Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel Award

Friday 10 January 2025

Morning (Time: 2 hours)

Paper reference **AAL30/01**

Algebra

Level 3

Calculator NOT allowed

You must have:
Ruler graduated in centimetres and millimetres, pair of compasses, pen, HB pencil, eraser.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators are not allowed.**

Information

- The total mark for this paper is 90
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 7 6 2 2 4 A 0 1 2 4

Pearson

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

You must NOT use a calculator.

1 (a) Simplify $n^3 \div n^{\frac{1}{2}}$

.....

(1)

(b) Simplify $(t^{-2})^{-3}$

.....

(1)

(Total for Question 1 is 2 marks)

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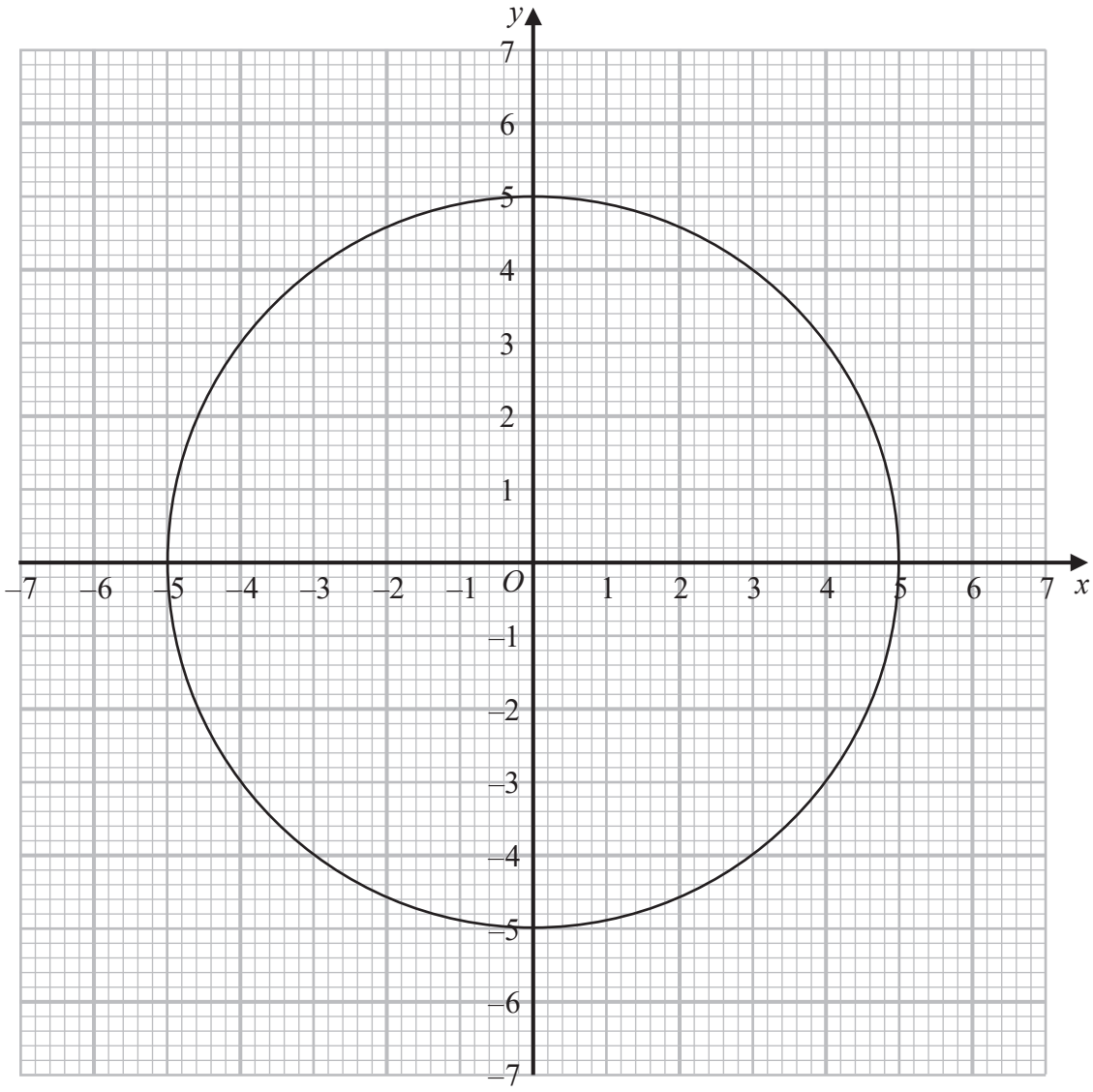
2 Here is a circle, **C**, drawn on a grid.



