GCSE 3310U50-1

MATHEMATICS – NUMERACY
UNIT 1: NON – CALCULATOR
HIGHER TIER

TUESDAY, 7 MAY 2019 – MORNING

1 hour 45 minutes (plus your additional time allowance)

THE USE OF A CALCULATOR IS NOT PERMITTED IN THIS EXAMINATION

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	5	
2.	4	
3.	6	
4.	11	
5.	5	
6.	6	
7.	4	
8.	4	
9.	6	
10.	4	
11.	15	
12.	10	
Total	80	

Surname:	
Other Names:	
Centre Number:	
Candidate Number:	0

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.

A spare Diagram Booklet.

Models for Question 1, Question 10 and Question 11 (c).

Cut out shapes for Question 3 (b).

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 continuation pages at the back of the booklet. Question numbers must be given for all work written on the continuation 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 4 (a), the assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing.

1. Ask for model 1 for Question 1.

   The model is NOT made to scale.

   RUPERT SHOES sells shoes online. Pairs of shoes are packed in shoeboxes. The dimensions of the shoebox used are given on the model.

   Ask for model 2 for Question 1.

   A customer orders 2 pairs of shoes.

continued on the next page . . .

Question 1 continued

The package for sending the shoes to the customer is made by:

- placing one box on top of the other, and
- taping the two boxes together.

This is shown on the model.

The cost for sending the package is calculated using the formula given in the separate Diagram Booklet.

All dimensions are measured in cm.

continued on the next page . . .

Question 1 continued

How much does it cost RUPERT SHOES to send the package?

Give your answer in pounds.

You must show all your working.

8

[5 marks]

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

A builder has drawn a plan for building 3 office blocks on a plot of land.

They are numbered 1, 2 and 3, as shown in the diagram.

The scale of the plan is

1 cm represents 10 metres.

continued on the next page . . .

Question 2 continued

2. (a) The builder is planning to plant a tree so that it is:

- the same distance from Block 1 as it is from Block 2
- 80 metres from the top left hand corner of Block 3

Mark the position for the planting of the tree.

[3 marks]

continued on the next page . . .

Question 2 continued

2. (b) What is the shortest possible distance between Block 2 and Block 3?

_____ **metres**

[1 mark]

3. (a) **SAM'S GARDEN CENTRE buys trees to sell.**

Sam bought 200 trees.

Each tree cost Sam £25

22% of the trees were not sold.

Sam sold all the other trees for £40 each.

How much profit did Sam make?

You must show all your working.

(Turn over)

[5 marks]

continued on the next page . . .

Question 3 continued

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

The trees are planted in identical pots. They each have a uniform cross – section in the shape of a regular hexagon.

Show that these pots will tessellate.

Cut out shapes are available for this question.

_____

_____

[1 mark]

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

The diagram shows a map of Wales.

A helicopter pilot is planning a route from Milford Haven to Ruabon and then on to Swansea.

(a) IN THIS PART OF THE QUESTION, YOU WILL BE ASSESSED ON THE QUALITY OF YOUR ORGANISATION, COMMUNICATION AND ACCURACY IN WRITING.

The plan for the flight is shown in the separate Diagram Booklet.

Question 4 (a) continued

Calculate the total distance of the flight.

Give your answer in miles.

You must show all your working.

[4 marks + 2 marks OCW]

continued on the next page . . .

Question 4 continued

4. (b) On average, the helicopter uses 0•4 gallons of fuel per minute.

Remember: 1 gallon = 4•55 litres

Use this information to calculate how many litres of fuel the helicopter would be expected to use for the flight planned in (a).

You must show all your working.

(Turn over)

Fuel = _____ litres

[5 marks]

5. You are given that:

1 gigalitre = 1 000 000 m^3

1 megalitre = 1 million litres

Lake Vyrnwy is a reservoir in mid Wales.

(a) Lake Vyrnwy can release between 25 and 45 megalitres of water per day from the dam.

The lake also supplies water through underground pipes to another reservoir at a rate of 230 000 m^3 per day.

continued on the next page . . .

Question 5 (a) continued

5. (a) (i) How many litres are there in 25 megalitres?

Circle your answer.

25×10^{8}	25×10^{-6}	25×10^{7}
$2{\cdot}5 \times 10^{6}$	$2{\cdot}5 \times 10^{7}$	

[1 mark]

Question 5 (a) continued

5. (a) (ii) Which is the best estimate for the volume of water passing through the underground pipes PER HOUR?

Circle your answer.

8500 m^3	9600 m^3	10 040 m^3
10 400 m^3	11 000 m^3	

[1 mark]

5. (b) Lake Vyrnwy has a surface area of approximately $4\,540\,000\ m^2$

Lake Vyrnwy contains 59•7 gigalitres of water.

Calculate an estimate of the average depth of the lake.

Give your answer in metres.

(Turn over)

Estimate of average depth is

_____ metres

[3 marks]

6. (a) Look at the three diagrams for Question 6 (a) in the separate Diagram Booklet. The diagrams are box – and – whisker plots.

Maesystrad, Rhewlteg and Glanmawr are three colleges. Each college recorded the times Year 12 students took to travel to college. The results are displayed in the box – and – whisker plots shown.

continued on the next page . . .

Question 6 (a) continued

6. (a) (i) Which of the three colleges has the greatest range of times?

What is the range of times for this college?

College _____

Range _____ minutes

[1 mark]

Question 6 (a) continued

6. (a) (ii) On average, in which college did Year 12 students have the longest travel times?

You must give a reason for your answer.

College _____

Reason _____

_____

_____

_____

[1 mark]

Question 6 (a) continued

6. (a) (iii) Which college has the greatest difference between the median and the lower quartile?

What is this difference?

College _____

Difference _____ **minutes**

[1 mark]

Question 6 (a) continued

6. (a) (iv) Which of the three colleges has the greatest number of Year 12 students?

Give a reason for your answer.

Maesystrad ☐

Rhewlteg ☐

Glanmawr ☐

Don’t know ☐

Reason _____

_____

[1 mark]

6. (b) At another college, Wynne College, there are 240 students in Year 12

The interquartile range of the times taken for these students to travel to college is 32 minutes.

continued on the next page . . .

Question 6 (b) continued

6. (b) (i) How many of these students have travel times within this interquartile range?

_____

_____

_____ students

[1 mark]

continued on the next page . . .

Question 6 (b) continued

6. (b) (ii) 75% of the Year 12 students at Wynne College take less than 55 minutes to travel to college.

Complete the following statement.

‘25% of the Year 12 students at Wynne College take less than _____ minutes to travel to college.’

[1 mark]

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

The table shows the approximate land area and population for 5 countries in 2014

(a) Which of the 5 countries had a population density of approximately 100 people per km^2?

Circle your answer.

Argentina	Austria	Canada
Pakistan	United Kingdom	

[1 mark]

continued on the next page . . .

Question 7 continued

7. (b) Which of these countries had the greatest population density? Circle your answer.

Argentina	Austria	Canada
Pakistan	United Kingdom	

[1 mark]

Question 7 continued

7. (c) Which of these countries had a population density that is approximately 4 times the population density of Canada?

You must show all your working.

[2 marks]

8. Bronwen is investigating the increase in the growth of algae on the surface of a pond.

The surface area covered by the algae is measured in cm^2

She finds the surface area covered by the algae t DAYS after the start of her investigation is given by the following expression.

$$400 + 4^{\frac{t}{2}}$$

continued on the next page . . .

Question 8 continued

8. (a) What surface area was covered by algae at the start of her investigation?

Circle your answer.

$404\ cm^2$	$401\ cm^2$	$4\ cm^2$
$402\ cm^2$	$400\ cm^2$	

[1 mark]

Question 8 continued

8. (b) Bronwen calculated the surface area covered by the algae 5 days after the start of the investigation.

She also calculated the surface area 7 days after the start of the investigation.

By how much did the surface area covered by the algae increase between these two times?

_____

_____

_____

(Turn over)

[3 marks]

9. The voltage, V volts, of an electric circuit is given by the formula

$$V = IR$$

where I is the current measured in amps, and R is the resistance measured in ohms.

During an experiment,

- V was measured at 280 volts, correct to the nearest 10 volts,
- I was measured at 0•2 amps, correct to the nearest 0•1 amps.

continued on the next page . . .

Question 9 continued

Calculate the least possible value and greatest possible value of the resistance *R*.

(Turn over)

(Turn over)

Least possible value

of R = _____ ohms

Greatest possible value

of R = _____ ohms

[6 marks]

10. Look at the diagram for Question 10 in the separate Diagram Booklet.
The diagram is NOT drawn to scale.

A tent company is designing a new 2 – person tent.
The base of the tent is in the shape of a kite, as shown in the diagram.
The width of the kite is 160 cm, and the two shorter sides are of length 100 cm.
The point where the diagonals of the kite intersect has been marked *O* on the diagram.

continued on the next page . . .

Question 10 continued

Ask for the model for Question 10.

The model is NOT made to scale.

E is the highest point of the tent, and is 110 cm vertically above *O*. Part of the frame that supports the tent cover is a straight pole that goes from *A* to *E*.

Calculate the length of pole *AE*.

Give your answer as a surd.

You do not need to simplify your answer.

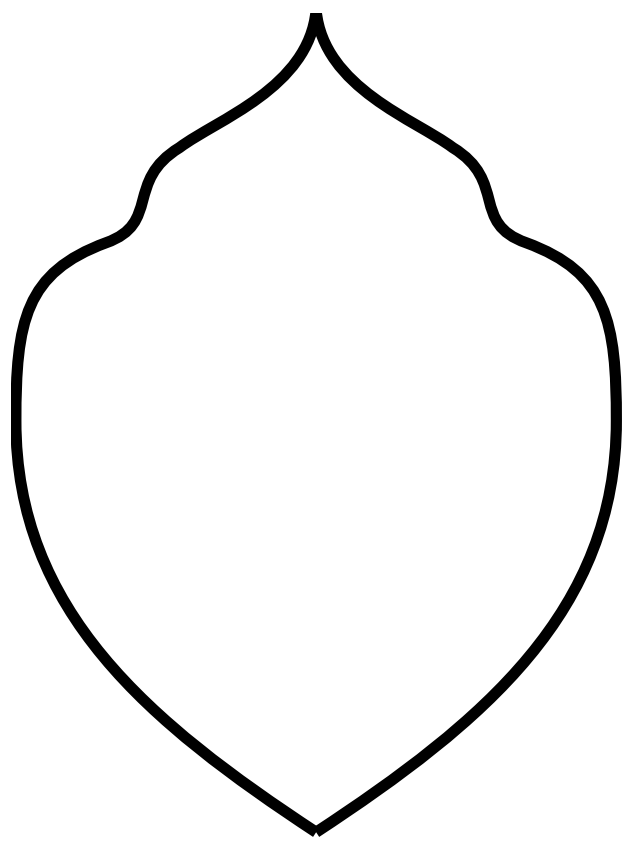
(Turn over)

[4 marks]

11. (a) Alun is a jeweller.

He is designing a symmetrical pendant, as shown below.

The diagram is NOT drawn to scale.



