



GCSE



C300UA0–1

THURSDAY, 15 MAY 2025 – 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.	4	
2.	1	
3.	4	
4.	6	
5.	5	
6.	8	
7.	5	
8.	5	
9.	7	
10.	5	
11.	6	
12.	4	
13.	4	
14.	13	
15.	3	
16.	4	
17.	9	
18.	7	
19.	7	
20.	5	
21.	8	
Total	120	

ADDITIONAL MATERIALS

An additional Formulae Booklet.

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

ITEMS INCLUDED WITH QUESTION PAPER

A separate Formula List.

A separate Diagram Booklet.

Model for Question 4.

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 this booklet, taking care to number the question(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)

Answer ALL questions.

- 1. Look at the diagram for Question 1 in the separate Diagram Booklet.**
The diagram is NOT drawn to scale.
A quarter of a circle has been cut from a rectangular card.

In the diagram:

$PRST$ is a rectangle.

PQT is a quarter of a circle.

$QR = 5 \text{ cm}$

$TS = 15 \text{ cm}$

Calculate the perimeter of the remaining piece of card.

Give your answer in the form $a\pi + b$.

(Turn over)

**Perimeter of the remaining piece of
card is _____ cm**

[4 marks]

2. Jamie wants to buy a pair of trainers online.

The online company has a sale reducing all prices by 25%

Jamie also has a discount code that will give him a further 10% off all SALE PRICES.

Jamie says,

“The trainers have been reduced in price by a total of 35%”

Explain why Jamie is incorrect.

(Turn over)

8

[1 mark]

(Turn over)

3. (a) Given that $3^{m+4} = 1$, find the value of m .

[1 mark]

continued on the next page . . .

(Turn over)

Question 3 continued

- 3. (b) Betty bought c cakes costing £2 each and d doughnuts costing £1.50 each.**

She paid with a twenty pound note and was given some change.

Write an inequality to show this information.

[2 marks]

continued on the next page . . .

(Turn over)

Question 3 continued

3. (c) Given that:

- **distance x = 15 miles**
- **distance y = 36 kilometres**
- **5 miles is approximately equal to 8 kilometres.**

Circle the ratio that best represents

distance x : distance y .

3:5	5:12	3:4	2:3	2:5
------------	-------------	------------	------------	------------

(Turn over)

12

[1 mark]

(Turn over)

4. Ask for the model for Question 4.
The model is NOT made to scale.
The model is a triangular prism
labelled *ABCDEF*.

On the model:

$$AB = 6 \text{ cm}$$

$$AC = 10 \text{ cm}$$

$$CD = 7 \text{ cm}$$

Angle *ABC* is a right angle.

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

The diagram is NOT drawn to scale.
The diagram shows the cross – section
of the prism.

continued on the next page . . .

(Turn over)

Question 4 continued

In the diagram:

$$\mathbf{AB = 6\text{ cm}}$$

$$\mathbf{AC = 10\text{ cm}}$$

Angle ABC is a right angle.

Calculate the total surface area of the triangular prism.

(Turn over)

[illegible]

(Turn over)

The total surface area of the triangular prism is _____ cm^2

[6 marks]

(Turn over)

- 5. Look at the diagram for Question 5 in the separate Diagram Booklet. The diagram is a Venn diagram.**

Last week, 142 pupils in Year 7 were given English homework and French homework.

10 pupils did not complete either homework.

Each expression in the Venn diagram represents the number of pupils that completed at least one homework.

- (a) Calculate the value of x .**

(Turn over)

$x =$ _____

[3 marks]

continued on the next page . . .

(Turn over)

Question 5 continued

- 5. (b) One pupil is chosen at random from the group.**

What is the probability that this pupil completed ONLY the French homework?

(Turn over)

**The probability that a pupil completed
ONLY the French homework
is _____**

[2 marks]

(Turn over)

6. (a) Work out $2\frac{1}{5} - 1\frac{2}{3}$

Give your answer in its simplest form.

[3 marks]

continued on the next page . . .

(Turn over)

Question 6 continued

6. (b) Calculate the value of the reciprocal of 0.4

Give your answer as a decimal.

[2 marks]

continued on the next page . . .

(Turn over)

Question 6 continued

6. (c) ESTIMATE the value of

$$\frac{3 \cdot 02^3 + \sqrt{4 \cdot 17 \times 8 \cdot 9}}{0 \cdot 289}$$

(Turn over)

24

[3 marks]

(Turn over)

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

A cuboid rests on a horizontal floor.

The cuboid exerts a force of 6.2 newtons on the floor.

The pressure of this cuboid on the floor is 0.05 N/cm^2

The base of the cuboid in contact with the floor has a WIDTH of 8 cm .

Calculate the LENGTH of the base of the cuboid.

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(Turn over)

Length of the base of the cuboid

= _____ cm

[5 marks]

(Turn over)

8. (a) Work out the value of $5^{-32} \div 5^{-35}$

[2 marks]

continued on the next page . . .

(Turn over)

Question 8 continued

- 8. (b) In a vacuum, a particle of light travels at approximately 3×10^8 metres per second.**

What is this speed in kilometres per minute?

Give your answer in standard form.

(Turn over)

30

[3 marks]

(Turn over)

9. Look at the diagram for Question 9 in the separate Diagram Booklet. The diagram is NOT drawn to scale. The diagram shows a square labelled *KLMN* and a rectangle labelled *PQRS*.

In the square *KLMN*:

$$KL = 12.5 \text{ cm}$$

$$KN = (5x - 3y)$$

In the rectangle *PQRS*:

$$PQ = (3x + 2y)$$

$$PS = (7x - 6y)$$

$$SR = 17 \text{ cm}$$

Use an algebraic method (not trial and improvement) to find the value of x and the value of y .

Hence, calculate the perimeter of *PQRS*.

continued on the next page . . .

(Turn over)

Question 9 continued

You must show all your working.

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(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)

The perimeter of $PQRS$ is _____ cm
[7 marks]

10. It takes 5 workers a total of 24 hours to build a wall 180 m long.

(a) The workers have enough materials left over to build a further 300 m of the same wall.

How long will it take 8 WORKERS to build this 300 m of wall?

**It will take 8 workers _____ hours
to build 300 m of wall.**

[3 marks]

continued on the next page . . .

(Turn over)

Question 10 continued

10. (b) (i) What assumption have you made in answering part (a)?

[1 mark]

continued on the next page . . .

(Turn over)

Question 10 (b) continued

10. (b) (ii) If your assumption is not correct, what effect would this have on your answer to part (a)?

[1 mark]

(Turn over)

11. (a) The n th term of a sequence is given by $2n^2 + 9$

Show that 90 is NOT a term in the sequence.

[2 marks]

continued on the next page . . .

(Turn over)

Question 11 continued

11. (b) The first four terms of a sequence are:

$$2a^{17}b^3, \quad 4a^{15}b^6, \quad 8a^{13}b^{12}, \quad 16a^{11}b^{24}, \dots$$

Write down the SIXTH term of this sequence.

[2 marks]

continued on the next page . . .

(Turn over)

Question 11 continued

- 11. (c) Look at the diagram for Question 11 (c) in the separate Diagram Booklet. The diagram shows shaded and white tiles used to make four patterns labelled Pattern 1, Pattern 2, Pattern 3 and Pattern 4**

Write an expression for the TOTAL number of tiles needed to make Pattern n .

(Turn over)

42

[2 marks]

(Turn over)

12. On the graph paper provided for Question 12 in the separate Diagram Booklet, draw the region that satisfies the following inequalities. Indicate clearly the region that is your answer.

$$x \leq 3$$

$$y \geq 2$$

$$y \leq x + 1$$

$$y \geq 5 - 2x$$

[4 marks]

(Turn over)

13. Rearrange the following formula to make u the subject.

$$\frac{t^2 + 4u}{u + 5} = w$$

(Turn over)

45

[4 marks]

(Turn over)

14. Cally, Deena and Juan are working on a GCSE project.

They are each in a different class.

Cally, Deena and Juan each record the journey times to school of pupils in their own class.

(a) Look at the table for Question 14 (a) in the separate Diagram Booklet.

The times for pupils in Cally's class are shown in the table.

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

The diagram is a histogram.

Cally decides to draw a histogram of her results.

continued on the next page . . .

(Turn over)

Question 14 (a) continued

Most of the frequency densities used in the histogram are incorrect.

What error did Cally make when she calculated the frequency densities?

[1 mark]

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 an incomplete histogram. Deena has correctly drawn the histogram for her results. 4 pupils take between 0 and 5 minutes to travel to school.**

- (i) Complete the scale on the frequency density axis.**

[2 marks]

continued on the next page . . .

(Turn over)

Question 14 (b) continued

- 14. (b) (ii) Calculate an estimate of the median journey time for the pupils in Deena's class. You must show all your working.**

[3 marks]

continued on the next page . . .