(a) Draw the tangent to **C** at the point with coordinates (3, 4)
Label the tangent T

(1)

(b) Write down an equation of the normal to **C** at the point with coordinates (0, 5)

.....

(1)

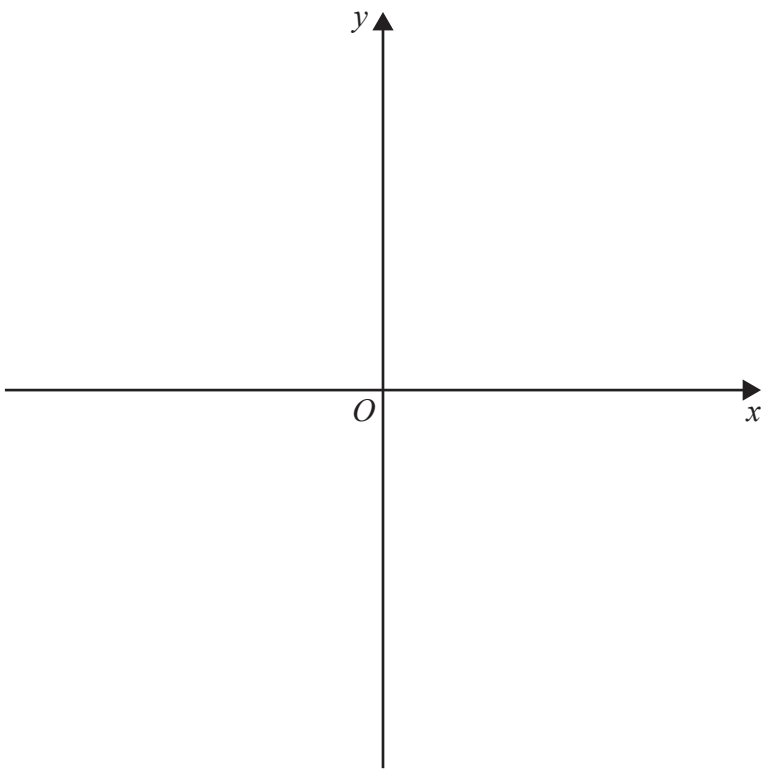
(Total for Question 2 is 2 marks)

3 Solve $\frac{k-2}{3} < \frac{k+1}{5}$

.....

(Total for Question 3 is 2 marks)

4 Sketch the graph of $x = 1 + y^2$



(Total for Question 4 is 2 marks)

5 (a) Factorise $x^2 + 9x + 8$

.....

(1)

(b) Factorise $15 - 10t + 12w - 8wt$

.....

(2)

(c) Factorise $8y^3 - 32y$

.....

(3)

(Total for Question 5 is 6 marks)

