Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel Award

Wednesday 10 May 2023

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 6 9 3 0 7 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) Factorise $21c^2d - 35cd^2$

.....

(2)

(b) Factorise $4k^2 + 10k - 6$

.....

(2)

(c) Expand and simplify $(w + 6)^2 + (w - 7)^2$

.....

(2)

(Total for Question 1 is 6 marks)

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2 Solve $10y^2 + 9y + 2 = 0$

.....

(Total for Question 2 is 2 marks)

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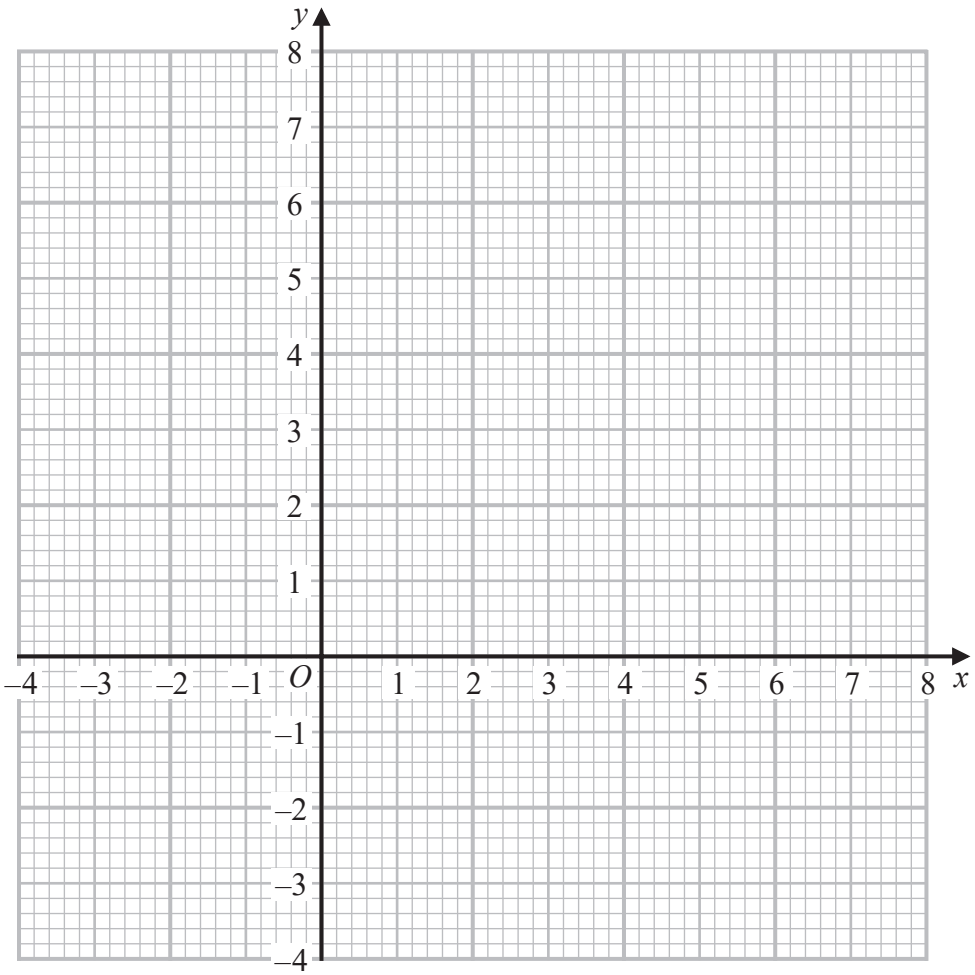
3 On the grid, shade the region that satisfies all these inequalities.

$$y < x \qquad x + 5y > 5 \qquad x - 3y < 5$$

Label the region **R**



(Total for Question 3 is 5 marks)

4 (a) Use the quadratic formula to solve the equation $3x^2 - 4x - 5 = 0$

Give your answer in the form $\frac{p \pm \sqrt{q}}{3}$ where p and q are integers.