(Turn over)

Question 14 continued

14. (c) Juan decides to display the journey times of the 24 pupils for his class on a cumulative frequency diagram.

Look at the diagram for Question 14 (c) in the separate Diagram Booklet. The diagram shows Juan's cumulative frequency diagram.

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

continued on the next page . . .

(Turn over)

Question 14 (c) continued

14. (c) (i) Calculate the percentage of pupils in Juan's class that take 45 minutes or longer to travel to school.

[3 marks]

continued on the next page . . . (Turn over)

Question 14 (c) continued

14. (c) (ii) Complete the table for the journey time to school of the pupils in Juan's class.

Median	
Lower quartile	
Upper quartile	
Inter – quartile range	

[3 marks]

continued on the next page . . .

(Turn over)

Question 14 (c) continued

14. (c) (iii) Two pupils were absent when Juan collected his data.

The journey times of these two pupils are 6 minutes and 40 minutes.

What effect would including these two results have on the median journey time for the class?

[1 mark]

(Turn over)

15. Factorise and hence solve
 $3x^2 - 13x - 10 = 0$

[3 marks]

(Turn over)

16. (a) Use the iterative formula

$$x_{n+1} = 2x_n - 5$$

Calculate the value of

$$x_4 \text{ when } x_1 = 6$$

$$x_4 = \underline{\hspace{4cm}}$$

[2 marks]

continued on the next page . . .

(Turn over)

Question 16 continued

16. (b) Use the iterative formula

$$x_{n+1} = \frac{2}{3} x_n$$

Calculate the value of x_3 when

$$x_5 = 8$$

(Turn over)

$x_3 =$ _____

[2 marks]

(Turn over)

17. (a) Calculate the value of
 $144^{0.5} \times 6^{-2}$

Give your answer as a fraction
in its simplest form.

[3 marks]

continued on the next page . . .

(Turn over)

Question 17 continued

17. (b) Write $\frac{430}{33}$ as a recurring decimal.

[1 mark]

continued on the next page . . .

(Turn over)

Question 17 continued

17. (c) Expand and simplify
 $(9 + 2\sqrt{5})(4 - 3\sqrt{5})$

[2 marks]

continued on the next page . . .

(Turn over)

Question 17 continued

17. (d) Find the mean of $4\sqrt{75}$ and $3\sqrt{48}$

**Give your answer in the form
 $a\sqrt{b}$ where b is as small as
possible.**

(Turn over)

[3 marks]

18. (a) Look at the diagram for Question 18 (a) in the separate Diagram Booklet. The diagram is NOT drawn to scale.
- The diagram shows triangle FGH .
 X is a point on FH where $FX:XH = 3:2$
 Y is the midpoint of FG .
- $FX = 9j$ and $GH = 8k$.
Write the vector FY in the form $aj + bk$.
-
-
-
-
-
-

FY = _____

[3 marks]

continued on the next page . . .

(Turn over)

Question 18 continued

- 18. (b) Look at the diagram for Question 18 (b) in the separate Diagram Booklet. The diagram is NOT drawn to scale. The vectors $\mathbf{OA}$, $\mathbf{OB}$ and $\mathbf{OC}$ are shown in the diagram.**

Show that the points A , B and C lie on a straight line.

(Turn over)

[4 marks]

(Turn over)

19. A bag contains 3 pink cubes and 5 green cubes.

The following steps are taken.

- **Step 1: A cube is chosen at random from the bag and replaced by 2 more cubes of the OTHER colour.**
- **Step 2: Repeat step 1**
- **Step 3: A third cube is chosen at random.**

(a) Show that the probability that all three cubes are pink is $\frac{1}{120}$

[3 marks]

continued on the next page . . .

(Turn over)

Question 19 continued

- 19. (b) Calculate the probability that the first two cubes are the same colour and the third cube is a different colour.**

(Turn over)

70

[4 marks]

(Turn over)

20. Look at the diagram for Question 20 in the separate Diagram Booklet.
The diagram is NOT drawn to scale.
The diagram is a sketch.
The sketch shows a circle with diameter PQ .
The point P has coordinates $(3, 4)$.
The line $y - 2x + 5 = 0$ is a tangent to the circle at the point Q .

Find the equation of the line PQ .
Write your answer in the form
 $ax + by + c = 0$

(Turn over)

72

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[5 marks]

(Turn over)

21. The function $f(x)$ is defined by
 $f(x) = 5x - 2$

(a) (i) Find $f^{-1}(x)$.

(Turn over)

[2 marks]

continued on the next page . . .

(Turn over)

Question 21 (a) continued

21. (a) (ii) Find and simplify an expression for $ff(x)$.

[2 marks]

continued on the next page . . .

(Turn over)

Question 21 continued

21. (b) The function $g(x)$ is defined by
 $g(x) = kx^2 + 3$

Given that $fg(-2) = 73$, calculate
the value of k .

(Turn over)

[4 marks]

END OF PAPER
TOTAL 120 MARKS

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

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THURSDAY, 15 MAY 2025 – MORNING