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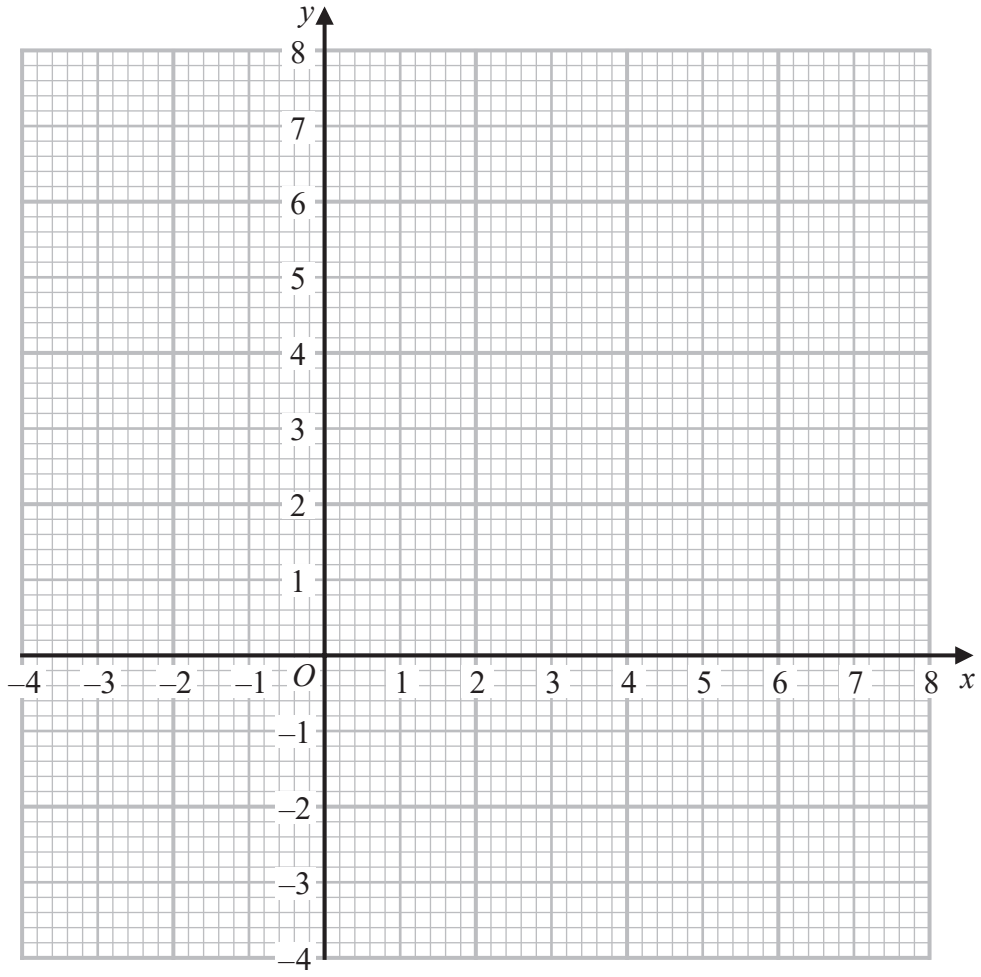
6 (a) On the grid, shade the region that satisfies all these inequalities.

$$y < \frac{1}{2}x + 2 \qquad 5x + 4y < 20 \qquad x + 2y > 4$$

Label the region **R**



(5)

(b) Write down the coordinates of each of the points with integer coordinates that satisfy

$$y < \frac{1}{2}x + 2 \qquad 5x + 4y < 20 \qquad x + 2y > 4$$

.....

(2)

(Total for Question 6 is 7 marks)

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7 Here are the first five terms of an arithmetic series.

8 12 16 20 24

(a) Work out the 100th term of this series.

.....

(2)

(b) Work out the sum of the first 200 terms of this series.

.....

(2)

(Total for Question 7 is 4 marks)

8 (a) Use the quadratic formula to solve the equation $3p^2 + 2p - 7 = 0$

Give your answer in the form $\frac{-1 \pm \sqrt{m}}{n}$ where m and n are integers.

.....

(3)

(b) (i) Write the quadratic expression $5x^2 - 20x$ in the form $c[(x + d)^2 + e]$ where c, d and e are integers.

.....

(3)

(ii) Solve the inequality $5x^2 - 20x > 105$

.....

(3)

(Total for Question 8 is 9 marks)

9 A straight line **L** is parallel to the line with equation $y = 4 - 3x$ and passes through the point with coordinates (4, 2)

(a) Find an equation for **L**
Give your answer in the form $ax + by = c$ where a, b and c are integers.

.....

(3)

The straight line **M** is perpendicular to the line with equation $y = 4 - 3x$ and passes through the origin.

(b) Find an equation for **M**

.....

(2)

(Total for Question 9 is 5 marks)

10 $g = \dfrac{3(h - e)}{h} + e$

(a) Work out the value of g when $h = 5$ and $e = 0.5$

.....

(2)

(b) Make e the subject of the formula $g = \dfrac{3(h - e)}{h} + e$

.....

(3)

(Total for Question 10 is 5 marks)

11 (a) (i) Find the sum of the roots of the equation $4x^2 + 2x + 3 = 0$

.....

(1)

(ii) Find the product of the roots of the equation $4x^2 + 2x + 3 = 0$

.....

(1)

(b) (i) Find, in terms of k, the discriminant of the equation $(k - 5)x^2 + 5x - k = 0$
Give your answer in the form $(mk + n)^2$ where m and n are integers.

.....

