GCSE

3310U50-1

FRIDAY, 20 MAY 2022 – MORNING

MATHEMATICS – NUMERACY

UNIT 1: NON – CALCULATOR

HIGHER TIER

1 hour 35 minutes plus your additional time allowance

THE USE OF A CALCULATOR IS NOT PERMITTED IN THIS EXAMINATION

Surname: _____

First name(s): _____

Centre Number: _____

Candidate Number: 0 _____

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**6**	
2.	**5**	
3.	**6**	
4.	**6**	
5.	**10**	
6.	**2**	
7.	**6**	
8.	**9**	
9.	**7**	
10.	**13**	
Total	**70**	

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 7, Question 9 (a) and Question 9 (b).

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 $3 \cdot 14$

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

1. (a) People travel by bus or by train from Hiraddug Station.

On Tuesday, 420 people travelled by bus from the station.

The ratio of the number of people travelling by bus to the number of people travelling by train was 20 : 17

Calculate the number of people who travelled by train from the station on Tuesday.

[3 marks]

1. (b) The price of a ticket to travel by bus to Glaswen Station has increased by 5% in each of the last 2 years.
Two years ago, the price of a ticket was £4
Calculate the current price of a ticket.

[3 marks]

2. (a) Gwyn is making some packs.

Each pack contains one nut, one bolt and one washer.

To make up these packs, Gwyn buys:

- **some boxes that contain 30 nuts each**
- **some boxes that contain 5 bolts each**
- **some boxes that contain 25 washers each.**

Gwyn wants to buy the LEAST POSSIBLE NUMBER OF BOXES so that, in making up the packs, he uses ALL of the nuts, bolts and washers he has bought.

continued on the next page . . .

Question 2 (a) continued

Complete the table provided for Question 2 (a) in the separate Diagram Booklet to show the number of boxes of each item that Gwyn needs to buy.

You must show all your working.

[3 marks]

continued on the next page . . .

Question 2 continued

2. (b) Each washer has a thickness of 2 mm, correct to the nearest 0•5 mm. Calculate the greatest possible thickness of a stack of 6 washers.

[2 marks]

3. **OrenVit is a company that produces bottles of orange juice.**

The company uses only bottles with a capacity of one litre.

Each day, the cost of producing bottles of orange juice is as follows:

Fixed charge for use of equipment	**£10**
Cost of ingredients	**80p per bottle**
Cost of empty bottles with labels	**20p per bottle**

(a) **Look at the diagram for Question 3 (a) in the separate Diagram Booklet.**

On the graph paper, draw a graph to show the total daily cost of producing between 0 and 100 bottles of orange juice.

_____

_____

_____

[3 marks]

continued on the next page . . .

Question 3 continued

3. (b) One day, OrenVit produces 1750 PINTS of orange juice in one – litre bottles. Calculate the cost of producing this quantity of orange juice.

[3 marks]

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

Rectangular stickers with warnings written on them are often placed near water taps.

Look at Diagram 1 and Diagram 2 for Question 4 in the separate Diagram Booklet. The diagrams are NOT drawn to scale.

The rectangular sticker shown in Diagram 1 warns of hot water.
It has a length of 14 cm and an area of 42 cm^2

Diagram 2 is mathematically similar to the first sticker.
It is an enlargement of the first sticker, with scale factor 4

continued on the next page . . .

Question 4 continued

Calculate the length and the width of the larger sticker (Diagram 2).

You must show all your working.

_____

_____

_____

[4 marks + 2 marks OCW]

5. (a) Look at the diagram for Question 5 (a) in the separate Diagram Booklet.
The diagram is a cumulative frequency graph.

An aquarium has 35 ray fish.
The cumulative frequency graph shows information about the lengths of these ray fish.

Use the cumulative frequency diagram to give the best estimates for the answers to the following questions.

(i) What is the median length of these ray fish?

_____

_____

_____ **cm**

[1 mark]

continued on the next page . . .

Question 5 (a) continued

5. (a) (ii) How many of these ray fish have lengths greater than 72 cm?

_____

_____

_____

[1 mark]

continued on the next page . . .

Question 5 continued

5. (b) The aquarium also has guppies.

The table below shows information about the length of the guppies in a sample of 60 guppies.

Minimum	**1·5 cm**
Range	**5·0 cm**
Median	**3·0 cm**
Lower quartile	**2·5 cm**
Interquartile range	**3·5 cm**

(i) On the grid provided for Question 5 (b) (i) in the separate Diagram Booklet, draw a box – and – whisker plot of this data.

[4 marks]

Question 5 (b) continued

5. (b) (ii) How many of the sample of 60 guppies have a length greater than or equal to 2·5 cm?

_____

_____

_____

_____

_____

[2 marks]

continued on the next page . . .

Question 5 continued

5. (c) A carp was weighed in November 2021.

It was weighed again in April 2022.

The carp had a mass of 9·9 kg in April 2022.

Between these dates, the mass of the carp increased by 10%

Calculate the mass of the carp in November 2021.

[2 marks]

6. The surface area of the Earth is

510 million km^2

Write this area in standard form.

_____

_____

_____

_____

_____

_____ **km^2**

[2 marks]

7. Ask for the models for Question 7.

The models are NOT made to scale.

There are two models, Model 1 and Model 2.

Tregareth Zoo has a large glass enclosure for reptiles.

Model 1 represents the large glass enclosure for the reptiles.

The enclosure consists of a hollow rectangular – based pyramid sitting on top of a cuboid.

The enclosure is to be modified by placing a wooden cuboid onto the base.

This cuboid will reduce the capacity of the enclosure.

This is shown in Model 2.

Model 2 has a length of 8 m, a width of 5 m and a height of 3 m.

continued on the next page . . .

Question 7 continued

Look at the diagram for Question 7 in the separate Diagram Booklet.
The diagram is NOT drawn to scale.
The diagram shows the front view of the modified enclosure.

The pyramid has a vertical height of 1·5 m.
The inserted wooden cuboid has dimensions 4 m by 3·5 m by 0·5 m.

Calculate the capacity of this modified enclosure as a percentage of the capacity of the original enclosure.

_____

_____

Capacity of the modified enclosure is

_____% of the capacity of the

original enclosure

[6 marks]

8. Look at the diagram for Question 8 in the separate Diagram Booklet.
The diagram is a histogram.

Robert's Plants is a company that grows ornamental trees to sell in its nursery.
The histogram shows the heights of the 80 trees in the nursery.

