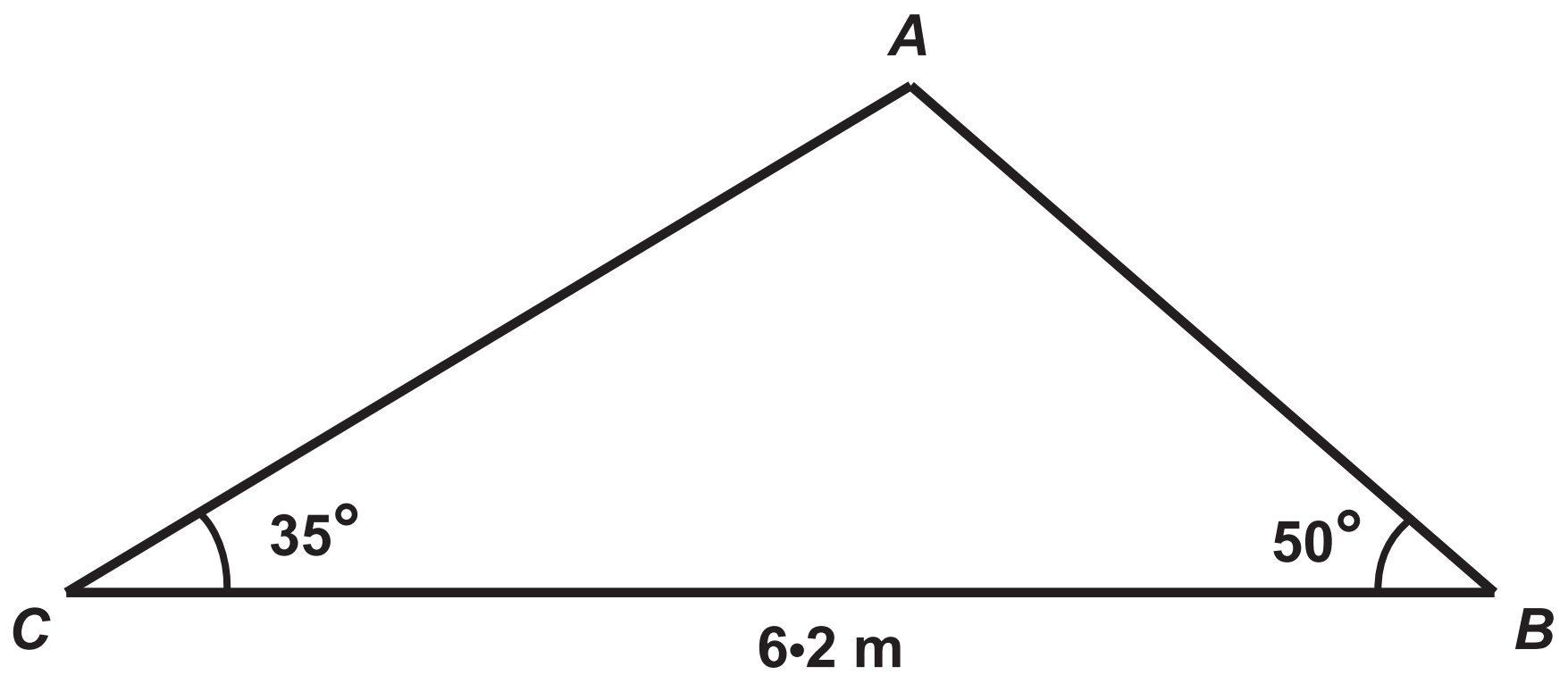
Diagram 2

Diagram NOT drawn to scale



Question 10 (a)

