Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel Award

Wednesday 8 May 2024

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 5 1 3 1 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 $(w^{-4})^2$

.....

(1)

(b) Simplify $(64t^3)^{\frac{1}{3}}$

.....

(2)

(c) Simplify $\dfrac{x^2 - 4x + 4}{x^2 - 4}$

.....

(2)

(Total for Question 1 is 5 marks)

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2 (a) Use the quadratic formula to solve the equation $2k^2 - 9k + 5 = 0$

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

.....

(2)

(b) Solve $y^2 + y - 12 > 0$

.....

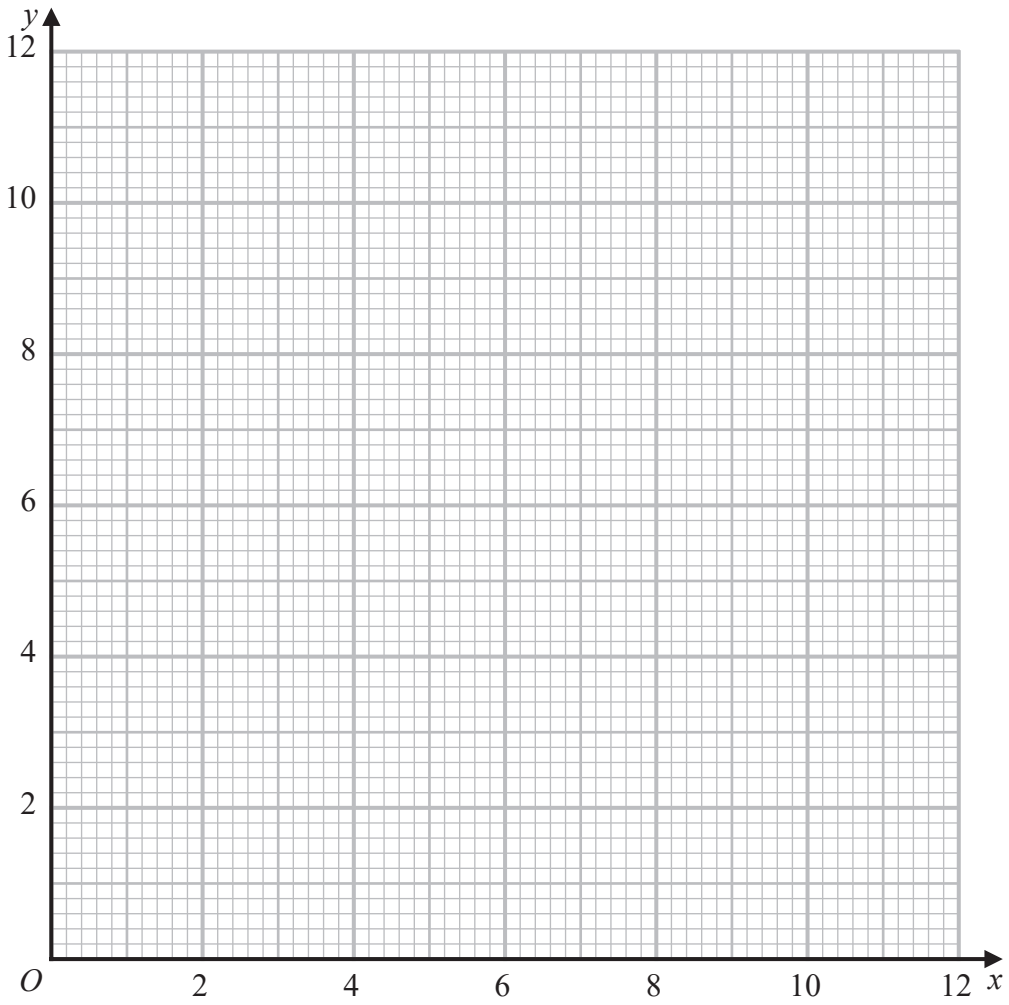
(3)

(Total for Question 2 is 5 marks)

3 On the grid, shade the region that satisfies all these inequalities.

$$x > \frac{1}{2}y \qquad x + 2y > 8 \qquad 5x + 4y < 40$$

Label the region **R**



(Total for Question 3 is 5 marks)

4 (a) (i) Calculate the discriminant of the equation $2x^2 - 8x - 5 = 0$

.....

(2)

(ii) State what your answer to part (a)(i) tells you about the roots of the equation $2x^2 - 8x - 5 = 0$

(1)