.....

(3)

$2x^2 - 6x + 5 = 2(x + p)^2 + q$ for all values of x.

(b) Find the value of p and the value of q.

$p =$ .....

$q =$ .....

(3)

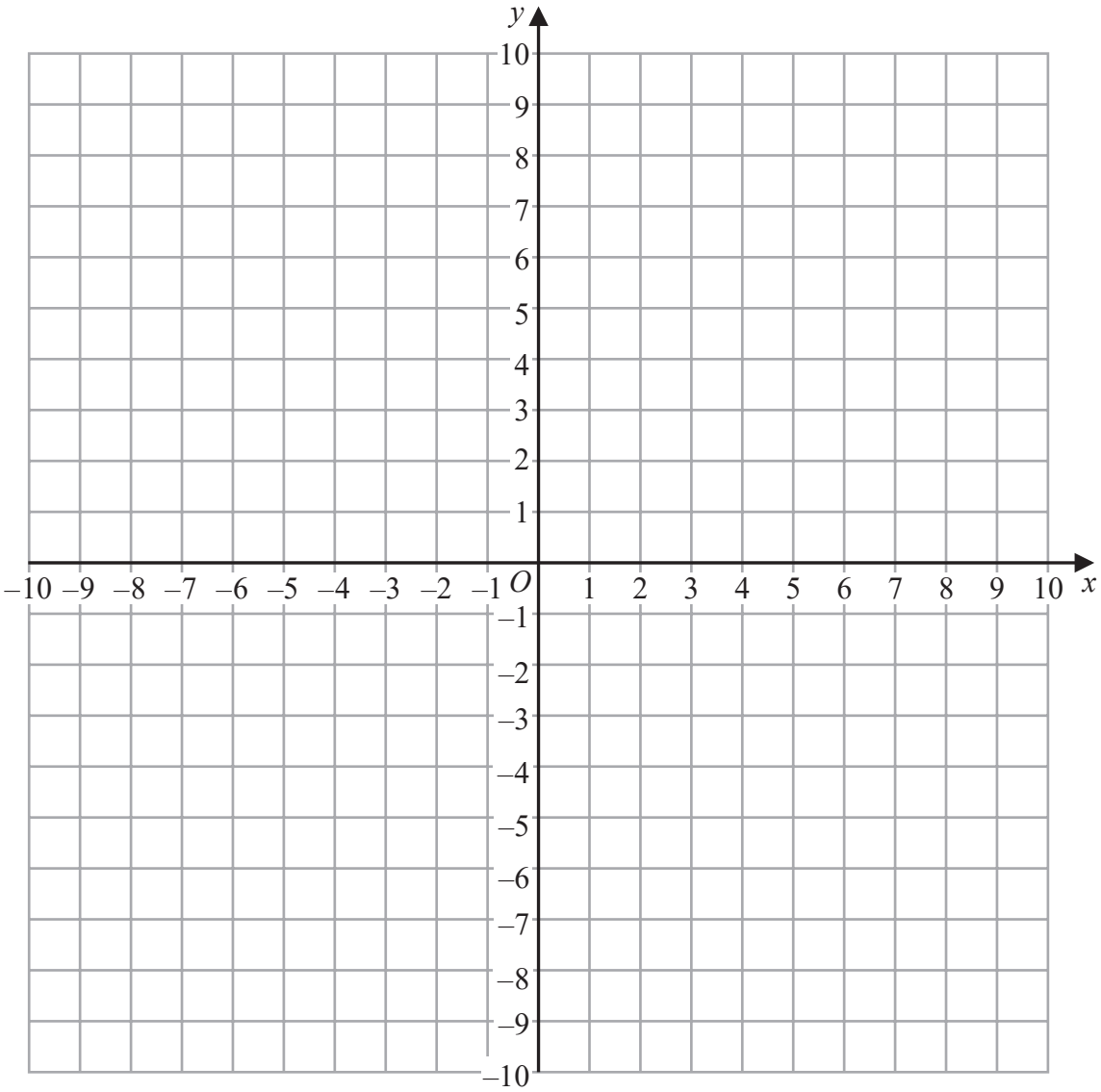
(c) Find the sum of the roots of the equation $4x^2 = 5 - 12x$

.....