(a) Trees that can be sold are at least 50 cm tall.
How many trees are TOO SHORT to be sold?

_____

_____

_____

_____

_____

[2 marks]

continued on the next page . . .

Question 8 continued

8. (b) Use the histogram to give the best estimates for the answers to the following questions.

(i) What is the median height of the 80 trees?

Circle your answer.

47•5 cm	**48 cm**	**50 cm**	**55 cm**	**60 cm**

[1 mark]

continued on the next page . . .

Question 8 (b) continued

8. (b) (ii) Calculate the inter – quartile range of the heights of the 80 trees.

[6 marks]

9. (a) Ask for the model for Question 9 (a).

The model is NOT made to scale.

Medi – Cap is a company that makes hollow spherical capsules for medicine.

One of its spherical capsules has a volume of 128π mm^3

Calculate the radius of this capsule.

Give your answer in the form $a\sqrt[3]{12}$

where a is an integer.

You must show all your working.

[4 marks]

continued on the next page . . .

Question 9 continued

9. (b) Ask for the model for Question 9 (b).
The model is NOT made to scale.

Medi – Cap also makes another shape of capsule, called a Bullet capsule.

These capsules are in the shape of two hollow hemispheres attached to each end of a hollow cylinder, as shown on the model.
The diameter of the cylinder, and of each hemisphere, is 8 mm.

To make a capsule easier to swallow, the exterior surface is coated with a glaze. Calculate the surface area that is covered by the glaze.

Give your answer in terms of π in its simplest form.

[3 marks]

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

The diagram is a speed – time graph.

Eliska competed in an indoor cycle race.

The speed – time graph shows Eliska's speed during the first 8 seconds of her race.

(a) Estimate the greatest acceleration that Eliska achieved during the first 8 seconds of her race.

Give your answer in its simplest form.

[4 marks]

continued on the next page . . .

Question 10 continued

10. (b) Eliska's initial acceleration was $0{\cdot}\dot{7}\dot{2}$ m/s^2

Write $0{\cdot}\dot{7}\dot{2}$ as a fraction.

[2 marks]

continued on the next page . . .

Question 10 continued

10. (c) Use the trapezium rule with exactly 4 STRIPS of equal width to estimate the distance Eliska travelled during the first 8 seconds of the race.

[3 marks]

continued on the next page . . .

Question 10 continued

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

The diagram is NOT drawn to scale.

The diagram is a speed – time graph.

The speed – time graph shows Eliska's speed from $t = 8$ seconds to $t = 48$ seconds.

The graph shows that her speed increased at a constant rate from $t = 8$ to $t = 16$, and at a different constant rate from $t = 16$ to $t = 48$

Eliska's speed at $t = 48$ was 1 m/s faster than her speed at $t = 16$

From $t = 8$ to $t = 48$, Eliska travelled 550 m.

Form and solve an equation to calculate Eliska's speed at time $t = 16$ seconds.

_____

_____

Eliska's speed at time $t = 16$ seconds

is _____ m/s

[4 marks]