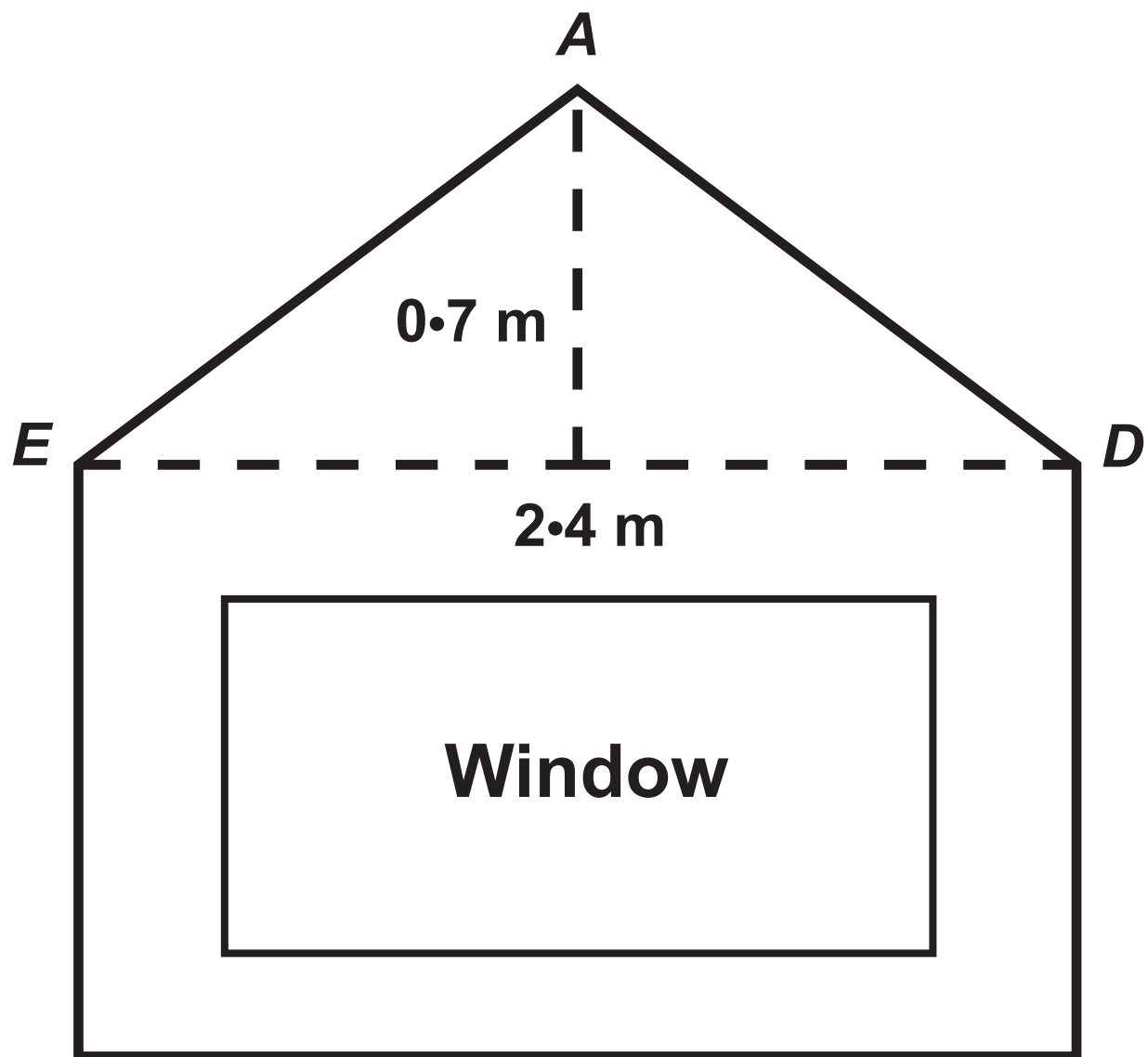
Diagram NOT drawn to scale



Question 10 (b)