(b) Find the sum and the product of the roots of the equation $2x^2 = 10x - 1$

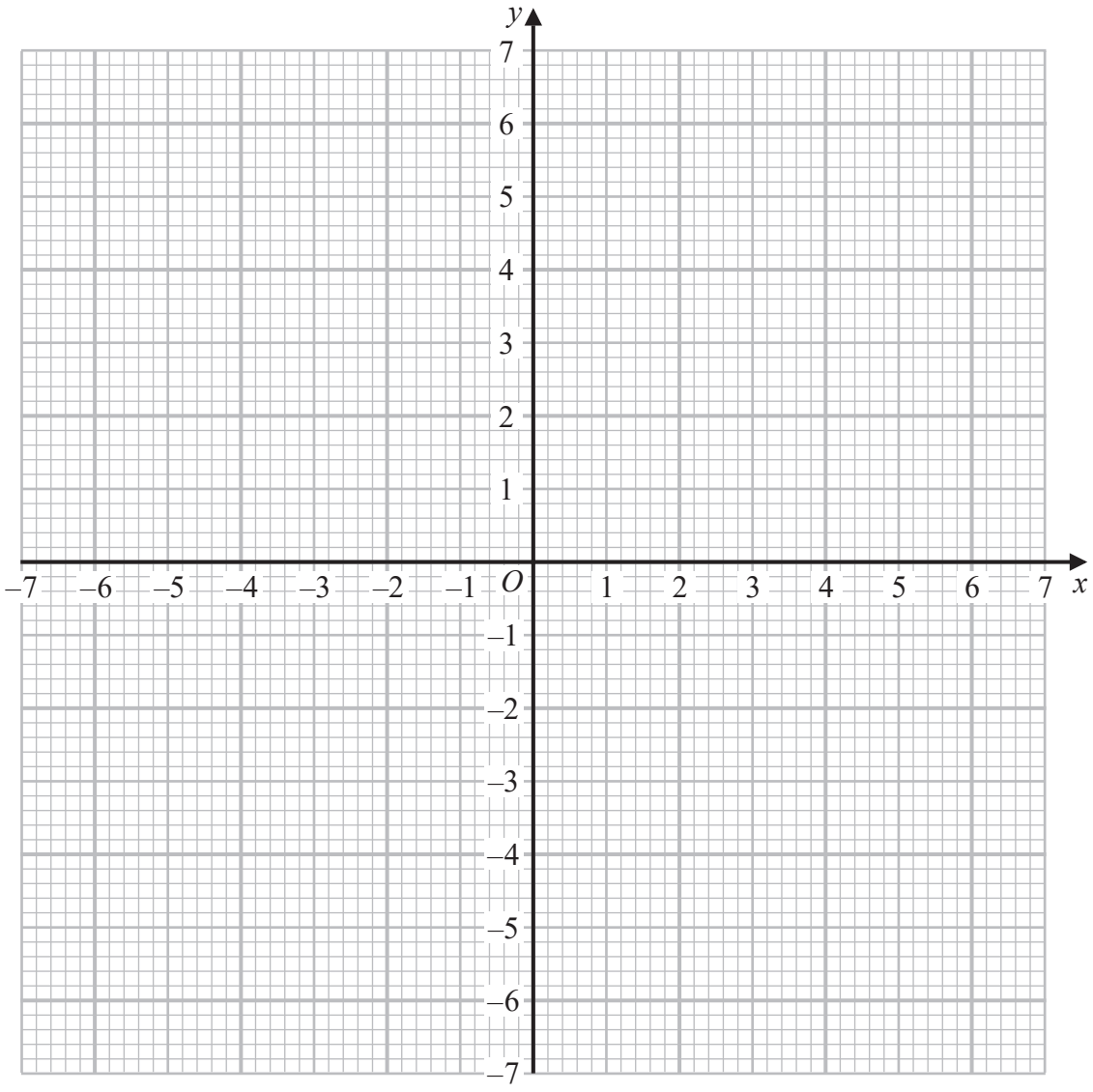
sum = ...

product = ...

(3)

(Total for Question 4 is 6 marks)

5 On the grid, construct the graph of $y^2 = 36 - x^2$



(Total for Question 5 is 2 marks)

6 (a) Factorise $6p^2n^2 + 9pn^4$

.....

(2)

(b) Factorise $4q^2 - 24q - 64$

.....

(2)

(c) Factorise $6 - 10d - 3m + 5dm$

.....

(2)

(Total for Question 6 is 6 marks)

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7 (a) Rationalise the denominator of $\frac{1}{2\sqrt{5}}$

Give your answer in the form $\frac{\sqrt{c}}{d}$ where c and d are integers.

.....

(2)

(b) Expand and simplify $(3 + \sqrt{3})(27 - \sqrt{27})$

Give your answer in the form $m(n + \sqrt{3})$ where m and n are integers.

.....

(3)

(Total for Question 7 is 5 marks)