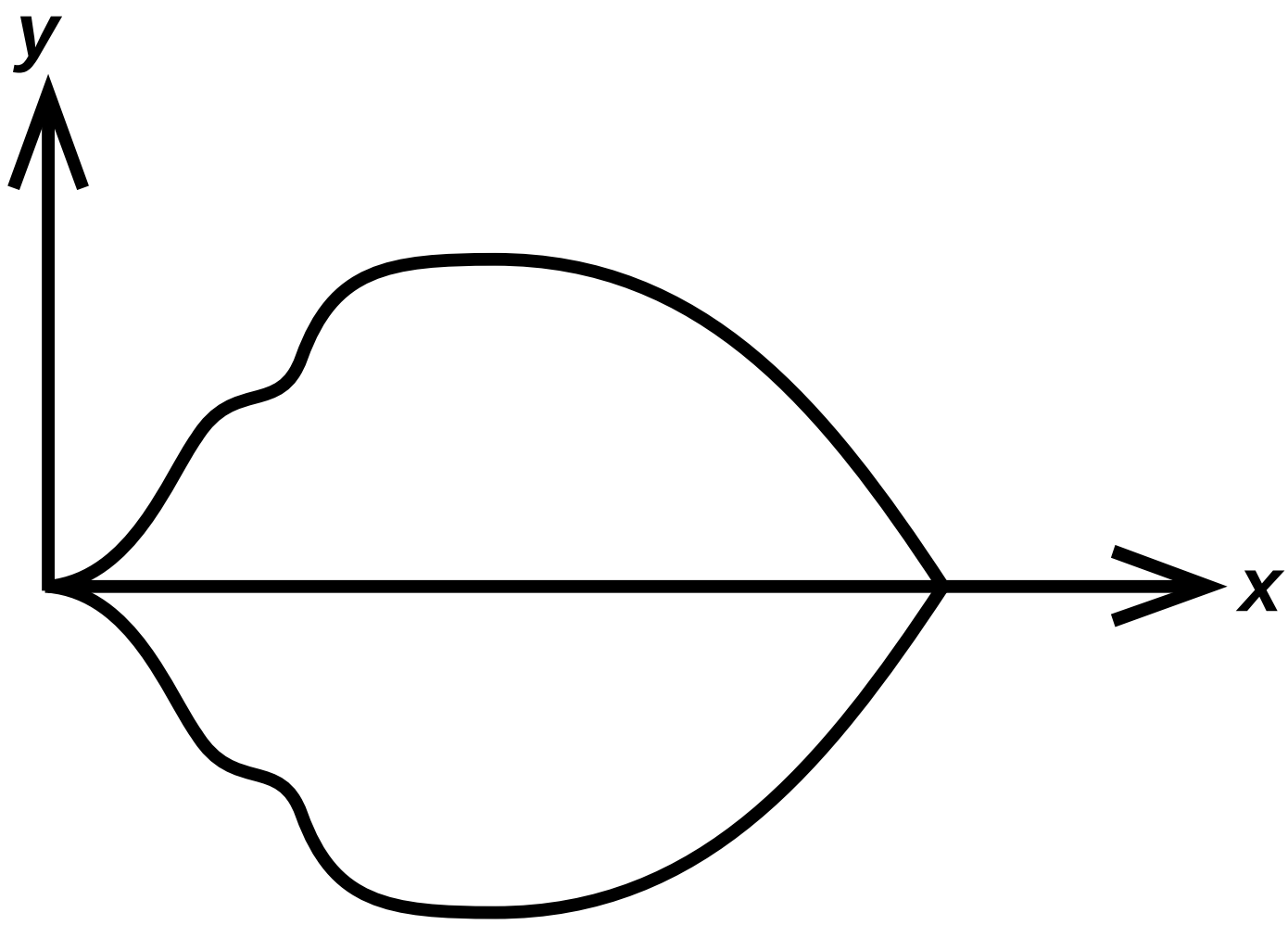
The pendant will be made from solid silver, with a uniform thickness of 3 mm.

continued on the next page . . .

Question 11 (a) continued

In order to calculate the cost of making the pendant, Alun wants to calculate an estimate of the volume of the pendant.

He has accurately drawn one of the symmetrical halves of the shape on graph paper.



continued on the next page . . .

Question 11 (a) continued

Look at the diagram for Question 11 (a) in the separate Diagram Booklet.

The diagram shows Alun's accurately drawn, one symmetrical half of the shape on graph paper.

Calculate an estimate of the volume of the whole pendant.

Use the graph provided, with 6 strips of equal width.

(Turn over)

[5 marks]

continued on the next page . . .

Question 11 continued

11. (b) Look at the diagram for Question 11 (b) in the separate Diagram Booklet. It is a table.

Alun makes pendants that are mathematical shapes.

The table shows the pendants and the number of these pendants that Alun made last month.

At the end of last month, Alun took a stratified sample of 30 of these 240 pendants to check their quality.

Question 11 (b) continued

Calculate how many pendants of each shape were in Alun's sample.

You must show all your working.

(Turn over)

PENDANT	NUMBER IN SAMPLE
Triangle	
Circle	
Rectangle	
Trapezium	

[4 marks]

continued on the next page . . .

Question 11 continued

11. (c) Ask for the models for Question 11 (c).

The models are NOT made to scale. There are two models, Model (i) and Model (ii).

Model (i) represents a metal cylinder.

Model (ii) represents a metal sphere.

Alun has 5 identical metal cylinders, each of length 40 mm.

continued on the next page . . .

Question 11 (c) continued

He has been asked to make a solid sphere of radius 30 mm.

He melts the 5 cylinders and recasts all the metal to make the sphere.

Calculate the radius of each of the cylinders.
Give your answer in mm, in the form $a\sqrt{b}$ where a and b are integers, and b is as small as possible.

(Turn over)

[6 marks]

12. A new athletics stadium is to be built in Alltycapel.

(a) A throwing circle is to be built for the shot put and discus events.

There are lines drawn from the centre of the circle.

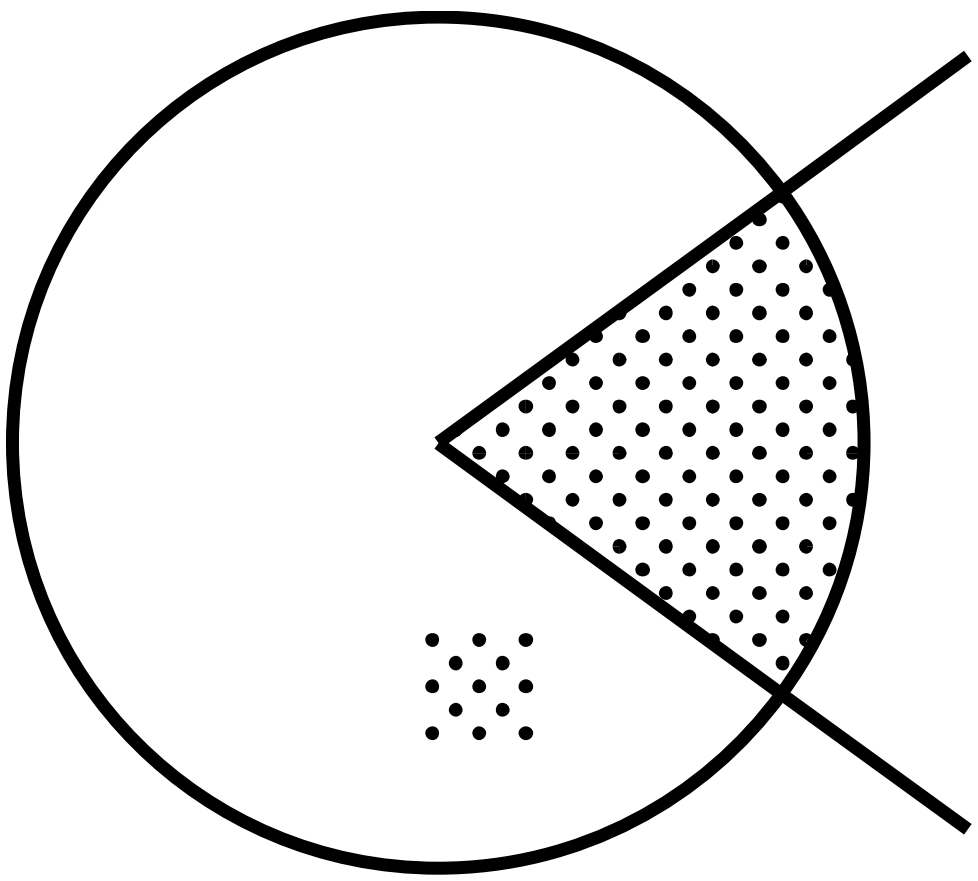
They show the athletes where the boundaries are for their throws.

The lines form a sector of the circle.

continued on the next page . . .

Question 12 (a) continued

This sector is to be painted, as shown in the diagram. The diagram is NOT drawn to scale.



The radius of the throwing circle is 120 cm.

The area of the sector is $0{\cdot}08\dot{3}$ of the area of the circle.

Question 12 (a) continued

12. (a) (i) Write $0{\cdot}08\dot{3}$ as a fraction in its simplest form.

[3 marks]

(Turn over)

Question 12 (a) continued

12. (a) (ii) Use your answer to (i) to calculate the area to be painted.

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

[2 marks]

continued on the next page . . .

Question 12 continued

12. (b) Look at the diagram for Question 12 (b) in the separate Diagram Booklet.

The diagram is NOT drawn to scale.

A new running track is to be built at the stadium.

Athletes in a 200 – metre race run in lanes. The inside line of one of the lanes is shown in the diagram.

continued on the next page . . .

Question 12 (b) continued

The inside line consists of:

- **a straight section of length 90 m,**
- **an arc of a circle with radius 36 m.**

The length of this inside line is 200 m.

Show that the value of x is $\frac{550}{\pi}$

(Turn over)

[5 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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GCSE

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MATHEMATICS – NUMERACY

UNIT 1: NON – CALCULATOR

HIGHER TIER

TUESDAY, 7 MAY 2019 – MORNING

Diagram Booklet

Surname:	
Other Names:	
Centre Number:	
Candidate Number:	**0**

Question 1

Formula

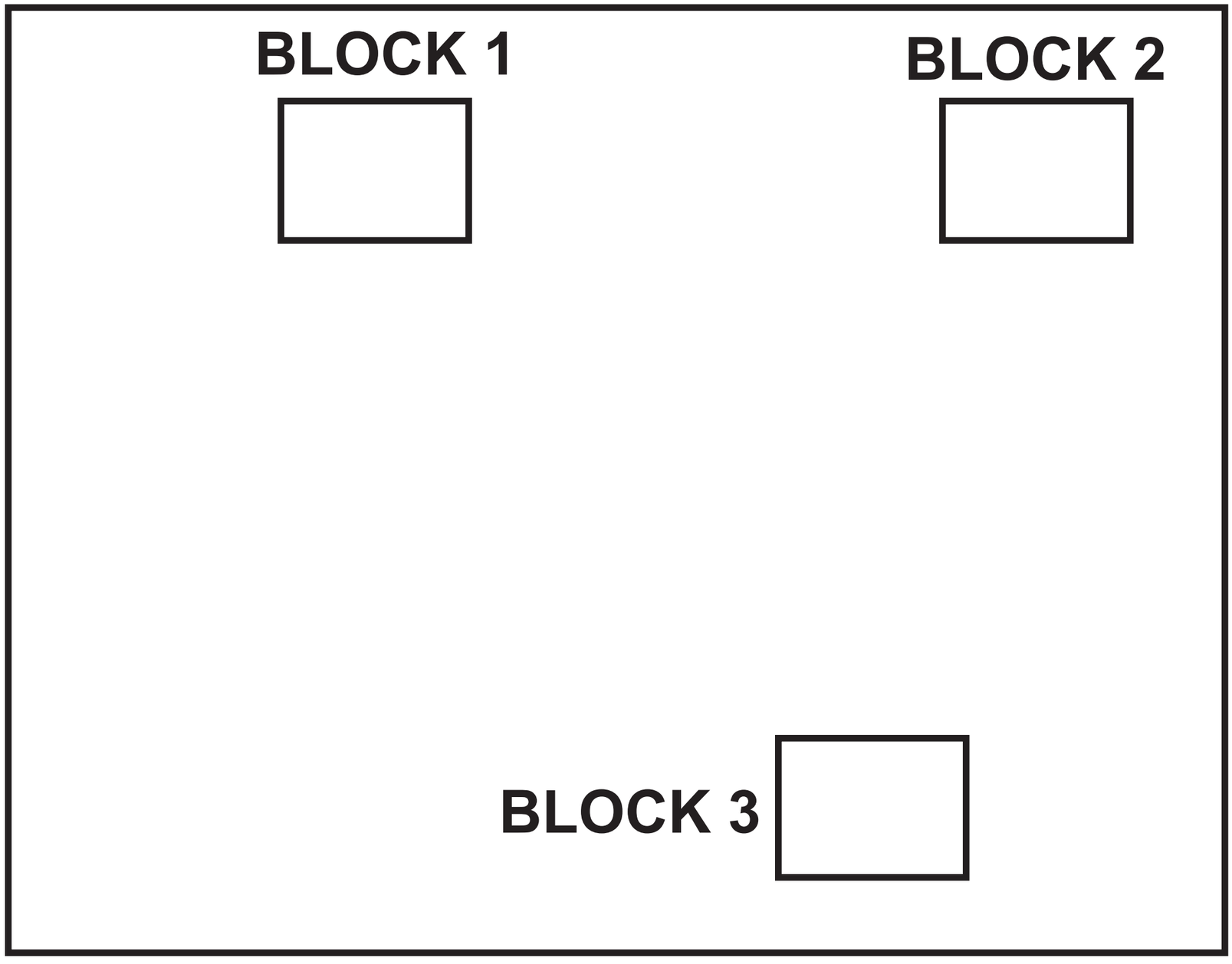
$$\text{Cost in £} = \frac{1}{5} \times (S + F) \times 0{\cdot}02$$