Diagram NOT drawn to scale

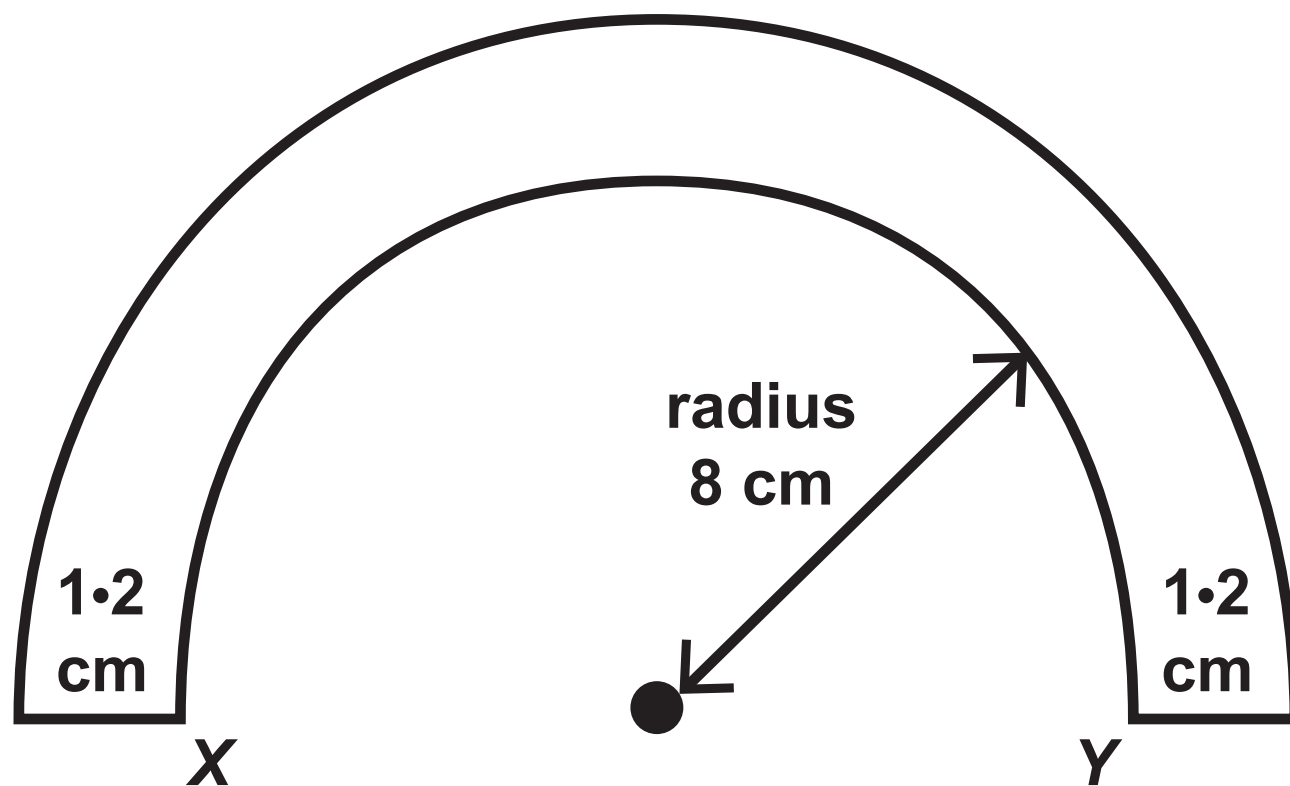
FRONT VIEW



Question 10 (b) (ii)