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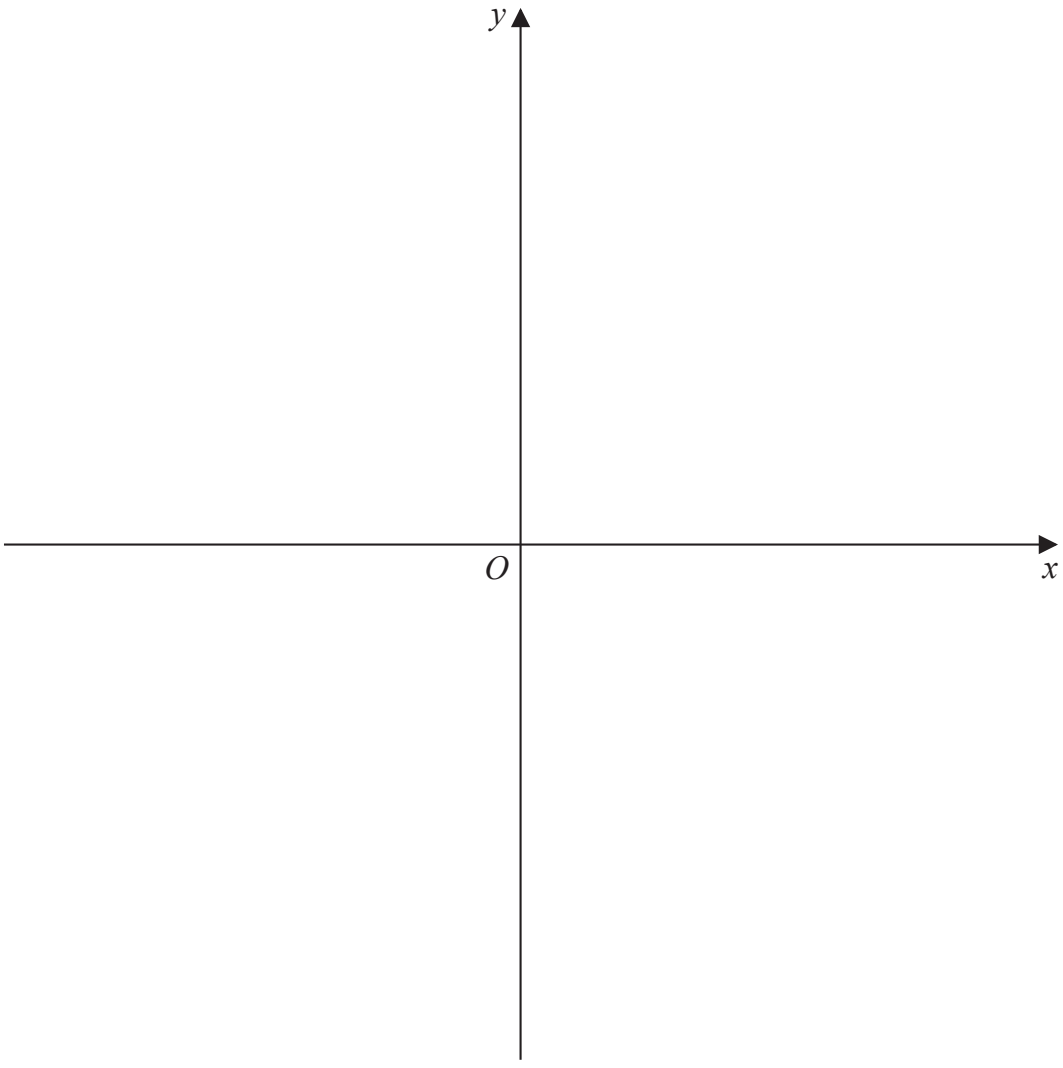
8 (a) Write the expression $x^2 + 6x + 2$ in the form $(x + c)^2 + d$ where c and d are constants.

.....

(2)

(b) Sketch the graph of $y = x^2 + 6x + 2$ showing the coordinates of any turning points and the coordinates of any points at which the graph intersects the y-axis.



(3)

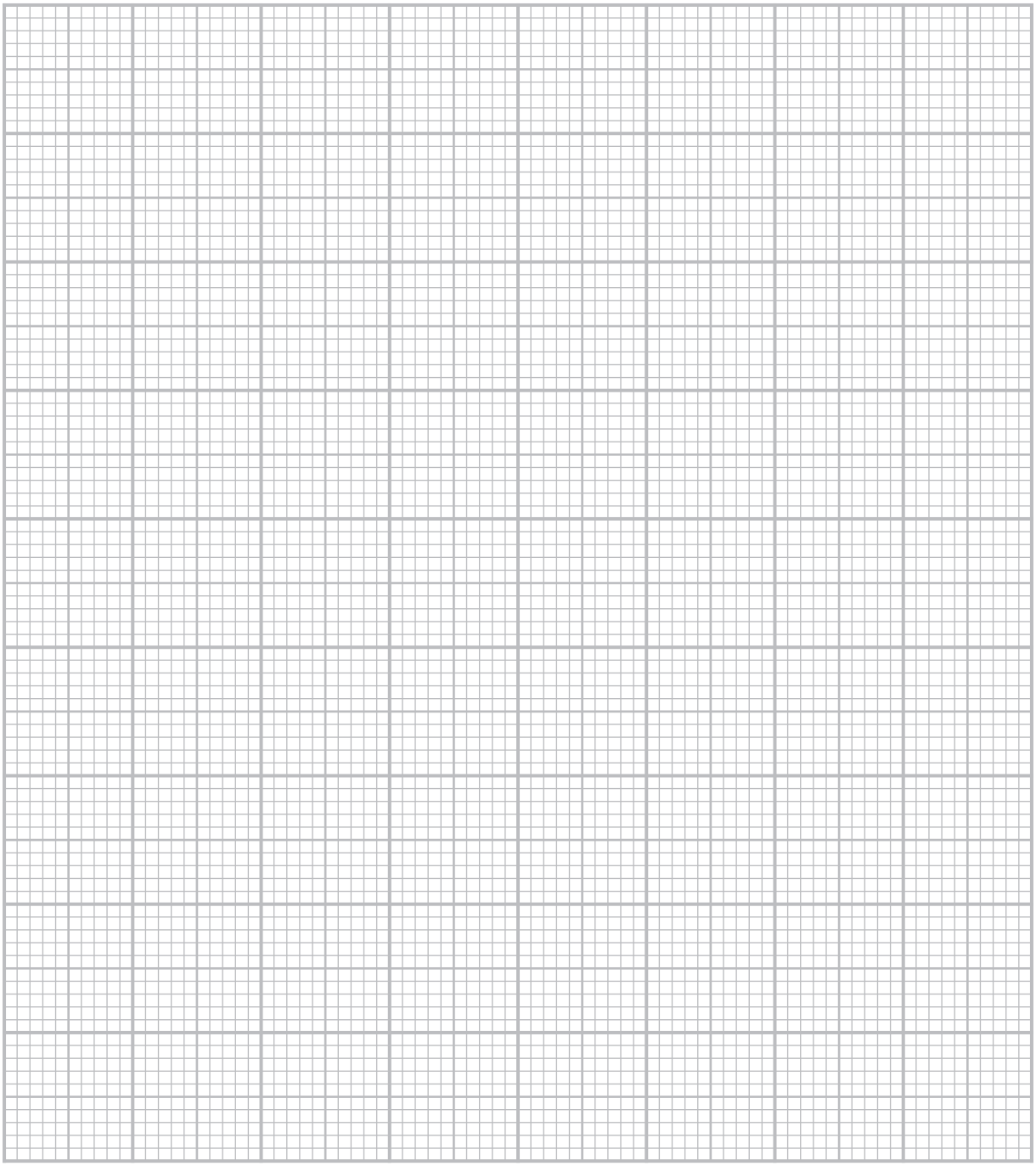
(Total for Question 8 is 5 marks)

