GCSE

3310U50–1

THURSDAY, 9 MAY 2024 – MORNING

MATHEMATICS – NUMERACY

UNIT 1: NON – CALCULATOR

HIGHER TIER

1 hour 45 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.	6	
3.	9	
4.	9	
5.	11	
6.	9	
7.	10	
8.	5	
9.	11	
10.	4	
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 List.

A separate Diagram Booklet.

Model for Question 6 (a).

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

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.

(Turn over)

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

Look at the diagram for Question 1 in the separate Diagram Booklet.

The diagram is a pie chart.

7200 spectators at a sports event were asked their nationality.

The results are displayed in the pie chart.

continued on the next page . . .

Question 1 continued

For the Welsh spectators, the ratio of the number of adults to the number of children was 6 : 5

How many adult Welsh spectators were at the event?

You must show all your working.

[4 marks + 2 marks OCW]

continued on the next page . . .

2. Look at the diagram for Question 2 in the separate Diagram Booklet.

The diagram is a scatter diagram.

Some houses in a village have new driveways laid by DriveDown.

The scatter diagram shows the area and cost of each driveway.

(a) Look at the diagram for Question 2 (a) in the separate Diagram Booklet.

The diagram is NOT drawn to scale.

The measurements of Gwenda's driveway are shown in the diagram.

continued on the next page . . .

Question 2 (a) continued

Consider the exact area of Gwenda's driveway.

Calculate an estimate of how much it would cost Gwenda to have a new driveway laid by DriveDown.

You must show all your working.

[4 marks]

continued on the next page . . .

Question 2 continued

2. (b) Tanya's driveway covers an area of 23 m^2

She decides to have her driveway repaired instead of having a new driveway.

Tanya thinks the repair will cost her 40% of the estimated cost of having a new driveway laid by DriveDown.

She has budgeted £575 for the repair of her driveway.

continued on the next page . . .

Question 2 (b) continued

Will Tanya's budget cover the cost of repairing her driveway?

Yes ☐ **No** ☐

You must show all your working and give a reason for your answer.

[2 marks]

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

The diagram IS drawn to scale.

Josif produces a scale drawing to show where he wants a tree planted in his garden.

He writes out instructions to show where the tree is to be planted.

Which two of the following instructions describe where the tree is to be planted?

continued on the next page . . .

Question 3 (a) continued

A. The tree must be **4 metres** from the hedge.

B. The tree must be **2 metres** from the hedge.

C. The tree must be **12 metres** from the hedge.

D. The tree must be **6 meters** from the hedge.

E. The tree must be **2 metres** from the wall.

continued on the next page . . .

Question 3 (a) continued

F. The tree must be equidistant from the hedge and the fence.

G. The tree must be equidistant from the hedge and the wall.

H. The tree must be equidistant from the wall and the house.

I. The tree must be equidistant from the hedge and the house.

J. The tree must be equidistant from the wall and the fence.

_____

_____

The two instructions are

_____ and _____

[2 marks]

continued on the next page . . .

Question 3 continued

3. (b) A garden centre buys trees from a grower for £30 each.

The garden centre sells the trees for £42 each.

(i) Calculate the percentage profit the garden centre makes from buying and selling one tree.

[2 marks]

continued on the next page . . .

Question 3 (b) continued

3. (b) (ii) The garden centre buys 10 of these trees to sell.

One of the trees gets damaged and cannot be sold.

The other 9 trees are sold.

Calculate the overall percentage profit or loss the garden centre makes from selling these trees.

continued on the next page . . .

Question 3 (b) (ii) continued

You must state whether your answer is a profit or a loss.

You must show all your working.

[4 marks]

continued on the next page . . .

Question 3 (b) continued

3. (b) (iii) Of the 10 trees bought by the garden centre, what is the minimum number that need to be sold to ensure that the garden centre makes a profit?

Circle your answer.

5	6	7	8	9

[1 mark]

4. (a) Look at the diagram for Question 4 (a) in the separate Diagram Booklet.

The diagram is a cumulative frequency diagram.

On 1st June last year, 200 customers used cash to pay at Shop Lil.

The cumulative frequency diagram represents the time each of these 200 customers waited to be given change at the checkout.

continued on the next page . . .

Question 4 (a) continued

4. (a) (i) How many of these customers waited between 30 and 50 seconds for their change?

[2 marks]

continued on the next page . . .

Question 4 (a) continued

4. (a) (ii) Use the graph to estimate the median time these 200 customers waited for their change.

Circle your answer.

30 seconds
34 seconds
36 seconds
50 seconds
100 seconds

[1 mark]

continued on the next page . . .

Question 4 (a) continued

4. (a) (iii) Calculate the fraction of these 200 customers who waited 40 seconds or longer for their change.

Give your answer in its simplest form.

[2 marks]

continued on the next page . . .

Question 4 continued

4. (b) Look at the diagram for Question 4 (b) in the separate Diagram Booklet.

The diagram is a box – and – whisker plot.

On 1st June this year, the manager at Shop Lil drew this box – and – whisker plot of the times 200 customers waited for their change at the checkout.

continued on the next page . . .

Question 4 (b) continued

Based on the results of these 200 customers, the manager made the following statements.

Complete the statements.

(i) “On 1st June this year, 50% of our customers were given their change in _____ seconds or less.”

[1 mark]

continued on the next page . . .

Question 4 (b) continued

4. (b) (ii) "On 1st June this year, the interquartile range of the times taken to give customers their change was _____ seconds."

_____

_____

_____

_____

[2 marks]

continued on the next page . . .

Question 4 continued

4. (c) Consider the 50 customers waiting the LONGEST times to get their change on 1st June last year and this year.

Has the speed of giving change at the checkout improved since last year?

Yes ☐ **No** ☐

You must give a reason for your answer.

_____

_____

[1 mark]

5. (a) The area of Wales is 20 735 km^2

The table below gives the population of Wales in 1977, 1998 and 2015.

YEAR	POPULATION
1977	2•8 million
1998	2•9 million
2015	3•1 million

continued on the next page . . .

Question 5 (a) continued

5. (a) (i) What was the increase in the population of Wales between 1977 and 1998? Circle your answer.

1×10^3	1×10^4	1×10^5	1×10^6	1×10^7

[1 mark]

continued on the next page . . .

Question 5 (a) continued

5. (a) (ii) Estimate the population density of Wales in 2015.

Population density of Wales in 2015

was _____ people / km^2

[3 marks]

continued on the next page . . .

Question 5 continued

5. (b) Cardiff is the largest city in Wales.

In 2018, the population of Cardiff was approximately 360 000

The population of Cardiff increased by 20% from 1991 to 2018.

Calculate the population of Cardiff in 1991.

[3 marks]

continued on the next page . . .

Question 5 continued

5. (c) Look at the diagrams for Question 5 (c) in the separate Diagram Booklet.

The diagrams are NOT drawn to scale.

DraigYma prints Welsh flags onto stickers.

Three of their mathematically similar Welsh flag stickers are shown in the diagrams.

continued on the next page . . .

Question 5 (c) continued

Calculate the missing length and height in the diagrams.

Length is _____ cm

Height is _____ cm

[4 marks]

6. Most aircraft are held together with metal rivets.

(a) Ask for the model for Question 6 (a).

The model is NOT made to scale.

The model represents a rivet used on one type of aircraft.

It can be thought of as a cylinder connected to a hemisphere.

continued on the next page . . .

Question 6 (a) continued

The cylinder has a diameter of 6 mm and a length of 9 mm.

The hemisphere has a diameter of 12 mm.

(i) Calculate the volume of the rivet.

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

[4 marks]

continued on the next page . . .

Question 6 (a) continued

6. (a) (ii) The manufacturer plans to reduce the length of the cylindrical part of the rivet from 9 mm to 8 mm. Calculate the fractional reduction in the volume of a rivet this would produce.

Fractional reduction in the volume of a rivet = _____

[2 marks]

continued on the next page . . .

Question 6 continued

6. (b) For another type of rivet, the manufacturer plans to reduce the volume by $0{\cdot}16\dot{1}$ of its original volume.

Write $0{\cdot}16\dot{1}$ as a fraction. Give your answer in its simplest form.

[3 marks]

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

The headteacher of Ynysgorwen School wants to know how long it takes pupils to travel to school.

The results for a sample of 120 pupils are shown in the table.

(a) (i) Complete the frequency density column.

[3 marks]

continued on the next page . . .

Question 7 (a) continued

7. (a) (ii) On the grid provided for Question 7 (a) (ii) in the separate Diagram Booklet, draw a histogram to display this data.

(b) (i) Calculate an estimate of the median travel time for the sample of pupils.

[4 marks]

continued on the next page . . .

Question 7 (b) continued

7. (b) (ii) What is the greatest possible median travel time for the sample of pupils?

[1 mark]

8. Look at the diagram for Question 8 in the separate Diagram Booklet.

The diagram is a graph.

Sian ran a 100 – metre race.