(3)

(ii) Use your answer to part (b)(i) to state what it tells you about the roots of $(k - 5)x^2 + 5x - k = 0$ when $k = 2.5$

(1)

(Total for Question 11 is 6 marks)

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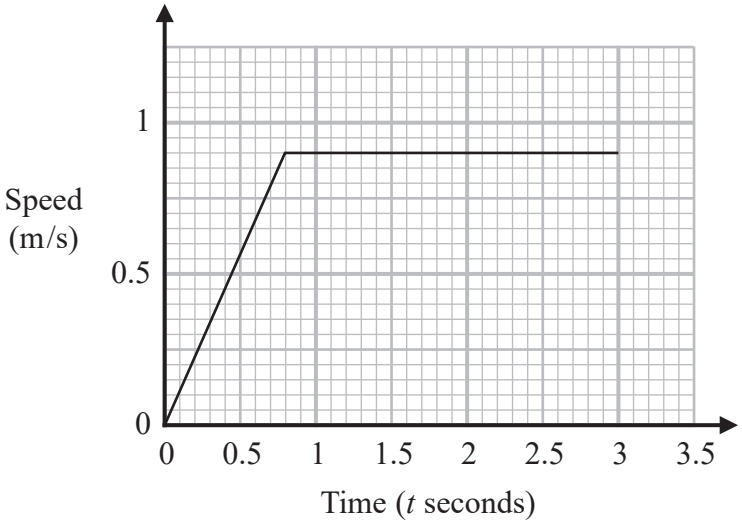
12 Here is the speed-time graph for a swimmer for the first 3 seconds of his swim.



(a) Work out the acceleration of the swimmer for values of t between $t = 0$ and $t = 0.8$

..... m/s^2

(2)

(b) Work out the total distance travelled by the swimmer between $t = 0$ and $t = 3$

..... m

(2)

(Total for Question 12 is 4 marks)

13 w is inversely proportional to t^4

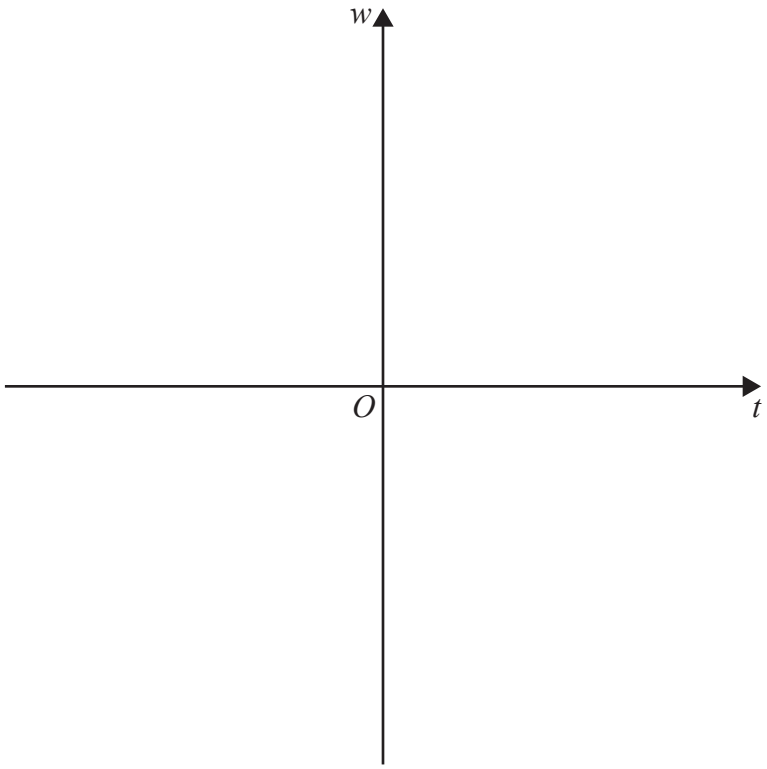
$w = 2$ when $t = 3$

(a) Find the value of w when $t = 2$

.....

(4)

(b) Sketch the graph of w against t for all values of t.