9 (a) Complete the table of values for $y = \frac{1}{2}(x - 1)^3$

x	–2	–1	0	1	2	3	4
y			–0.5			4	

(2)

(b) On the grid, draw the graph of $y = \frac{1}{2}(x - 1)^3$ for values of x from –2 to 4



(3)

(c) Use your graph to find an estimate for the solution of $(x - 1)^3 = 6$

.....

(2)

(Total for Question 9 is 7 marks)

10 y is directly proportional to $\sqrt{x}$

$y = 0.1$ when $x = 25$

(a) Find a formula for y in terms of x.

.....

(3)

(b) Calculate the value of x when $y = 6$

.....

(2)

(Total for Question 10 is 5 marks)

11 A straight line **L** is parallel to the line with equation $y = \frac{1}{2}x$ and passes through the point with coordinates (0, –3)

(a) Find an equation for **L**
Give your answer in the form $y = mx + c$

.....

(2)

The straight line **M** passes through the points with coordinates (1, –1) and (2, 3)

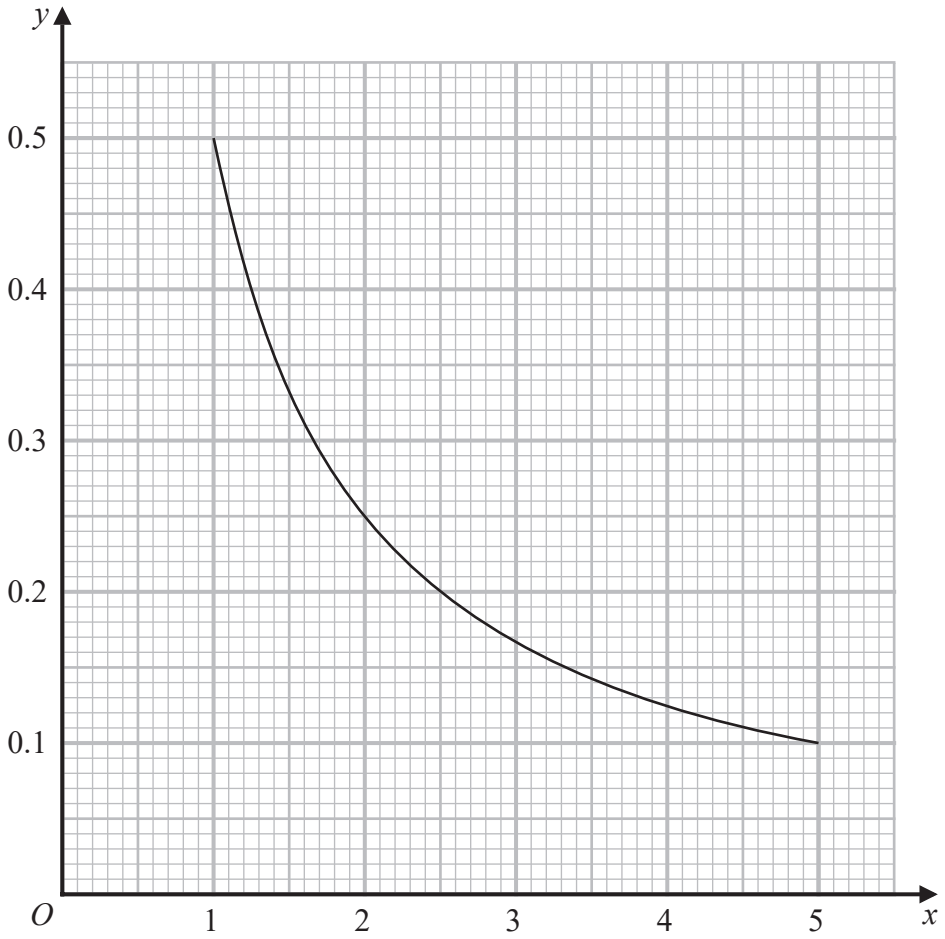
(b) Find an equation for **M**
Give your answer in the form $ax + by = c$ where a, b and c are integers.

