



GCSE



C300UA0-1

THURSDAY, 16 MAY 2024 – MORNING

MATHEMATICS – COMPONENT 1

NON – CALCULATOR MATHEMATICS

HIGHER TIER

**2 hours 15 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.	3	
2.	3	
3.	5	
4.	2	
5.	4	
6.	5	
7.	4	
8.	5	
9.	3	
10.	4	
11.	6	
12.	4	
13.	2	
14.	4	
15.	6	
16.	13	
17.	3	
18.	9	
19.	7	
20.	8	
21.	4	
22.	4	
23.	7	
24.	5	
Total	120	

(Turn over)

ADDITIONAL MATERIALS

An additional formulae booklet.

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.

**Models for Question 18 (a),
Question 18 (b) and Question 20 (b).**

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

(Turn over)

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, taking care to number the questions(s) correctly.

(Turn over)

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.

You are reminded of the need for good English and orderly, clear presentation in your answers.

(Turn over)

5

Answer ALL questions.

1. Estimate the value of

$$\frac{2.01^3 \times \sqrt{98.5}}{0.195}$$

[3 marks]

(Turn over)

6

2. Solve $11p + 3 = 4(p + 2)$

[illegible]

[3 marks]

(Turn over)

3. (a) Write 2475 as a product of its prime factors in index form.

[illegible]

(Turn over)

[3 marks]

continued on the next page . . .

(Turn over)

Question 3 continued

3. (b) Write down the square root of

$$64 \times 5^4 \times 7^4$$

Give your answer as a product of prime factors in index form.

[2 marks]

(Turn over)

- 4. Sara works for the winter – clothing company Zipski.**

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

The table shows the monthly sales figures for 2023.

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

Sara used the information in the table to draw the graph shown.

continued on the next page . . .

(Turn over)

Question 4 continued

Give TWO reasons why Sara's graph may be misleading.

Reason 1: _____

[2 marks]

continued on the next page . . .

(Turn over)

Question 4 continued

Reason 2: _____

[2 marks]

(Turn over)

5. Pippa and Joe are working on a school project.

The project is based on the use of the local leisure facilities.

(a) Pippa decides to ask adults how much they spend on gym membership each month.

In the box shown for Question 5 in the separate Diagram Booklet, write a suitable question with appropriate response boxes to collect this information.

[2 marks]

continued on the next page . . .

(Turn over)

Question 5 continued

- 5. (b) Joe asked some adults how many hours they each spent at the leisure centre during the previous week.**

His results are shown below.

NUMBER OF HOURS	NUMBER OF ADULTS
0 – 4	9
5 – 9	2
10 – 14	1
15 – 19	1
20 – 24	2

continued on the next page . . .

(Turn over)

Question 5 (b) continued

Joe accurately calculated an estimate of the mean time spent per adult to be 7 hours.

In his project he stated:

‘On average, the adults in my survey each spent 7 hours at the leisure centre last week.’

continued on the next page . . .

(Turn over)

Question 5 (b) continued

5. (b) (i) Explain why the mean is not the best average to use for this data.

[1 mark]

continued on the next page . . .

(Turn over)

Question 5 (b) continued

5. (b) (ii) Give ONE other reason why Joe's results may not be reliable.

[1 mark]

(Turn over)

6. An empty water tank is filled using a hose with a steady rate of flow.

The tank takes:

- 30 minutes to fill if water is added at x litres/min
- 40 minutes to fill if the water is added at $(x - 2)$ litres/min.

Form an equation in terms of x .

Solve the equation and hence find the capacity of the tank in litres.

(Turn over)

19

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

[5 marks]

(Turn over)

7. Three friends, Louis, Krystal and Jamal win some money in a competition.

They share the money in the ratio 3 : 7 : 11

(a) What fraction of the total money won is given to Jamal?

[1 mark]

continued on the next page . . .

(Turn over)

Question 7 continued

(b) JAMAL spends £45 of the money he won.

He now has exactly twice as much as LOUIS won.

How much money did KRYSTAL win?

(Turn over)

[3 marks]

(Turn over)

8. (a) p and n are two non – zero numbers.

p is a positive number and
 n is a negative number.

Look at the statements in the table for Question 8 (a) provided separately in the Diagram Booklet. For each statement, choose one of the following:

‘Always true’, ‘Never true’ or
‘Sometimes true’.

Tick (✓) ONE box for each statement.

[2 marks]

continued on the next page . . .

(Turn over)

Question 8 continued

**8. (b) Calculate the value of the
reciprocal of $3\frac{1}{2}$**

**Give your answer in its
simplest form.**

(Turn over)

[2 marks]

8. (c) Write down the value of 0.2^0

[1 mark]

(Turn over)

9. 6 printers take 36 minutes to print a number of identical booklets.

How long will it take 9 printers to print HALF as many of these booklets?

You may assume that all printers print at the same rate.

(Turn over)

[3 marks]

(Turn over)

10. (a) The price of an item in a sale has been reduced by 25%.

If the sale price is £54 what was the original price of the item?

[2 marks]

10. (b) Percentage change can be calculated using multipliers.

(i) A number is decreased by 33% of its value.

Circle the multiplier that would find the value after this decrease.

0.67	-1.33	-0.67
0.33	0.77	

[1mark]

continued on the next page . . .

(Turn over)

Question 10 (b) (i) continued

10. (b) (ii) A number is increased by 6% of its value.

This is done 3 times, each time increasing the previous value by 6%.

Circle the multiplier that would find the value after the 3 increases.

1.06	1.18	1.06^3
0.18		0.06^3

[1 mark]

(Turn over)

11. Three friends, Luka, Mali and Nina buy some fruit.

Luka buys 3 apples and 4 bananas and pays £2.70

Mali buys 2 apples and 3 bananas and pays £1.95

Use an algebraic method to calculate how much Nina pays for 4 apples and 2 bananas.

(Turn over)

(Turn over)

(Turn over)

35

Nina pays _____

[6 marks]

(Turn over)

12. (a) Calculate the value of

$$\frac{1.29 \times 10^5}{3 \times 10^{-7}}$$

**Give your answer in
standard form.**

(Turn over)

[2 marks]

- 12. (b) Calculate the value of**
 $(7.6 \times 10^5) + (3 \times 10^4)$
Give your answer in
standard form.

(Turn over)

[2 marks]

(Turn over)

13. Write $32 \times (2^3)^7$ in the form 2^n

[2 marks]

(Turn over)

14. (a) The n th term of a sequence is given by the expression

$$\mathbf{n^2 + 3n + 2}$$

Prove that every term of the sequence is an even number.

Show all your working.

(Turn over)

[2 marks]

continued on the next page . . .

(Turn over)

Question 14 continued

14. (b) Look at the diagram for Question 14 (b) in the separate Diagram Booklet.

The diagram shows four patterns made using rectangular tiles.

Find an expression for the number of rectangular tiles needed for the n th pattern.

(Turn over)

43

[2 marks]

(Turn over)

15. Pupils in a GCSE class have to perform two experiments.

(a) Jenny performs the first experiment.

Look at the diagram for Question 15 (a) in the separate Diagram Booklet.

She sketches this graph of her results.