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

Diagram Booklet

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

Surname: _____

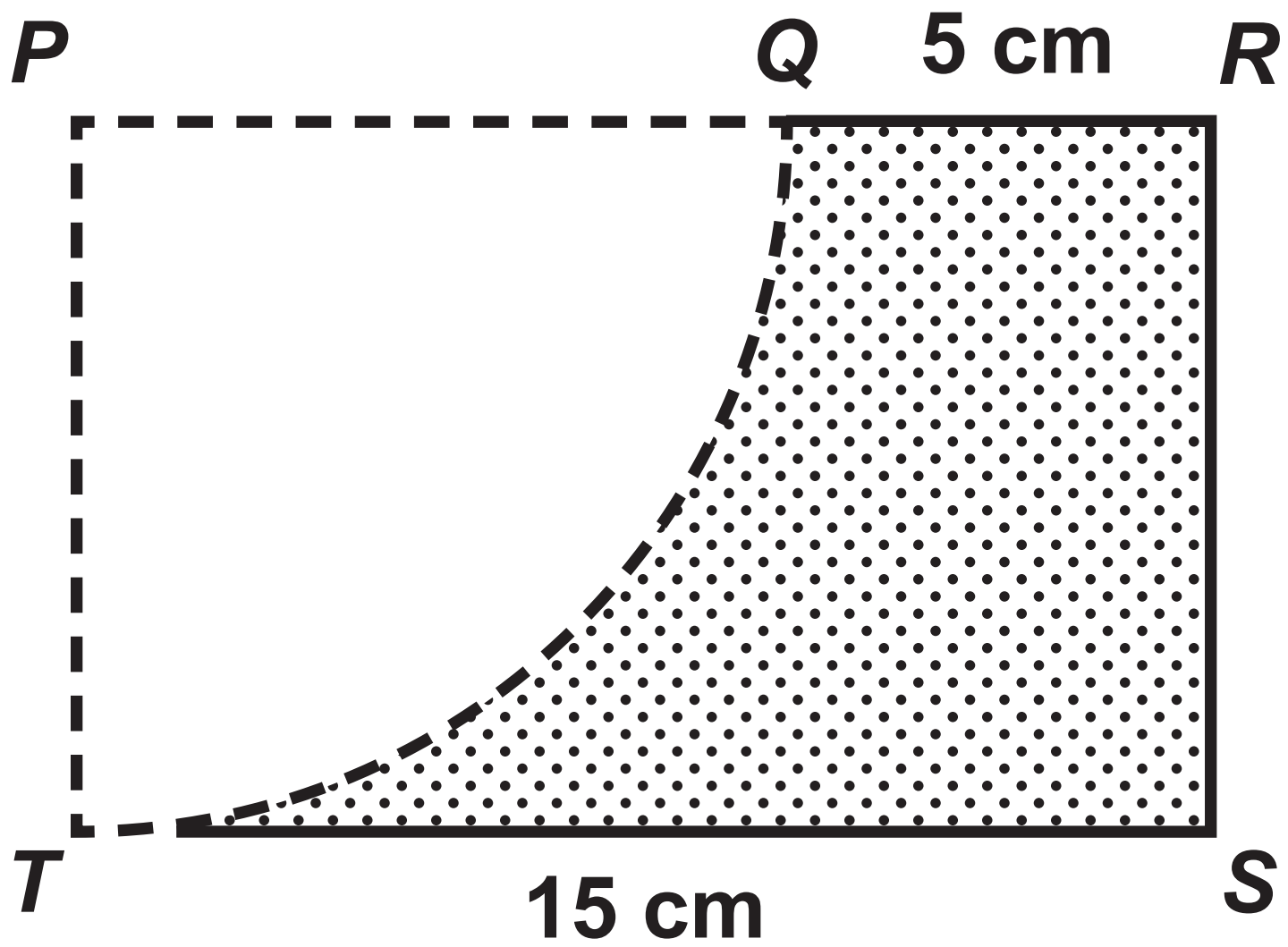
First name(s): _____

Centre Number: _____

Candidate Number: 0 _____

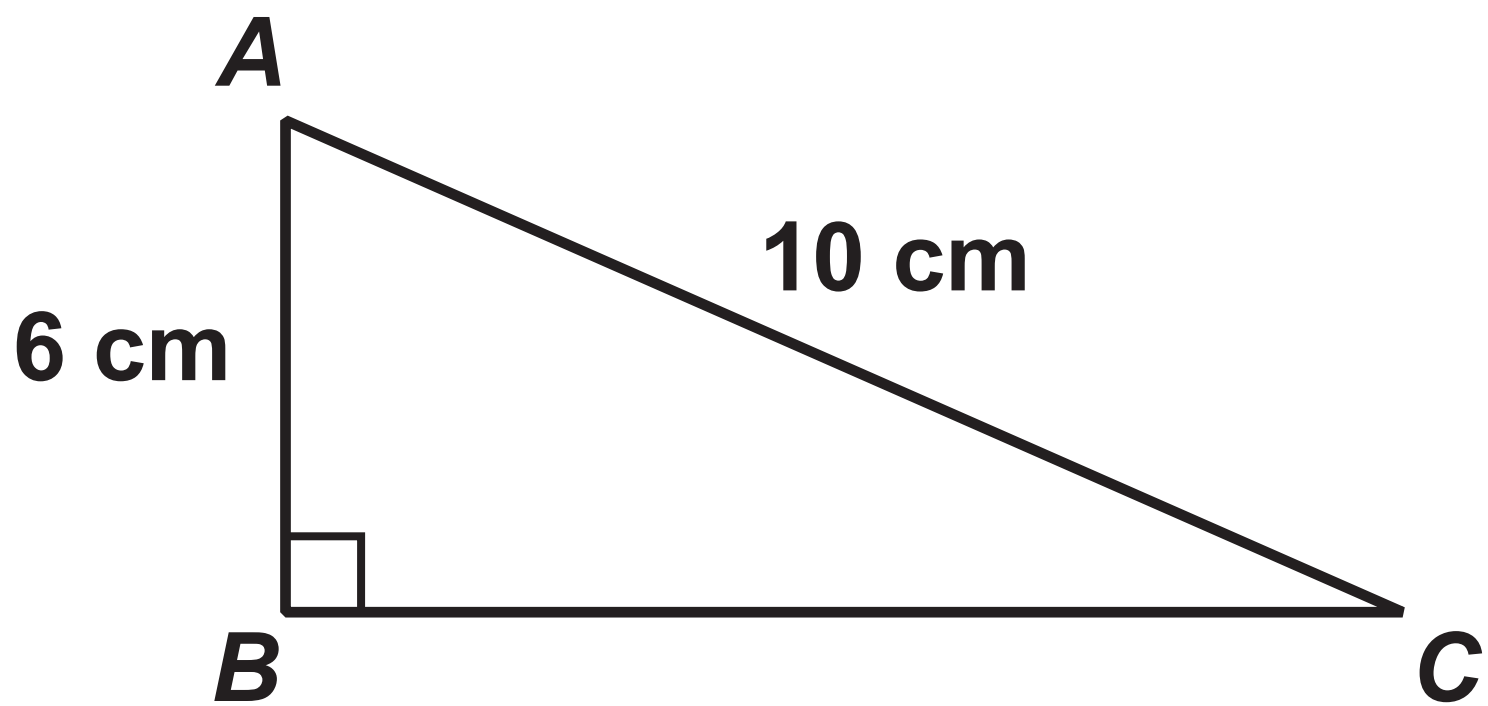
Question 1

Diagram NOT drawn to scale

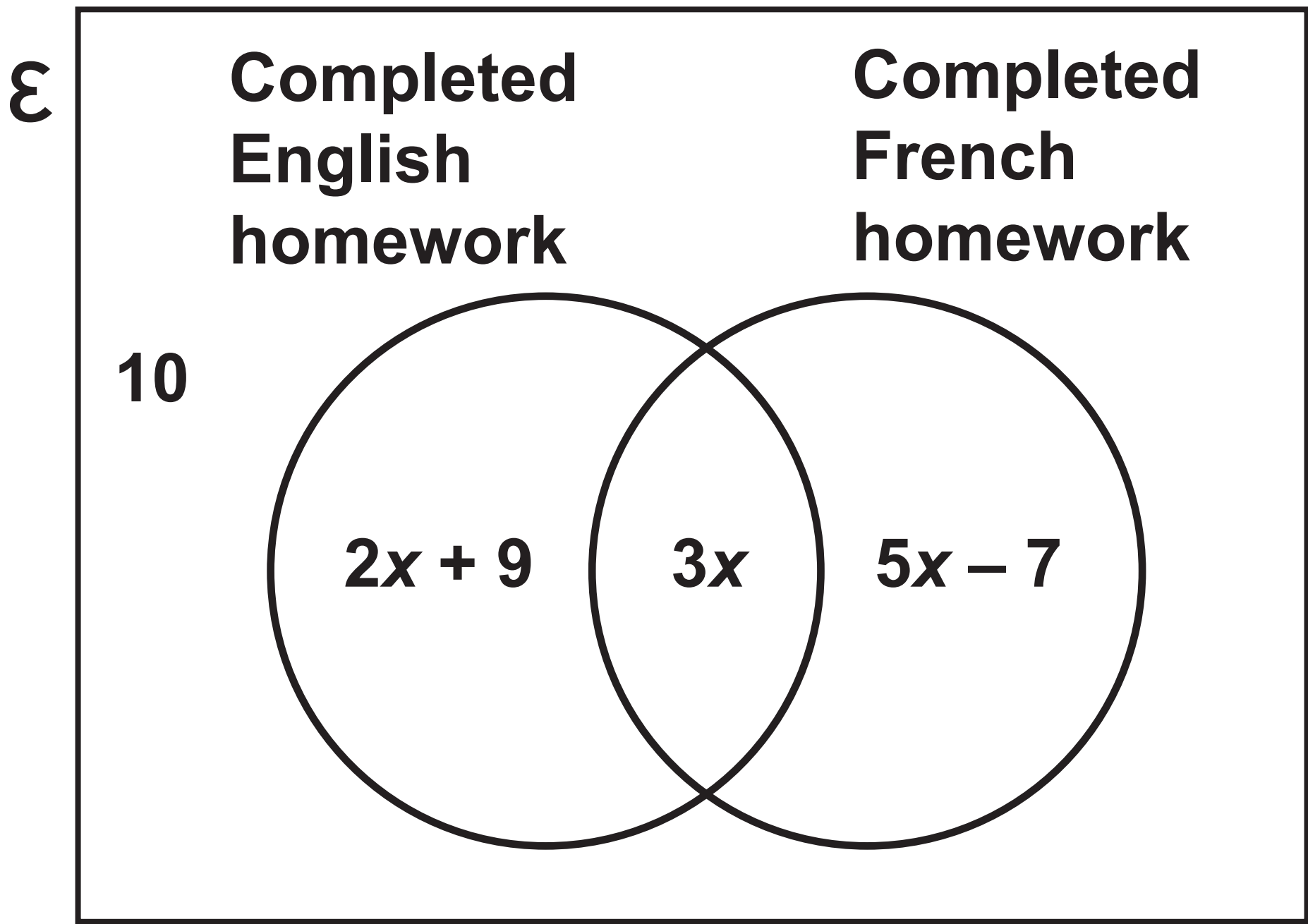