Diagram NOT drawn to scale

Cross – section of the tile



**GCSE
MATHEMATICS
and
NUMERACY**



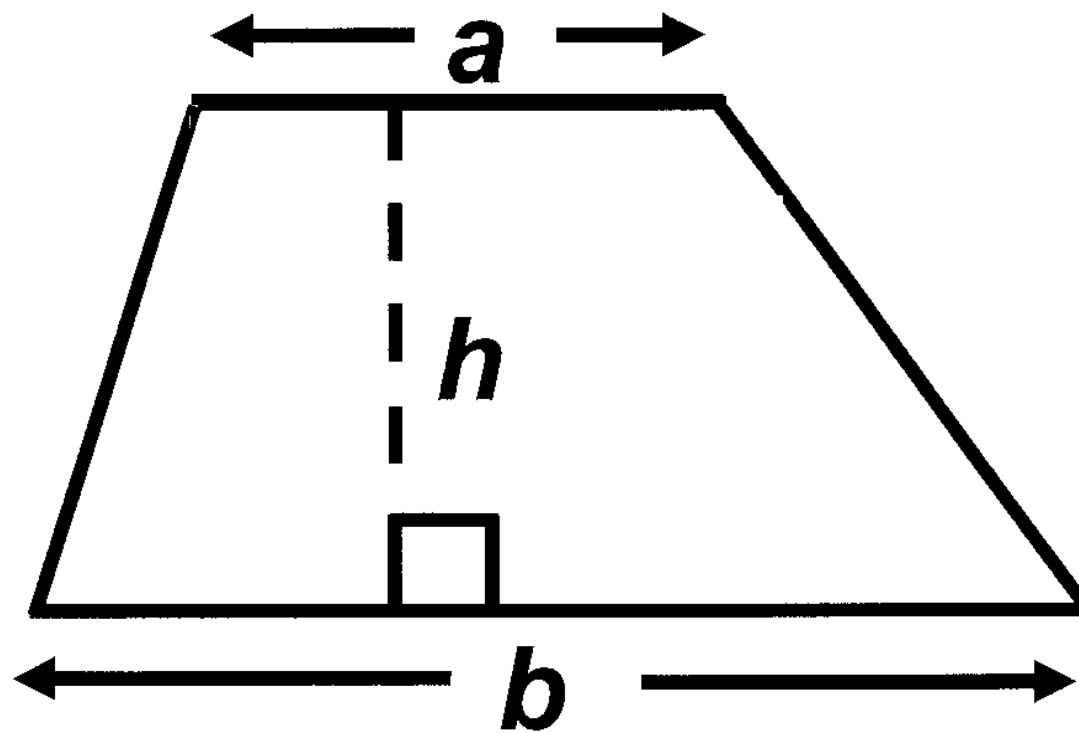
**FORMULA LIST
HIGHER TIER
GCSE**

You must not write on these formula pages.

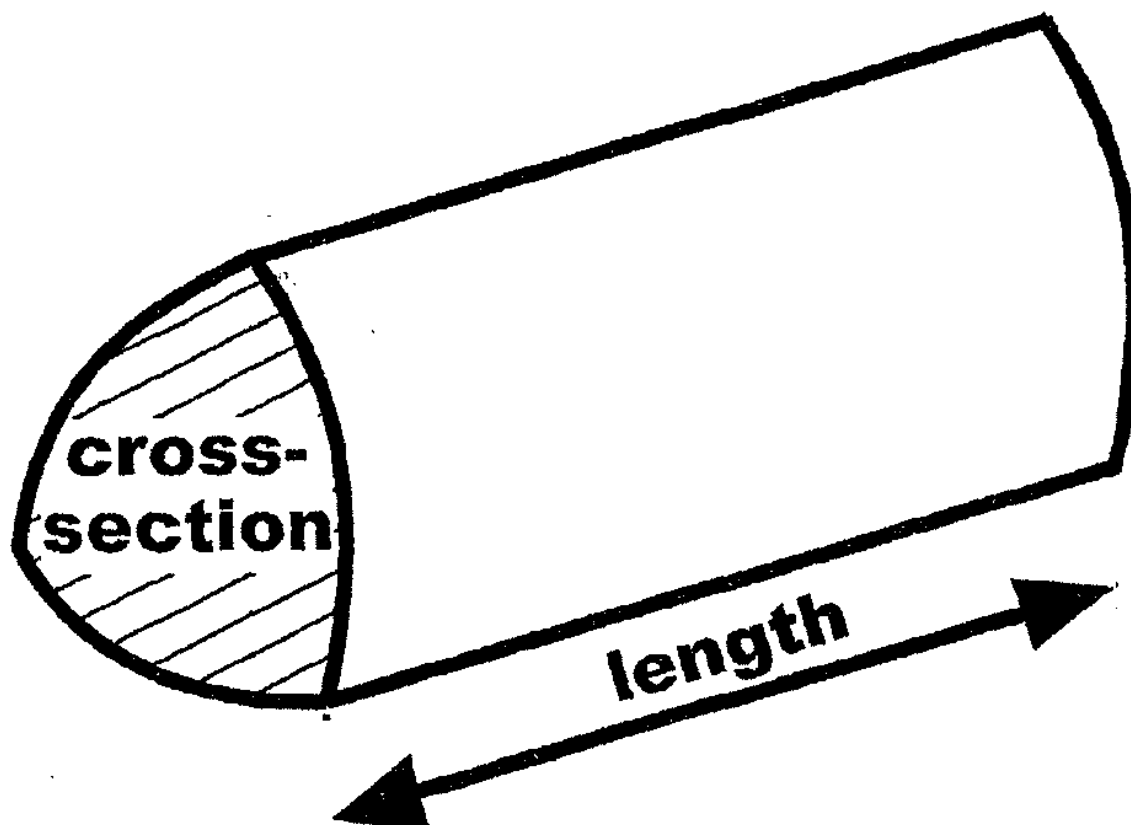
Anything you write on these formula pages will gain NO credit.