(2)

(Total for Question 4 is 8 marks)

5 (a) On the grid, construct the graph of $3x^2 + 3y^2 = 75$



(2)

(b) Make y the subject of $3x^2 + 3y^2 = 75$

.....

(3)

(Total for Question 5 is 5 marks)

6 Simplify fully $\dfrac{x-3}{x^2-9} \div \dfrac{x^2+x-6}{(x+3)^2}$

.....

(Total for Question 6 is 3 marks)

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7 (a) Find the value of $\dfrac{1+4\sqrt{u}}{12-\sqrt{u}}$ when $u = 25$

.....

(2)

(b) Simplify $\left(8-\sqrt{32}\right)\left(5+\sqrt{8}\right)$

Give your answer in the form $a\left(b-\sqrt{c}\right)$ where a, b and c are integers.

.....

(3)

(Total for Question 7 is 5 marks)

8 $10x^{-2}\left(\frac{1}{5}x^2 + \frac{1}{2}x^8\right)$ can be written in the form $c + dx^n$

(a) Find the value of c, the value of d and the value of n.

$c =$ .....

$d =$ .....

$n =$ .....

(2)

(b) Simplify $\left(2t^{\frac{2}{3}}\right)^3 \times (125t^6)^{\frac{1}{3}}$

.....

(3)

(Total for Question 8 is 5 marks)

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9 The straight line $\mathbf{L}_1$ passes through the points with coordinates (–1, 3) and (5, 6)

(a) Find an equation for $\mathbf{L}_1$ in the form $y = mx + c$

.....

(3)

The straight line $\mathbf{L}_2$ is perpendicular to $\mathbf{L}_1$ and passes through the point with coordinates (4, –2)

(b) Find an equation for $\mathbf{L}_2$ in the form $ax + by = c$ where a, b and c are integers.

.....

(3)

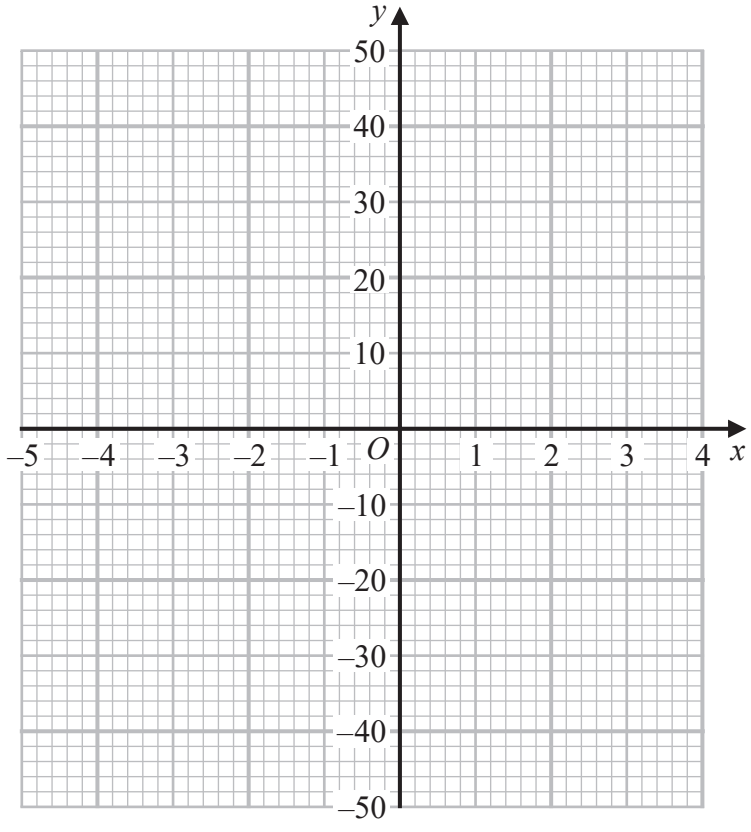
(Total for Question 9 is 6 marks)