Question 4

Diagram NOT drawn to scale



Question 5



Question 7

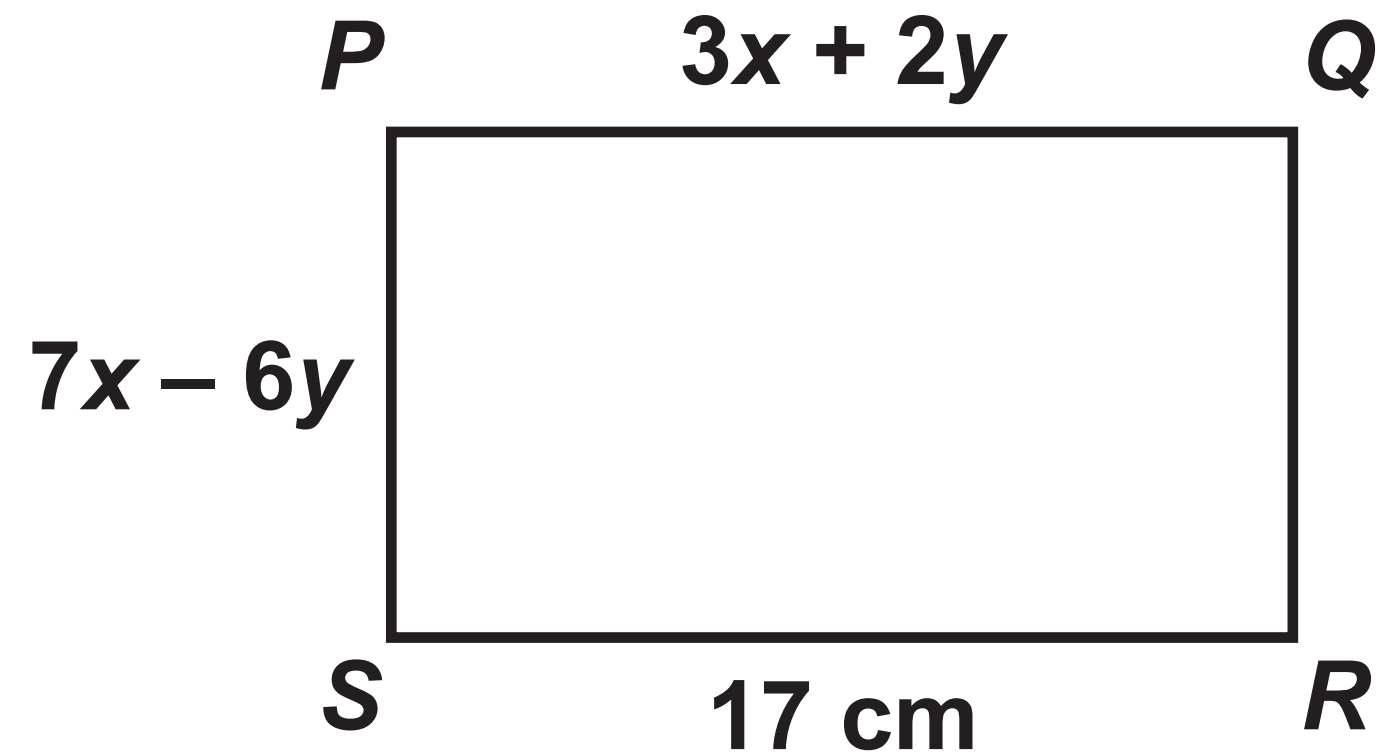
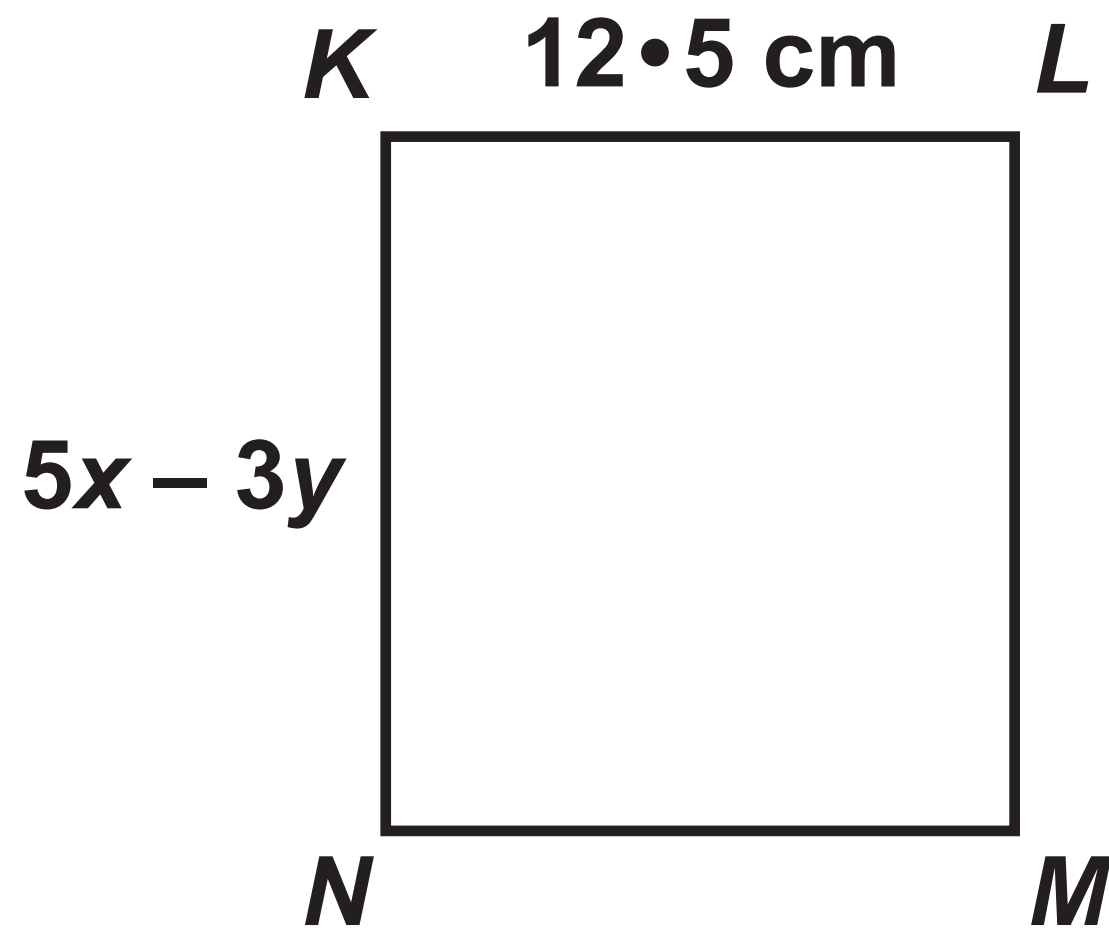
Formula

Use:

$$\text{Pressure} = \frac{\text{Force (N)}}{\text{Area (cm}^2\text{)}}$$

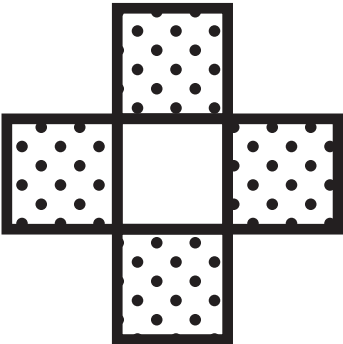
Question 9

Diagram NOT drawn to scale

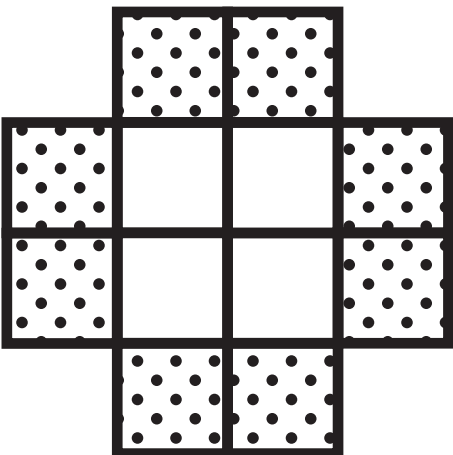


Question 11 (c)