The graph below shows Sian's speed over the FIRST 8 seconds of the race.

Sian then ran the rest of the race at a constant speed of 8 m/s.

continued on the next page . . .

Question 8 continued

By first using the trapezium rule with 4 strips of equal width for The first 8 seconds, estimate the total time it took Sian to run the 100 – metre race.

You must show all your working.

Sian’s total time to run the 100 – metre race = _____ seconds

[5 marks]

9. (a) Look at the diagram for Question 9 (a) in the separate Diagram Booklet.

Geraint has bought a new front cog for his bike.

The cog has a mass of 150 g, correct to the nearest 10 g.

The cog has been made from a metal that has a density of 3 g/cm^3, correct to the nearest g/cm^3

Calculate the maximum possible volume of the cog.

_____

_____

[3 marks]

continued on the next page . . .

Question 9 continued

9. (b) Look at the diagram for Question 9 (b) in the separate Diagram Booklet.

The diagram is NOT drawn to scale.

The diagram is a simplified diagram of the cogs and the chain on Geraint's bike.

X and *Y* are the centres of The cogs and *XY* is a line of symmetry.

BC and *AD* are straight sections of the chain.

continued on the next page . . .

Question 9 (b) continued

The larger cog has a radius of 12 cm.

The smaller cog has a radius of 2 cm.

(i) Use Pythagoras' theorem to show that the length of AD is $10\sqrt{15}$ cm.

You must show all your working.

[3 marks]

continued on the next page . . .

Question 9 (b) continued

9. (b) (ii) Look at the diagram for Question 9 (b) (ii) in the separate Diagram Booklet. The diagram is NOT drawn to scale.

In the diagram,

Angle $AXB = 150°$,

Relex angle $CYD = 210°$,

$BC = AD = 10\sqrt{15}$ cm.

continued on the next page . . .

Question 9 (b) (ii) continued

Calculate the total length of the chain.

Give your answer in the form $a\sqrt{15} + b\pi$, where a and b are rational numbers.

(Turn over)

[5 marks]

10. 7 water pumps can fill a swimming pool in 12 hours.

These 7 water pumps work together at the same rate.

When the pool is empty, the 7 pumps are turned on.

After working for 3 hours, 2 of the pumps are turned off.

The other pumps carry on working until the swimming pool is full.

continued on the next page . . .

Question 10 continued

Calculate how long in total it takes for the swimming pool to be filled. Give your answer in hours and minutes.

(Turn over)

Total time taken for the pool to be filled

= _____ hours _____ minutes

[4 marks]