(2)

(Total for Question 13 is 6 marks)

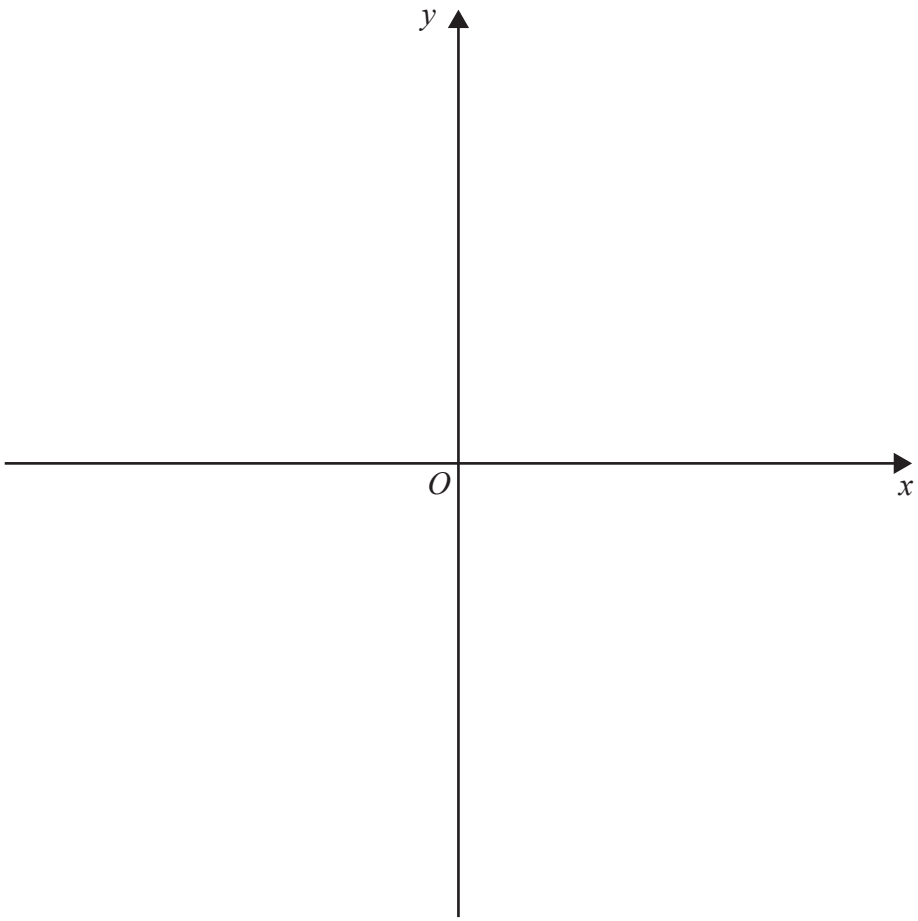
14 Solve $\dfrac{x}{2x+1} + \dfrac{6}{1-x} = 1$

Give your answers in the form $m \pm \sqrt{n}$ where m and n are integers.

.....

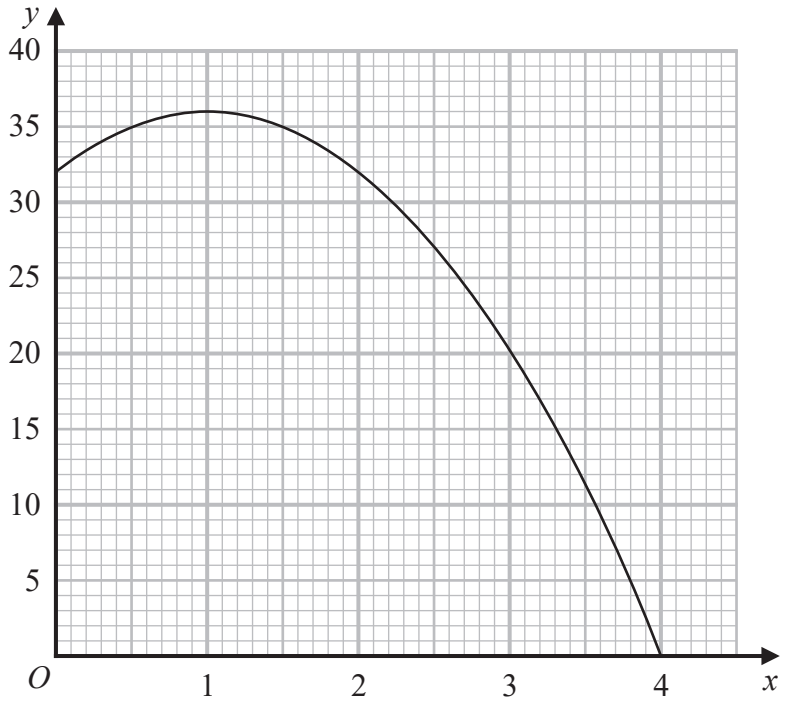
(Total for Question 14 is 5 marks)

15 Using the axes below, sketch the graph of $y = 3(x - 4)(x + 2)$
Show clearly the coordinates of any turning points and points of intersection of the graph with the axes.