S = value of the sum of the 3 dimensions of the package

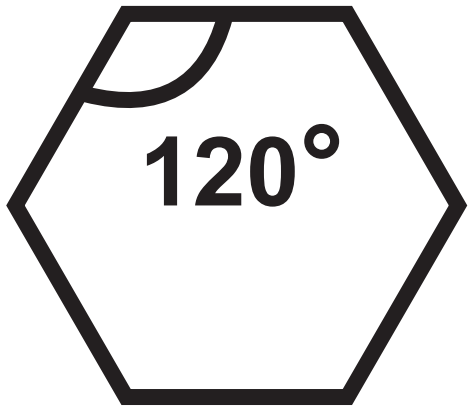
F = value of the area of one of the LARGEST faces of the package

Question 2

The scale of the plan is 1 cm represents 10 metres

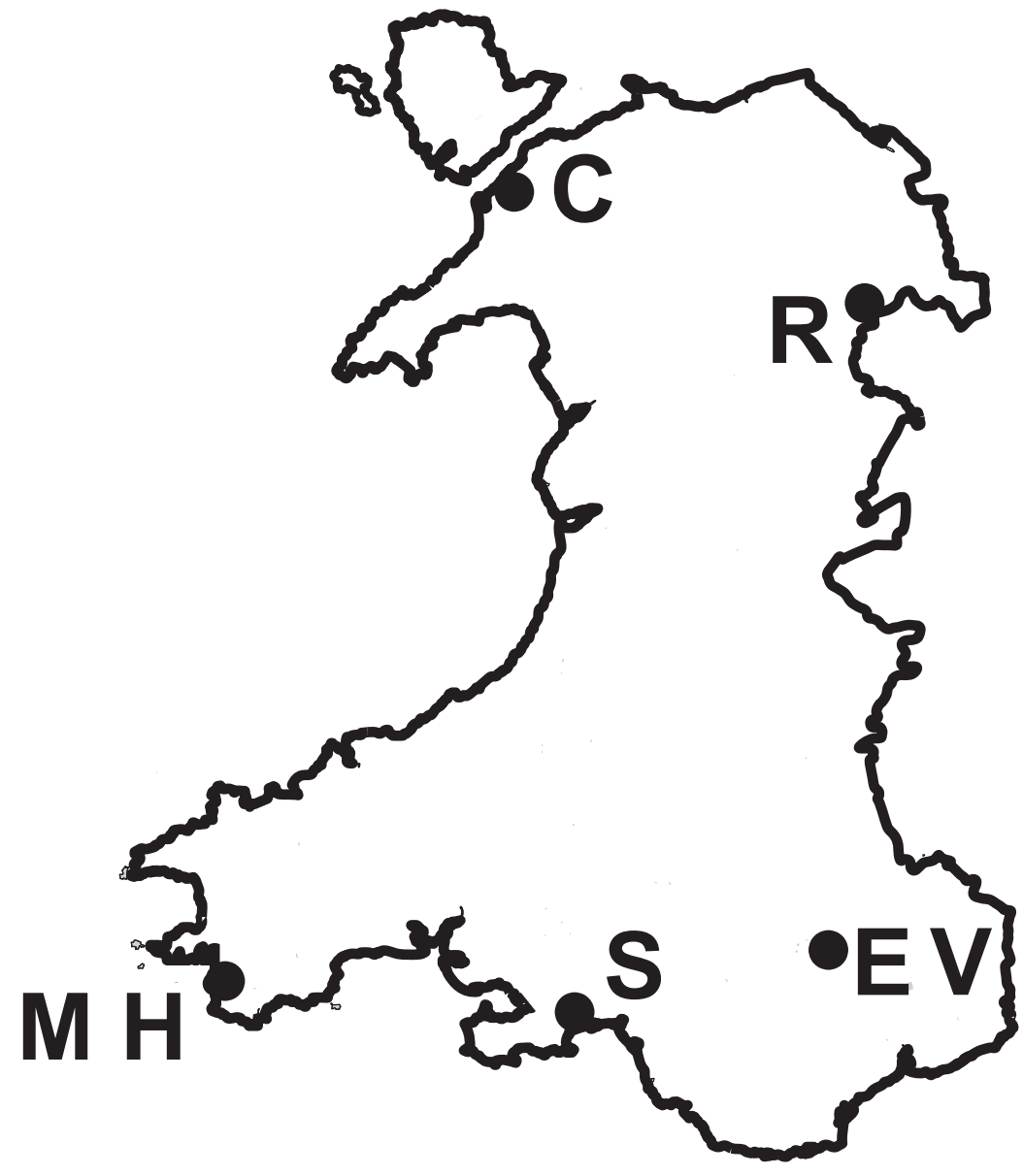


Question 3 (b)



Question 4

KEY:
C - Caernarfon
E V - Ebbw Vale
M H - Milford Haven
R - Ruabon
S - Swansea



Question 4 (a)

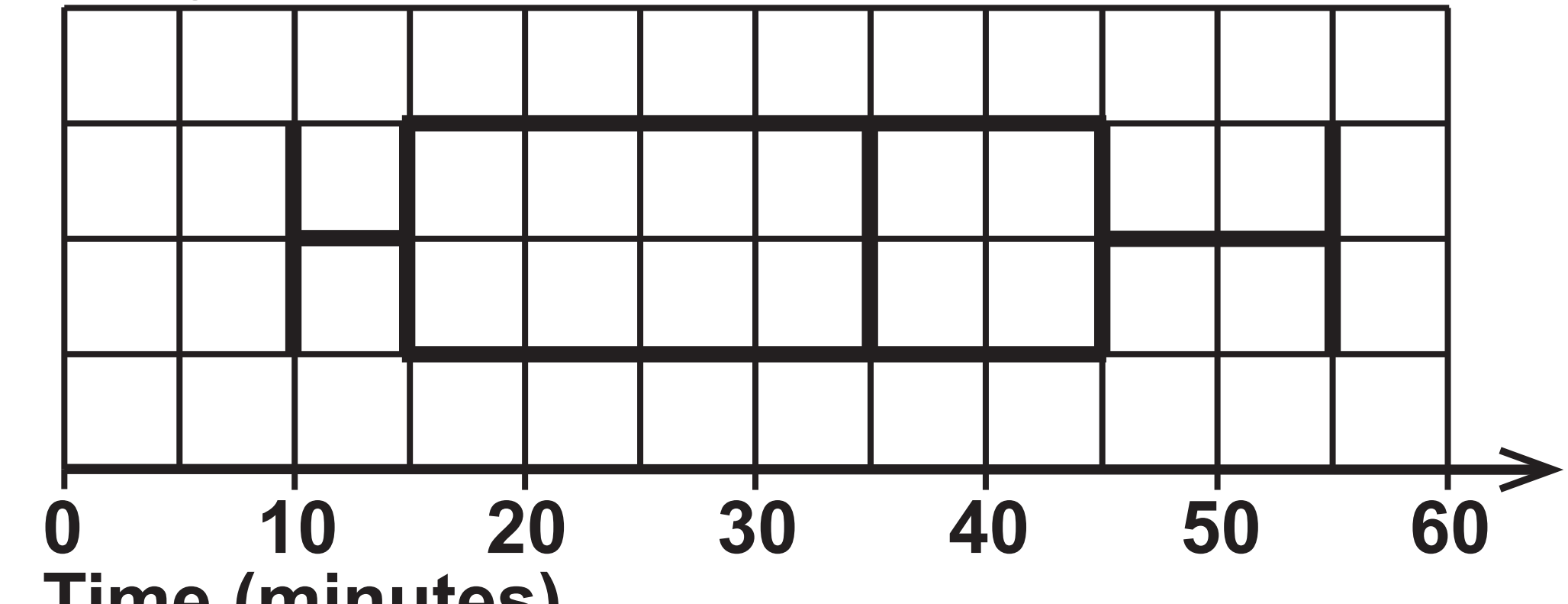
Information

Plan for the flight

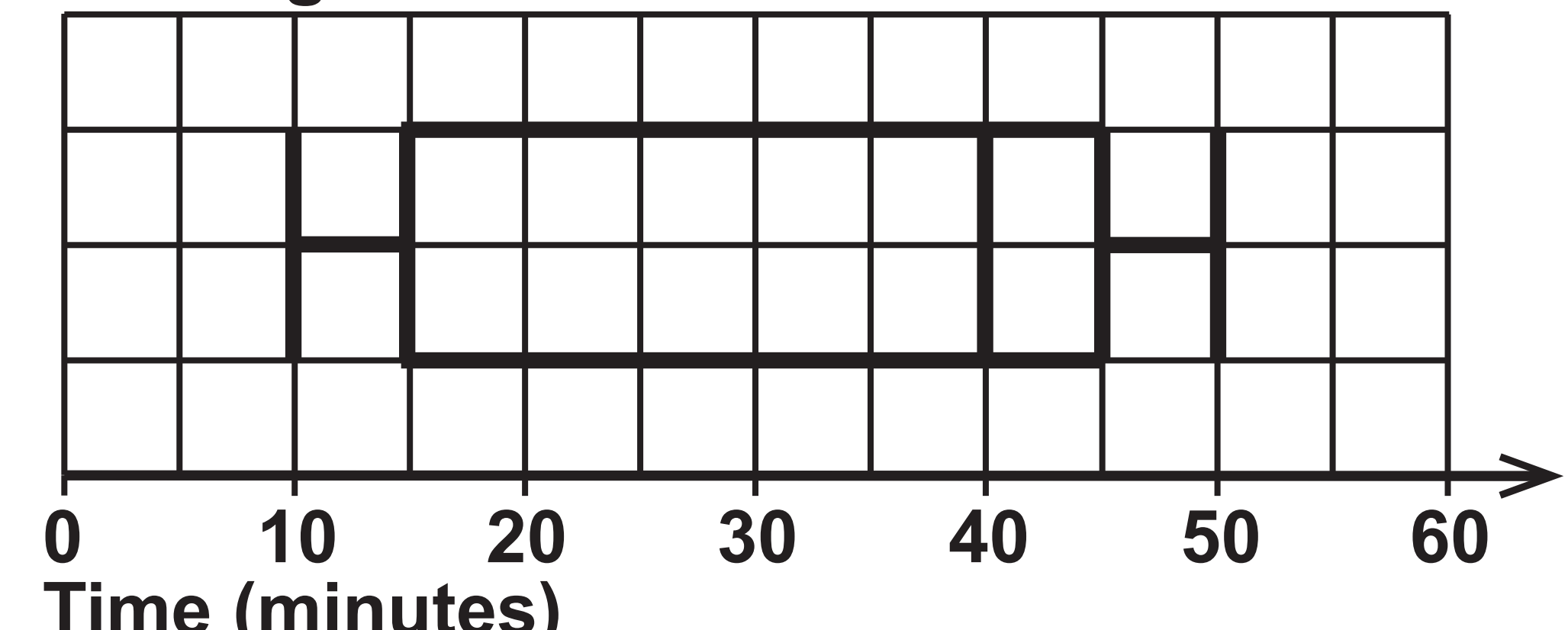
Journey	Average speed	Time
Milford Haven to Ruabon	90 mph	1 hour 20 minutes
Ruabon to Swansea	80 mph	1 hour 15 minutes

Question 6 (a)