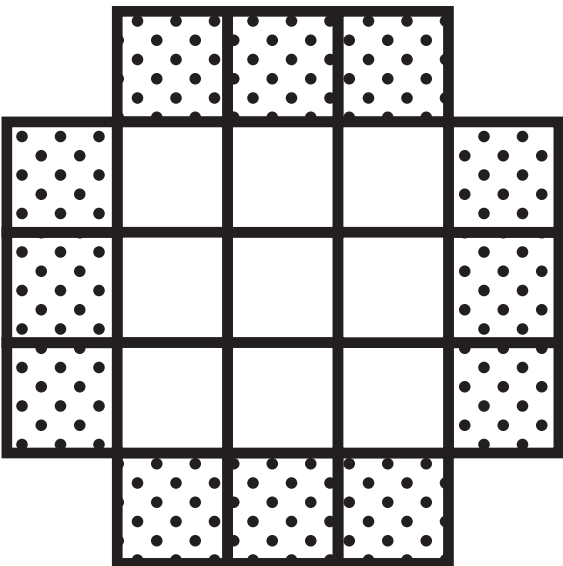
Pattern 1



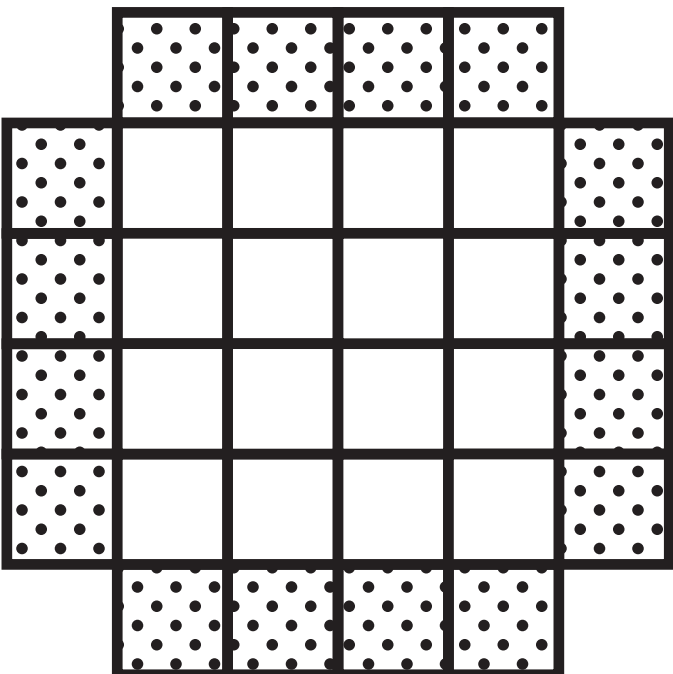
Pattern 2



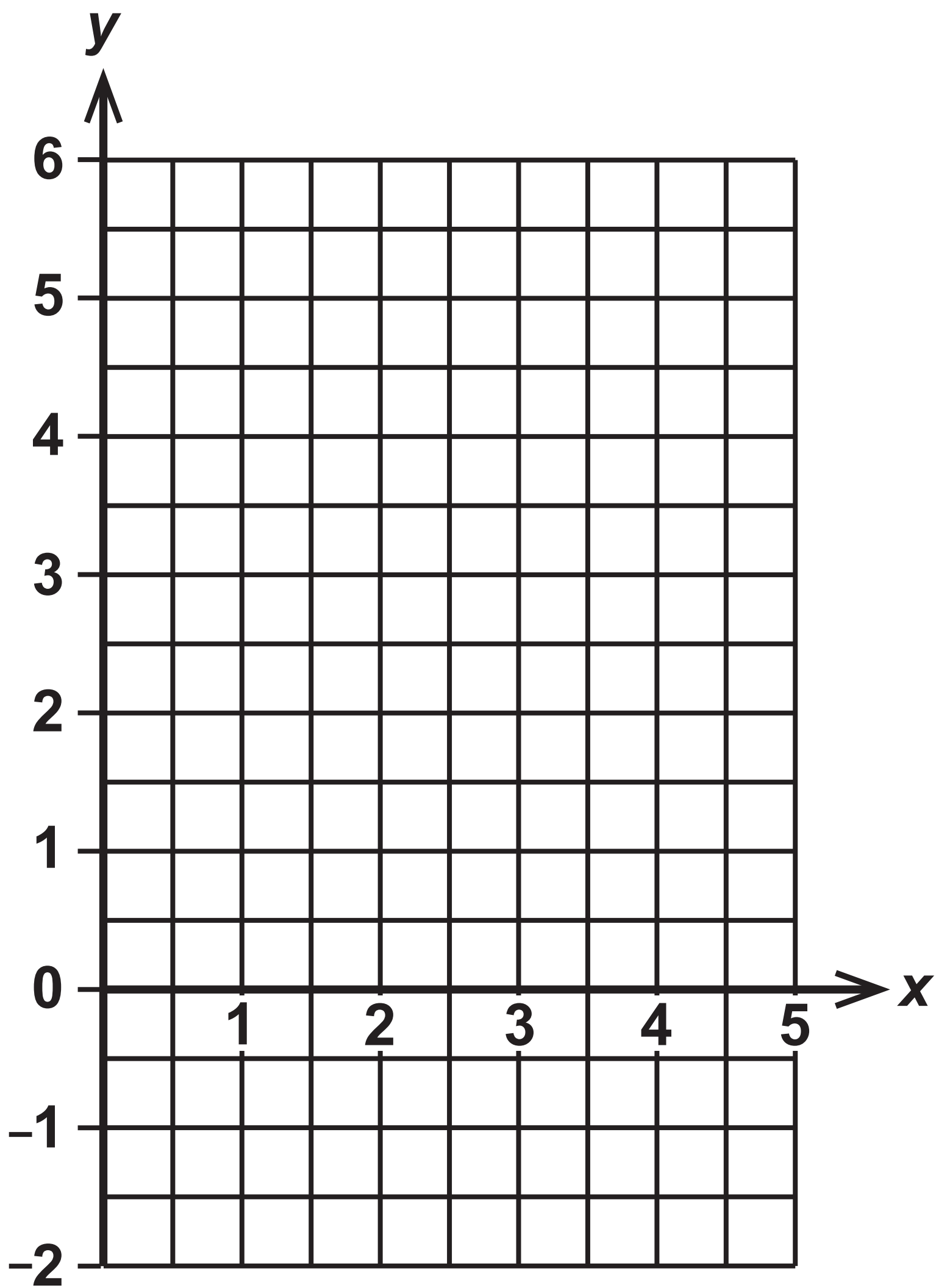
Pattern 3



Pattern 4



Question 12



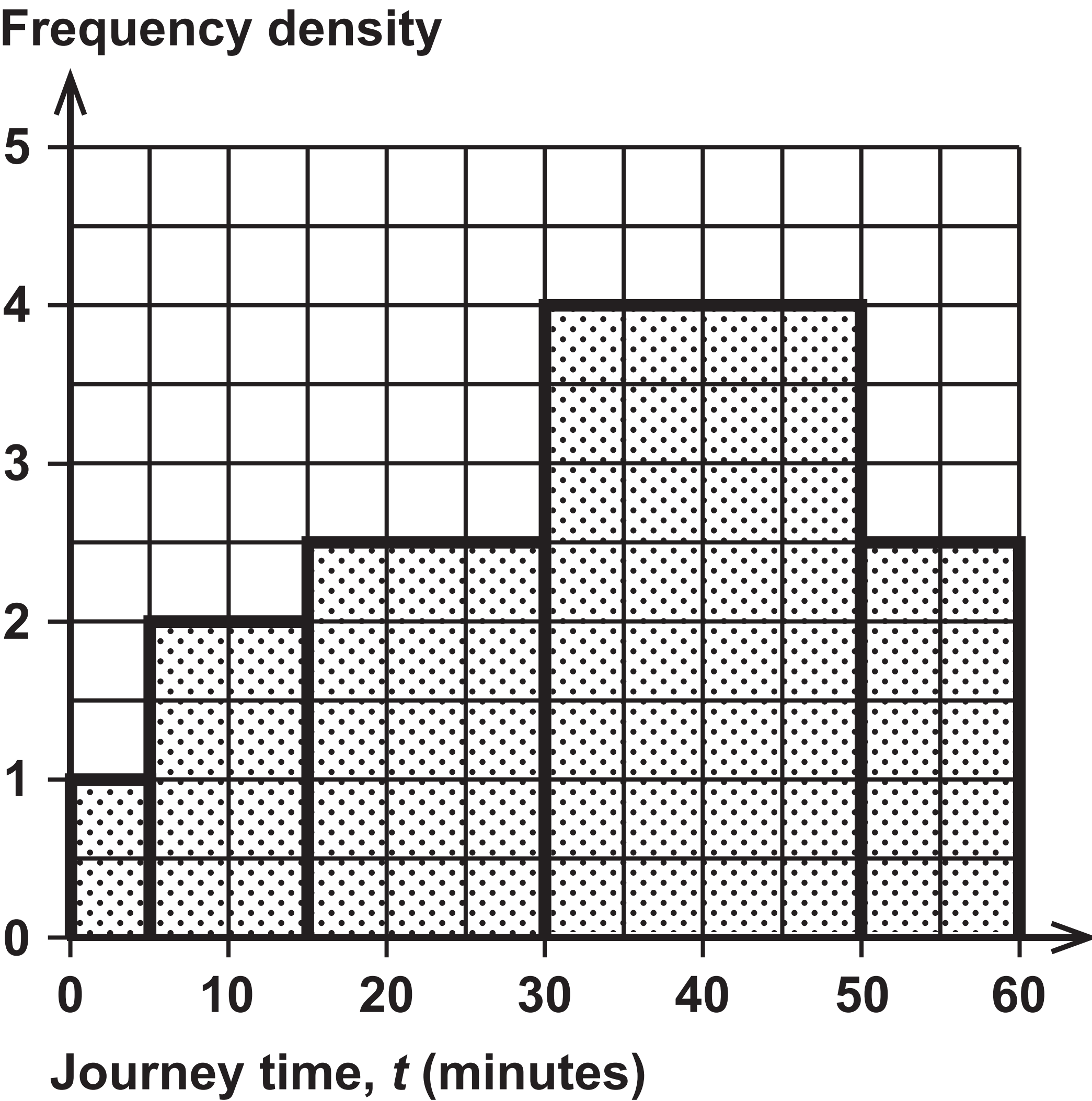
Question 14 (a)