(Total for Question 15 is 3 marks)

16 Here is the graph of $y = f(x)$

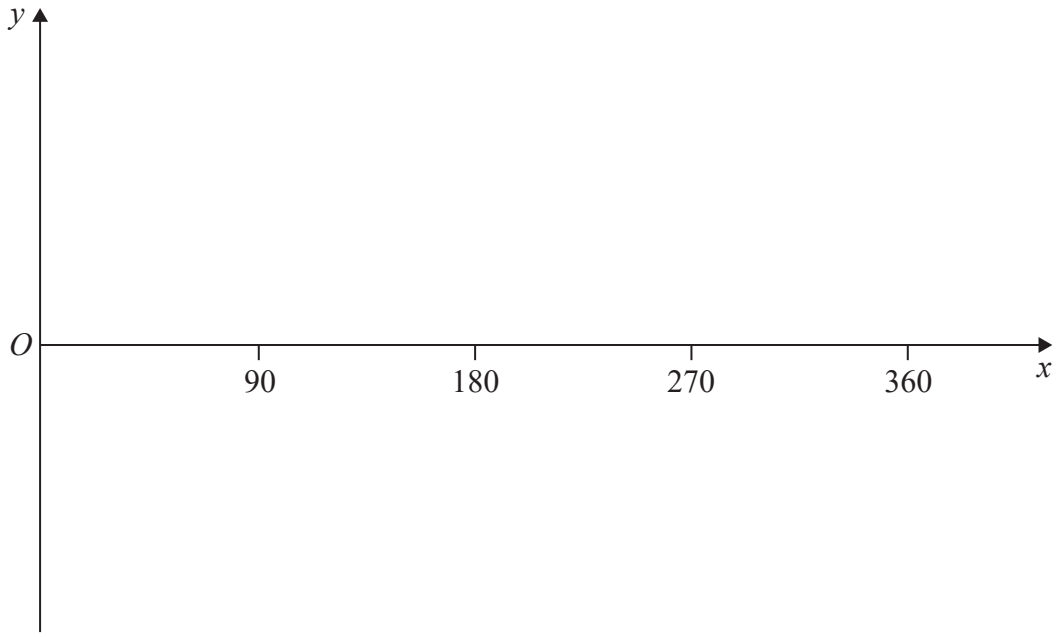


Use the trapezium rule to find an estimate for the area of the region under the curve and between $x = 0$, $x = 4$ and the x-axis.
Use 4 strips of equal width.

.....

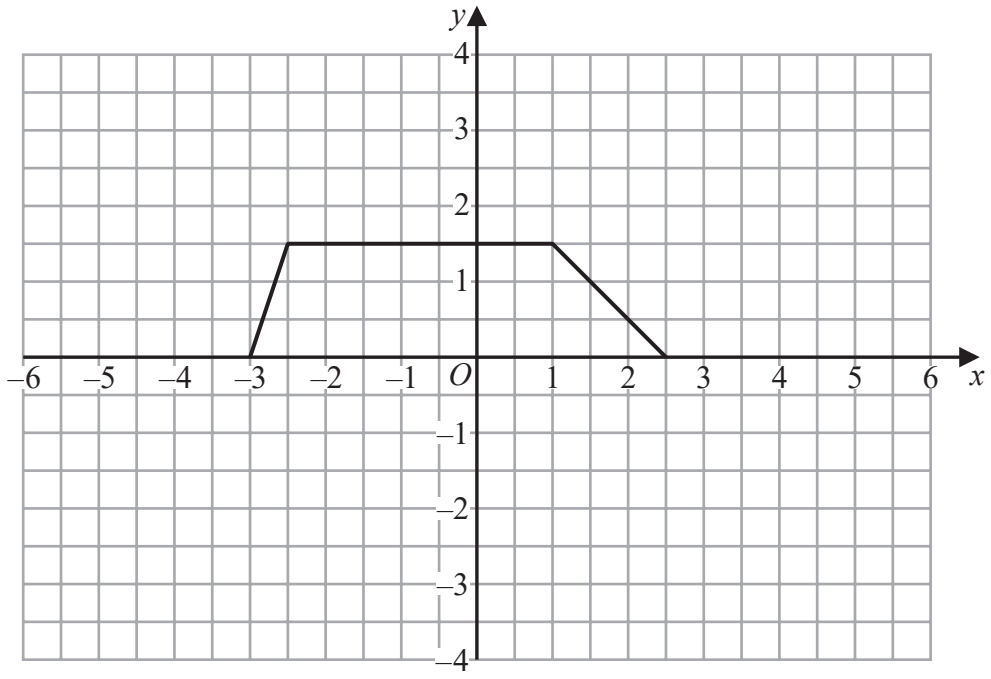
(Total for Question 16 is 3 marks)