.....

(3)

(Total for Question 11 is 5 marks)

12 Here is the graph of $y = g(x)$ for $1 \leqslant x \leqslant 5$



Use the trapezium rule to find an estimate for the area of the region under the curve and between $x = 1$, $x = 5$ and the x-axis.

Use 4 strips of equal width.

.....

(Total for Question 12 is 3 marks)

13 The 100th term of an arithmetic series is 520
The common difference of this series is 5

(a) Work out the first term of this series.

.....

(2)

The common difference of a different arithmetic series is –5
The first term of this series is 20

(b) Work out the sum of the first 51 terms of this series.

.....

(3)

(Total for Question 13 is 5 marks)

14 $m = 6\sqrt{\frac{2}{c}} - 1$

(a) Work out the value of m when $c = 50$

.....

(2)

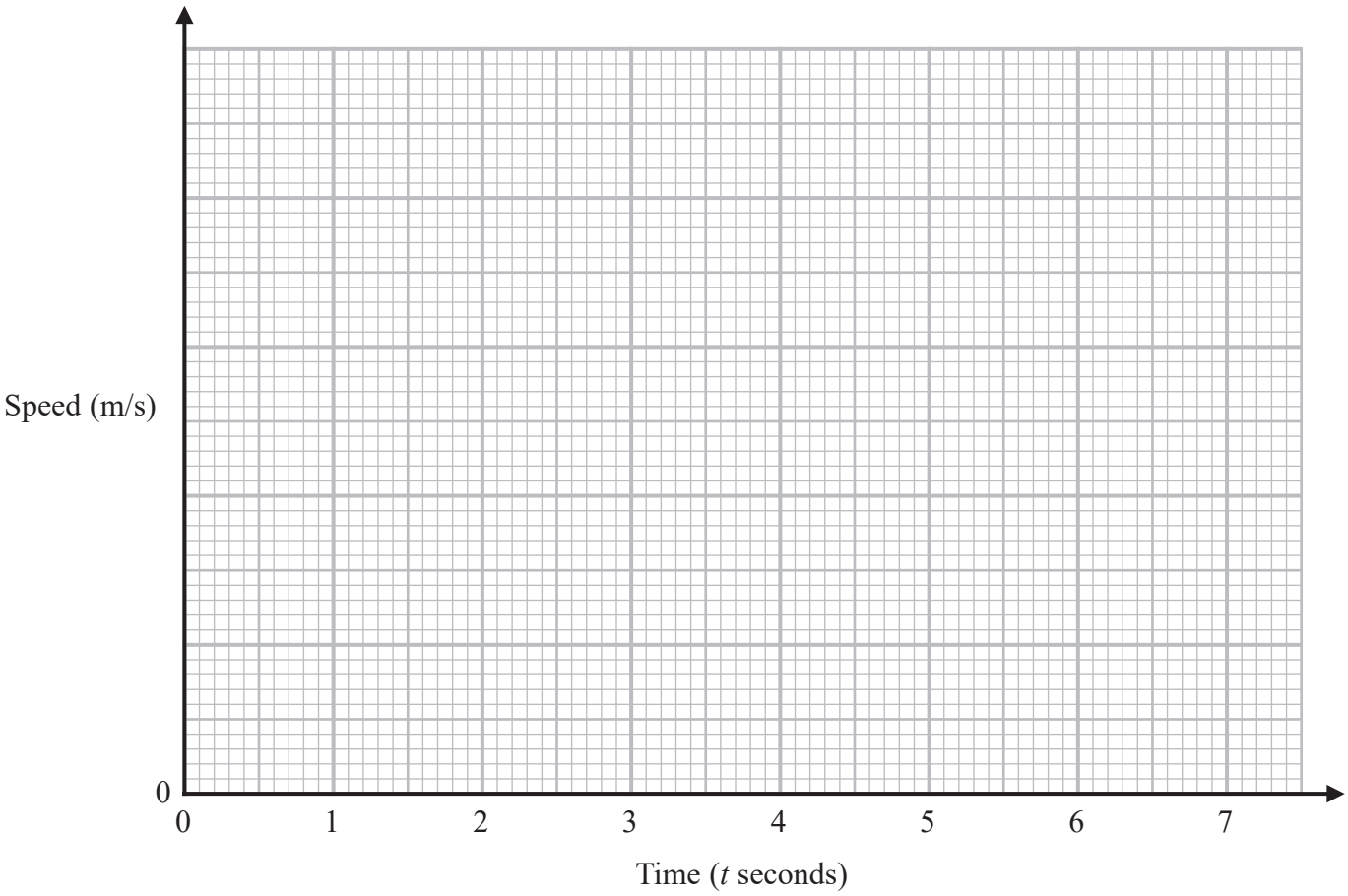
(b) Make c the subject of $m = 6\sqrt{\frac{2}{c}} - 1$

.....

(3)

(Total for Question 14 is 5 marks)

15 An athlete takes part in a race.
She starts from rest.
The athlete accelerates at 2.5 m/s^2 for the first 3 seconds of the race, then she runs at a constant speed for 4 seconds.