Formula List – Higher Tier

$$\text{Area of trapezium} = \frac{1}{2}(a + b)h$$

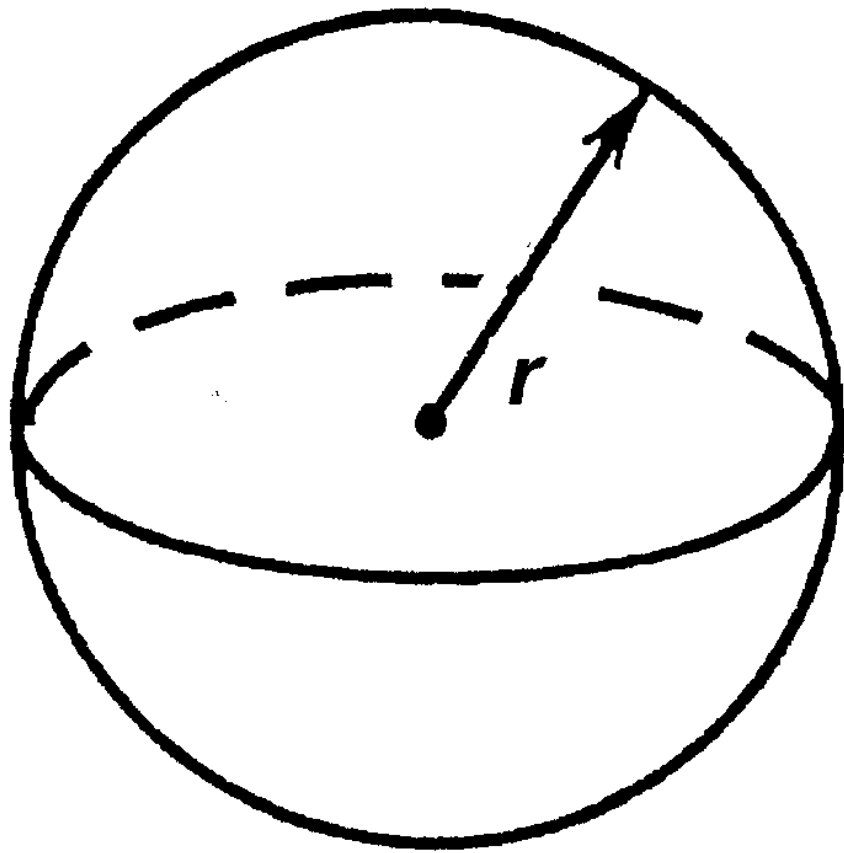


$$\text{Volume of prism} = \text{area of cross-section} \times \text{length}$$



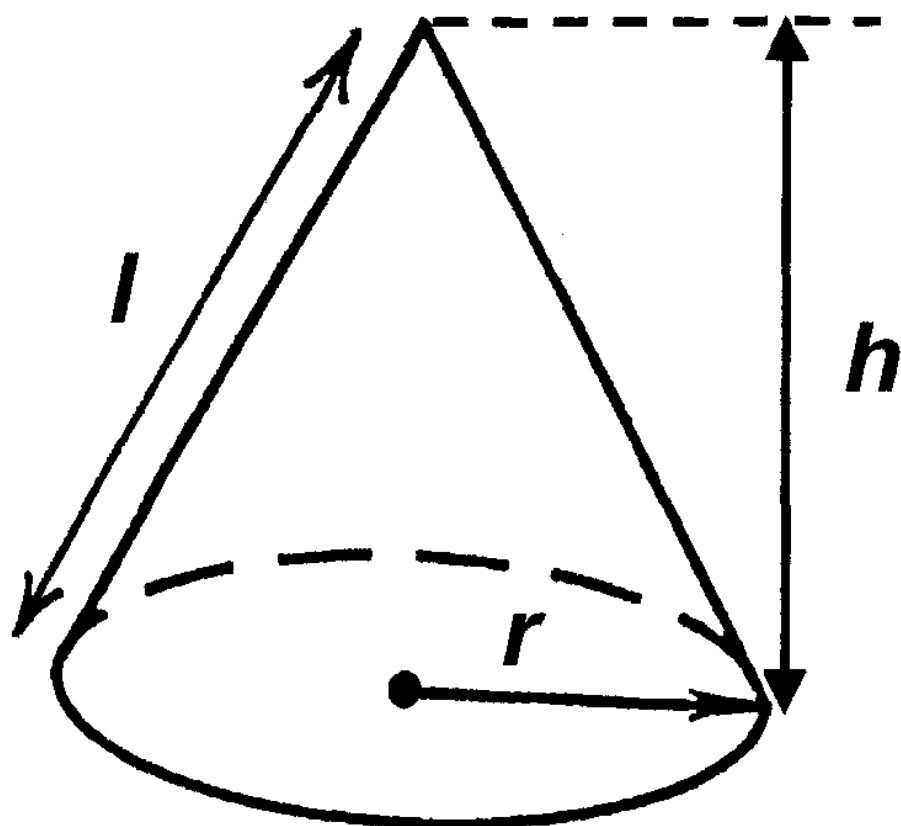
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$