END OF PAPER

TOTAL 70 MARKS

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

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MATHEMATICS – NUMERACY

UNIT 1: NON – CALCULATOR

HIGHER TIER

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

Diagram Booklet

Surname: _____

First name(s): _____

Centre Number: _____

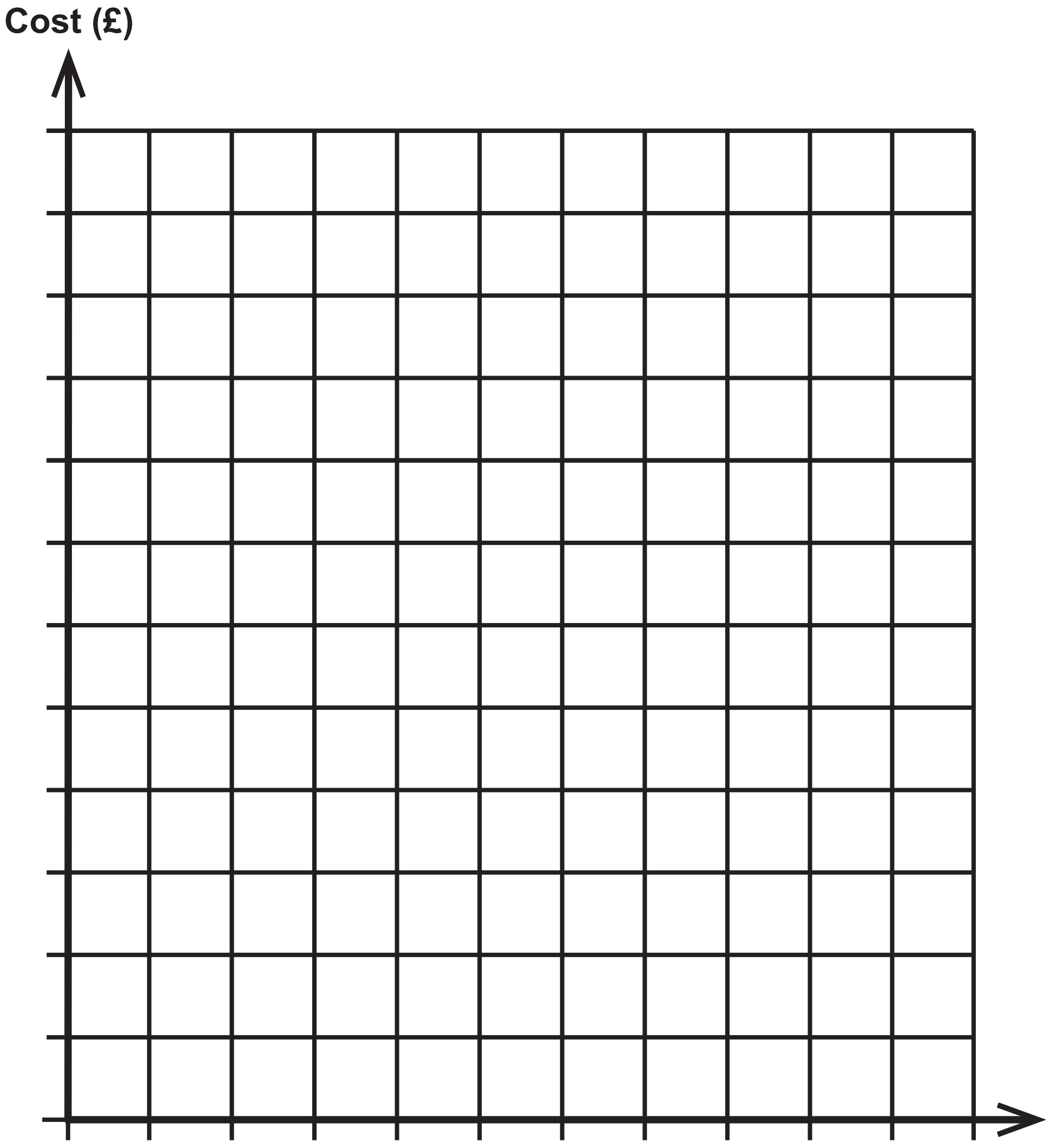
Candidate Number: 0 _____

Question 2 (a)

Table

	Number of boxes needed
Nuts (30 in each box)	_____ boxes
Bolts (5 in each box)	_____ boxes
Washers (25 in each box)	_____ boxes

Question 3 (a)