END OF PAPER

TOTAL 80 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

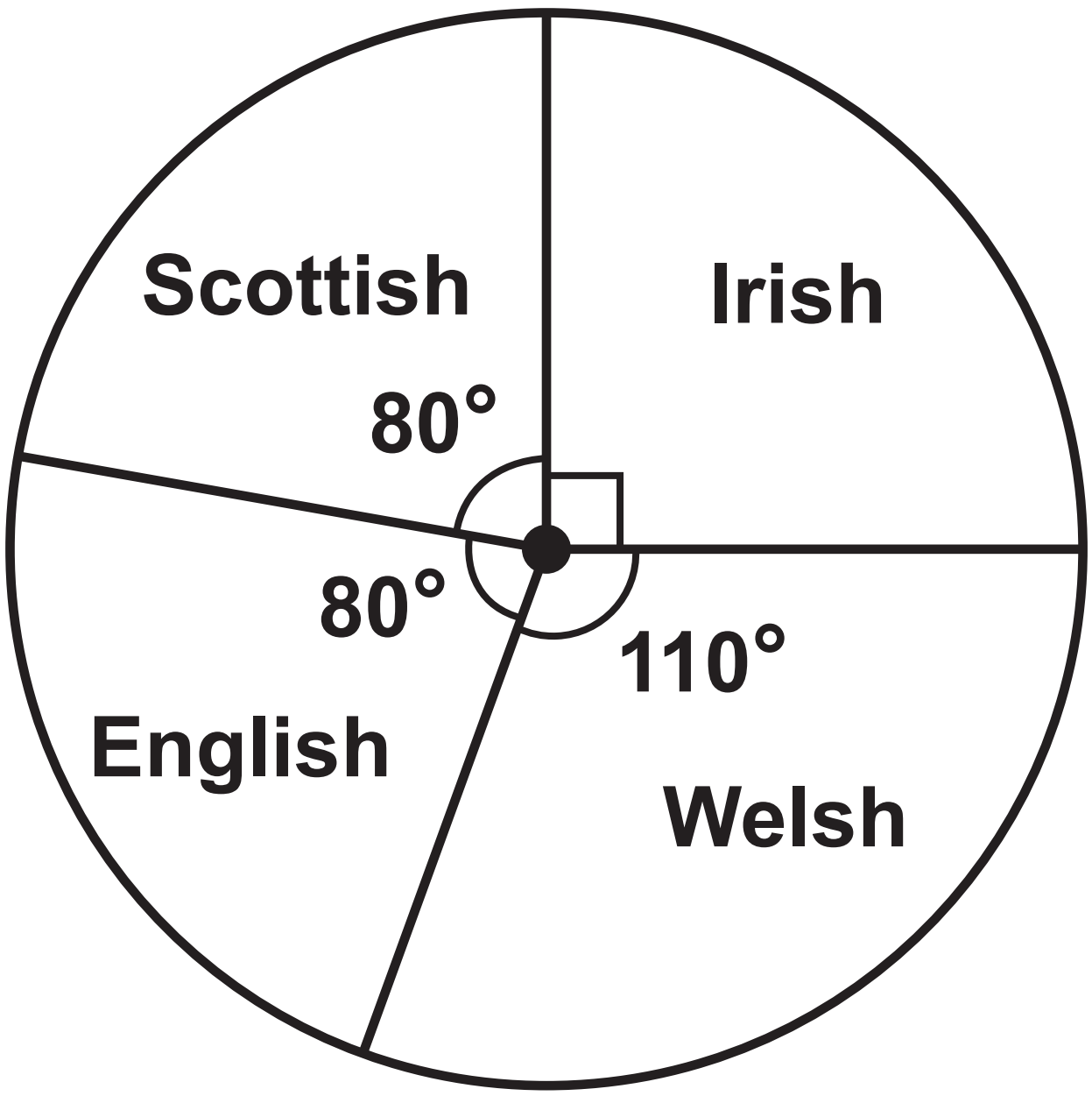
Surname: _____

First name(s): _____

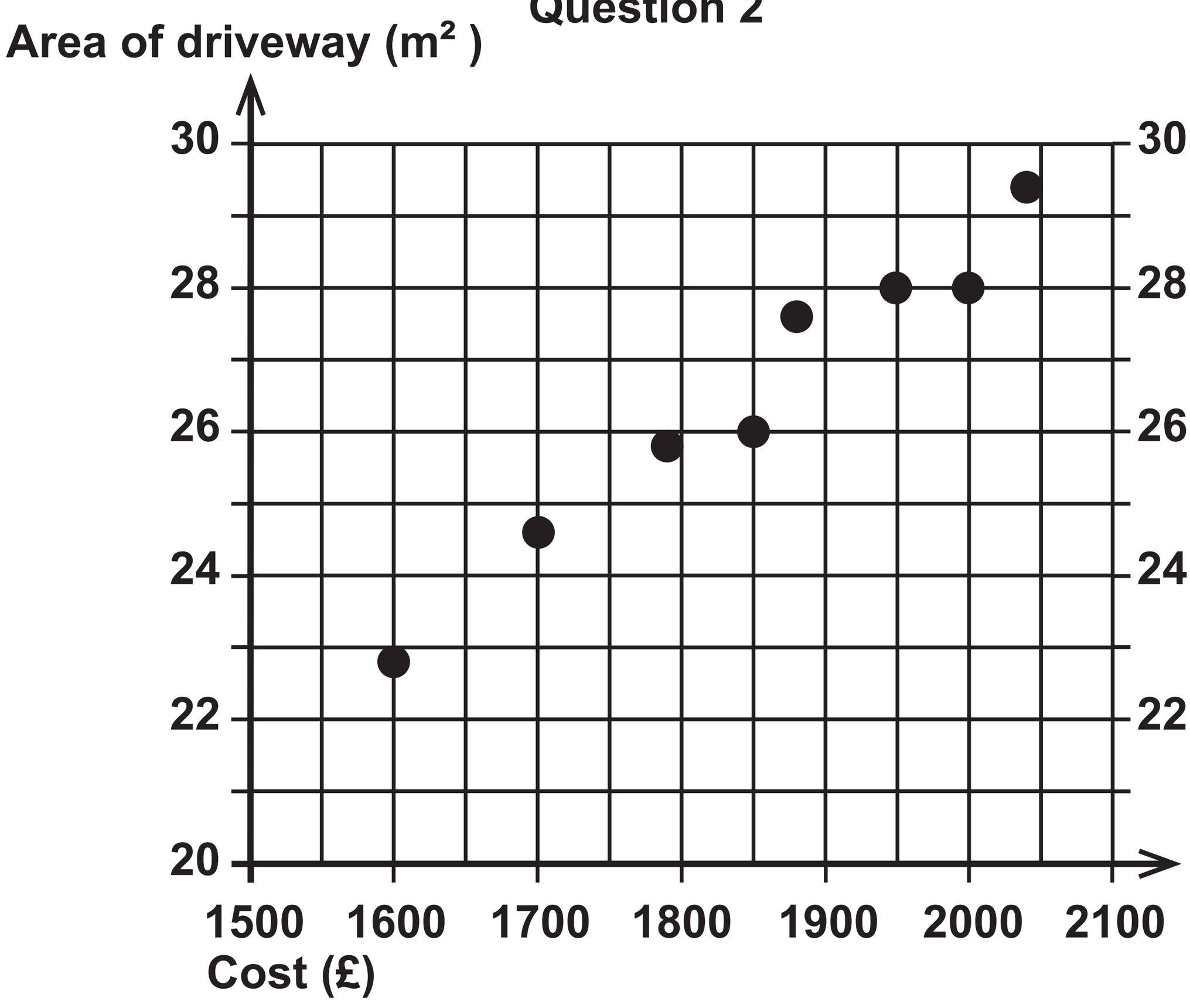
Centre Number: _____

Candidate Number: 0 _____

Question 1

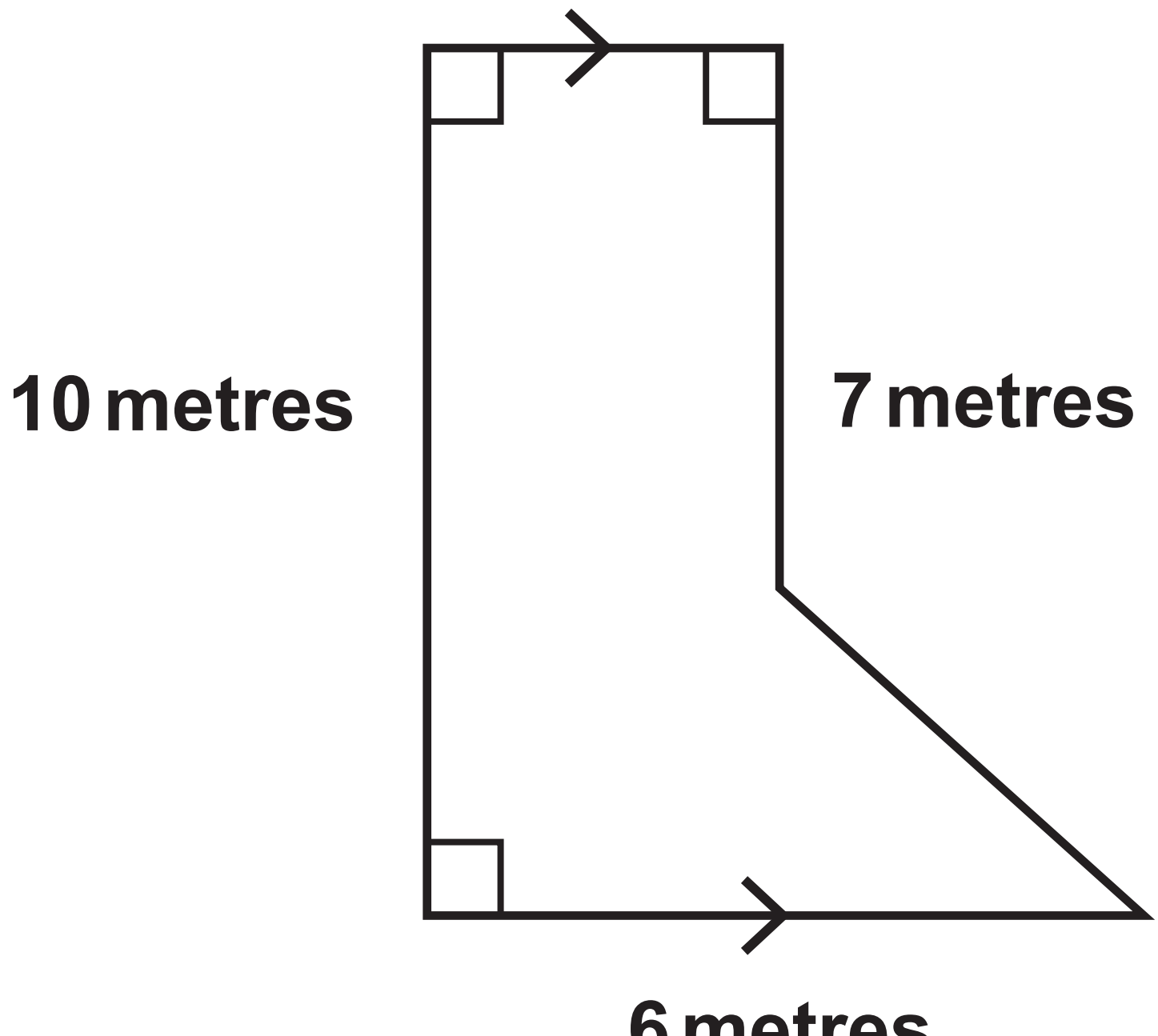


Question 2


Area of driveway (m²)
30
28
26
24
22
20
1500
1600
1700
1800
1900
2000
2100
Cost (£)

Question 2 (a)