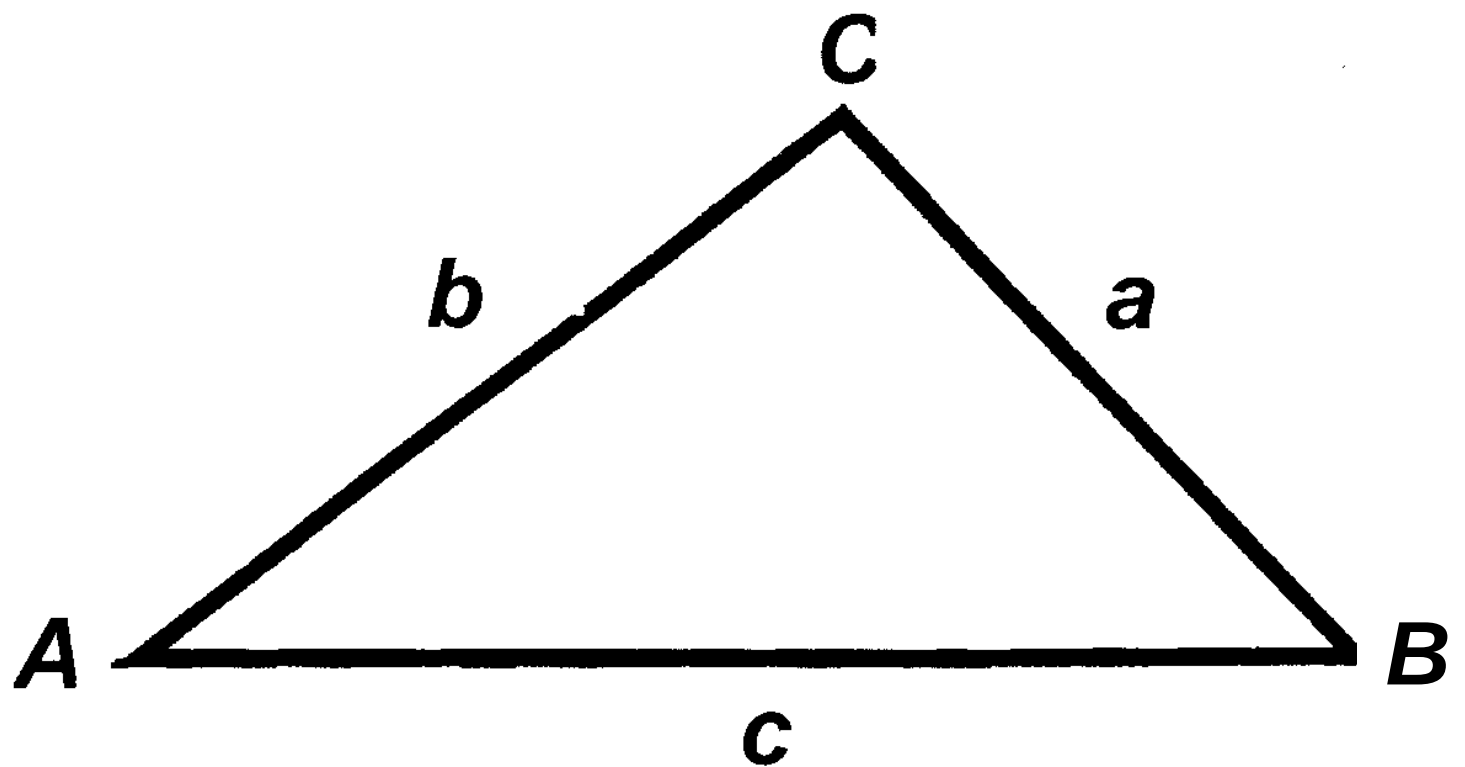


Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$



In any triangle ABC



Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle $= \frac{1}{2}ab \sin C$

The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Annual Equivalent Rate (AER)

AER, as a decimal, is calculated using

the formula $\left(1 + \frac{i}{n}\right)^n - 1$, where i is the nominal interest rate per annum as a

decimal and n is the number of

compounding periods per annum.