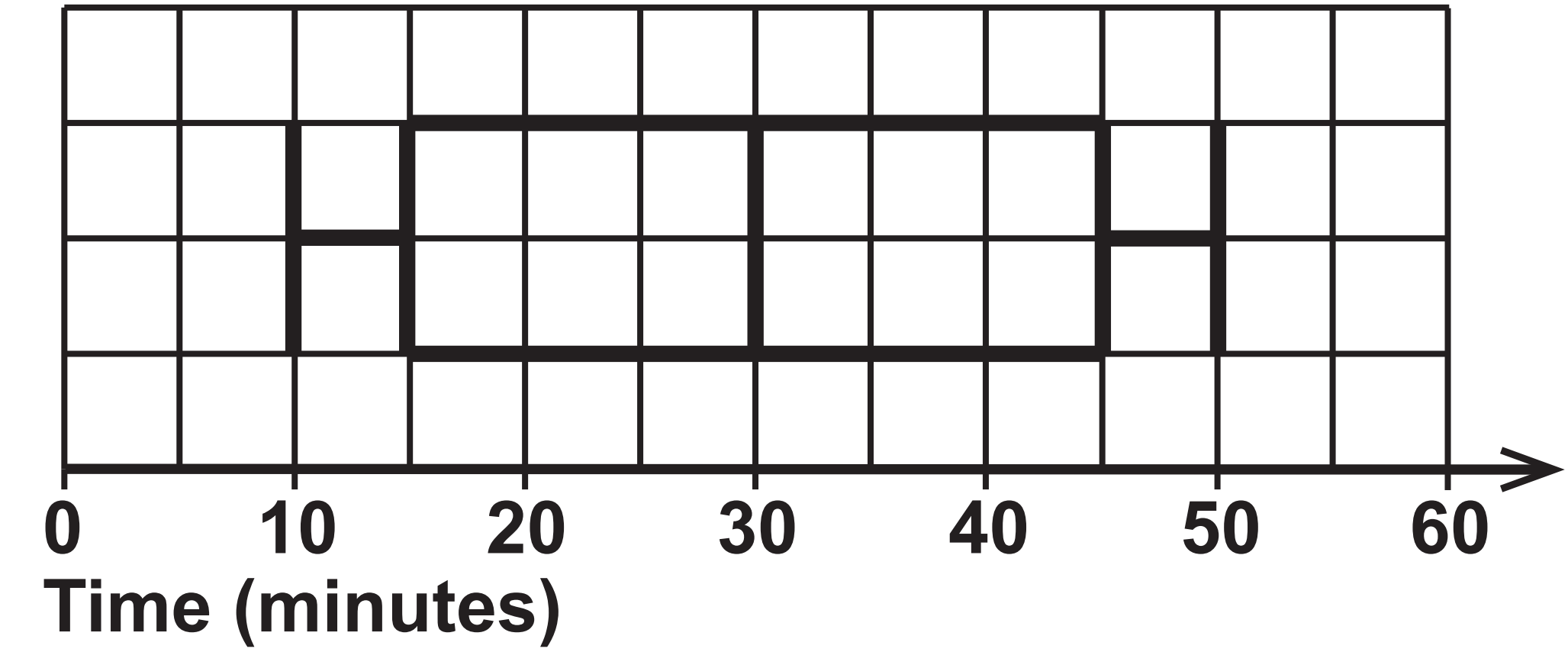
Maesystrad



Rhewlteg



Glanmawr



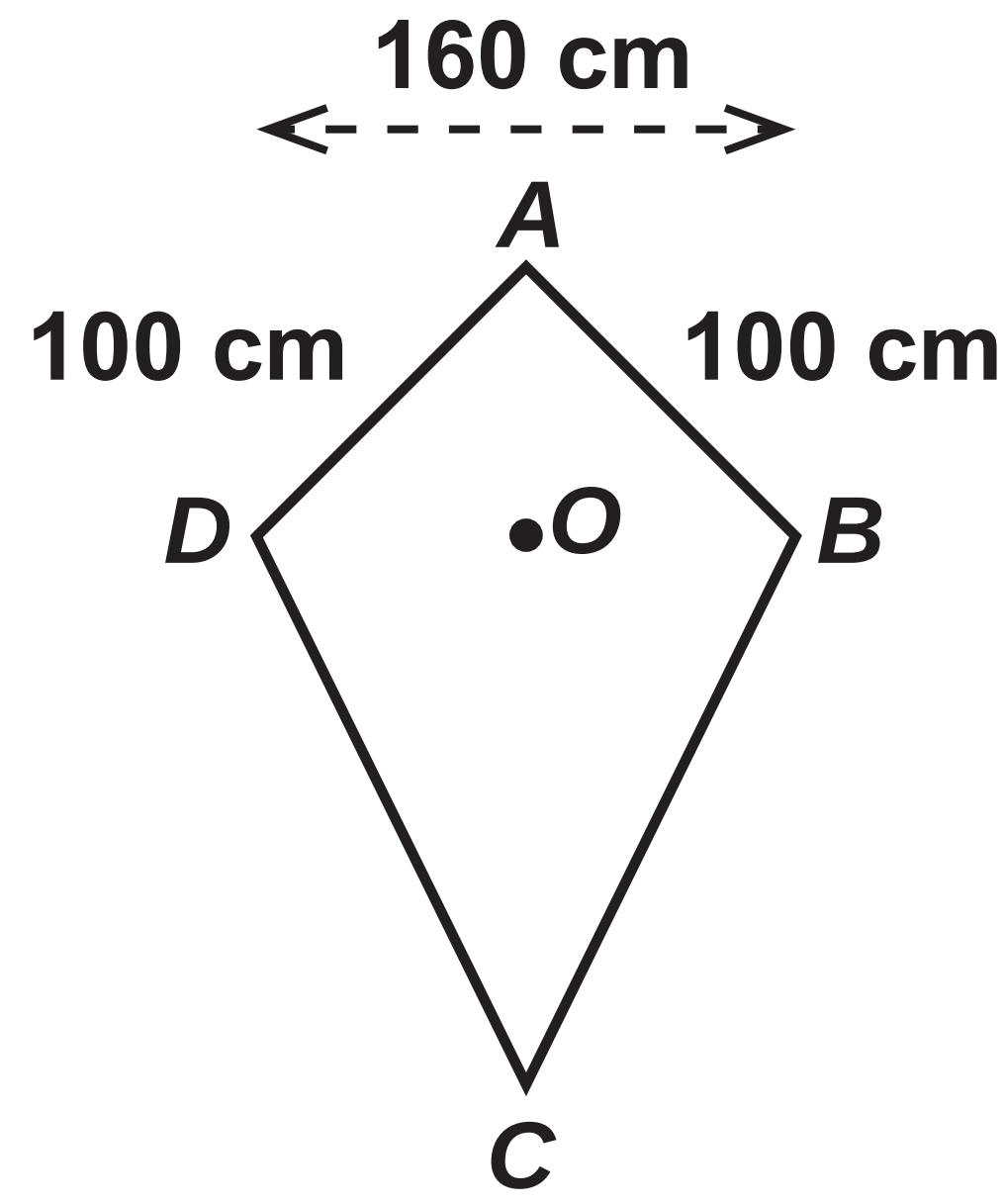
Question 7

Table

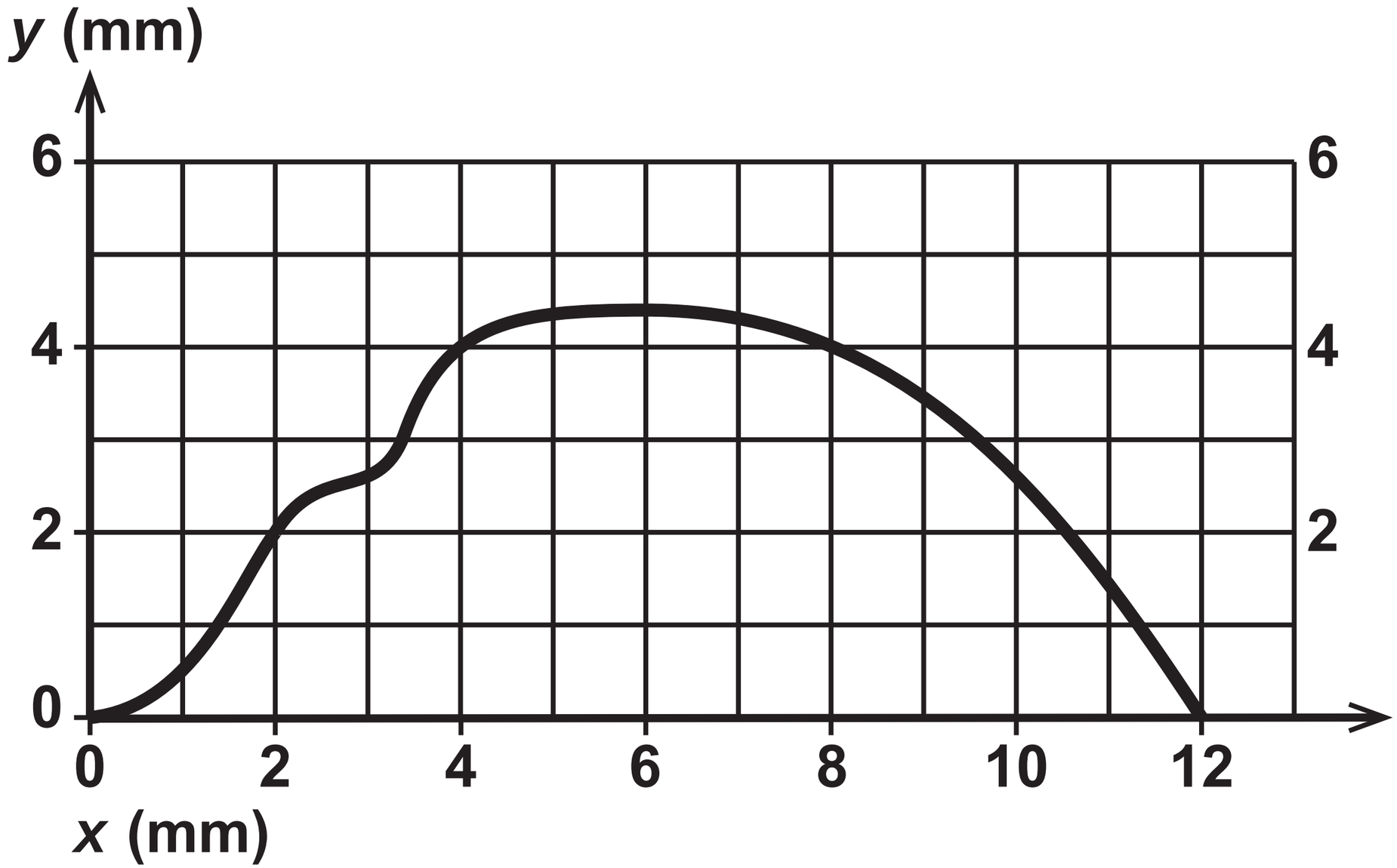
COUNTRY	APPROXIMATE LAND AREA, km^2	APPROXIMATE POPULATION
Argentina	2 800 000	40 000 000
Austria	84 000	8 400 000
Canada	10 000 000	34 000 000
Pakistan	800 000	170 000 000
United Kingdom	240 000	62 000 000

Question 10

Diagram NOT drawn to scale

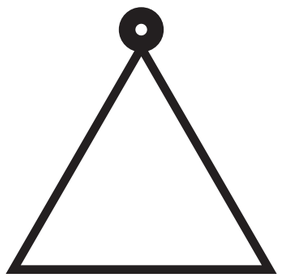
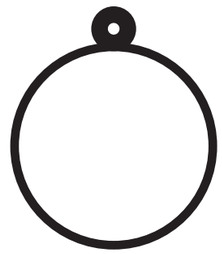
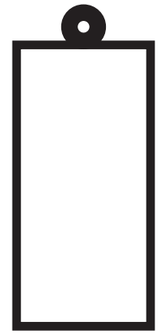
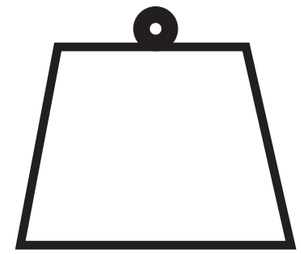


Question 11 (a)