Question 4

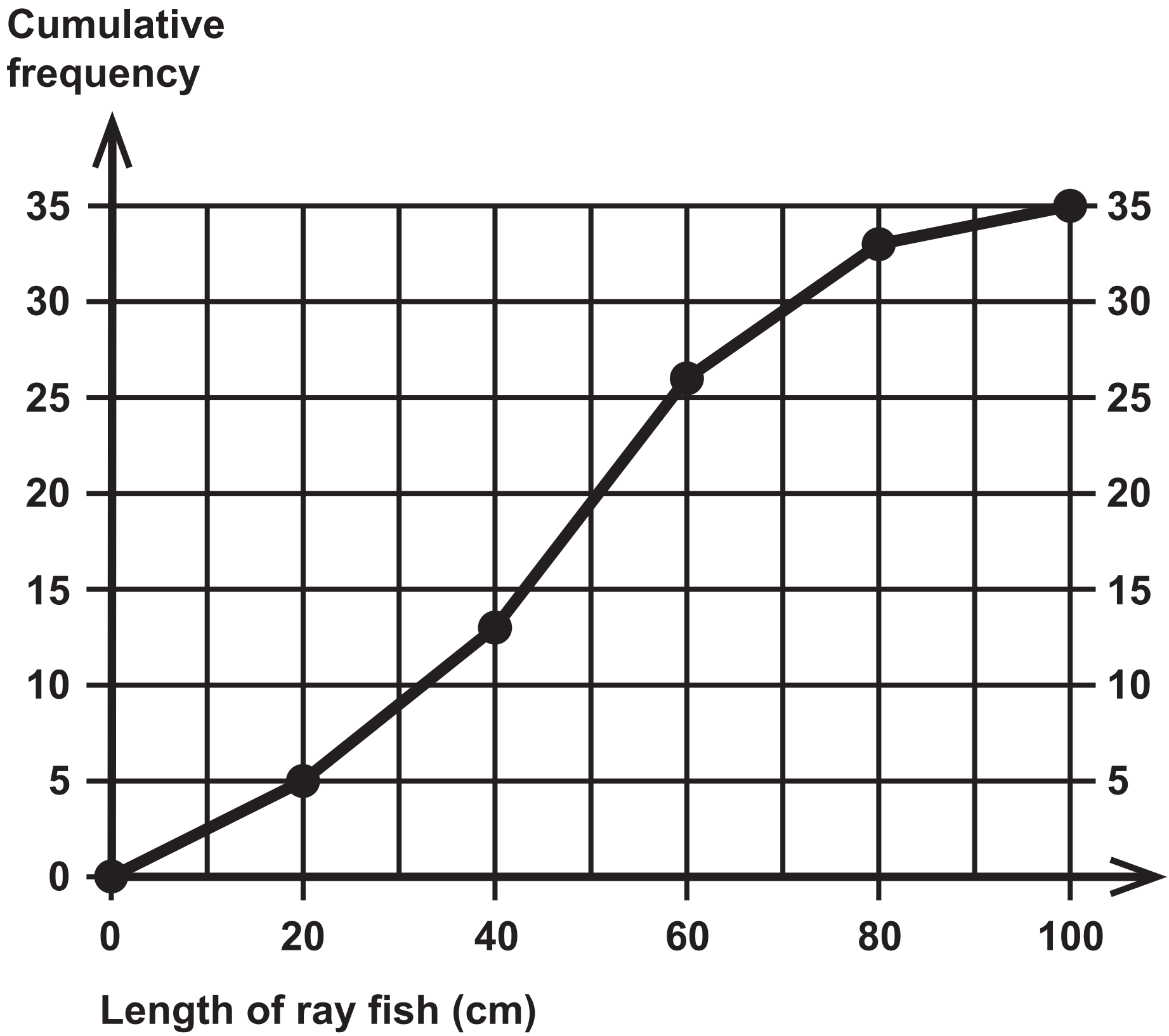
Diagram 1

Diagram NOT drawn to scale

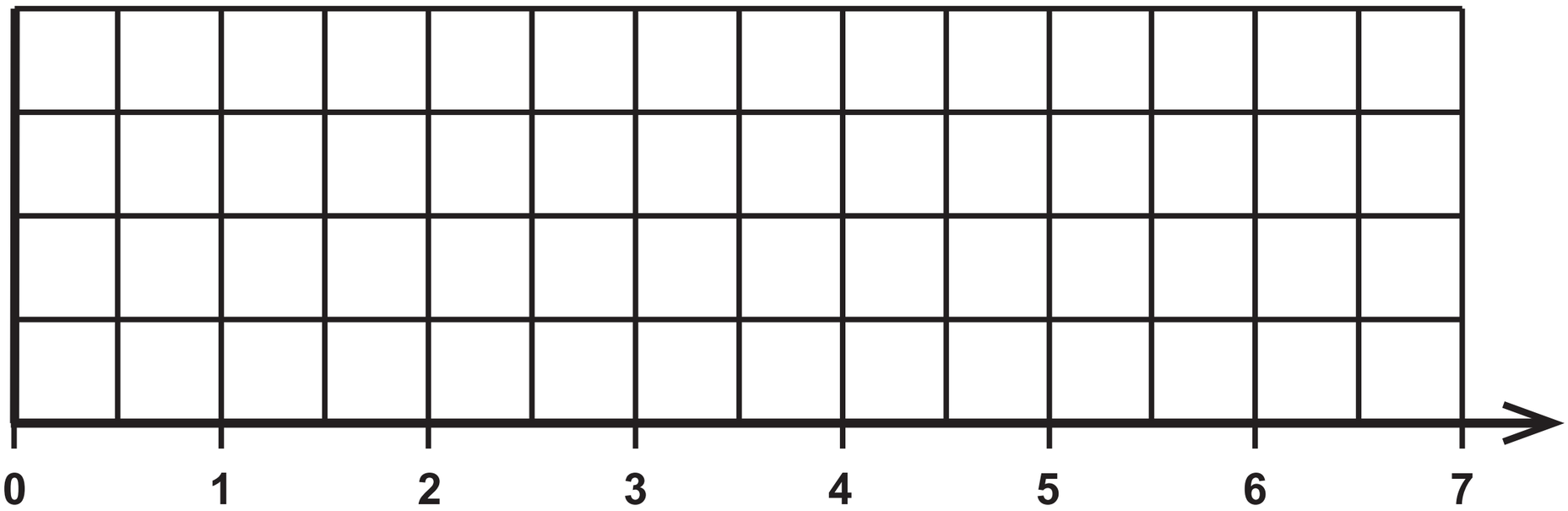
Diagram 2

Diagram NOT drawn to scale

Question 5 (a)


Cumulative frequency
35
30
25
20
15
10
5
0
0
20
40
60
80
100
Length of ray fish (cm)

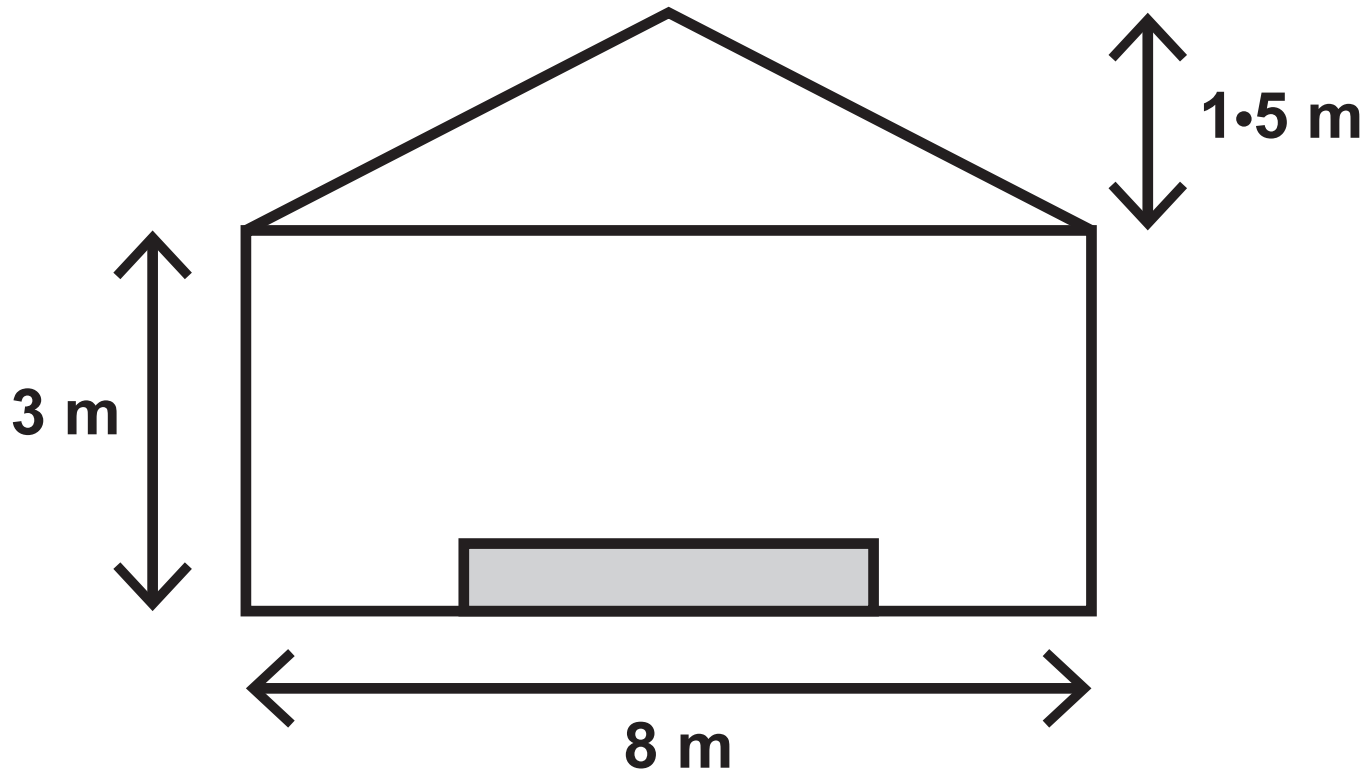
Question 5 (b) (i)