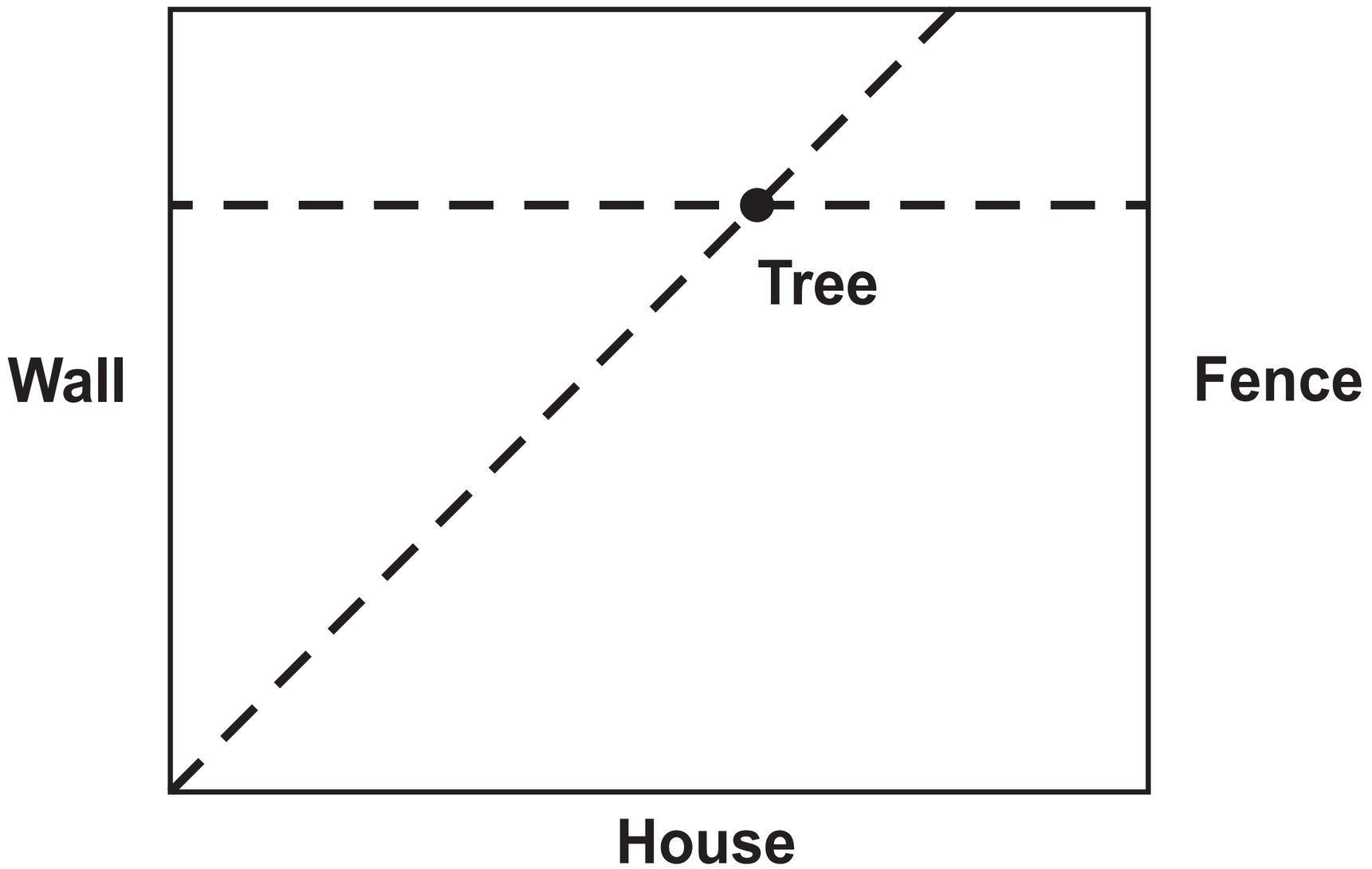
Diagram NOT drawn to scale



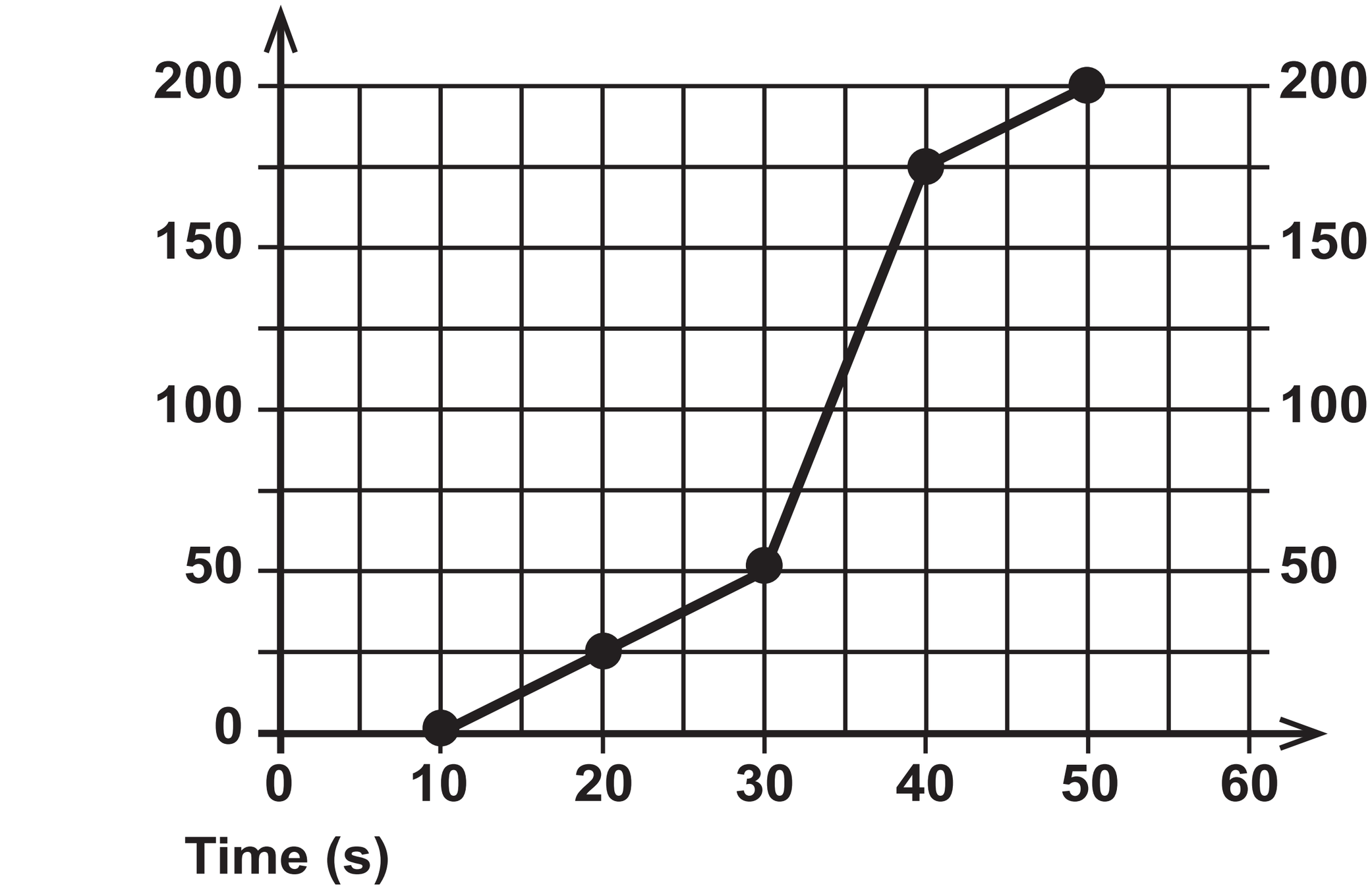
Question 3 (a)

Diagram IS drawn to scale

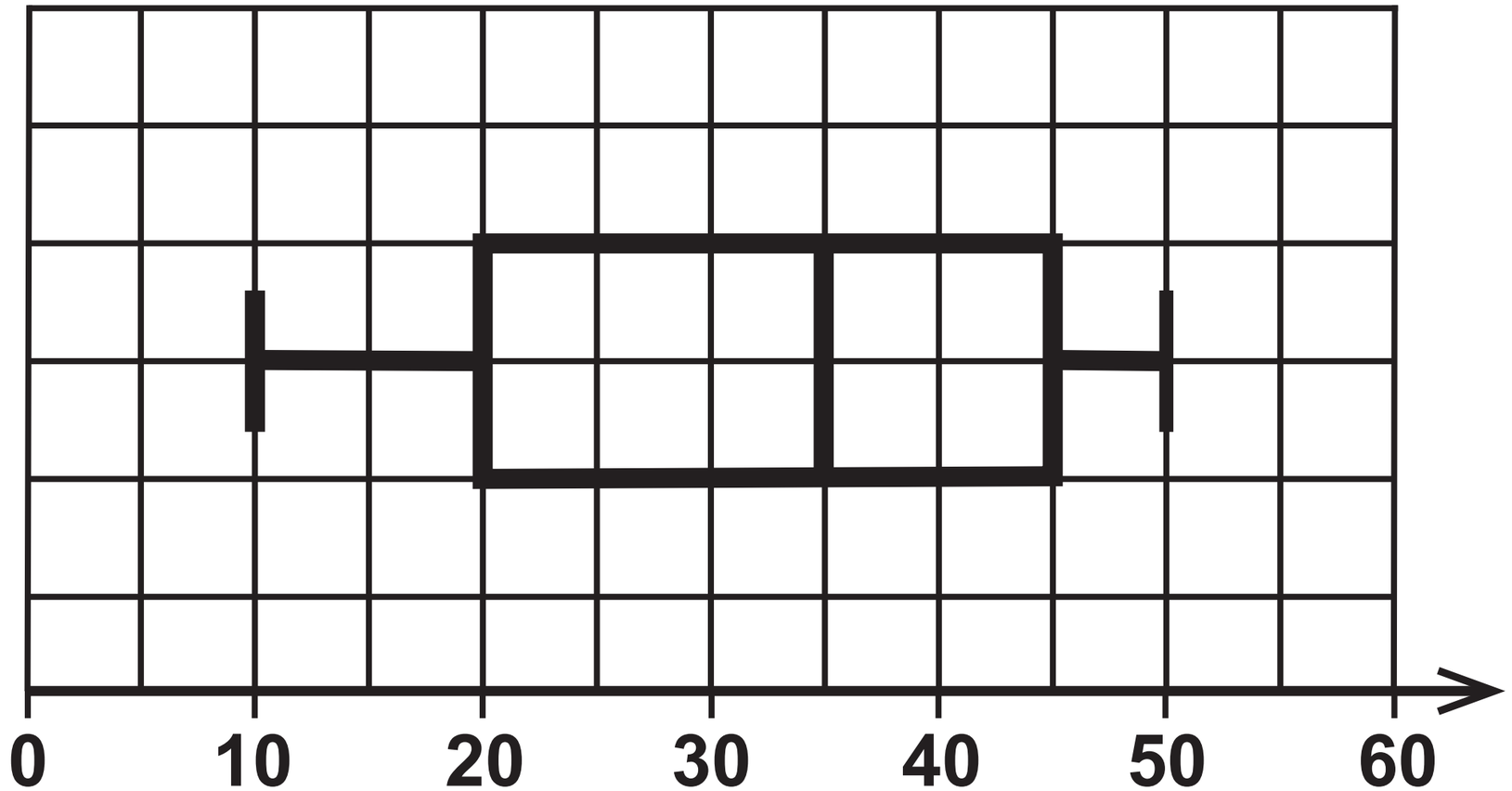
Scale: 1cm represents 0 • 5 metres



Question 4 (a)