She thinks the graph shows that the variable h is proportional to the cube root of the variable g .

continued on the next page . . .

(Turn over)

Question 15 (a) continued

Explain why Jenny cannot be correct.

[1 mark]

continued on the next page . . .

(Turn over)

Question 15 continued

15. (b) Results of a second experiment show that there is a relationship between two POSITIVE variables p and q .

It has been found that p is inversely proportional to the square root of q .

(i) When $p = 36$, $q = 25$

Write a formula for p in terms of q .

(Turn over)

continued on the next page . . .

(Turn over)

Question 15 (b) continued

15. (b) (ii) Use the formula to complete the table below.

p	q
	9
36	25
45	

(Turn over)

[illegible]

(Turn over)

16. (a) A new restaurant needs to buy some tables.

Small tables each seat 4 people.

Large tables each seat 6 people.

Each of the following three conditions must be met:

- 1. There must be more than 12 large tables.**
- 2. The number of large tables must be less than double the number of small tables.**
- 3. The total number of seats must be less than 120**

continued on the next page . . .

(Turn over)

Question 16 (a) continued

Let S represent the number of small tables and L represent the number of large tables.

- (i) Complete the table below by writing the inequalities for conditions 2 and 3**

CONDITION	INEQUALITY
1	$L > 12$
2	
3	

[2 marks]

continued on the next page . . .

(Turn over)

Question 16 (a) continued

16 (a) (ii) On the graph paper provided for Question 16 (a) (ii) in the separate Diagram Booklet, draw the region that satisfies all three inequalities. Indicate clearly the region that is your answer.

(Turn over)

[4 marks]

continued on the next page . . .

(Turn over)

Question 16 (a) continued

**16. (a) (iii) The restaurant owner makes
a 4th condition.**

**There cannot be exactly
13 large tables.**

**From your graph, write down
the number of small and the
number of large tables that
can be bought where
ALL FOUR CONDITIONS
are satisfied.**

(Turn over)

Number of small tables

Number of large tables

[1 mark]

continued on the next page . . .

(Turn over)

Question 16 continued

16. (b) On the opening night of the restaurant, the time that each customer had to wait for their meal was recorded.

It is known that:

- **150 customers ate a meal at the restaurant**
- **45 customers had to wait between 0 and 15 minutes**
- **every customer waited less than 1 hour.**

continued on the next page . . .

(Turn over)

Question 16 (b) continued

**16. (b) (i) Complete the histogram
provided for Question 16 (b) in
the separate Diagram Booklet.**

[2 marks]

continued on the next page . . .

(Turn over)

Question 16 (b) continued

16. (b) (ii) Calculate the PERCENTAGE of the 150 customers who had to wait longer than 30 minutes for their meal.

[4 marks]

(Turn over)

17. Factorise and hence solve the following equation.

$$3x^2 + 7x - 20 = 0$$

[3 marks]

(Turn over)

18. A cheese factory makes two different types of cheese.

Both types of cheese are in the shape of a cylinder.

(a) Ask for the model for Question 18 (a).

The model is NOT made to scale.

The first cheese, model A,

has radius 12 cm and

height 7 cm.

Work out the total surface area of this cheese.

continued on the next page . . .

(Turn over)

Question 18 (a) continued

Give your answer as a
multiple of π .

(Turn over)

[4 marks]

continued on the next page . . .

(Turn over)

Question 18 continued

18. (b) Ask for the models for Question 18 (b). The models are NOT made to scale.

The second cheese, model B, has a radius of r cm and height 25 cm.

A cheese taster working at the factory cuts a wedge – shaped piece out of this cheese, model C.

It is cut to the centre of the cheese with an angle of 30° and a depth of 8 cm.

continued on the next page . . .

(Turn over)

Question 18 (b) continued

**Work out the volume of the
wedge – shaped piece as a
FRACTION of the whole cheese.
Give your answer in its
simplest form.**

(Turn over)

(Turn over)

[5 marks]

(Turn over)

19. Anya and Elis sit examinations at a college.

(a) Anya sits two examinations, one for Spanish and the other for French.

The probability that Anya passes Spanish is 0.6

The probability that Anya passes French is 0.7

The probability of Anya passing Spanish is INDEPENDENT of her passing French.

continued on the next page . . .

(Turn over)

Question 19 continued

Anya tries to calculate the probability of her passing exactly one examination.

She writes $0.6 \times 0.3 = 0.18$

- (i) Without giving any calculations, explain why this answer is not fully correct.**

(Turn over)

[1 mark]

**19. (a) (ii) Calculate the probability of
Anya passing exactly one
examination.**

(Turn over)

[2 marks]

continued on the next page . . .

(Turn over)

Question 19 continued

19. (b) Elis sits one examination.

The examination has 75 multiple choice questions.

For each question:

- **there are five possible answers to choose from**
- **only one of the five possible answers is correct.**

Elis knows the answer to 60% of the questions and will get these correct.

continued on the next page . . .

(Turn over)

Question 19 (b) continued

Of the remaining questions, he randomly selects one of the five possible answers.

**A question is selected at random.
What is the probability that Elis answers this question correctly?**

(Turn over)

73

[4 marks]

(Turn over)

20. (a) Look at the diagram for Question 20 (a) in the separate Diagram Booklet.

The diagram is NOT drawn to scale.

The diagram is a sketch of an equilateral triangle with sides 2 cm and an angle of 60°

continued on the next page . . .

(Turn over)

Question 20 (a) continued

Complete the table below.

Write both missing values in surd form.

The sketch of the equilateral triangle may help you.

$\sin 30^\circ$	$\frac{1}{2}$
$\cos 30^\circ$	
$\tan 30^\circ$	

[2 marks]

continued on the next page . . .

(Turn over)

Question 20 continued

20. (b) Ask for the model for Question 20 (b).

The model is NOT made to scale.

The model is a cuboid.

A , B , C and D are vertices of the cuboid.

$BD = 10$ cm, $AC = 12$ cm and

Angle $DBC = 30^\circ$

Calculate the distance AD .

You must show all your working.

(Turn over)

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

(Turn over)

21. The mean of the three values

$$x, \frac{12}{\sqrt{3}} \text{ and } (\sqrt{3})^5 \text{ is } 6\sqrt{3}$$

Calculate the value of x .

Give your answer in the form $a\sqrt{3}$
where a is an integer.

(Turn over)

[4 marks]

(Turn over)

22. Use the method of completing the square to find the coordinates of the turning point of the curve

$$y = x^2 + 14x + 70$$

(Turn over)

Coordinates of the turning point

(_____ , _____)

[4 marks]

(Turn over)

**23. Look at the diagram for Question 23.
The diagram is NOT drawn to scale.
The vectors $\mathbf{OP}$, $\mathbf{OQ}$ and $\mathbf{OR}$ are
shown in the diagram.**

(a) (i) $\mathbf{RQ} = k\mathbf{OP}$.

Find the value of k .

**You must show all your
working.**

(Turn over)

The value of $k =$ _____

[3 marks]

continued on the next page . . .

(Turn over)

Question 23 (a) continued

23. (a) (ii) Write down TWO facts about the lines OP and RQ.