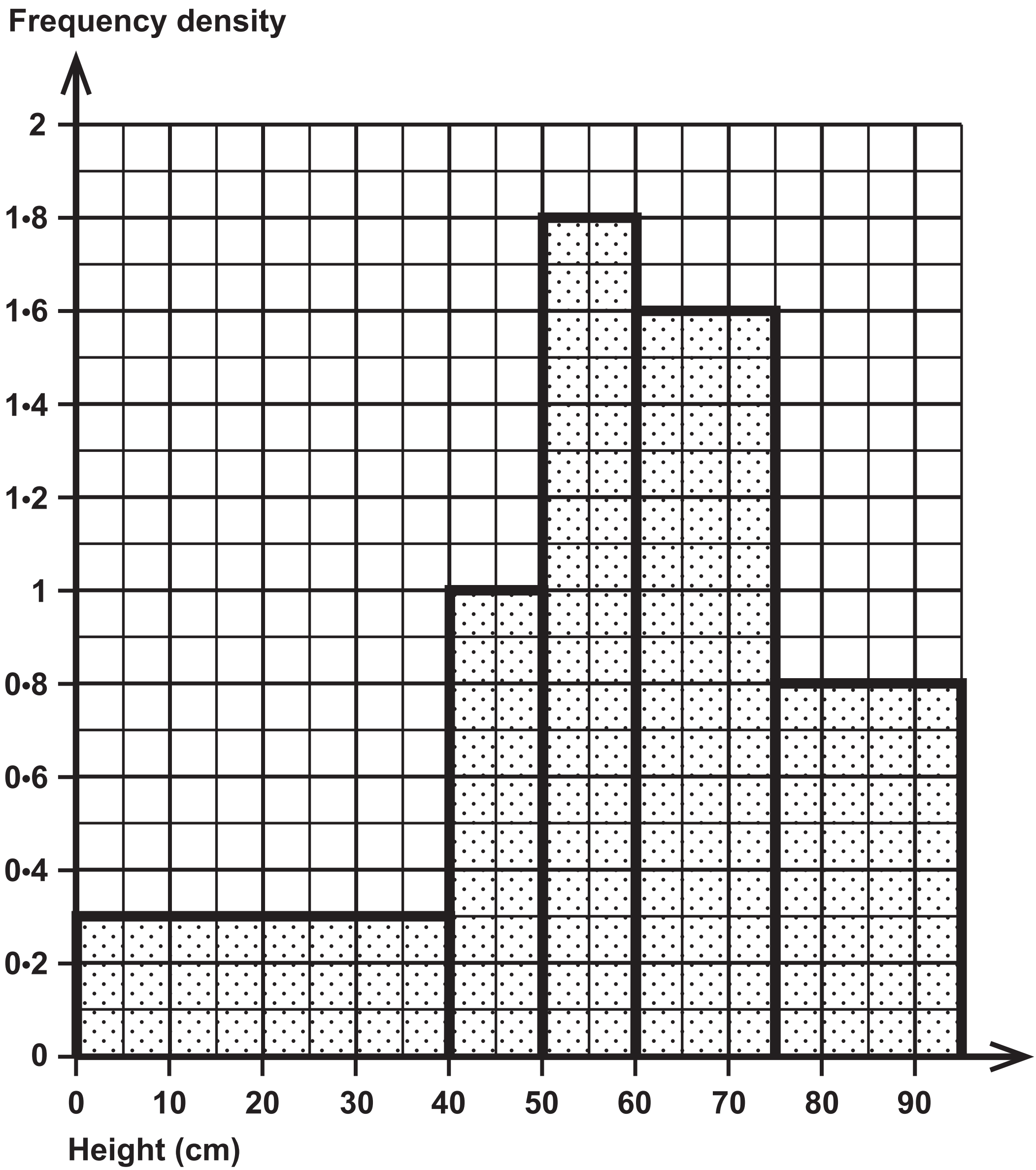
Question 7

Diagram NOT drawn to scale

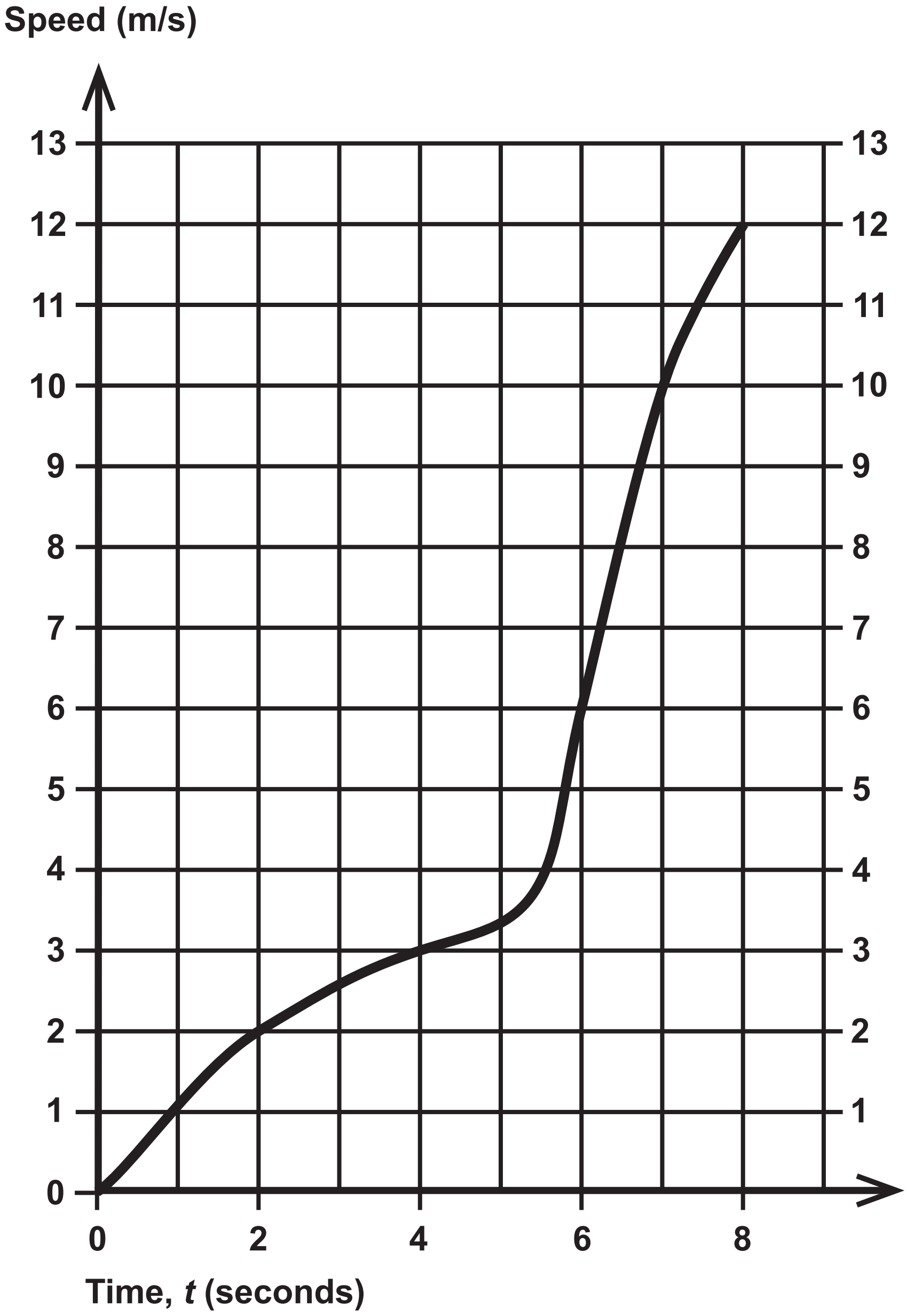
Front view



Question 8

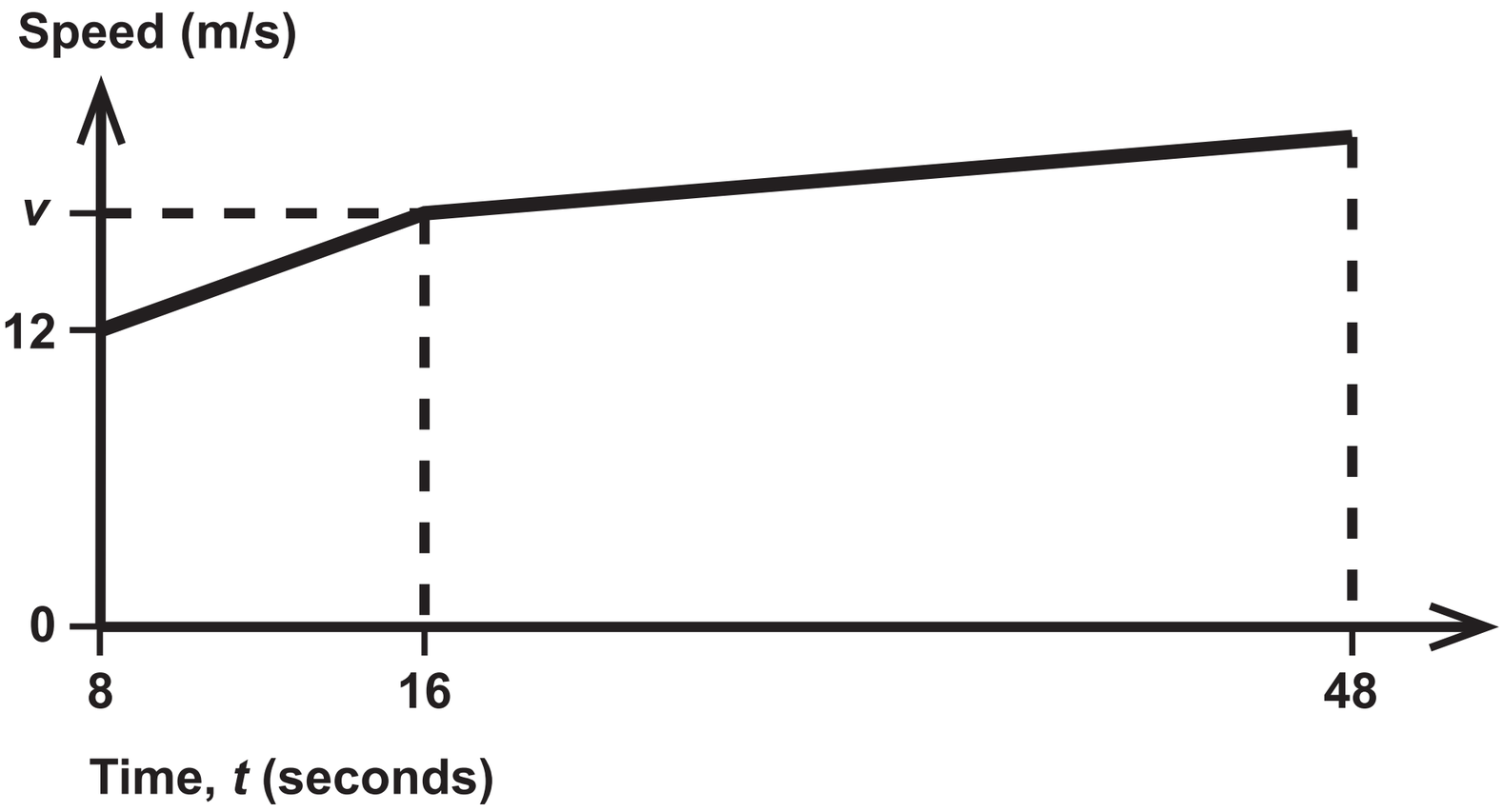

Frequency density
2
1•8
1•6
1•4
1•2
1
0•8
0•6
0•4
0•2
0
0
10
20
30
40
50
60
70
80
90
Height (cm)

Question 10



Question 10 (d)

Diagram NOT drawn to scale



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MATHEMATICS
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FORMULA LIST