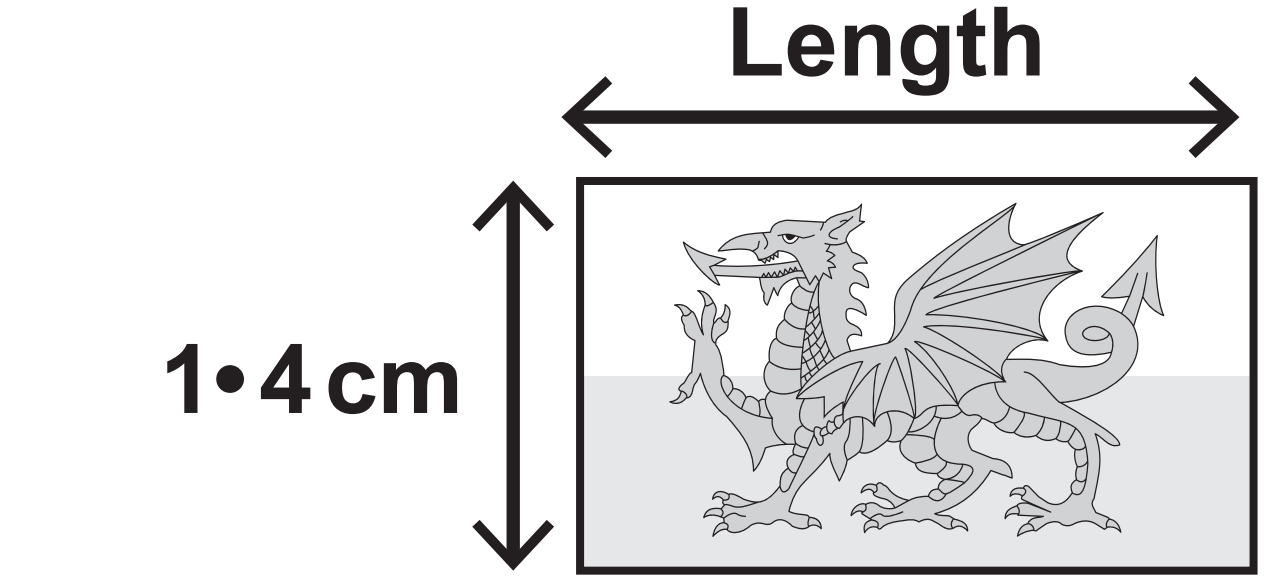


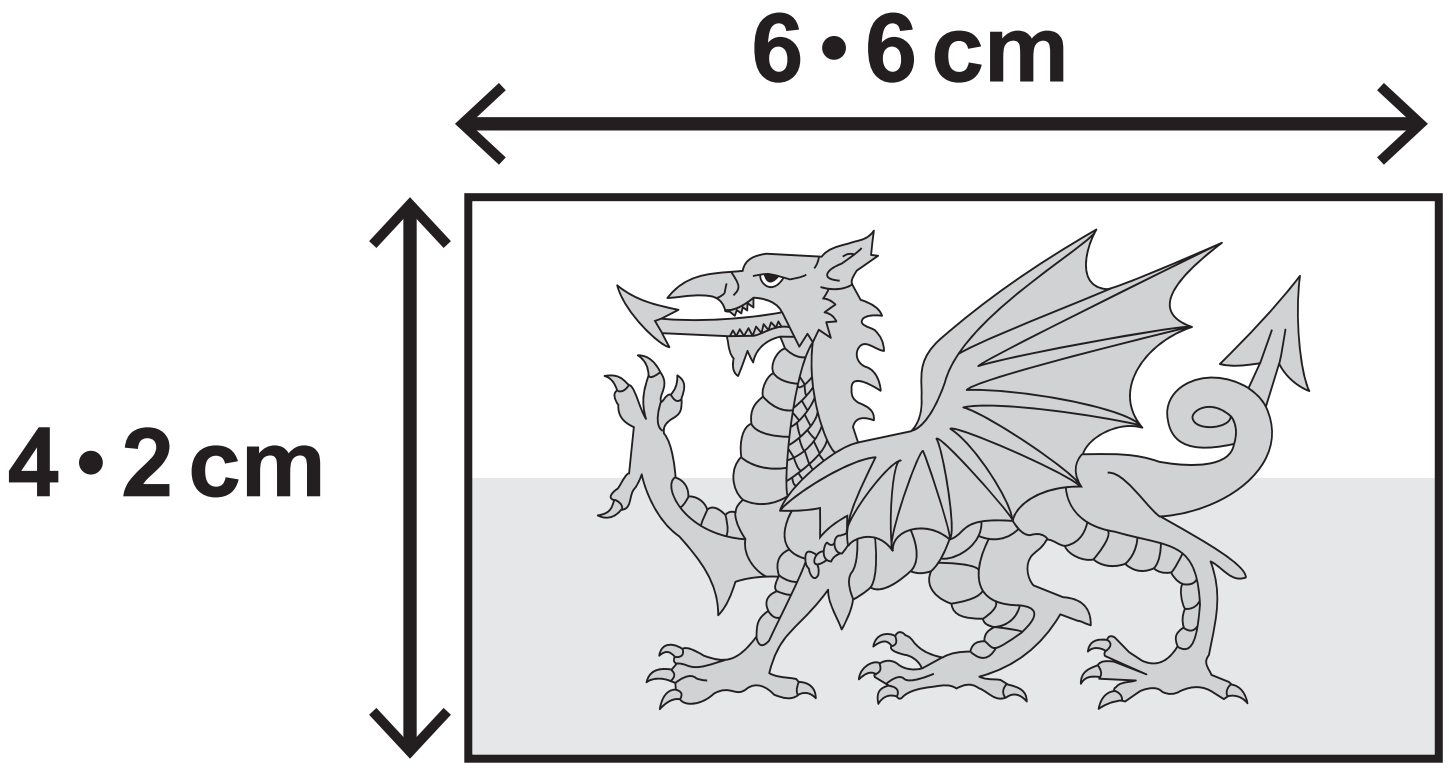
Question 4 (b)

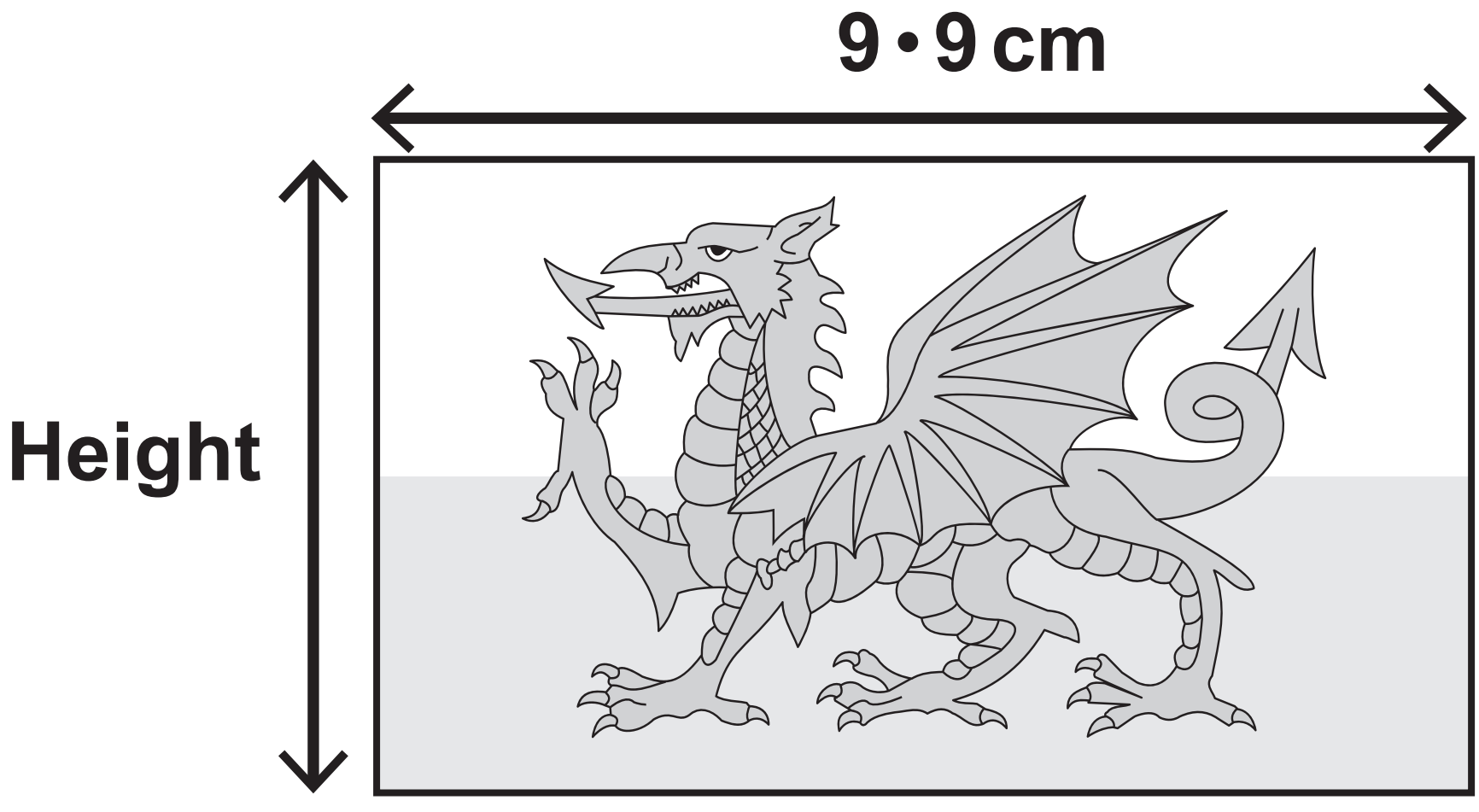


Question 5 (c)