(a) On the grid, draw a speed-time graph to show this information.

(3)

(b) Work out the total distance run by the athlete between $t = 0$ and $t = 7$

..... m

(2)

(Total for Question 15 is 5 marks)

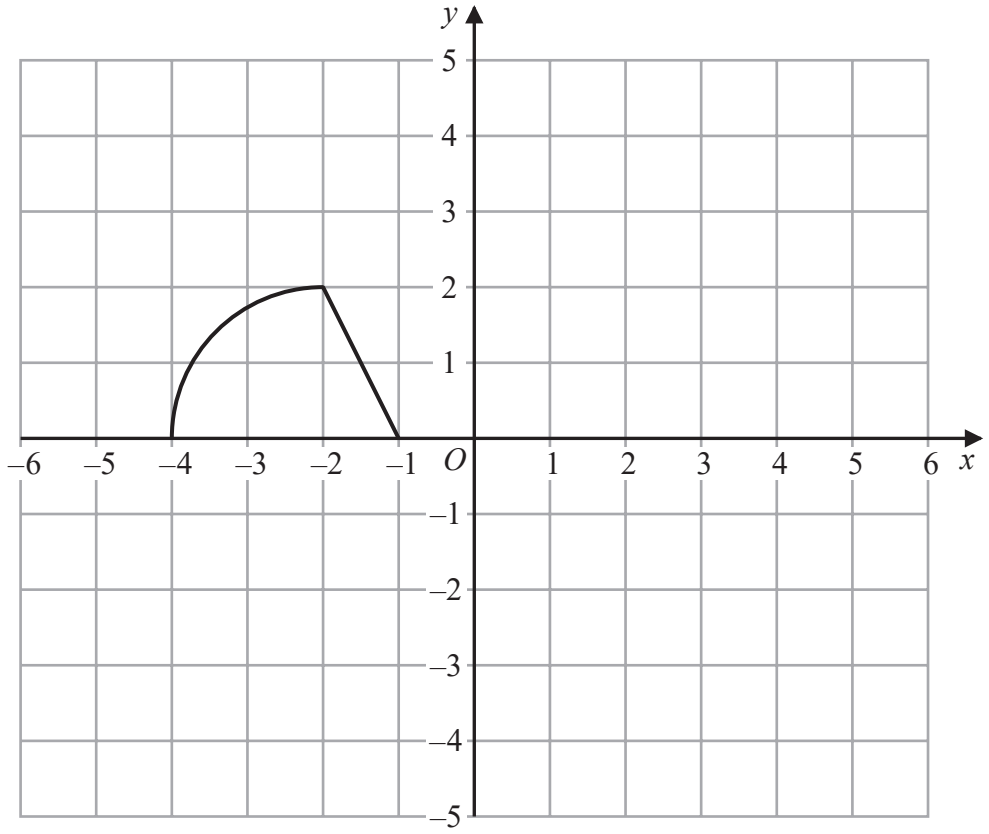
16 Solve, algebraically, the simultaneous equations

$$3x^2 - 2y^2 + 5 = 0$$
$$y = 3x - 1$$

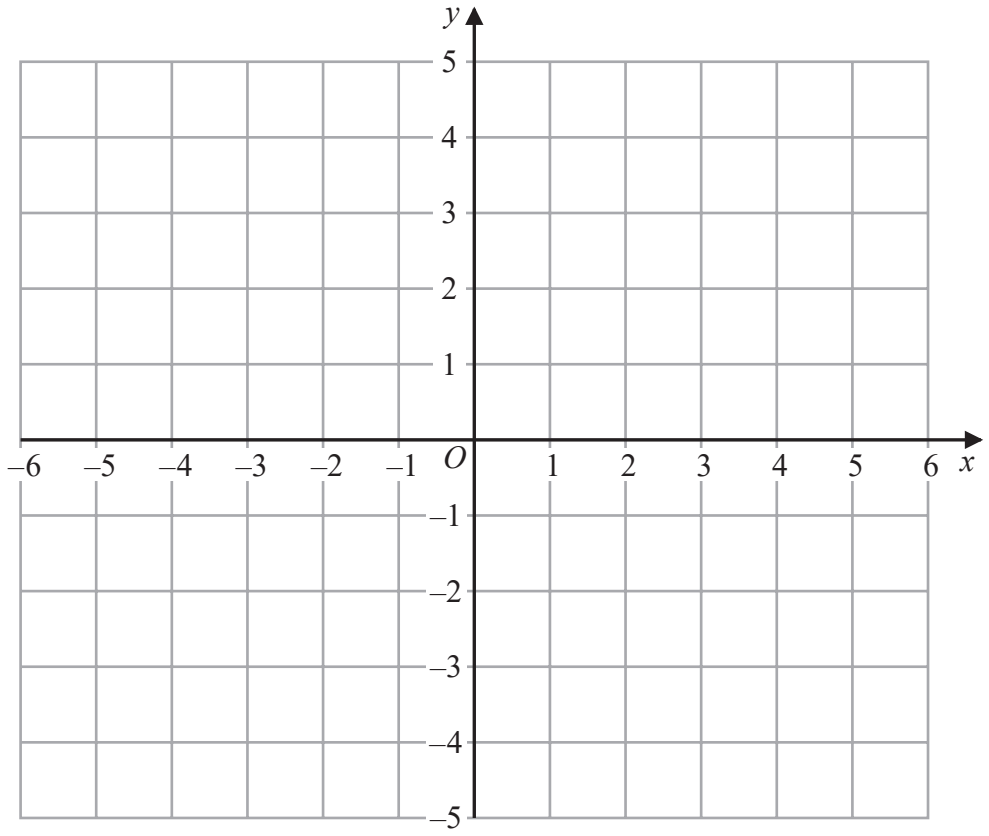
.....