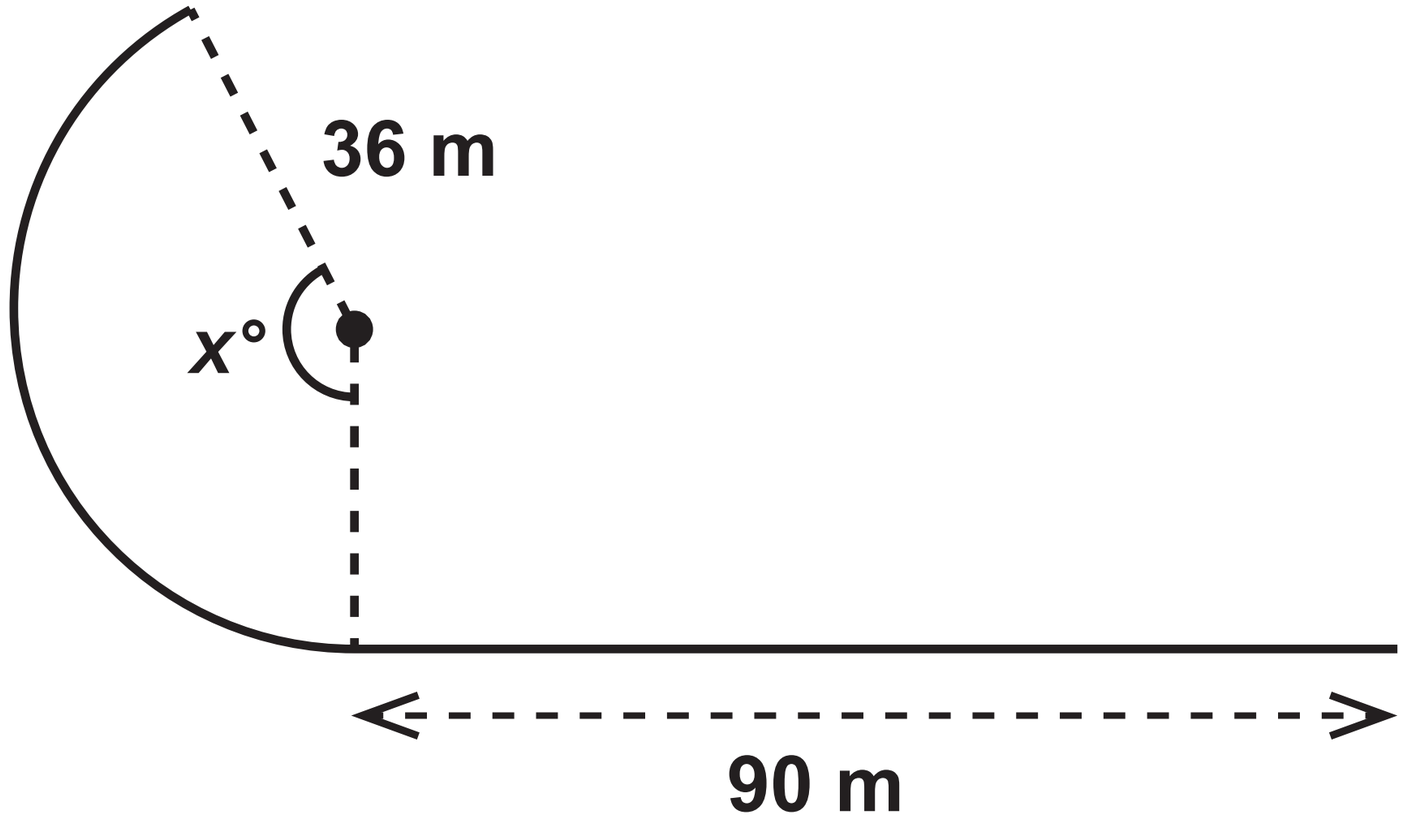
Question 11 (b)

Table

	Triangle	Circle	Rectangle	Trapezium
Pendant				
Number made last month	**52**	**96**	**30**	**62**

Question 12 (b)

Diagram NOT drawn to scale



GCSE

3310U50-1

MATHEMATICS – NUMERACY

UNIT 1: NON – CALCULATOR

HIGHER TIER

TUESDAY, 7 MAY 2019 – MORNING

Spare Diagram Booklet

Surname:	
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Question 1

Formula

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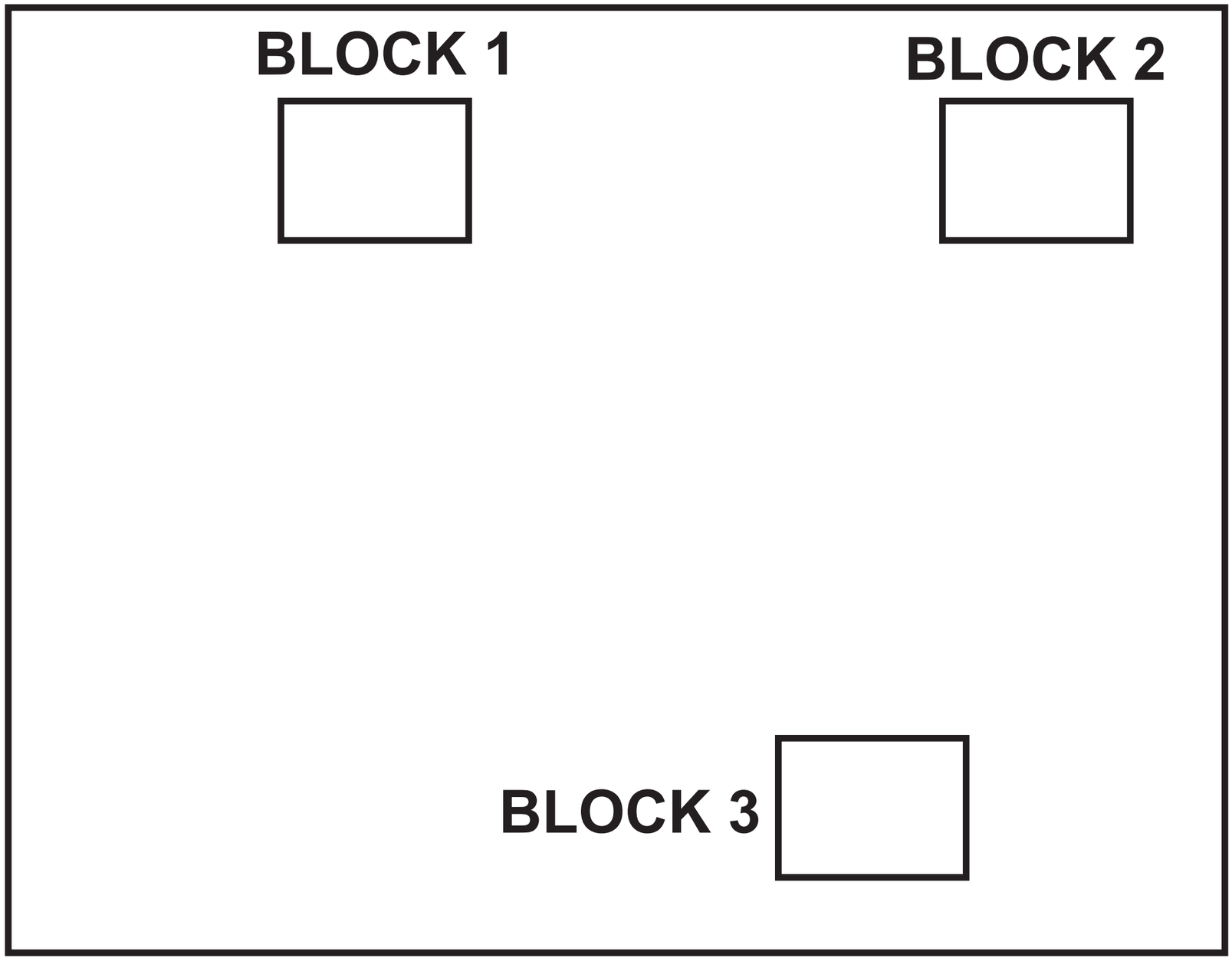
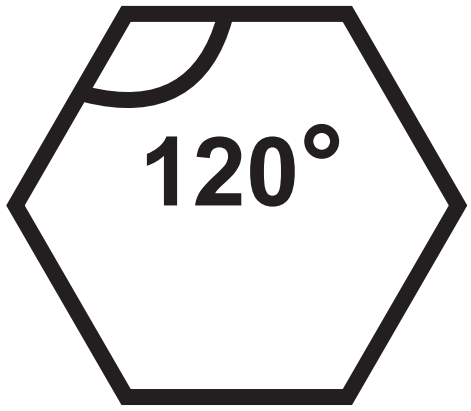
Question 2

The scale of the plan is 1 cm represents 10 metres

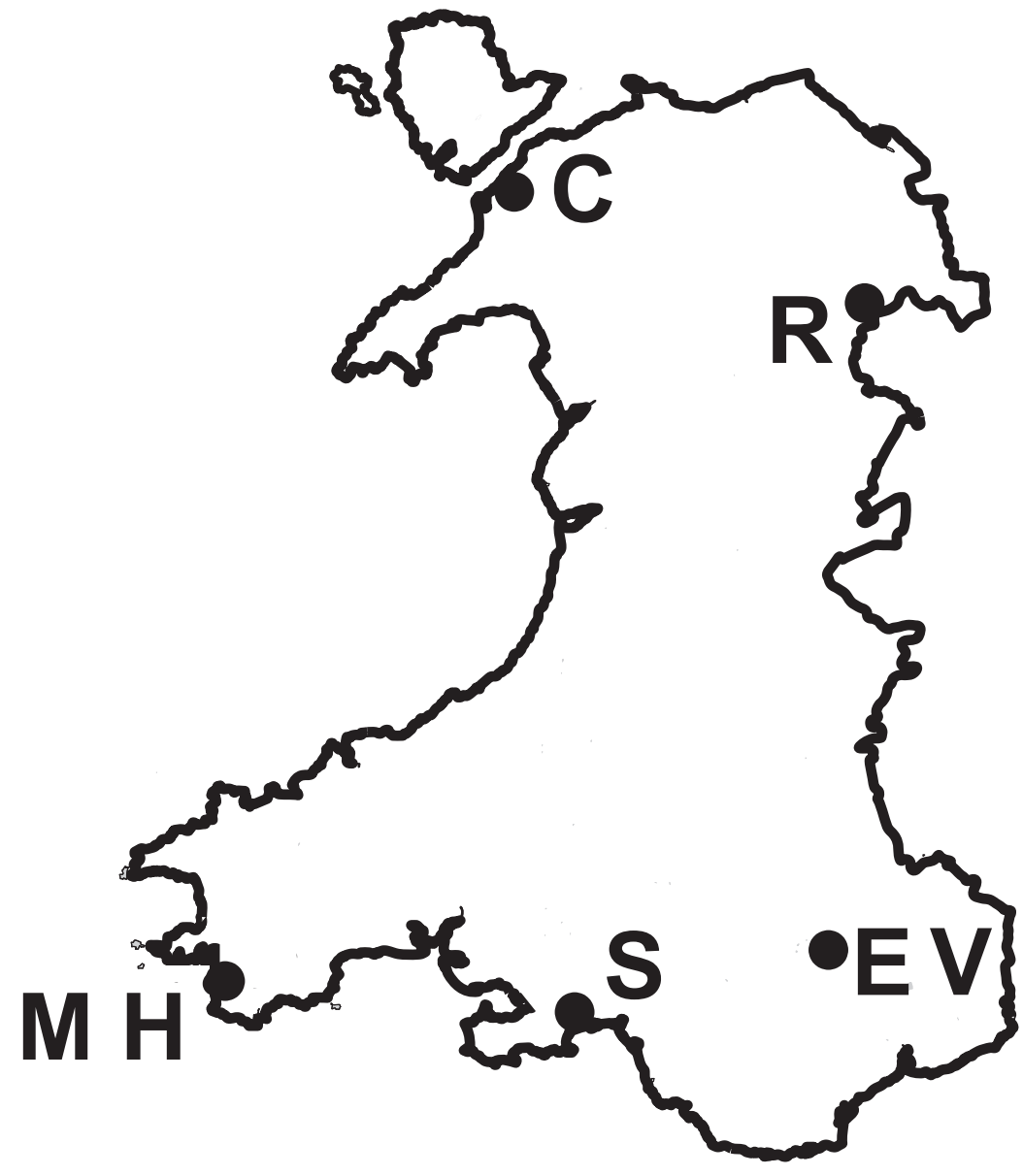


Question 3 (b)