Fact 1: _____

Fact 2: _____

[2 marks]

continued on the next page . . .

(Turn over)

Question 23 continued

(b) O is the midpoint of the line PX.

Find PX in the form $mf + ng$

where m and n are integers.

[2 marks]

(Turn over)

- 24. (a) Look at the diagram for Question 24 (a) in the separate Diagram Booklet.**

The diagram shows a sketch of $y = f(x)$.

The point A has the coordinates $(-2, 0)$

On the same diagram, sketch $y = f(x - 3)$

Mark clearly the new coordinates of point A .

[2 marks]

continued on the next page . . .

(Turn over)

Question 24 continued

24. (b) Look at the diagram for Question 24 (b) in the separate Diagram Booklet.

The diagram shows a sketch of $y = g(x)$.

**On the same diagram,
sketch $y = -g(x) + 5$**

**Mark clearly the coordinates of
the point where this sketch
intersects an axis.**

[3 marks]

END OF PAPER

TOTAL 120 MARKS

(Turn over)

[illegible]

(Turn over)

[illegible]

(Turn over)

[illegible]

(Turn over)

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

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THURSDAY, 16 MAY 2024 – MORNING

**MATHEMATICS – COMPONENT 1
NON – CALCULATOR MATHEMATICS
HIGHER TIER**

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

Diagram Booklet

Surname: _____

First name(s): _____

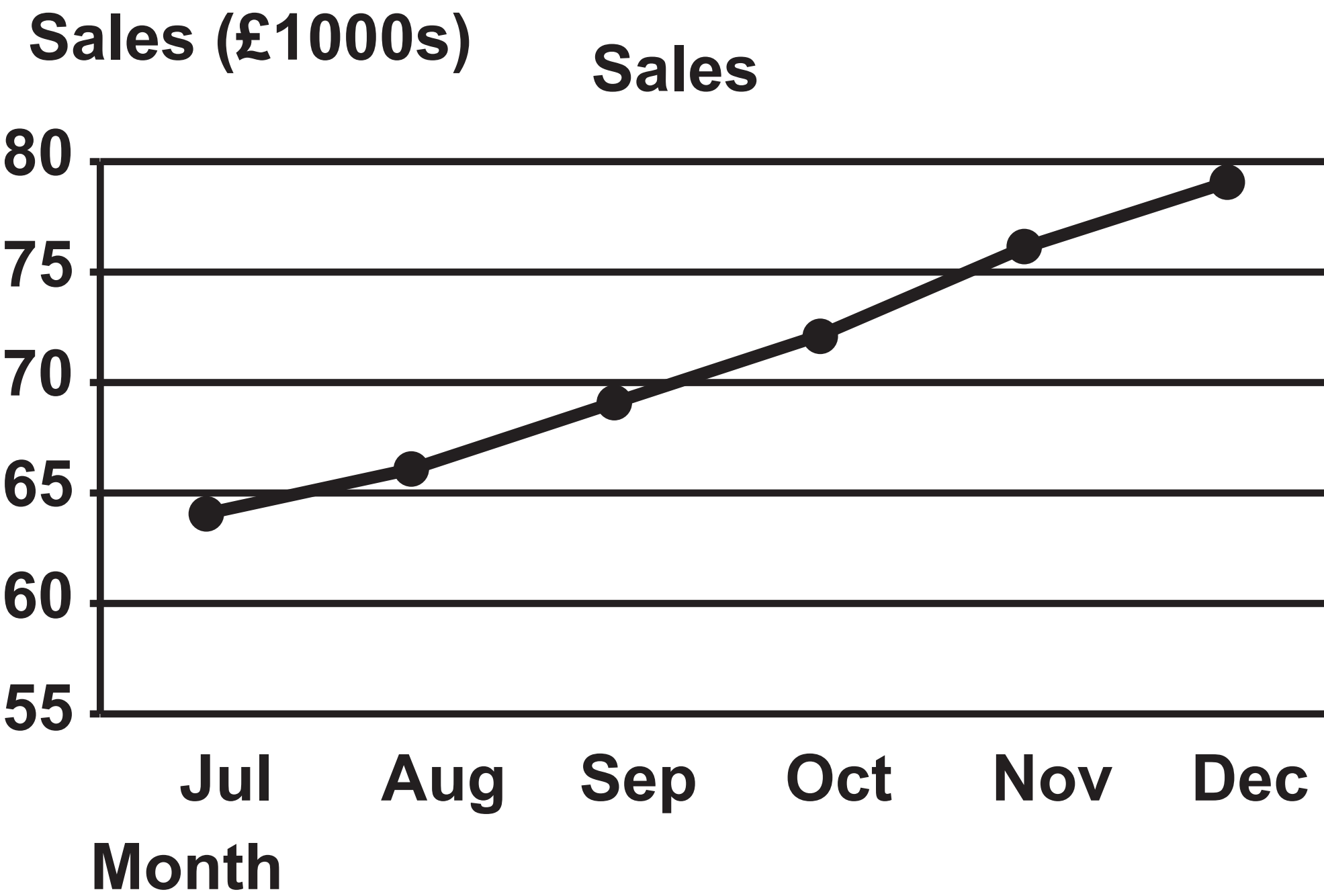
Centre Number: _____

Candidate Number: 0 _____

Question 4 Table

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sales (£1000s)	90	83	75	68	65	62	64	66	69	72	76	79

Question 4



Question 5

QUESTION

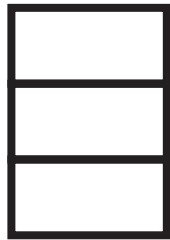
RESPONSE BOXES

Question 8 (a) Table

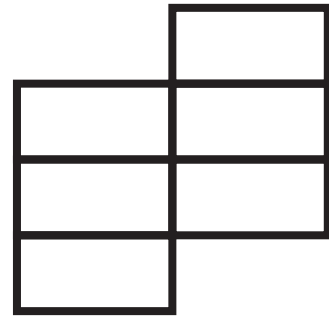
STATEMENT	ALWAYS TRUE	NEVER TRUE	SOMETIMES TRUE
$p^2 = n^2$			
$p < n$			
$\frac{n}{p} < 0$			
$n^2 > p^3$			

Question 14 (b)