Diagrams NOT drawn to scale





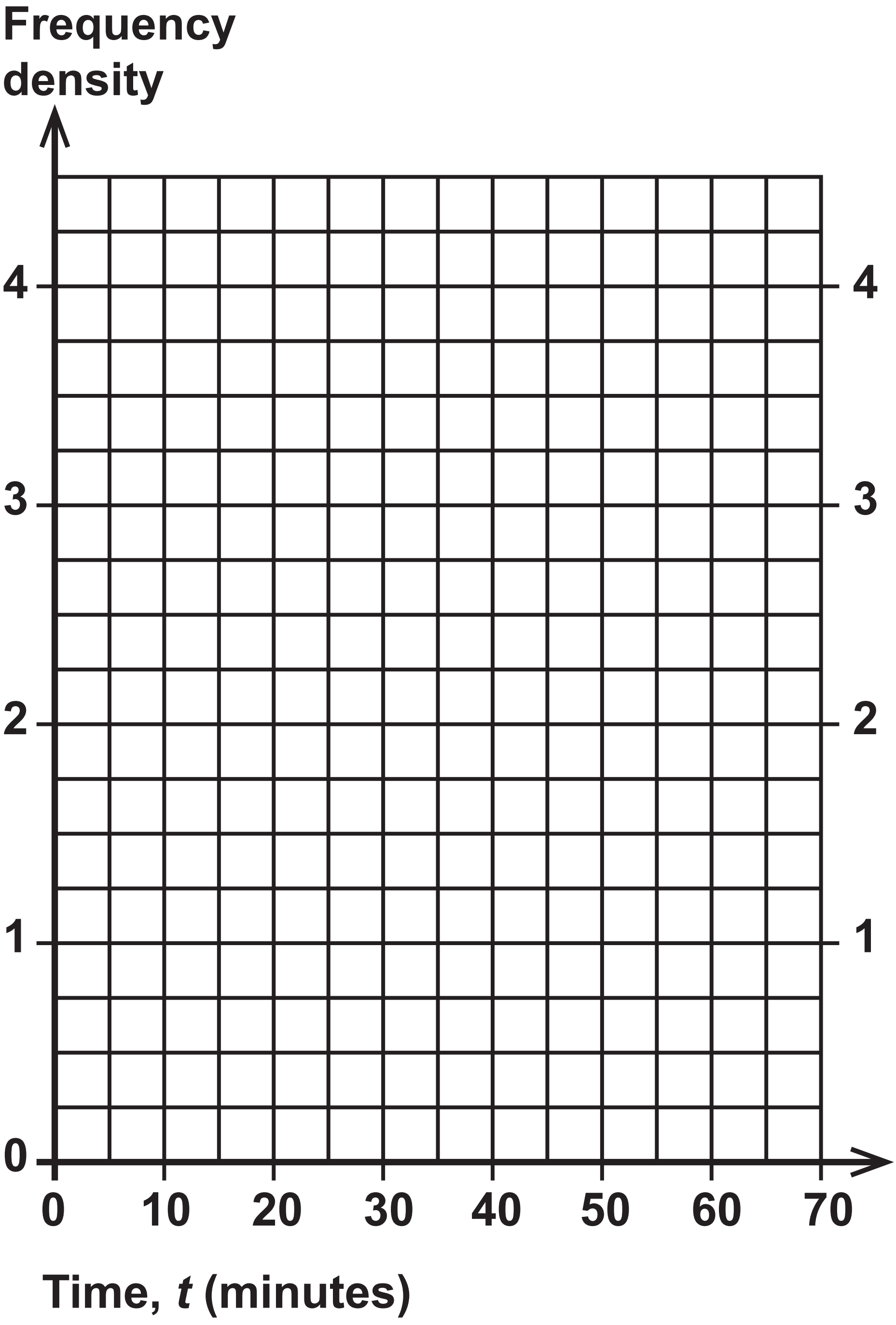


Question 7

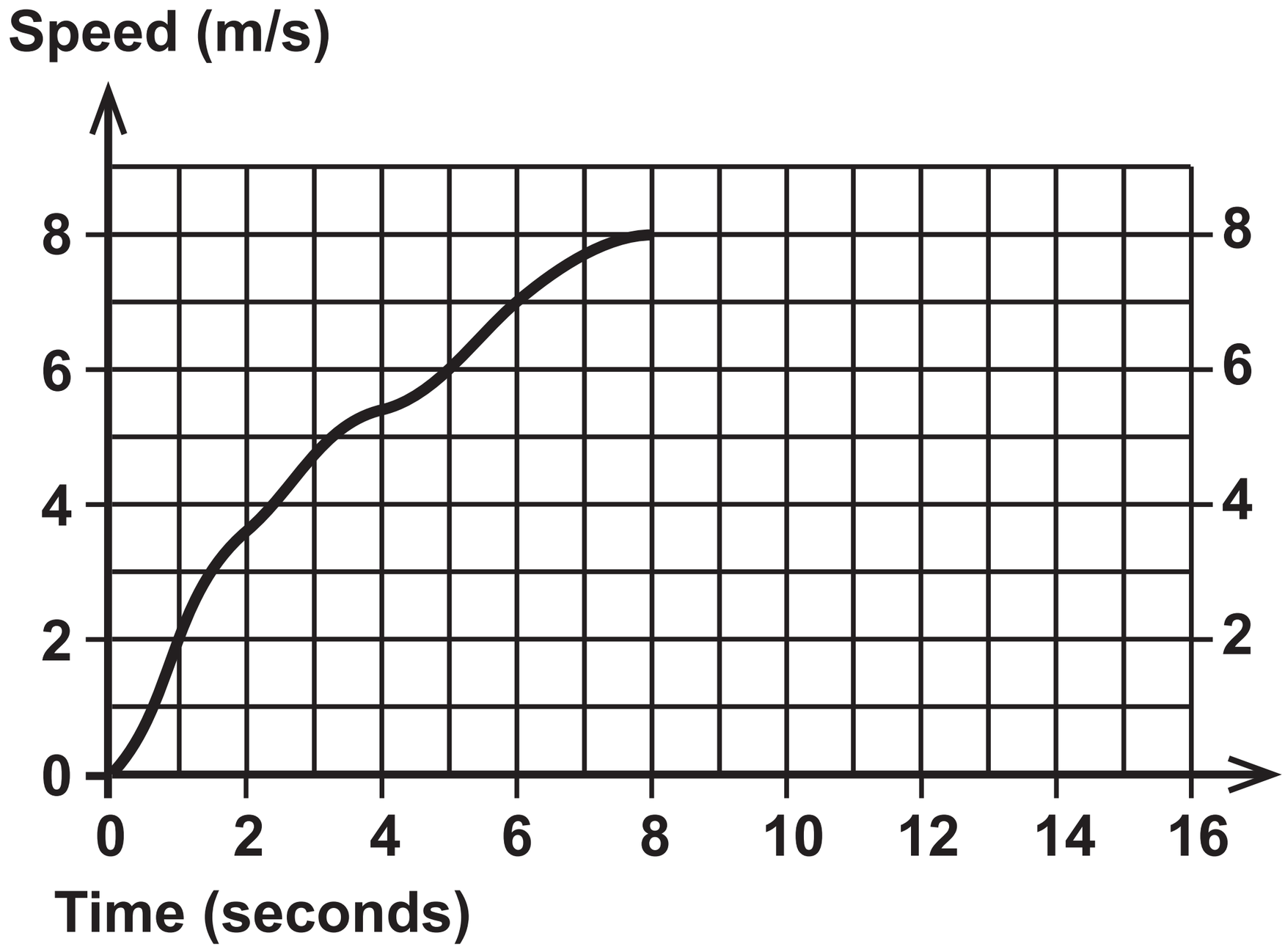
Table

Time taken, t (minutes)	Frequency	Frequency density
$0 < t \leq 10$	30	3
$10 < t \leq 20$	40	
$20 < t \leq 35$	30	
$35 < t \leq 50$	15	
$50 < t \leq 70$	5	