17 Sketch the graph of $y = \cos x°$ for $0 \leqslant x \leqslant 360$



(Total for Question 17 is 2 marks)

18 Here is the graph of $y = \mathrm{h}(x)$

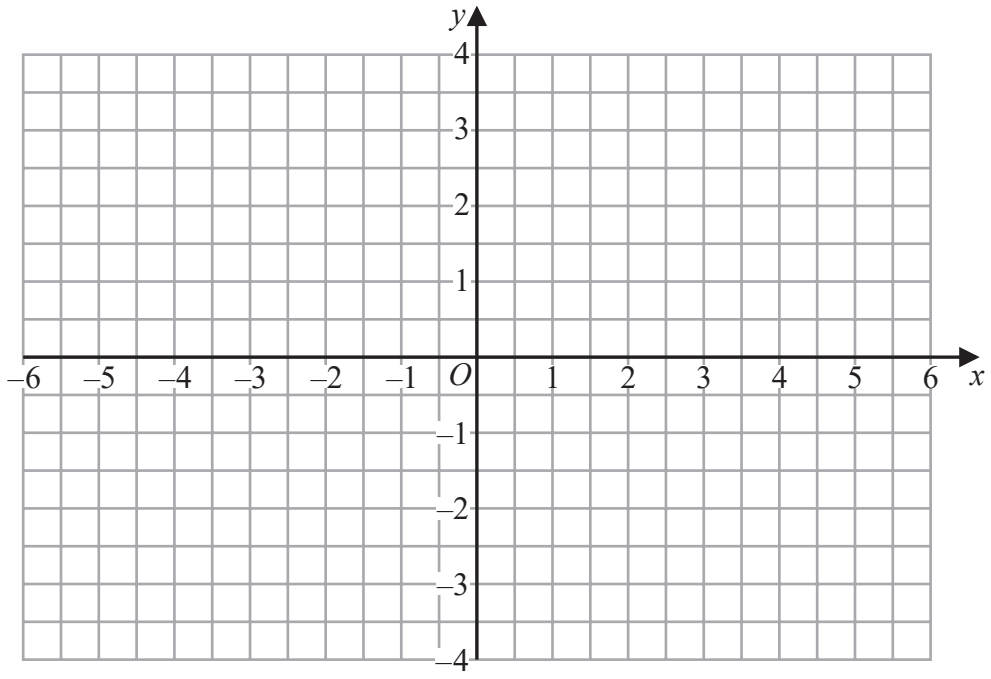


(a) Solve the equation $\mathrm{h}(x) = \frac{3}{4}$

.....