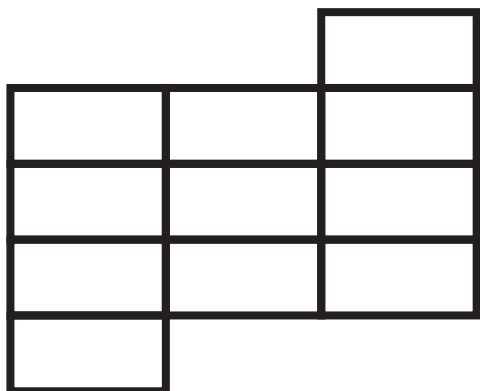
Pattern 1



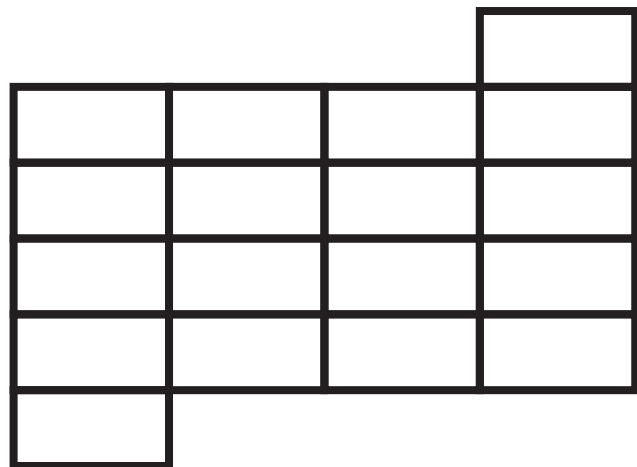
Pattern 2



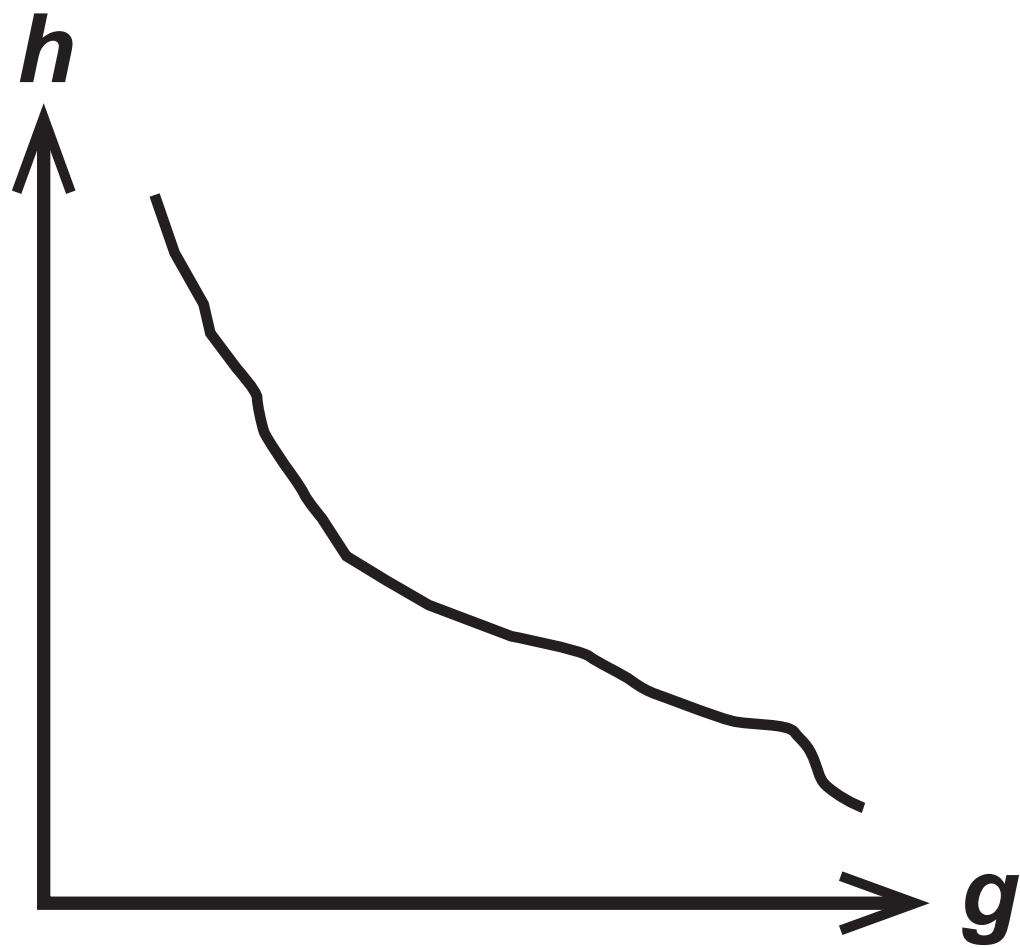
Pattern 3



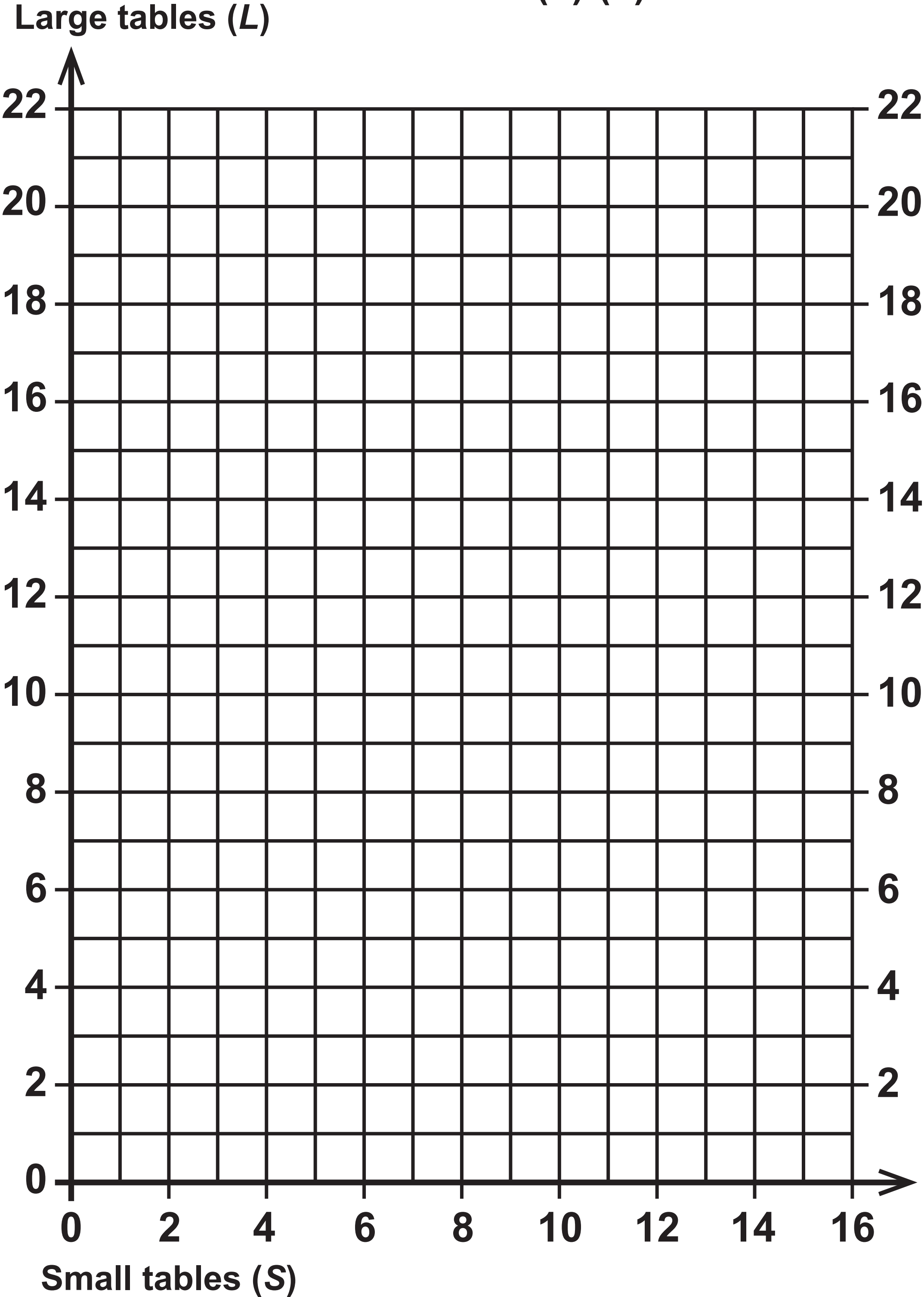
Pattern 4



Question 15 (a)