Table

Journey time, t (minutes)	Number of pupils
$0 < t \leq 5$	5
$5 < t \leq 15$	5
$15 < t \leq 30$	6
$30 < t \leq 50$	5
$50 < t \leq 60$	4

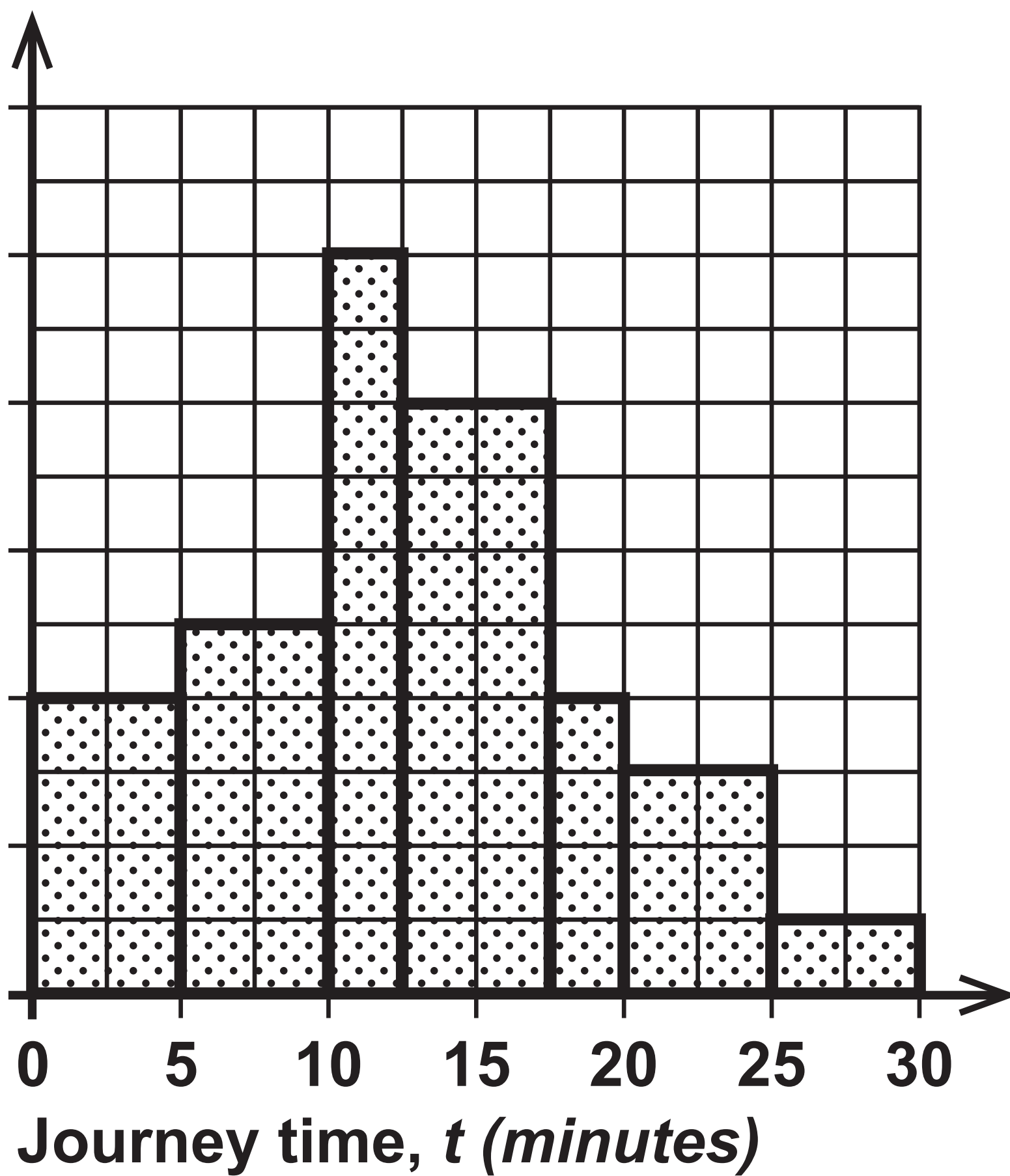
Question 14 (a)

Diagram



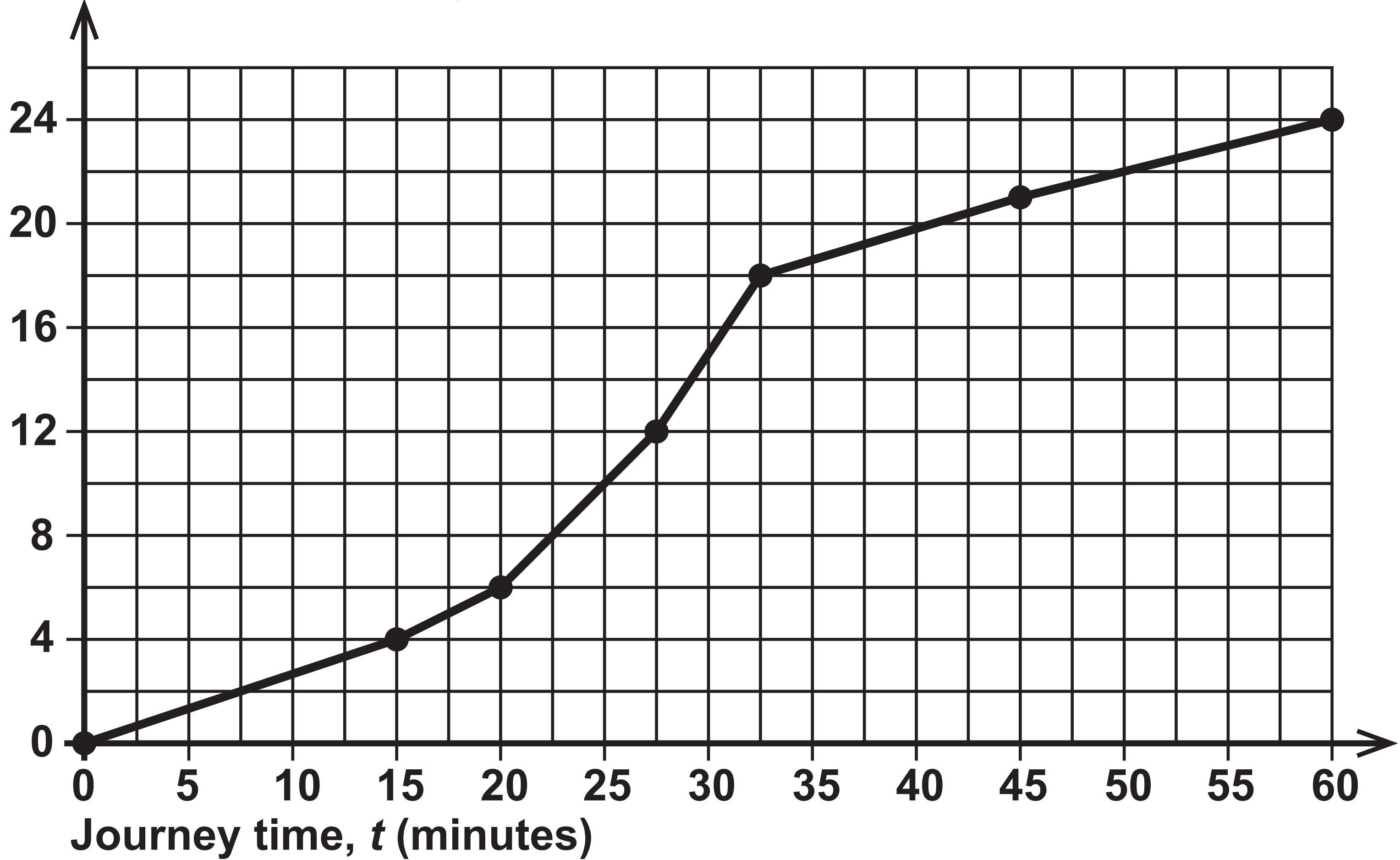
Question 14 (b)