(Total for Question 16 is 5 marks)

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

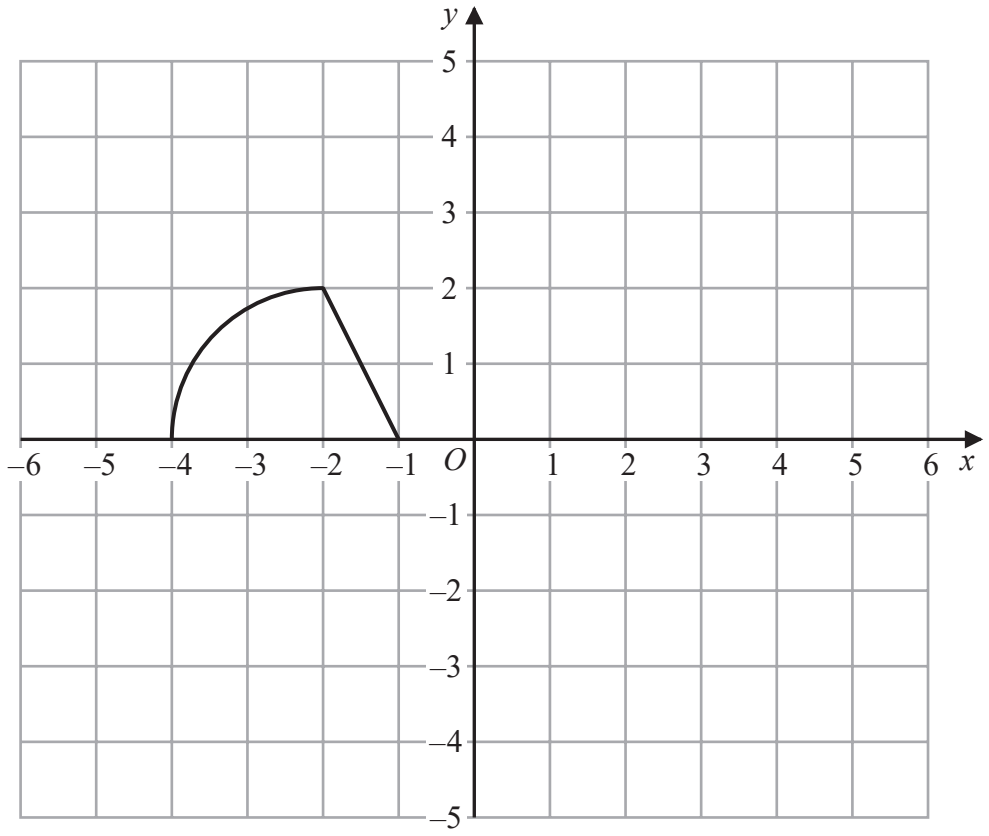


(a) On the grid below, draw the graph of $y = f(x) + 2$

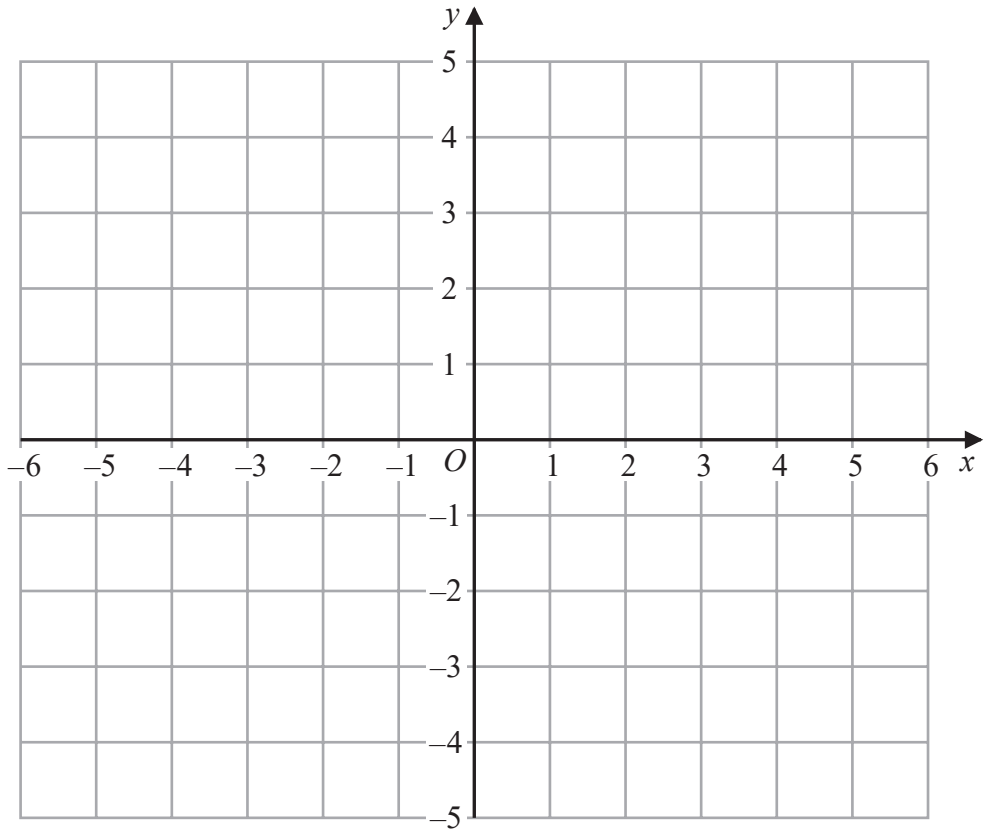


(2)

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



(b) On the grid below, draw the graph of $y = f(-x)$

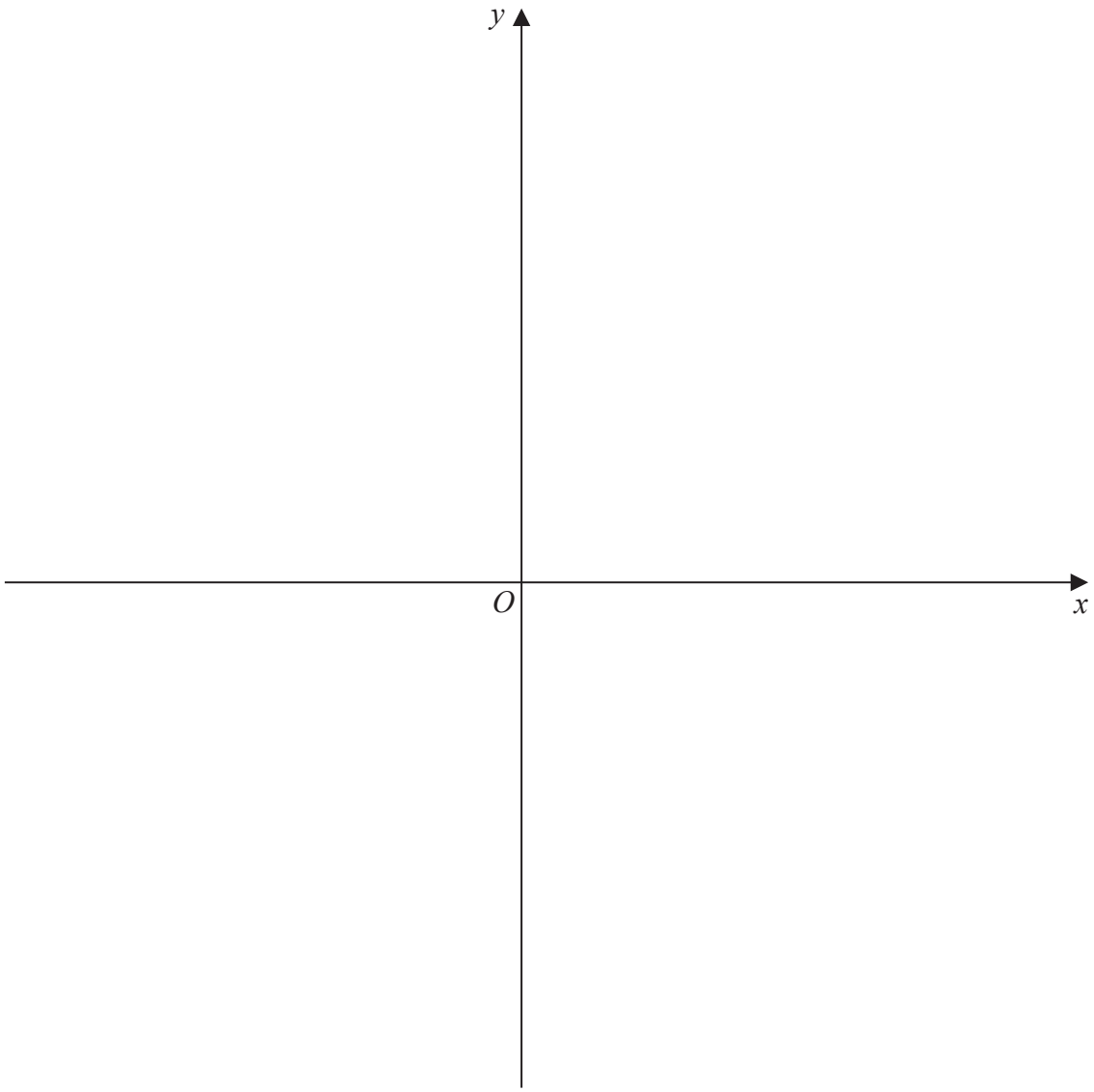


(2)

(Total for Question 17 is 4 marks)

18 Sketch the graph of $y = 5^x$

Mark, on your sketch, the coordinates of any points where the graph intersects the axes.



(Total for Question 18 is 3 marks)

19 Solve algebraically $\frac{8}{x+2} + \frac{3}{2x-1} = 1$

.....

(Total for Question 19 is 4 marks)

TOTAL FOR PAPER IS 90 MARKS

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