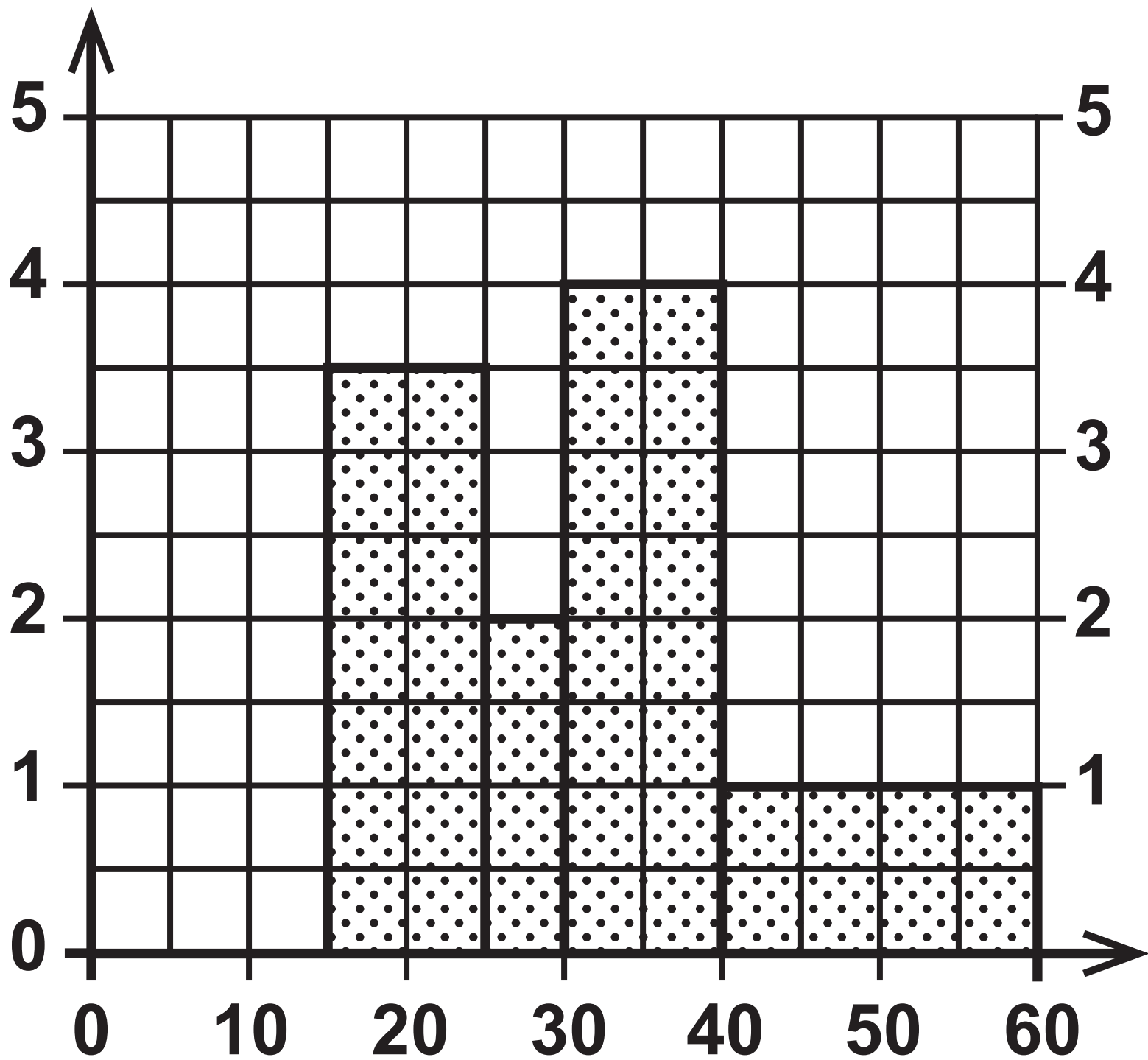


Question 16 (a) (ii)



Question 16 (b)

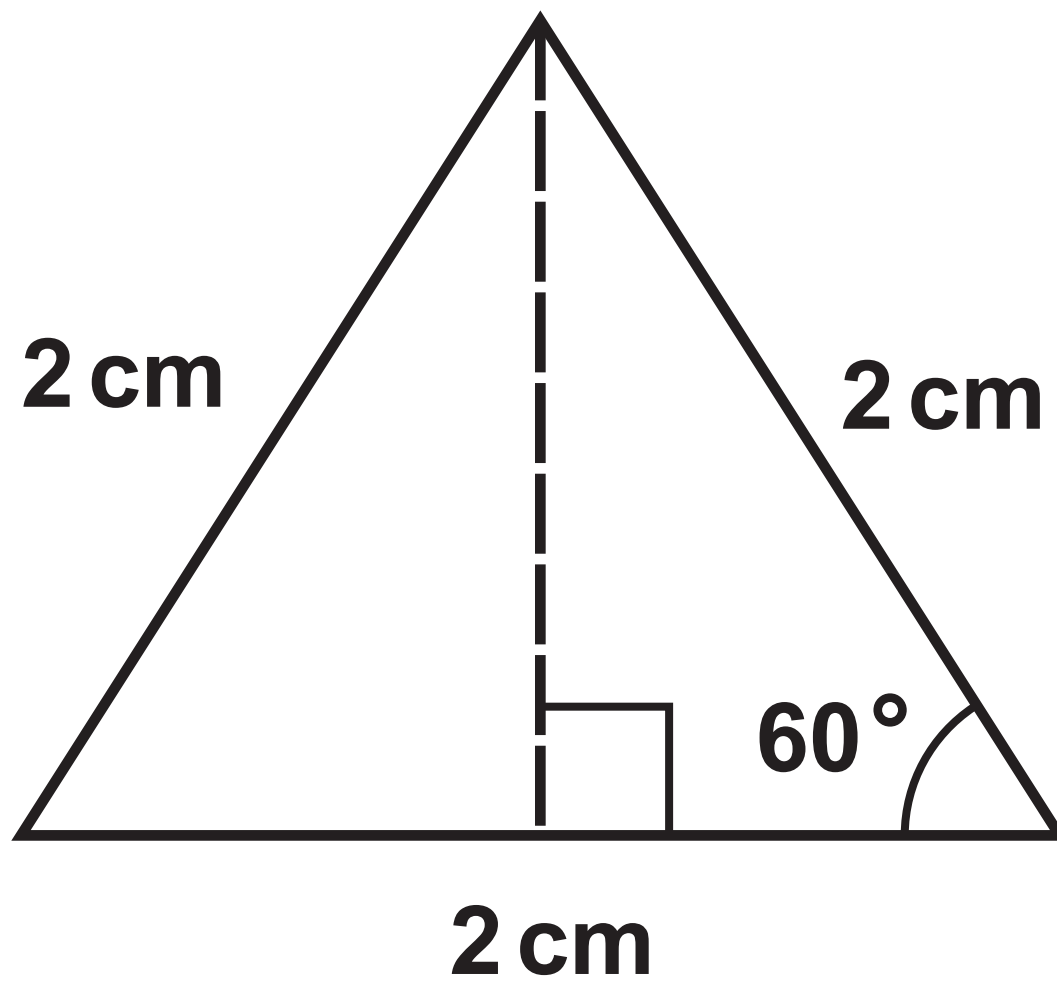
Frequency Density



Waiting times (minutes)