Frequency density



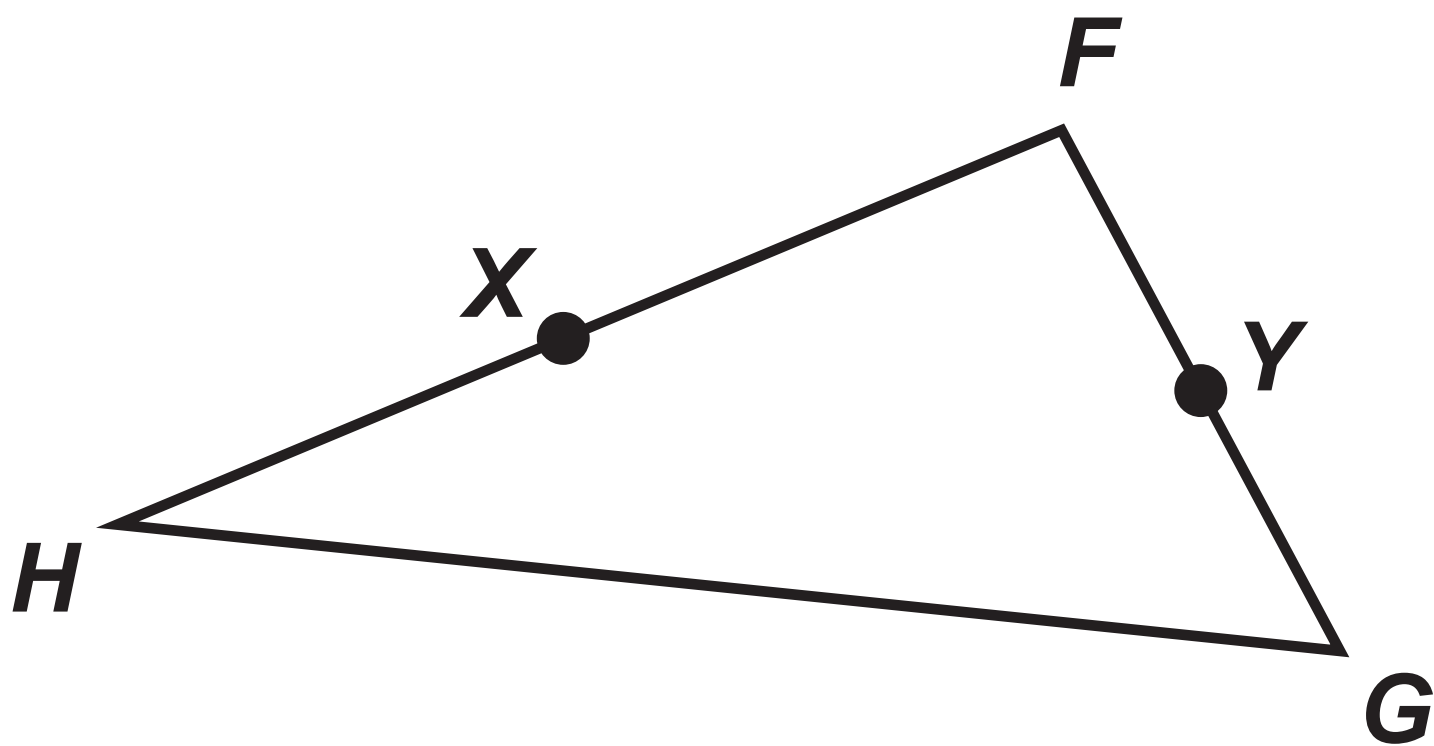
Question 14 (c)

Cumulative frequency



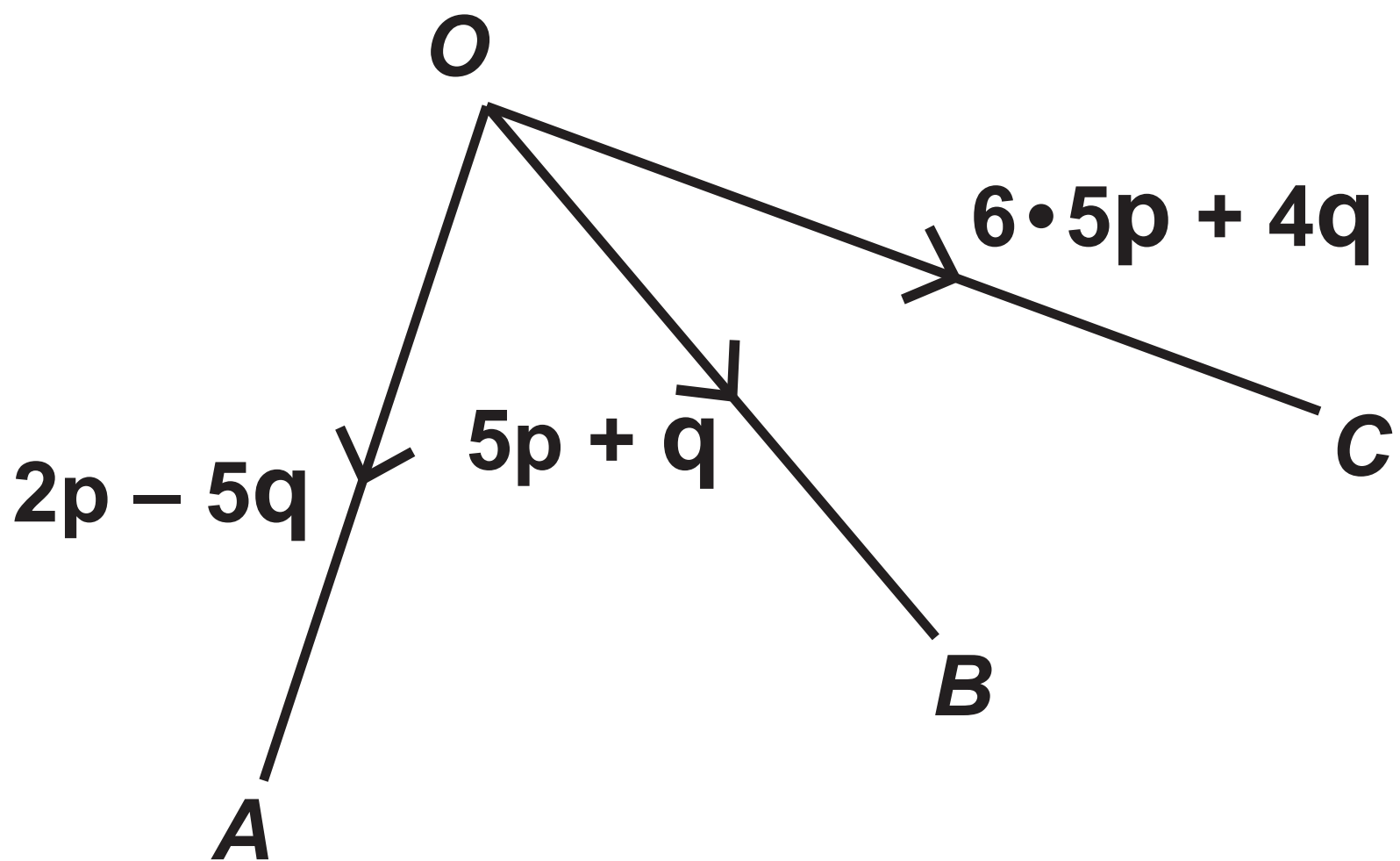
Question 18 (a)

Diagram NOT drawn to scale



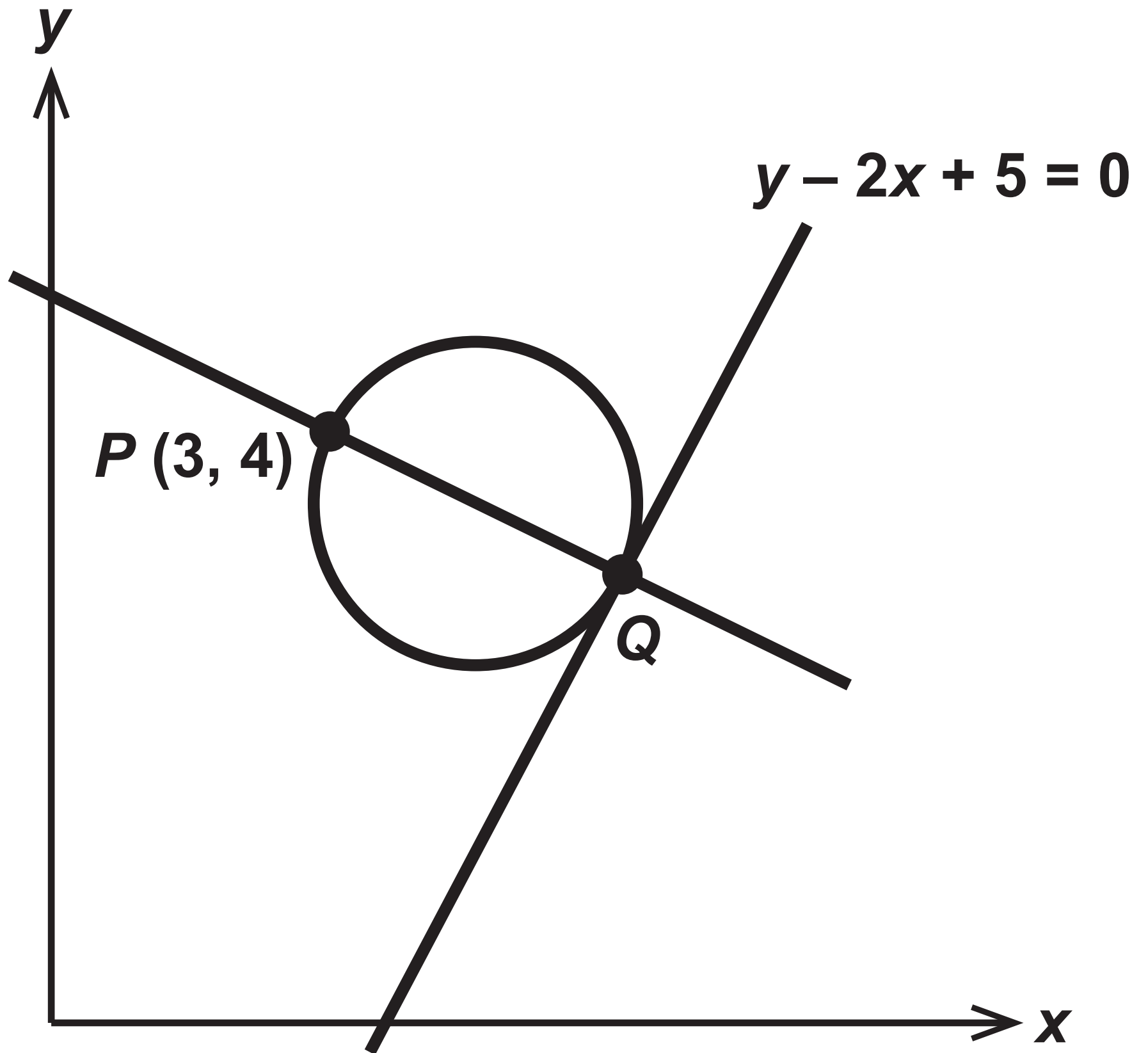
Question 18 (b)