HIGHER TIER

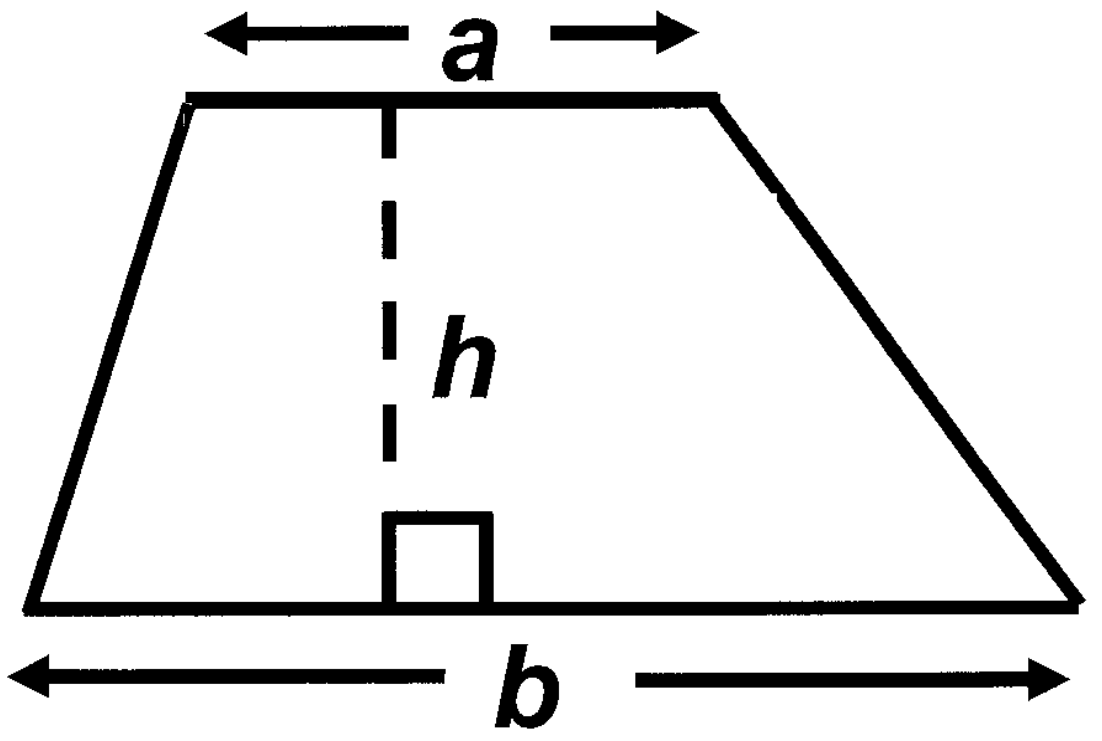
GCSE

You must not write on these formula pages.