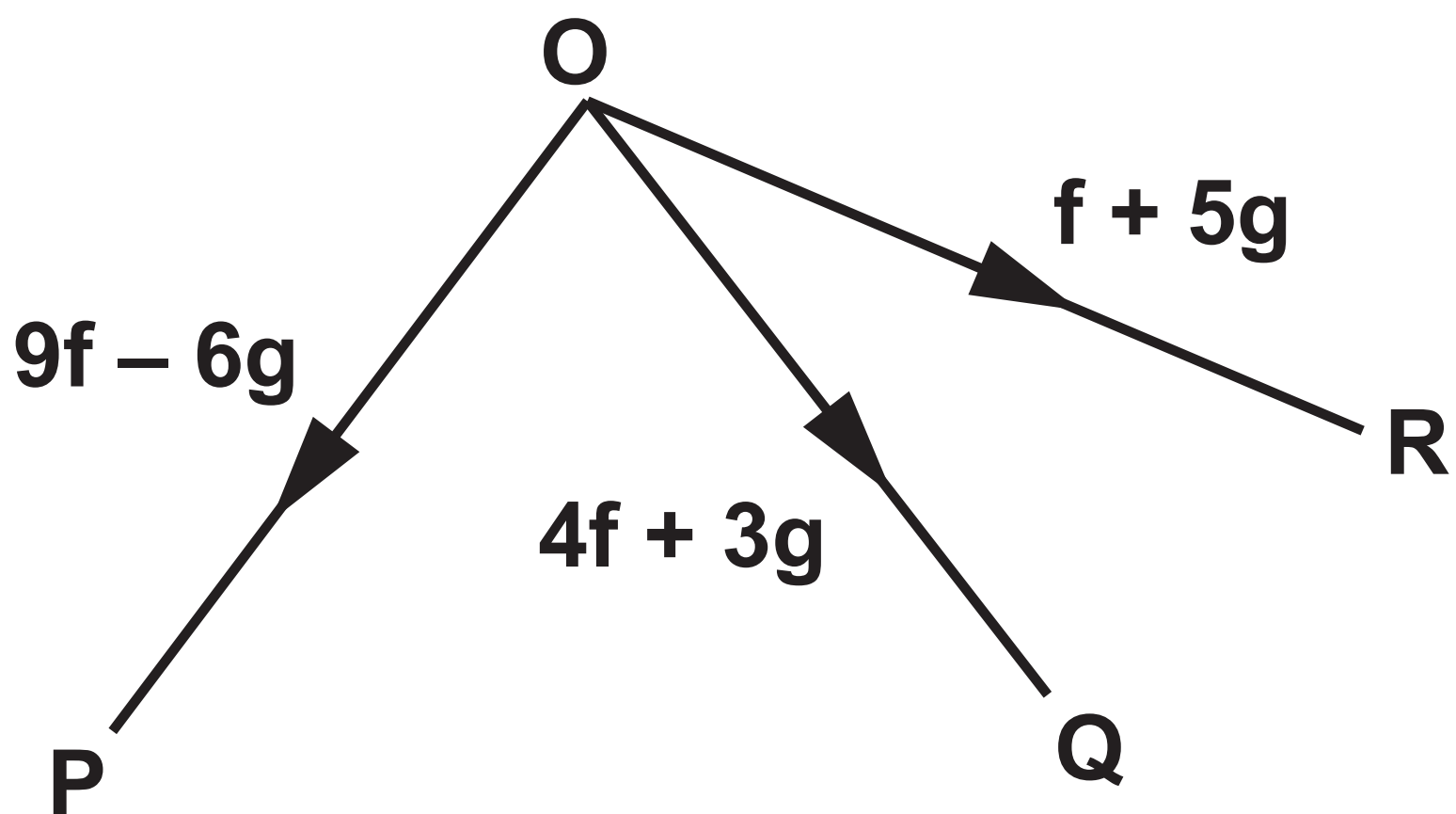
Question 20 (a)