Diagram NOT drawn to scale



Question 20

Diagram NOT drawn to scale



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:

$$v = u + at$$

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

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

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THURSDAY, 15 MAY 2025 – 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:

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

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

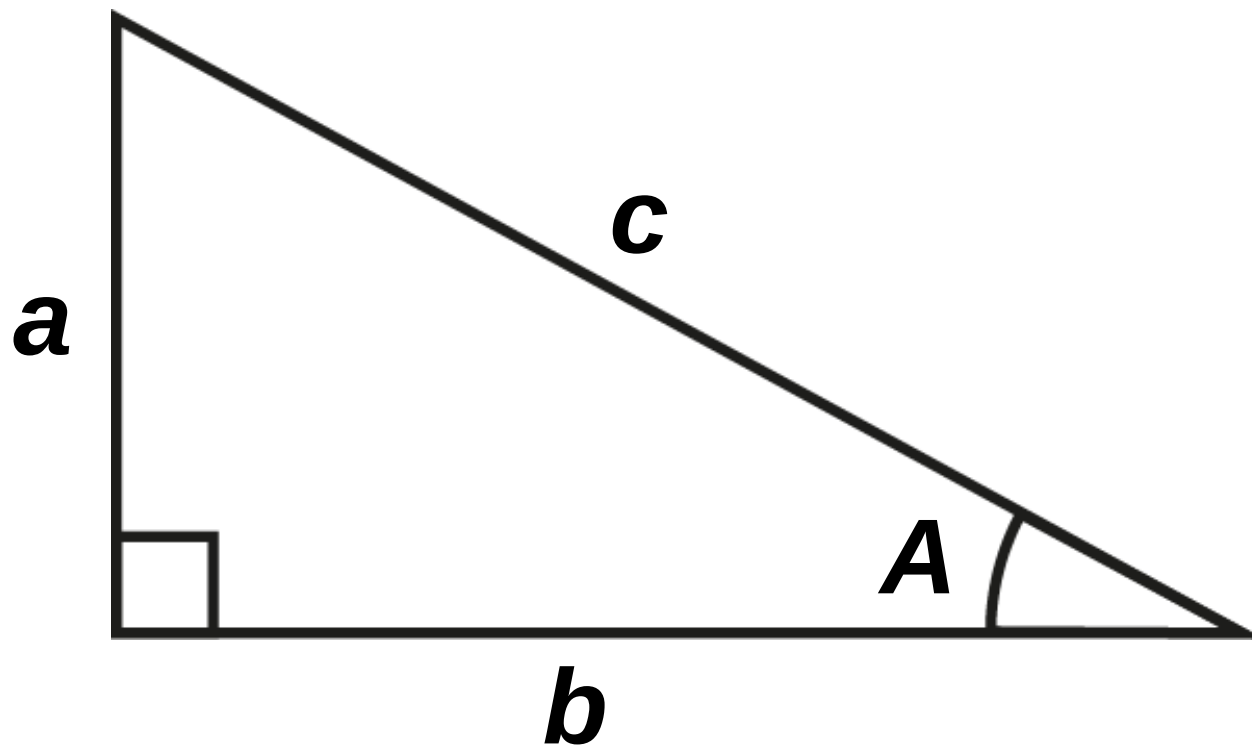
QUADRATIC FORMULA

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

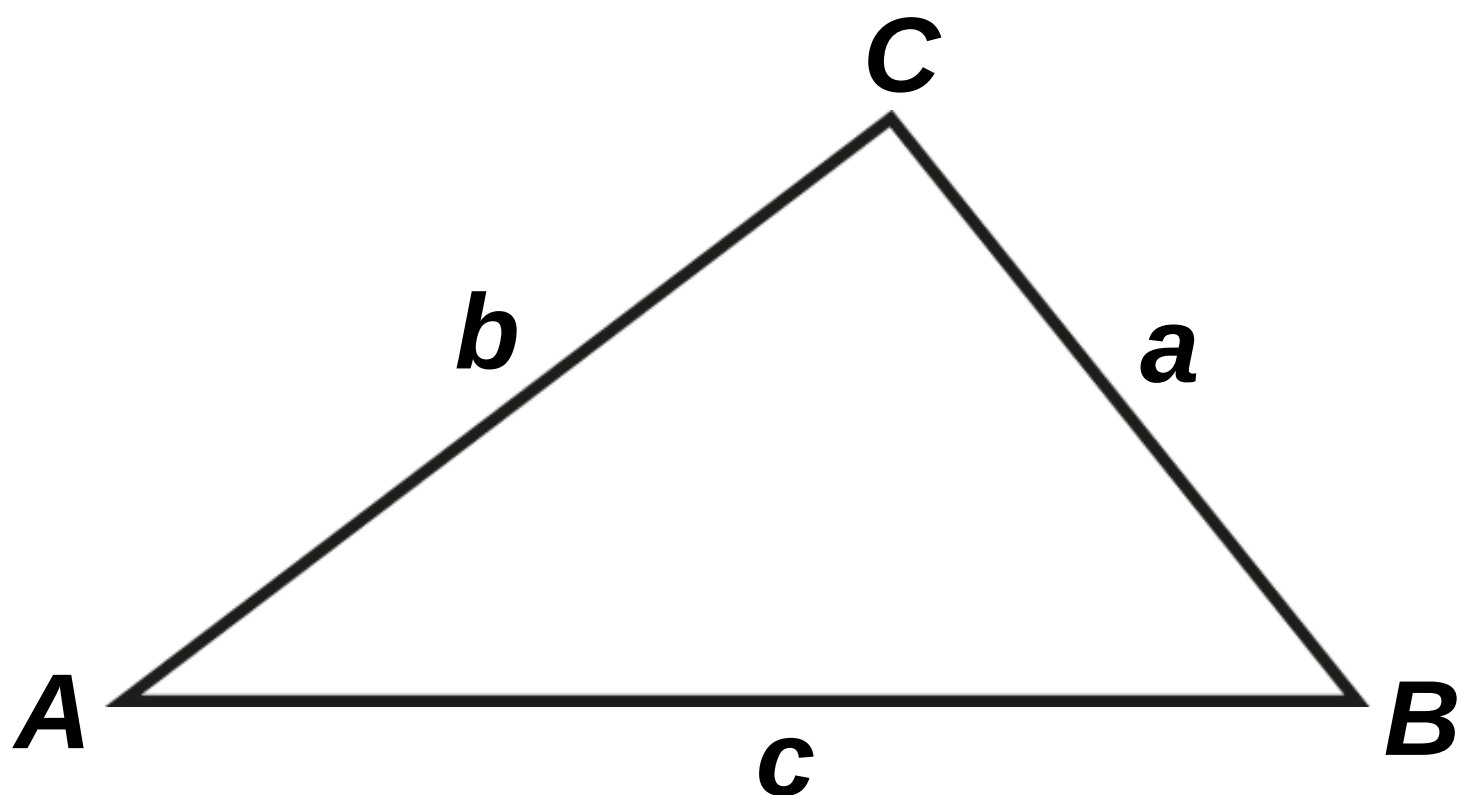


In any right – angled triangle where a , b and c are the length of the sides and c is the hypotenuse:

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

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 :

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

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