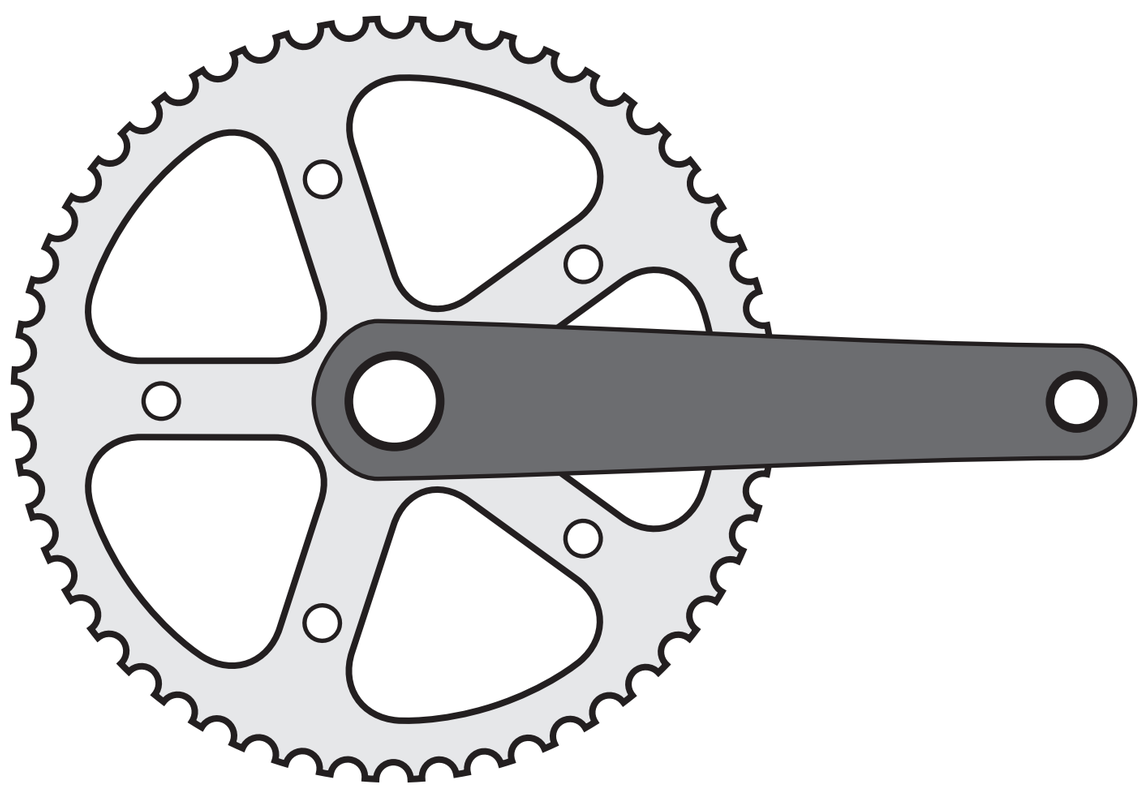
Question 7 (a) (ii)



Question 8

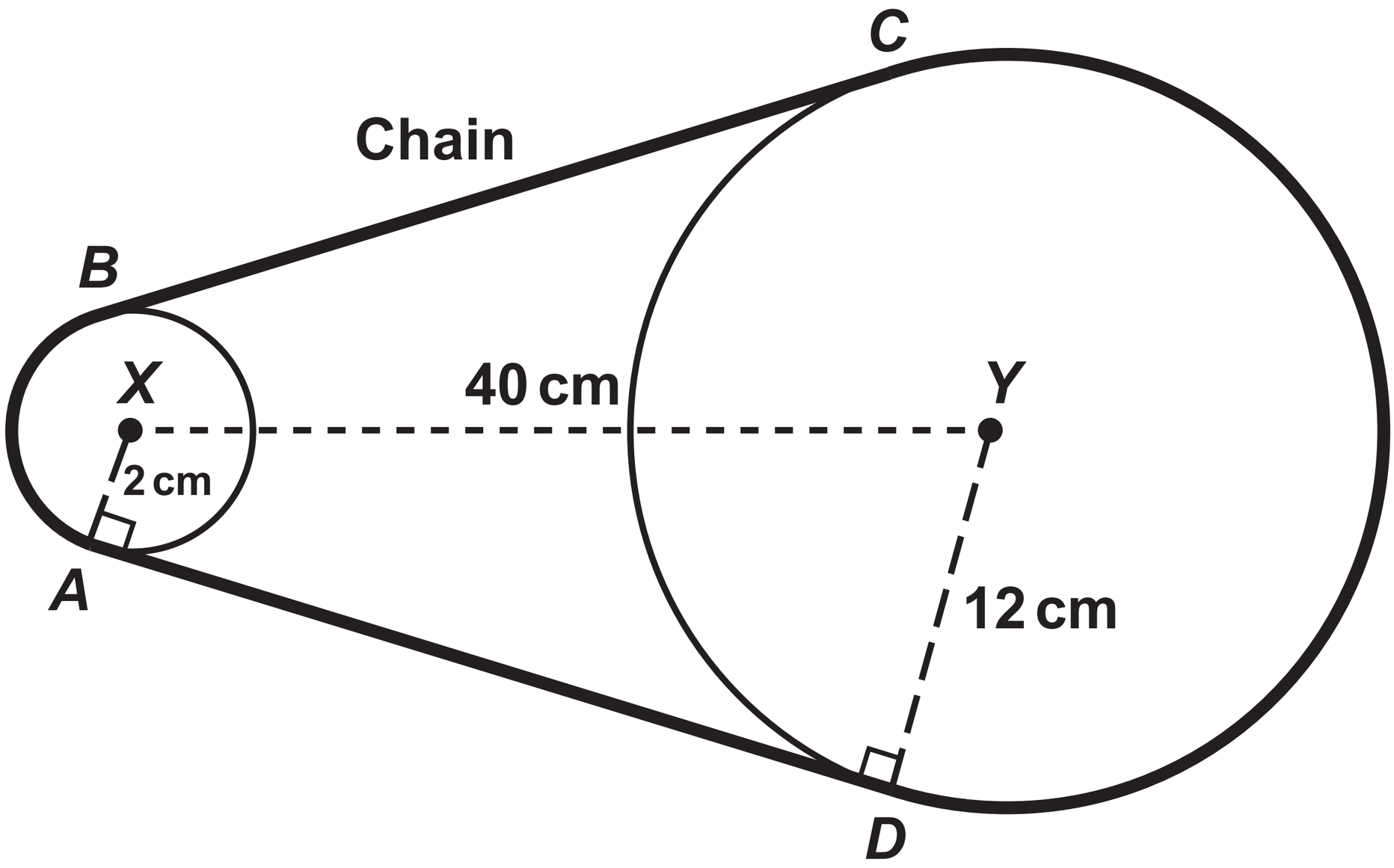


Question 9 (a)



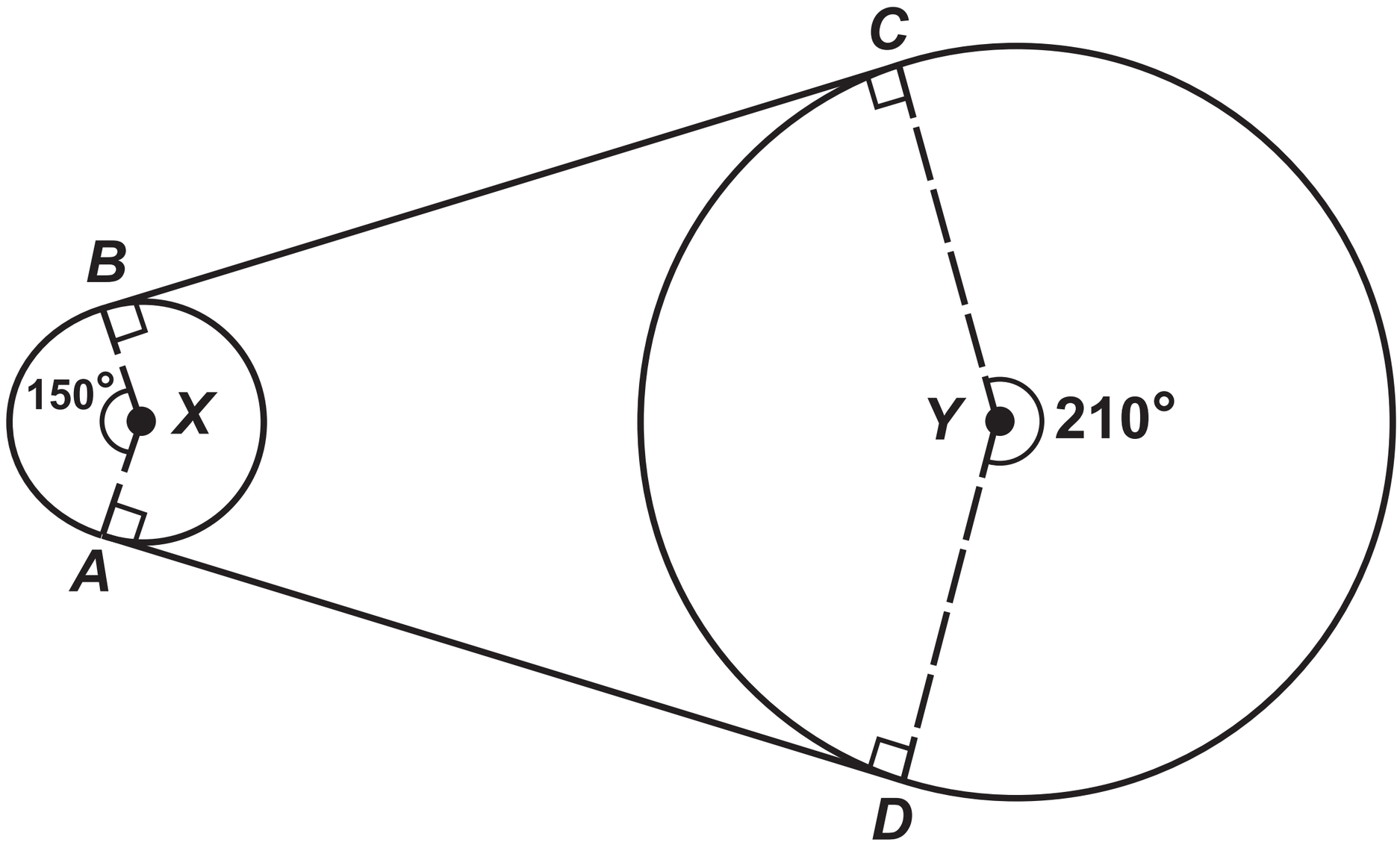
Question 9 (b)