Diagram NOT drawn to scale

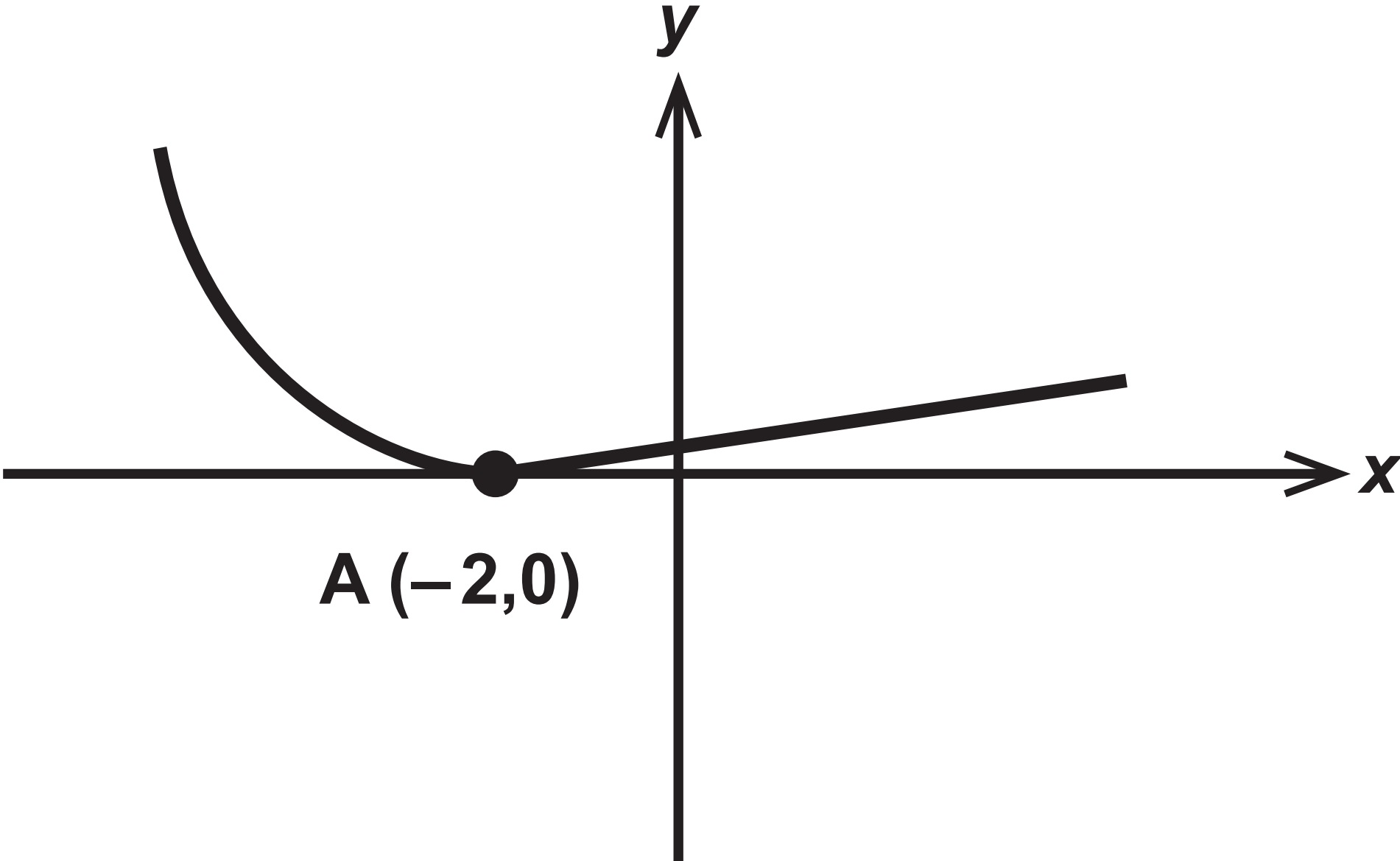


Question 23

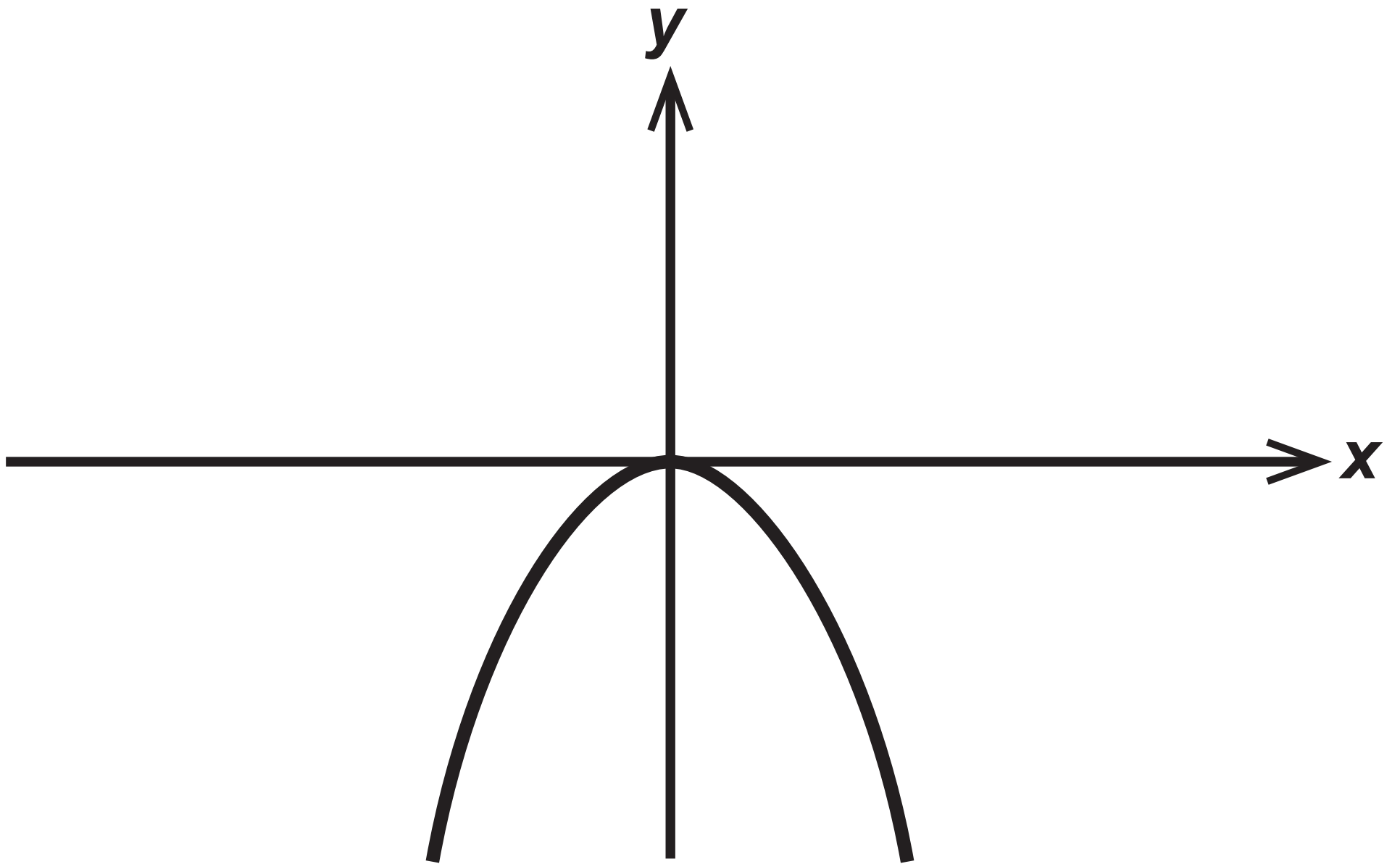
Diagram NOT drawn to scale



Question 24 (a)



Question 24 (b)



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THURSDAY, 16 MAY 2024 – MORNING

MATHEMATICS

HIGHER TIER

Additional Formulae

PERIMETER, AREA AND VOLUME

Where a and b are the lengths of the parallel sides and h is their perpendicular separation:

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

**Volume of a prism =
area of cross section $\times$ length**

**Where r is the radius and
 d is the diameter:**

$$\text{Circumference of a circle} = 2\pi r = \pi d$$

$$\text{Area of a circle} = \pi r^2$$

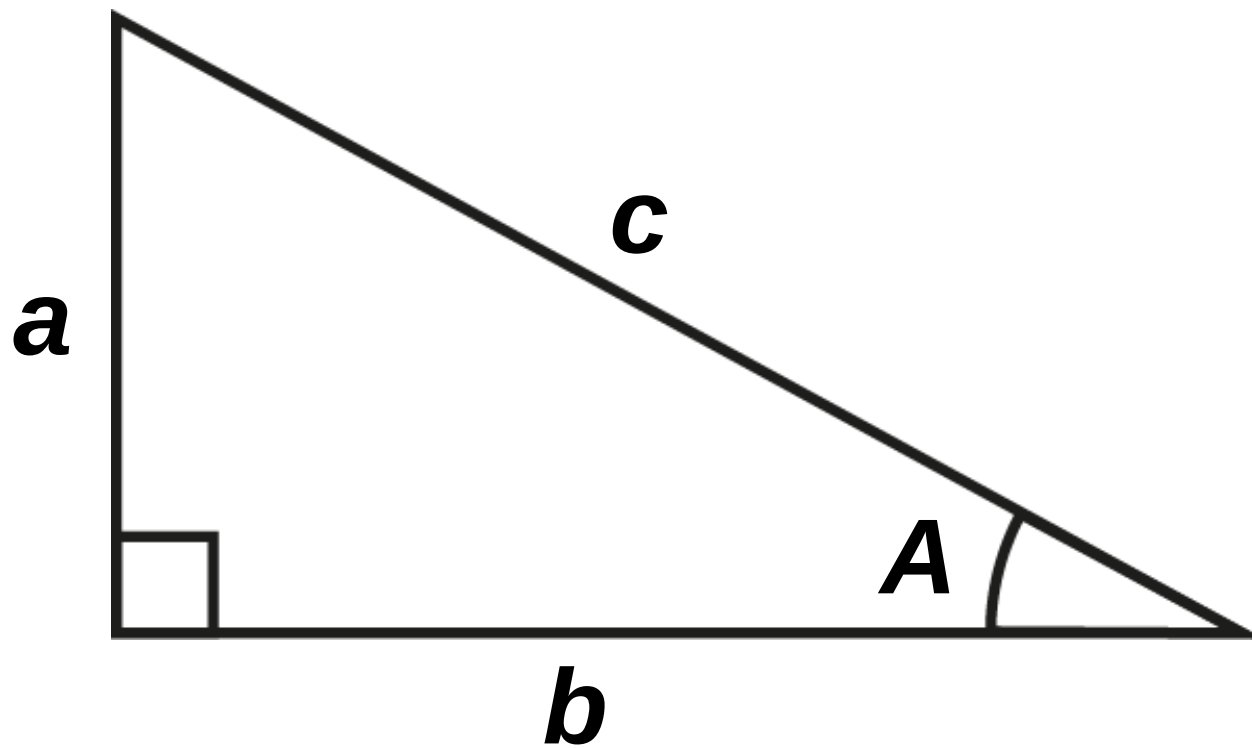
QUADRATIC FORMULA

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

where $a \neq 0$:

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

PYTHAGORAS' THEOREM AND TRIGONOMETRY

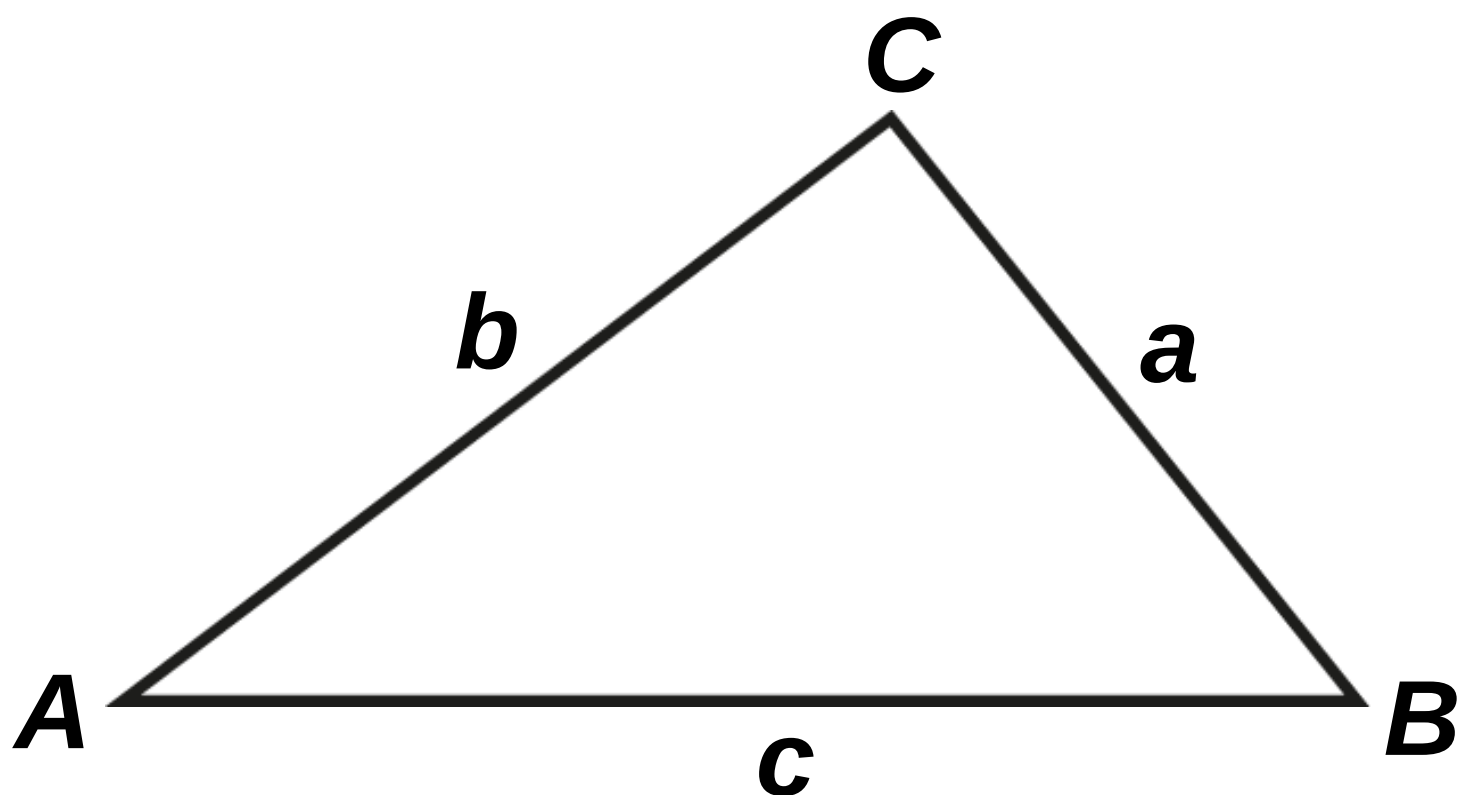


In any right – angled triangle where a , b and c are the length of the sides and c is the hypotenuse:

$$a^2 + b^2 = c^2$$

In any right – angled triangle ABC where a , b and c are the length of the sides and c is the hypotenuse:

$$\sin A = \frac{a}{c} \quad \cos A = \frac{b}{c} \quad \tan A = \frac{a}{b}$$



In any triangle ABC where a , b and c are the length of the sides:

$$\text{sine rule: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

cosine rule:

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

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

COMPOUND INTEREST

Where P is the principal amount,
 r is the interest rate over a given period
and n is number of times that the
interest is compounded:

$$\text{Total accrued} = P \left(1 + \frac{r}{100} \right)^n$$

PROBABILITY

Where $P(A)$ is the probability of
outcome A and $P(B)$ is the probability
of outcome B :

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$P(A \text{ and } B) = P(A \text{ given } B) P(B)$$

MATHEMATICS

**FORMULA LIST
FOUNDATION TIER
AND HIGHER TIER
GCSE**

You must not write on these formulae pages.

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

AREA AND VOLUME FORMULAE

Where r is the radius of the sphere or cone,
 l is the slant height of a cone and
 h is the perpendicular height of a cone:

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

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

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

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

KINEMATICS FORMULAE

Where a is constant acceleration,
 u is initial velocity, v is final velocity,
 s is displacement from the position
when $t = 0$ and t is time taken:

$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$