Question 4

KEY:
C - Caernarfon
E V - Ebbw Vale
M H - Milford Haven
R - Ruabon
S - Swansea



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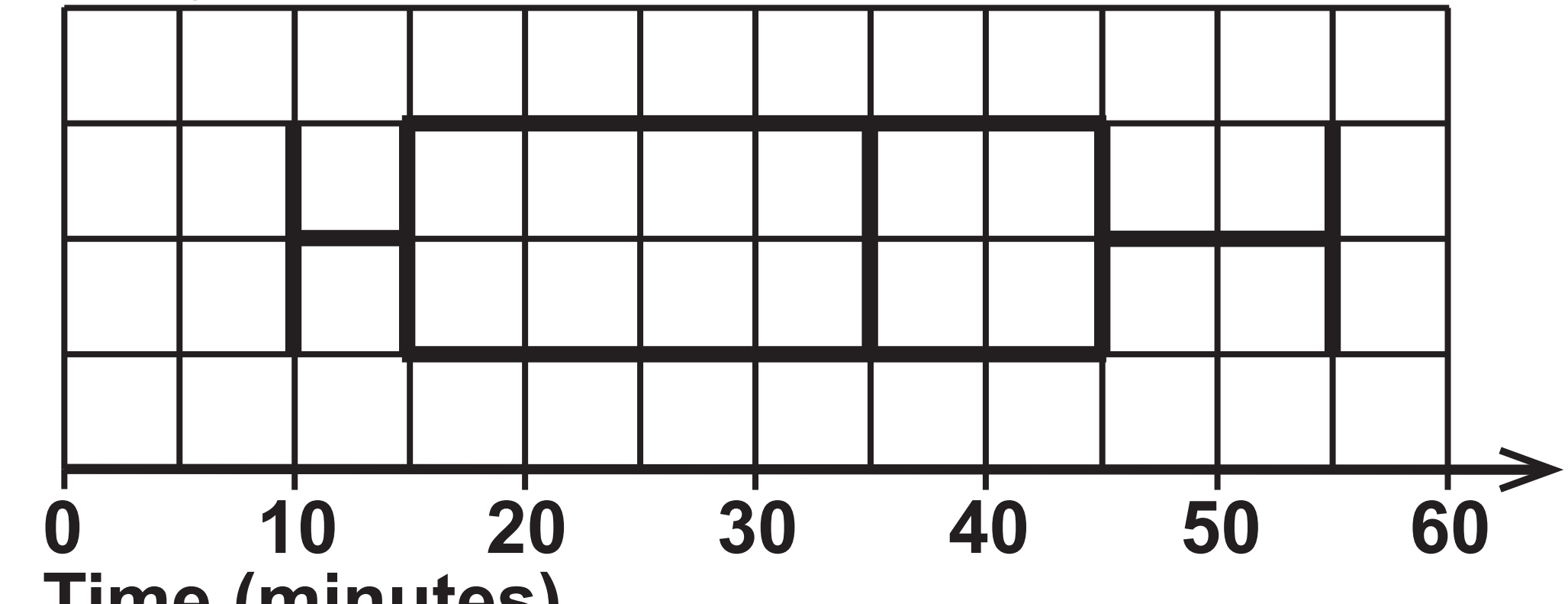
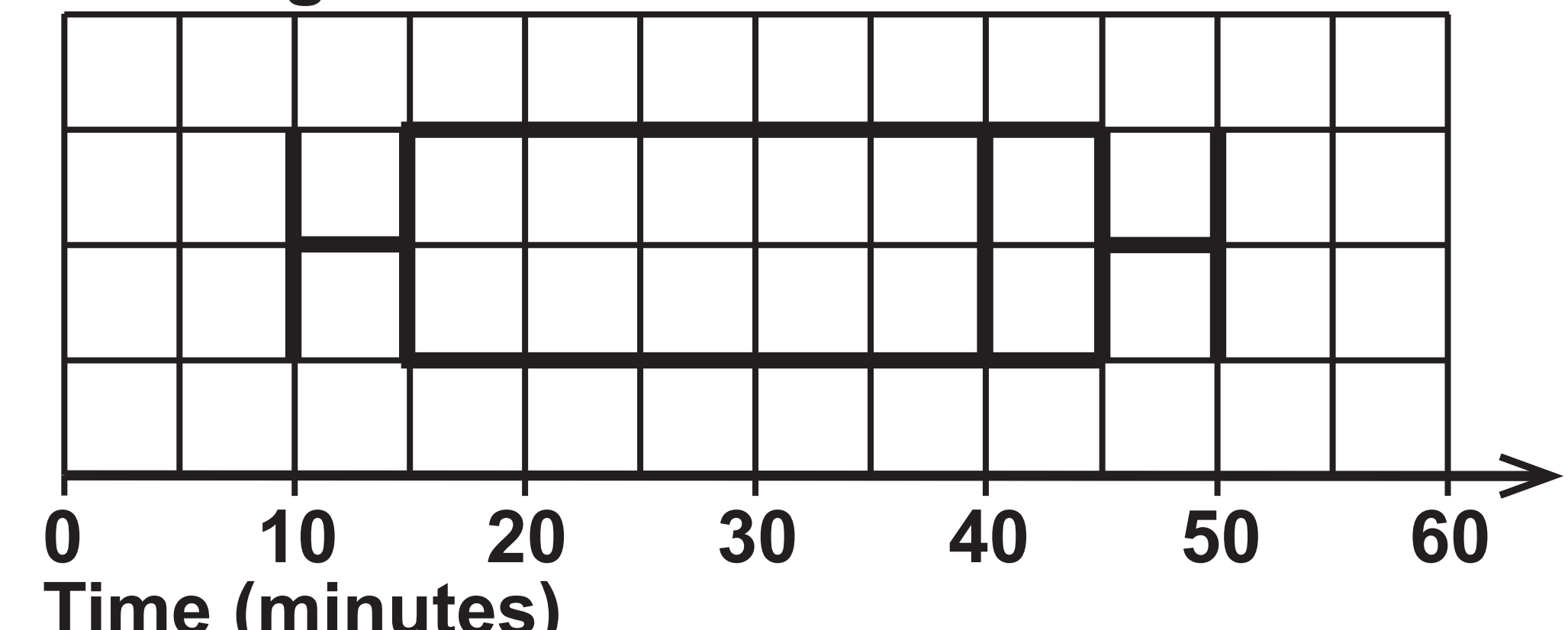
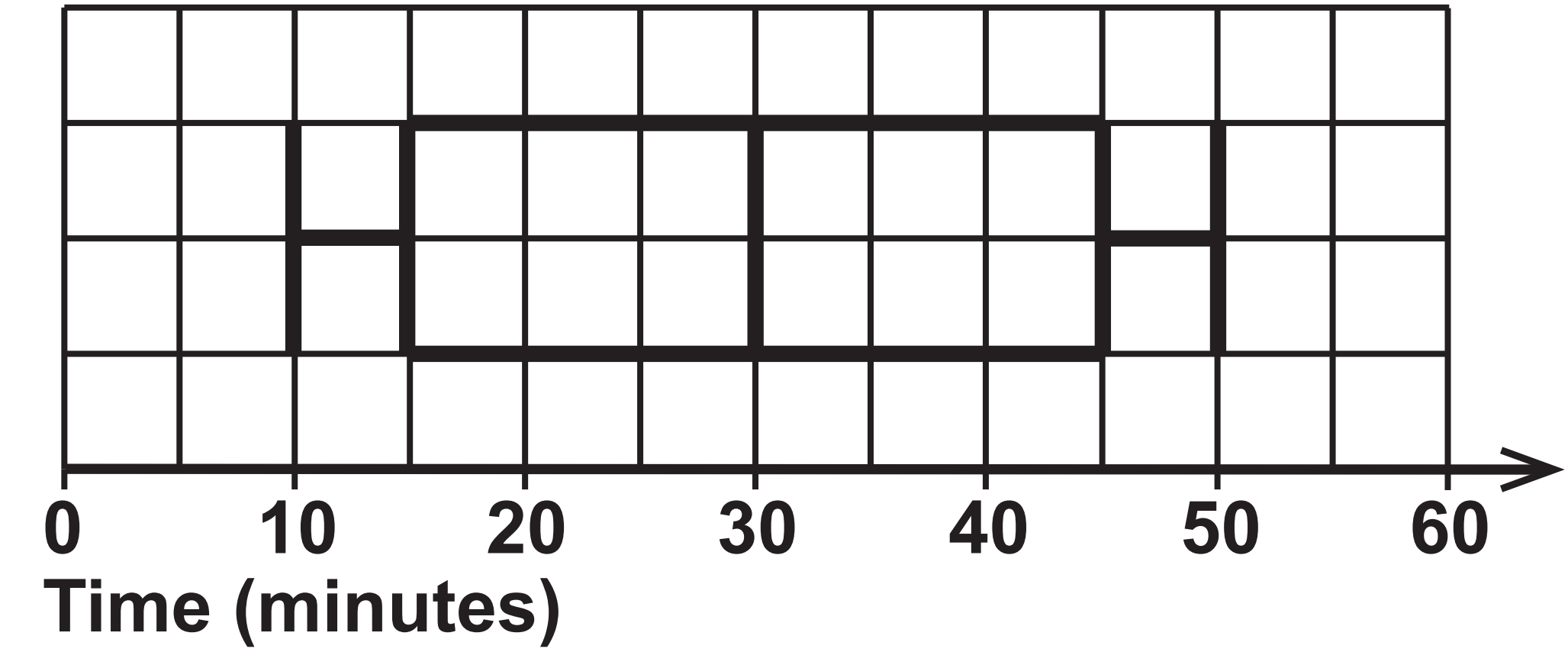