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

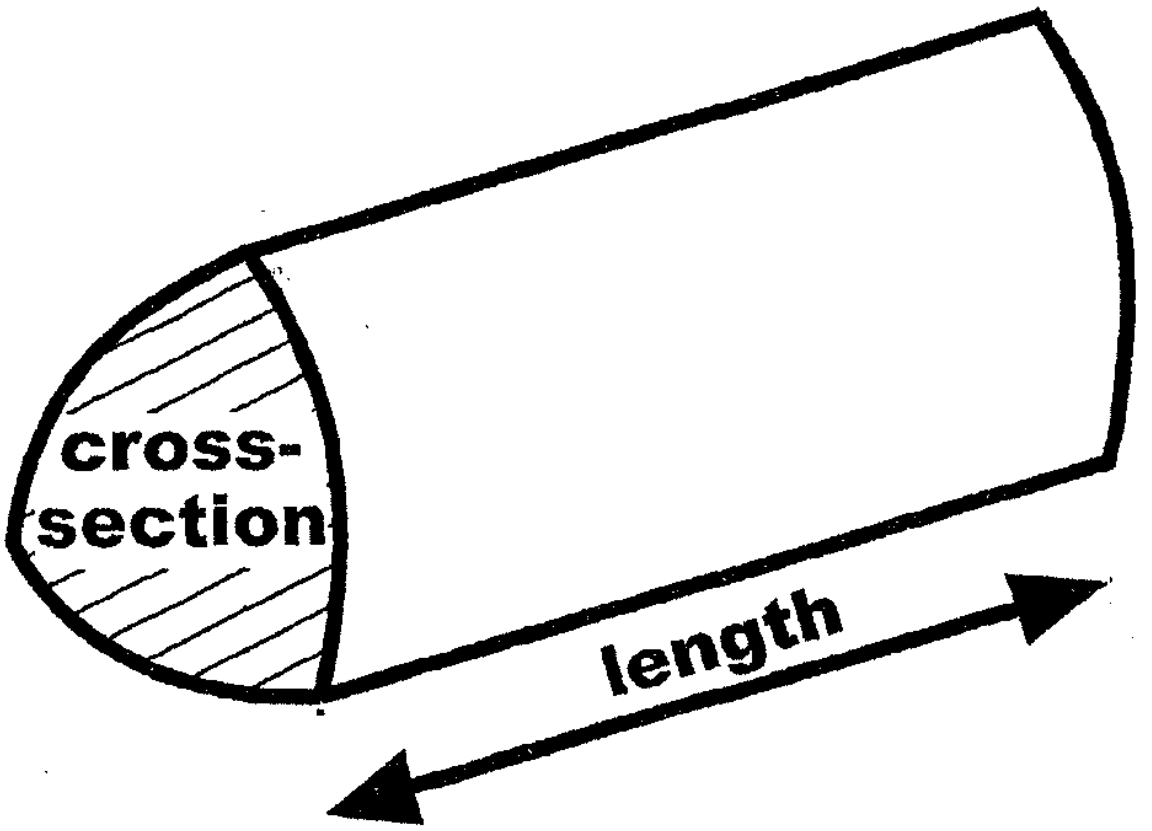
Formula List – Higher Tier

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



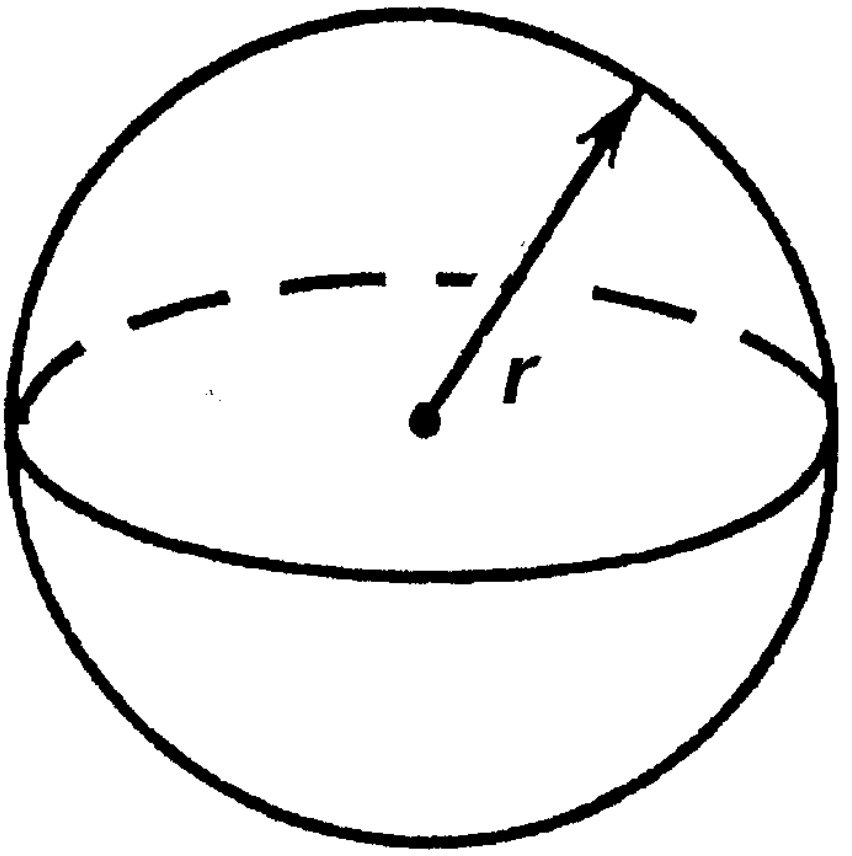
Volume of prism =

area of cross – section × length



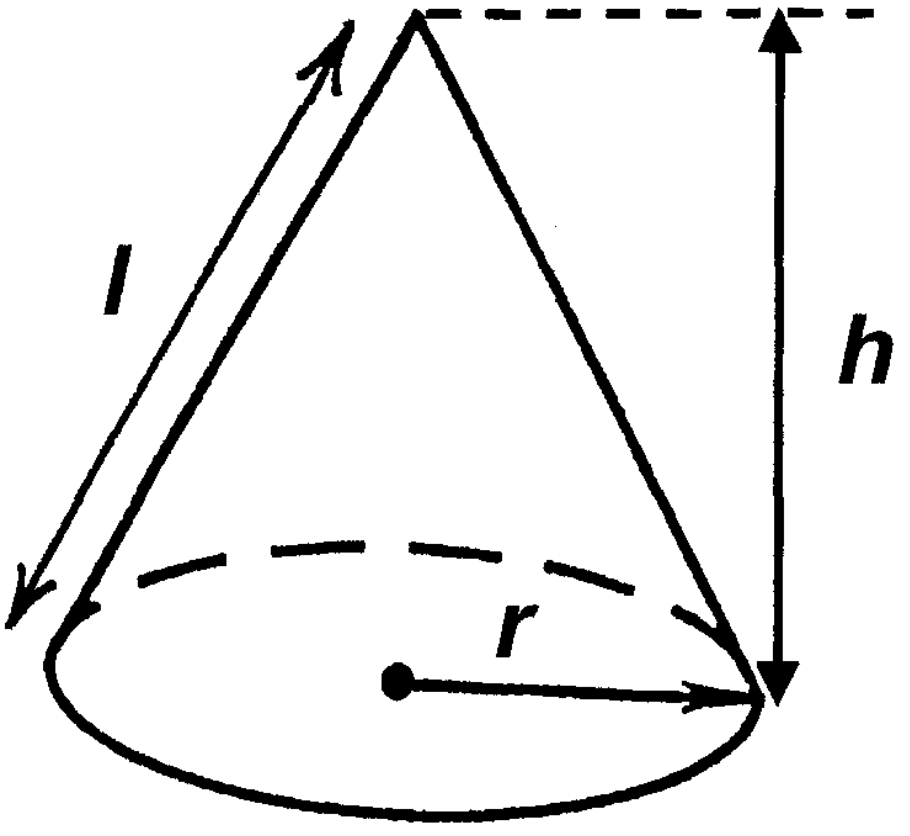
Volume of sphere $= \frac{4}{3}\pi r^3$

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

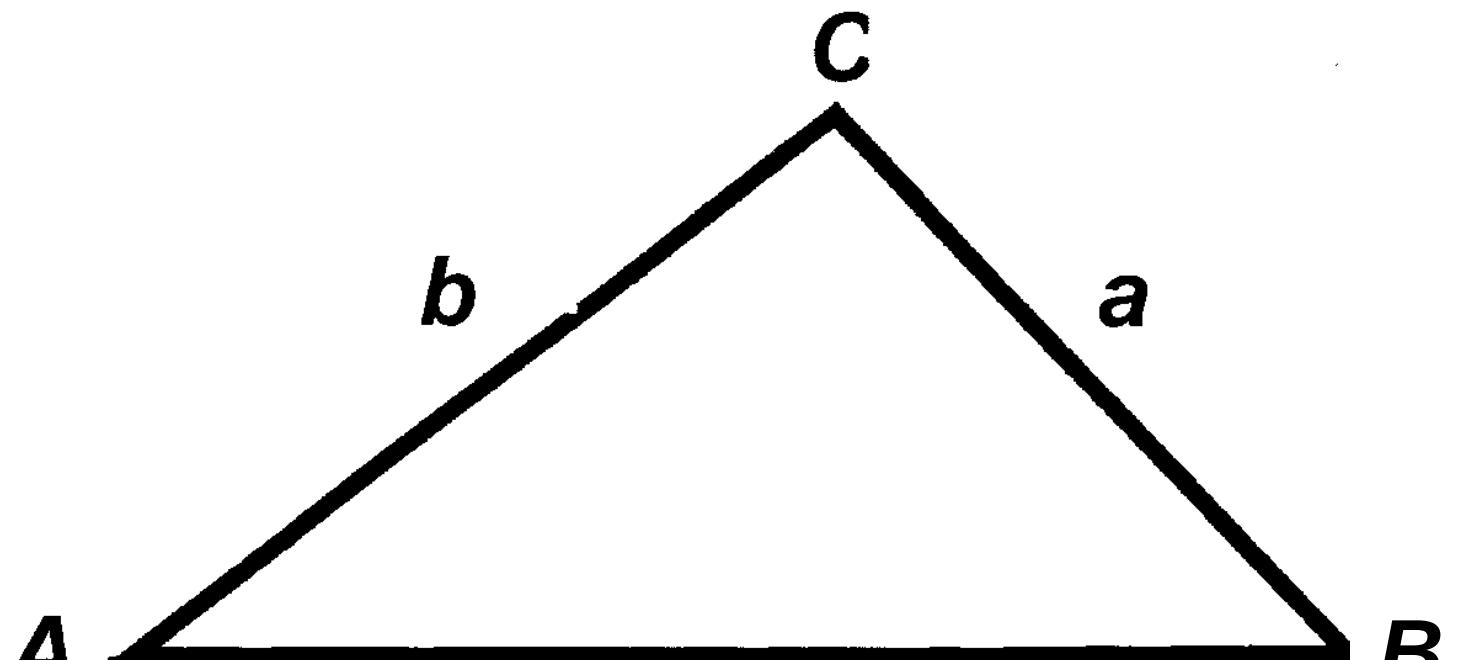


Volume of cone $= \frac{1}{3}\pi r^2 h$

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



In any triangle ABC



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

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

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

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.