Diagram NOT drawn to scale



Question 9 (b) (ii)

Diagram NOT drawn to scale



GCSE

MATHEMATICS

and

NUMERACY

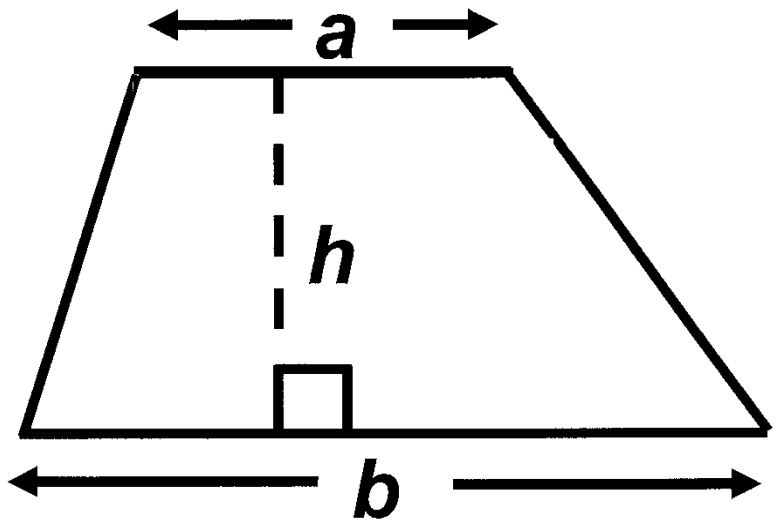
FORMULA LIST
HIGHER TIER
GCSE

You must not write on these formula pages.

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

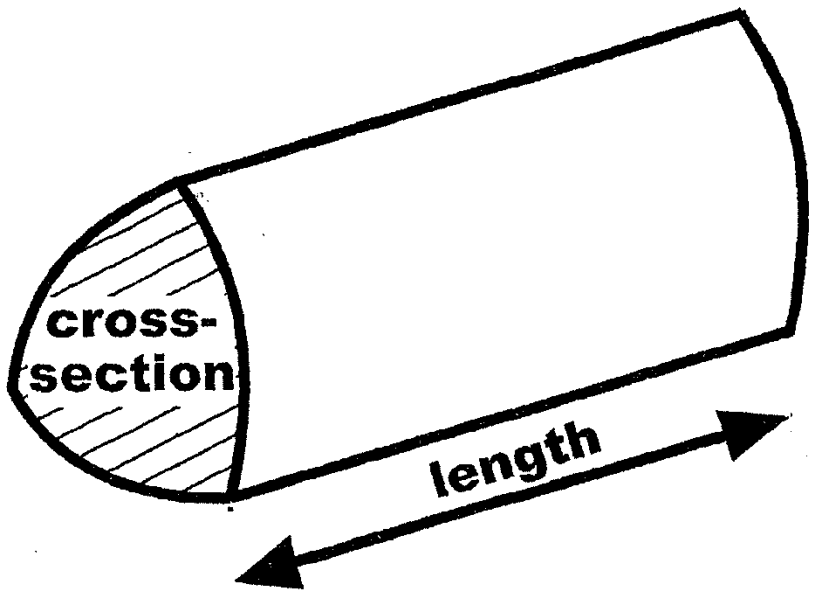
Formula List – Higher Tier

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



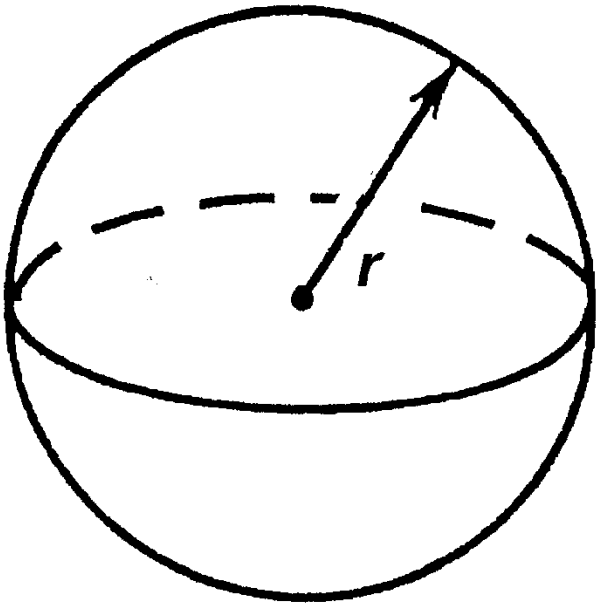
Volume of prism =

area of cross – section × length



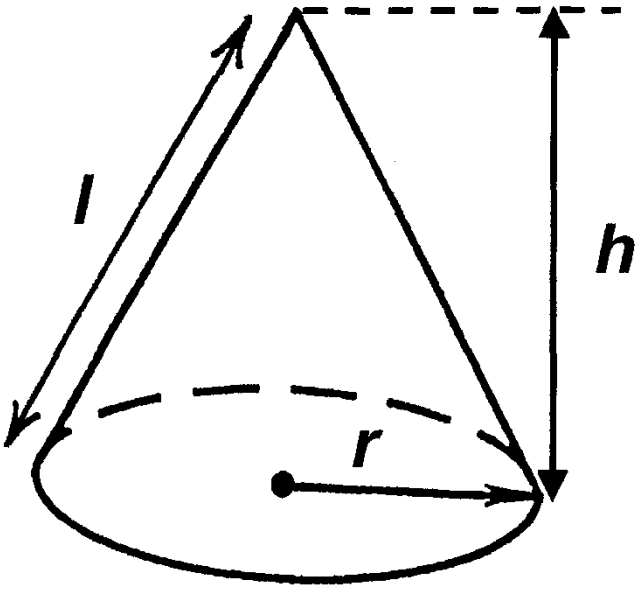
Volume of sphere $= \frac{4}{3}\pi r^3$

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

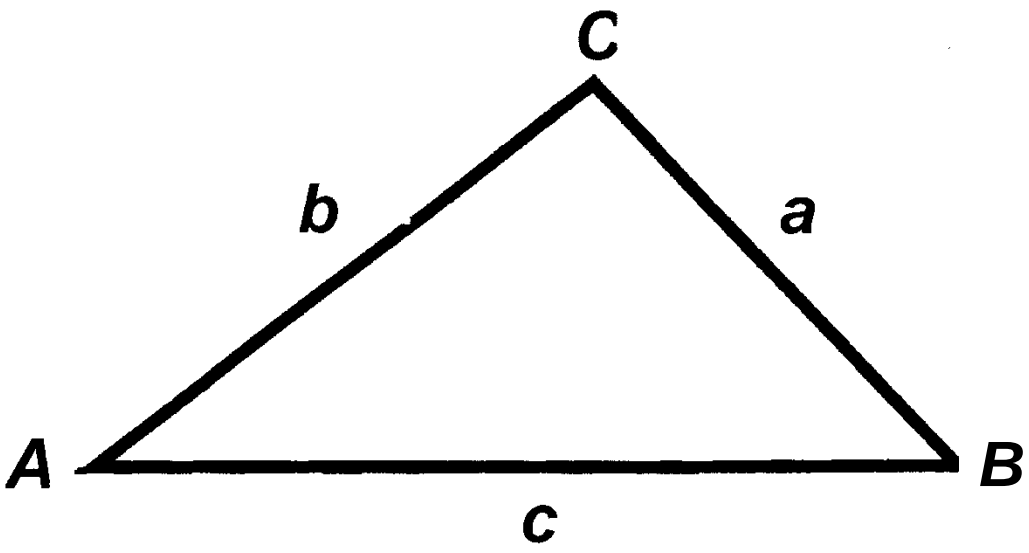


Volume of cone $= \frac{1}{3}\pi r^2 h$

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.