Rhewlteg



Glanmawr



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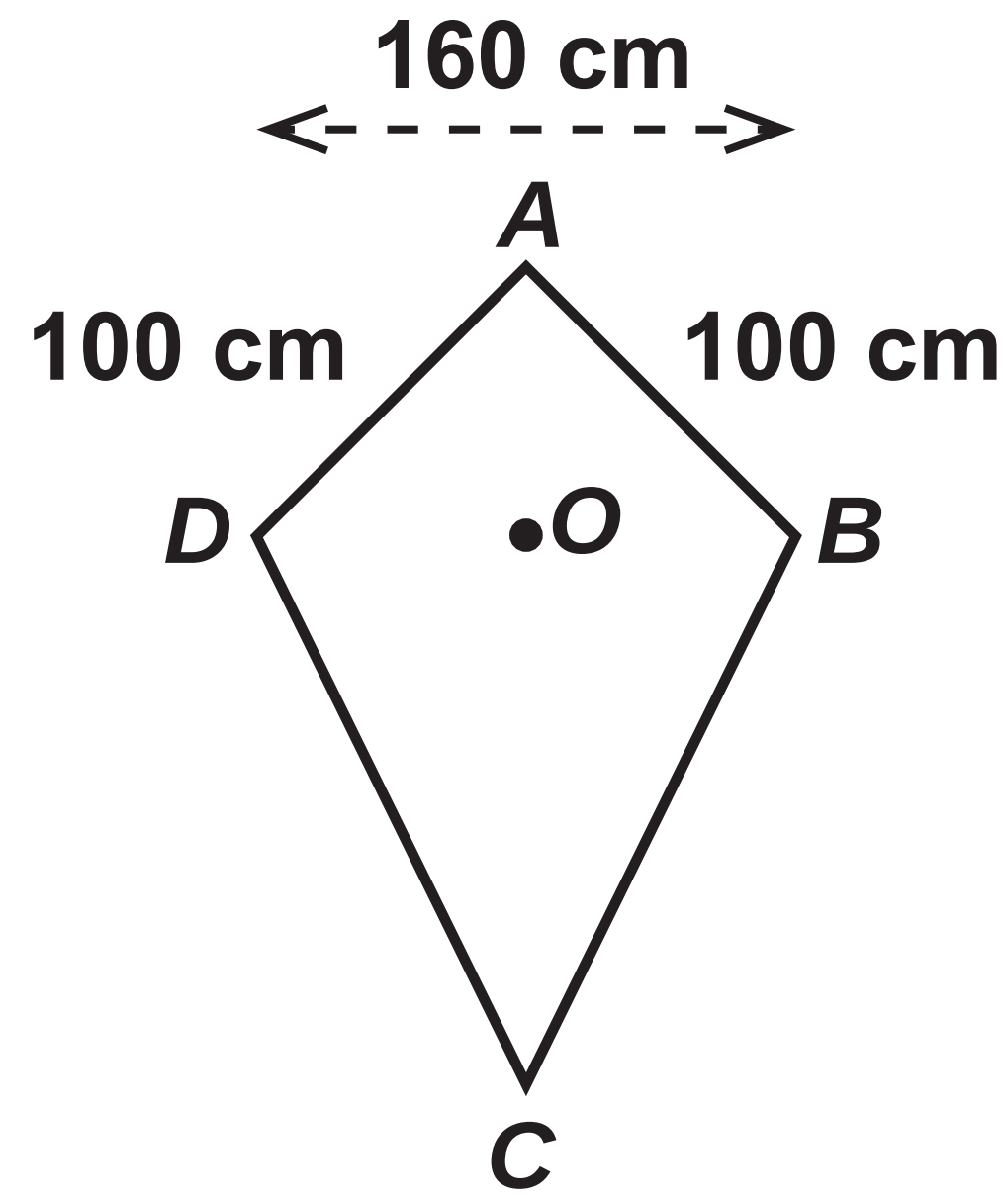
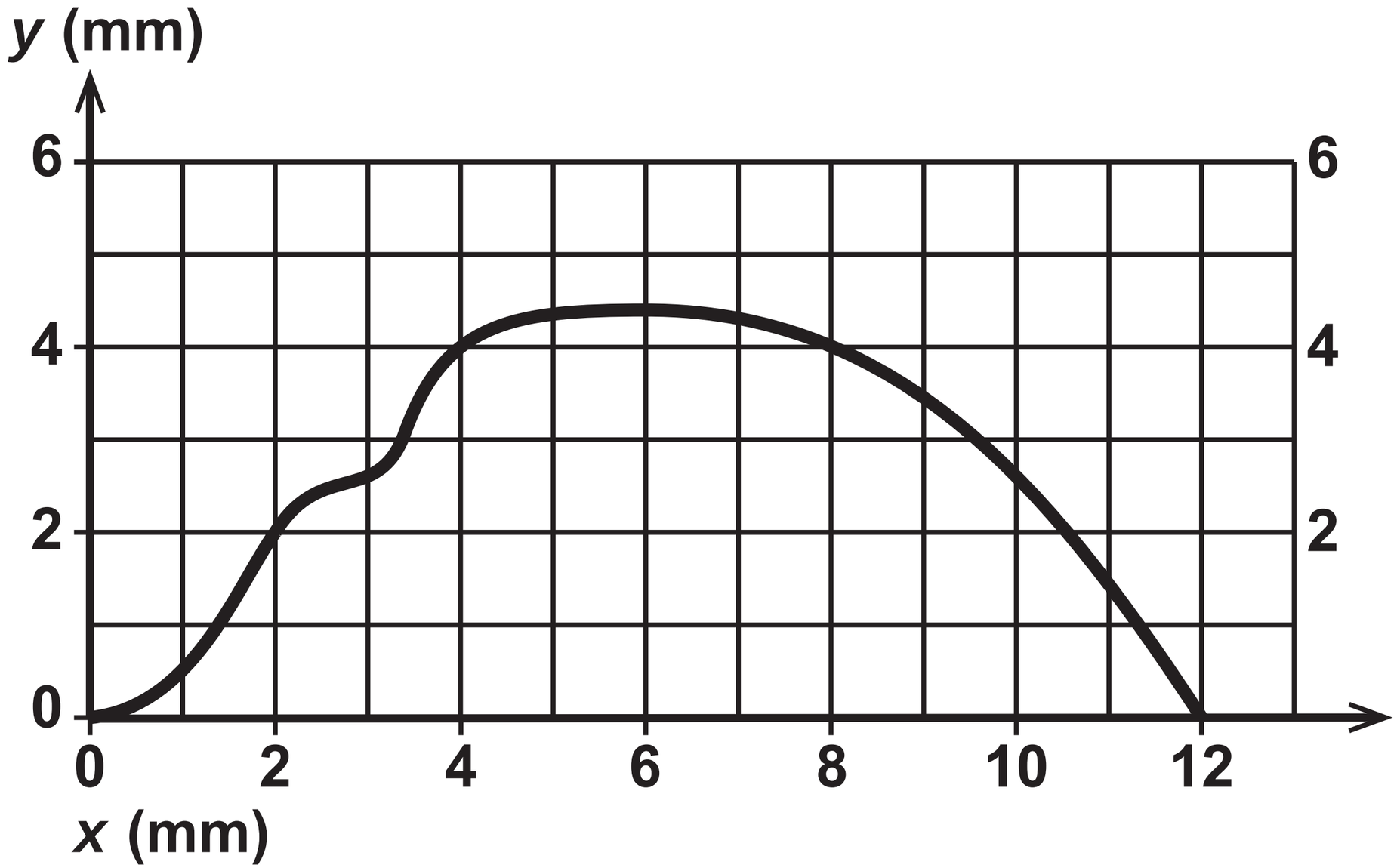
Austria	84 000	8 400 000
Canada	10 000 000	34 000 000
Pakistan	800 000	170 000 000
United Kingdom	240 000	62 000 000

Question 10

Diagram NOT drawn to scale

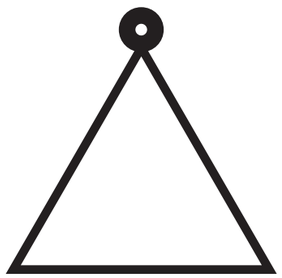
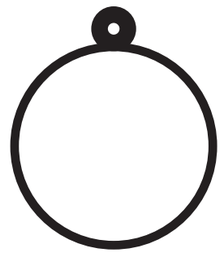
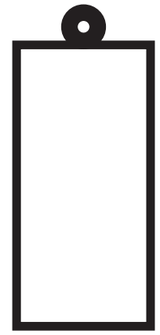
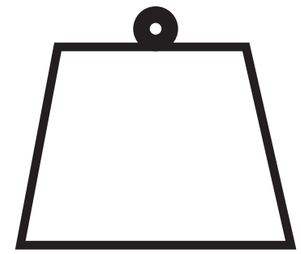


Question 11 (a)



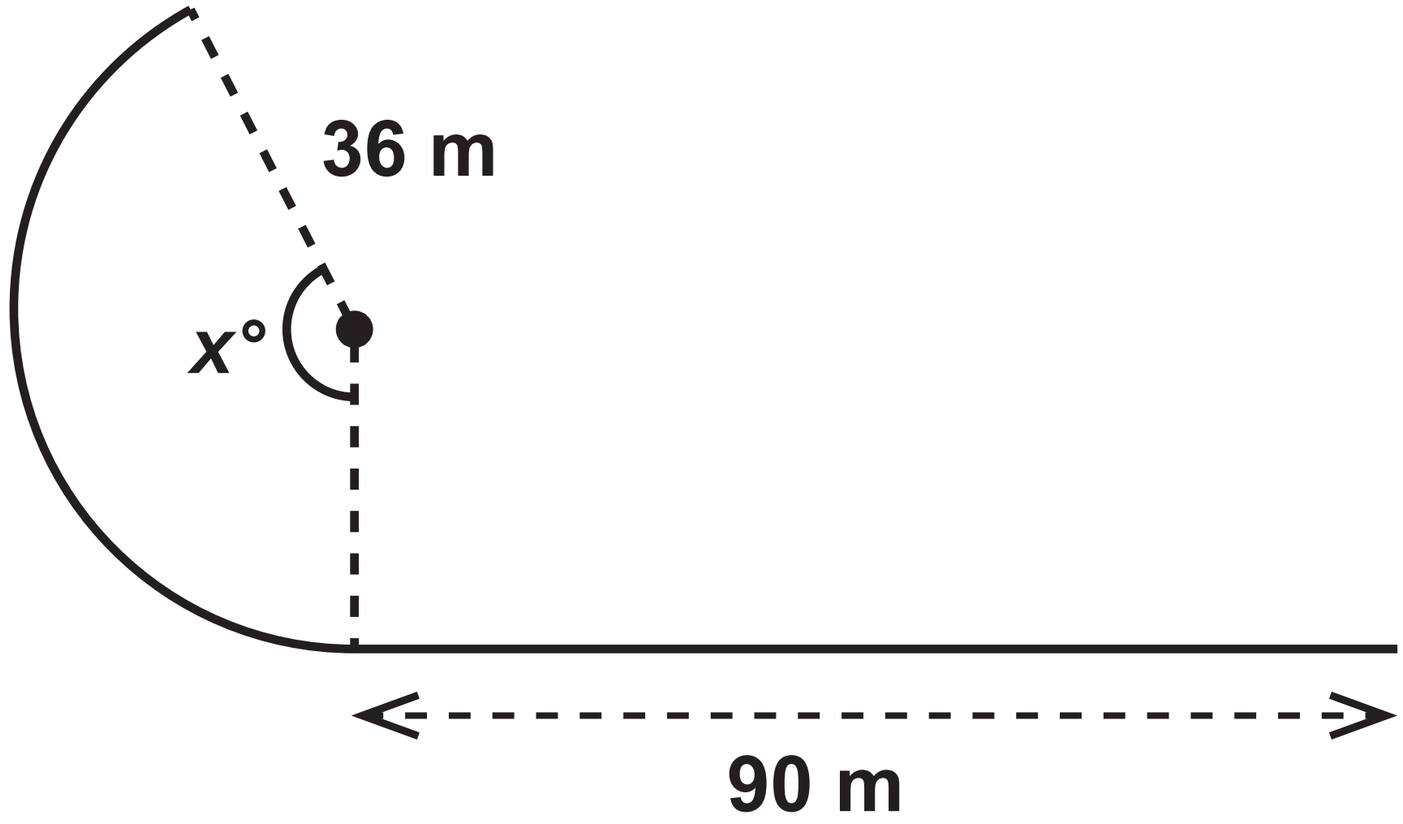
Question 11 (b)

Table

	Triangle	Circle	Rectangle	Trapezium
Pendant				
Number made last month	**52**	**96**	**30**	**62**

Question 12 (b)

Diagram NOT drawn to scale



GCSE – NEW MATHEMATICS and NUMERACY

wjec cbac

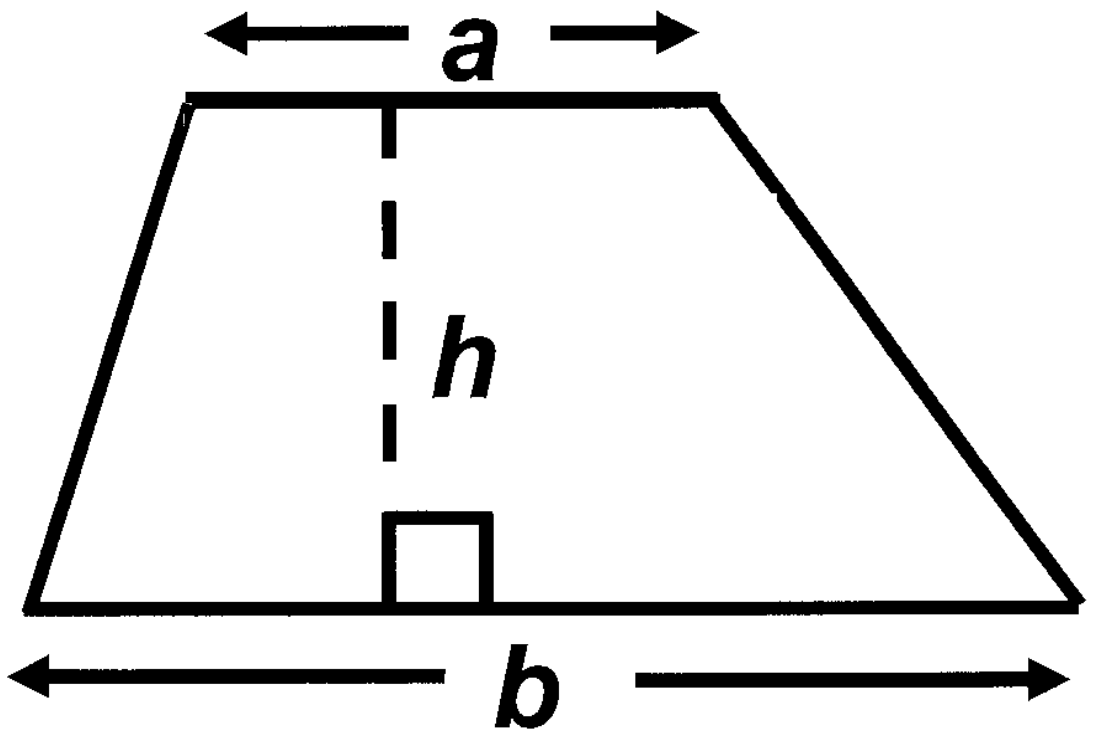
FORMULA LIST
HIGHER TIER
GCSE

You must not write on these formula pages.