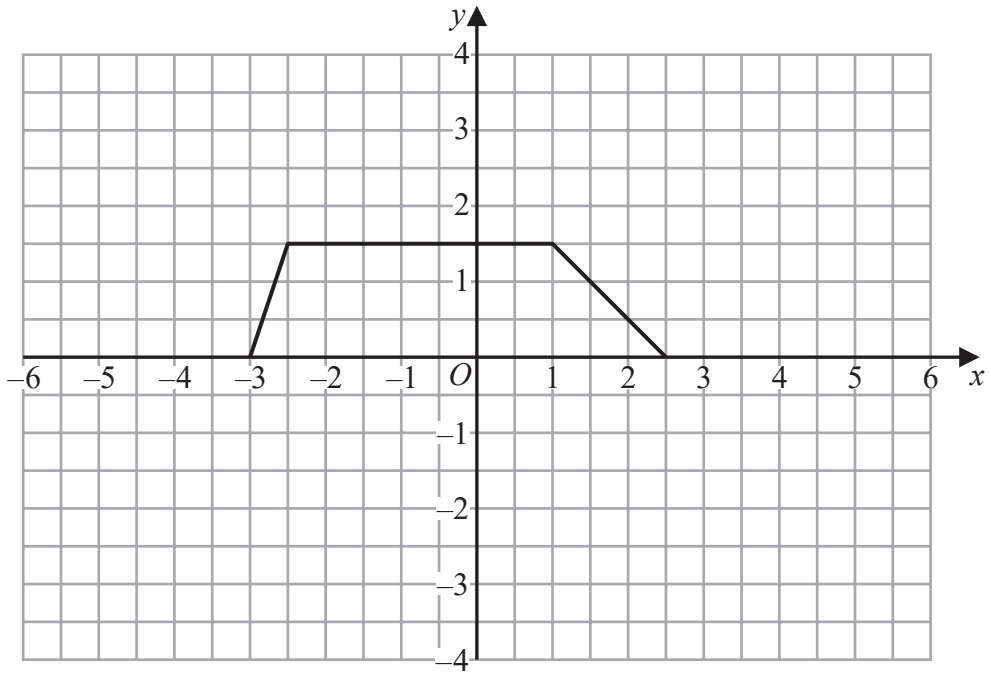
(2)

(b) On the grid below, draw the graph of $y = -\mathrm{h}(x)$

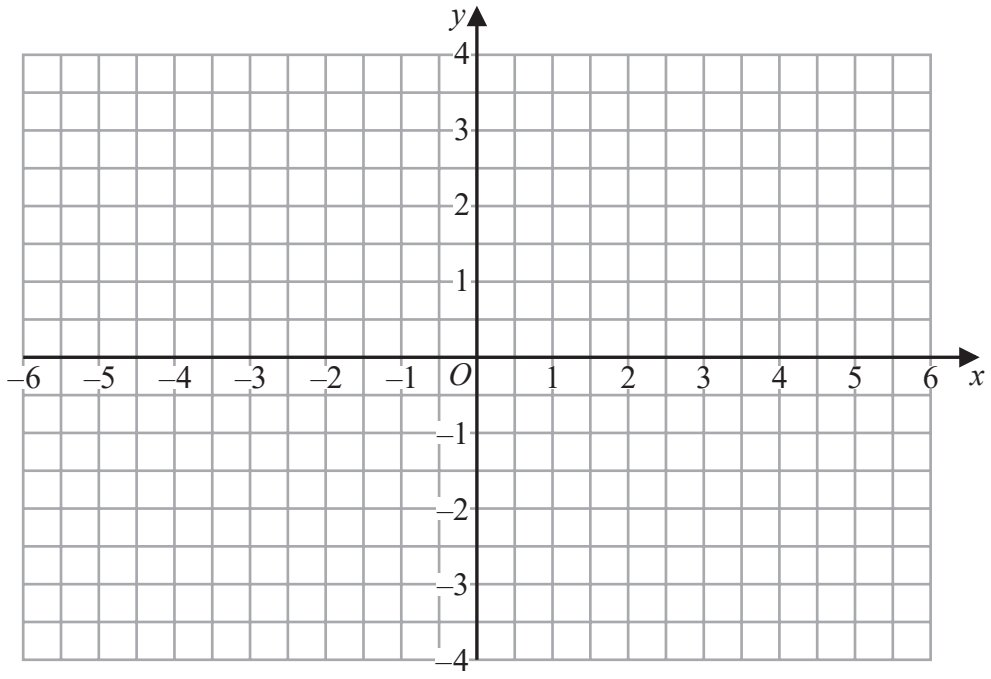


(2)

Here is the graph of $y = h(x)$



(c) On the grid below, draw the graph of $y = 2h(x)$



(2)

(Total for Question 18 is 6 marks)

19 The integer n is not a square number.

(a) Rationalise the denominator of $\dfrac{5\sqrt{n}}{5-\sqrt{n}}$

Give your answer in its simplest form.

.....

(3)

(b) Simplify $\dfrac{4}{3\sqrt{m}} \div \dfrac{2}{9m\sqrt{m}}$

.....

(3)

(Total for Question 19 is 6 marks)

20 Solve, algebraically, the simultaneous equations

$$4x^2 + 4y^2 = 25$$
$$2x + 2y = 1$$

.....

(Total for Question 20 is 5 marks)

TOTAL FOR PAPER IS 90 MARKS

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