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

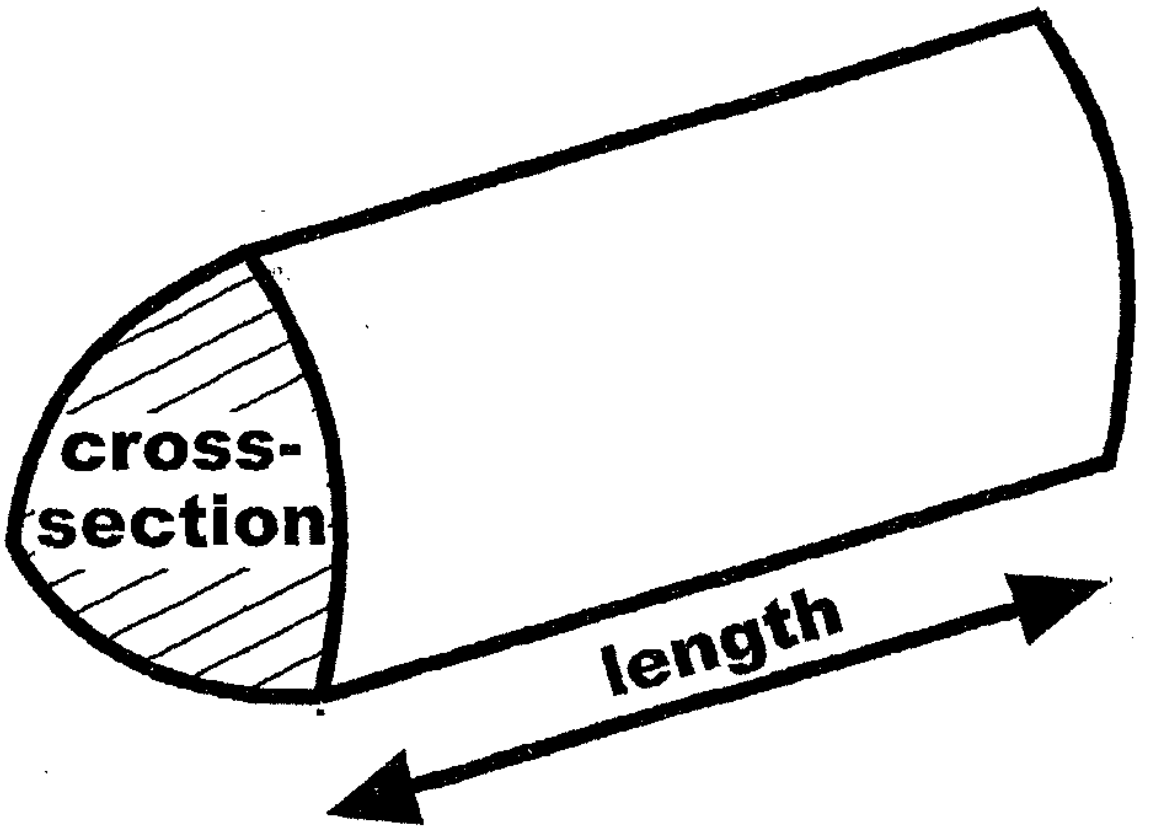
Formula List – Higher Tier

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



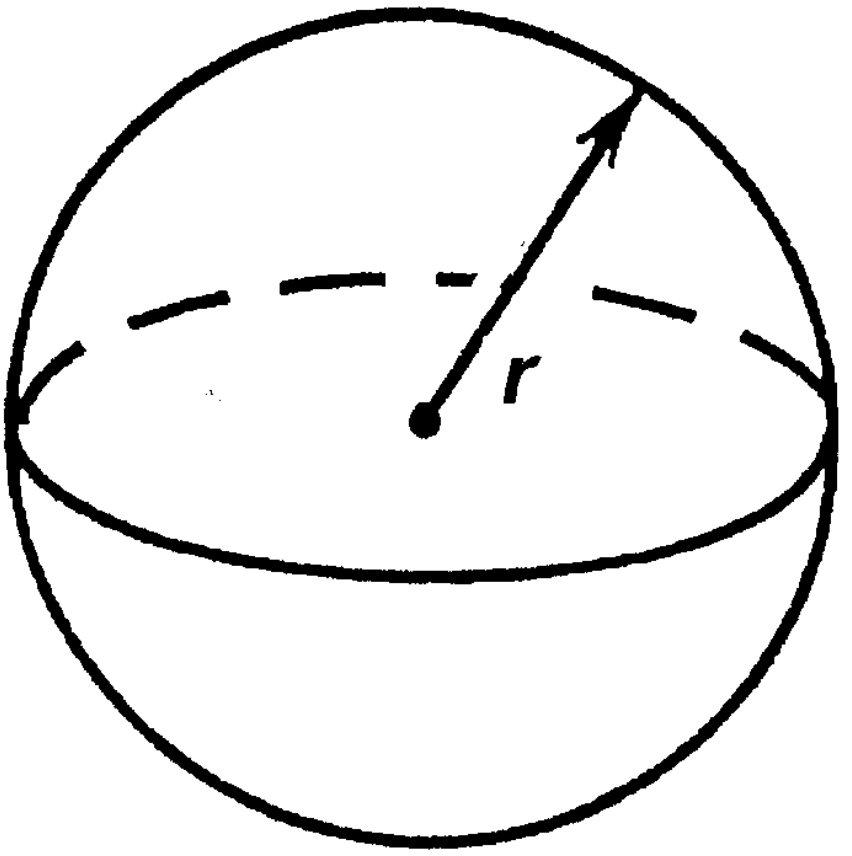
Volume of prism =

area of cross – section × length



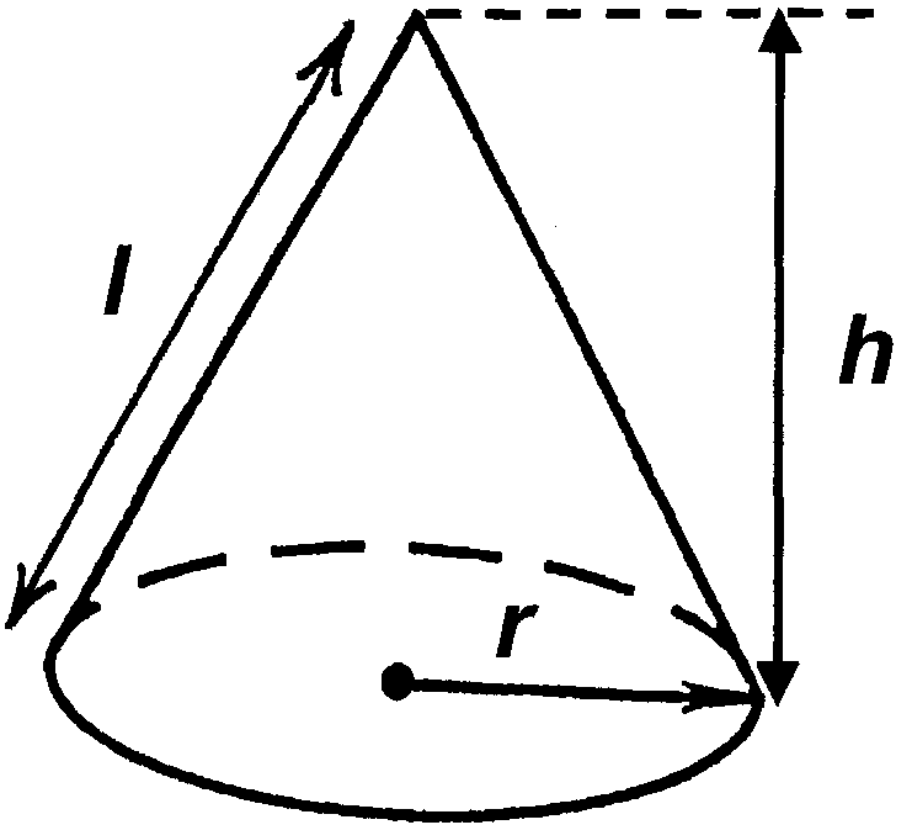
Volume of sphere $= \frac{4}{3}\pi r^3$

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

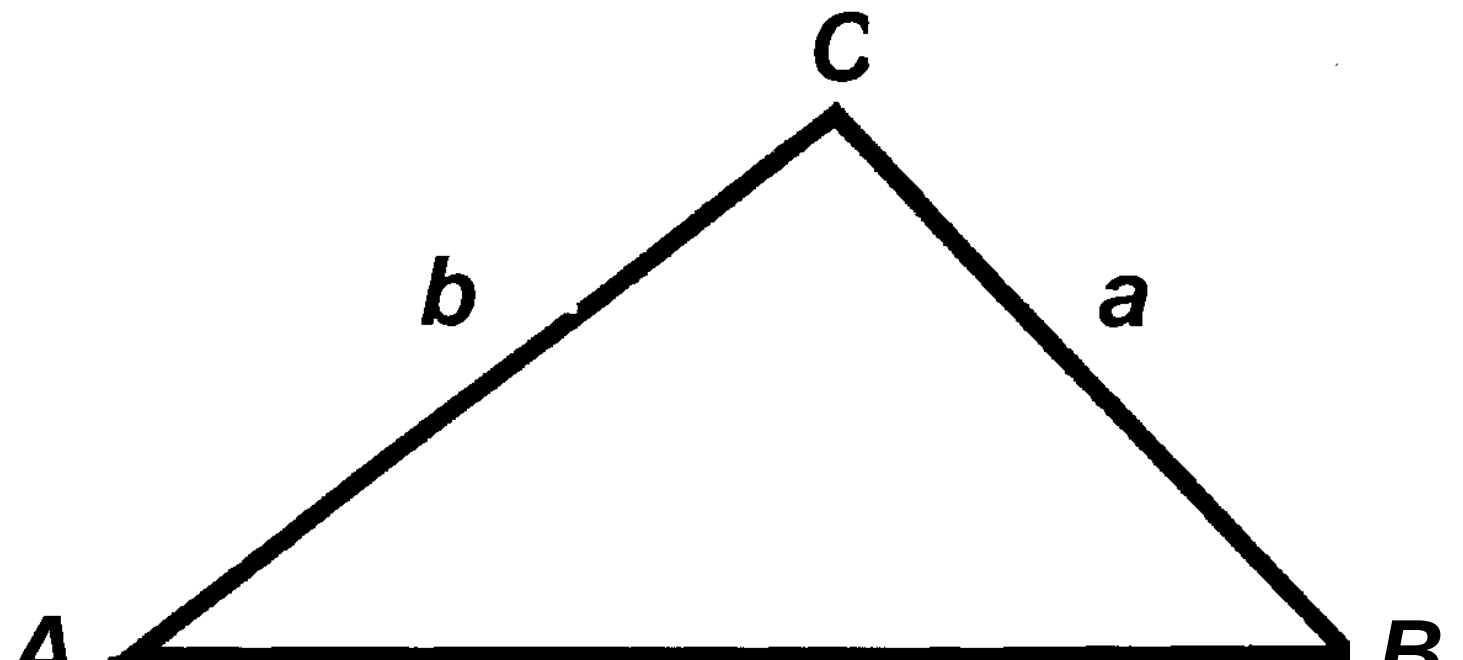


Volume of cone $= \frac{1}{3}\pi r^2 h$

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.