10 (a) Complete the table of values for $y = 2x^3 + 3x^2 - 21x$

x	–4	–3	–2	–1	0	1	2	3
y	4			22			–14	18

(2)

(b) On the grid, draw the graph of $y = 2x^3 + 3x^2 - 21x$ for values of x from −4 to 3



(2)

(Total for Question 10 is 4 marks)

11 p is directly proportional to $\sqrt{n}$

When $n = 100$, $p = 5$

(a) Find a formula for p in terms of n.

.....

(3)

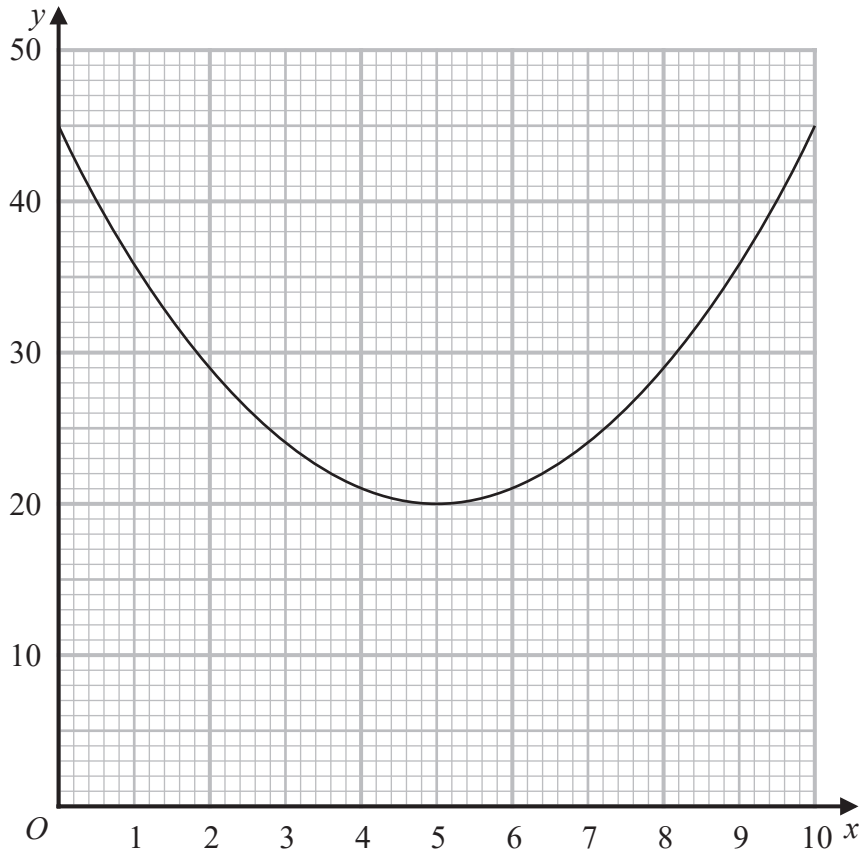
(b) Calculate the value of n when $p = 20$

.....

(2)

(Total for Question 11 is 5 marks)

12 Here is the graph of $y = x^2 - 10x + 45$ for values of x from 0 to 10



(a) Use the graph to find estimates for the solutions of $x^2 - 10x + 15 = 0$

.....

(2)

(b) Use the trapezium rule to find an estimate for the area of the region under the curve and between $x = 0$, $x = 9$ and the x-axis.

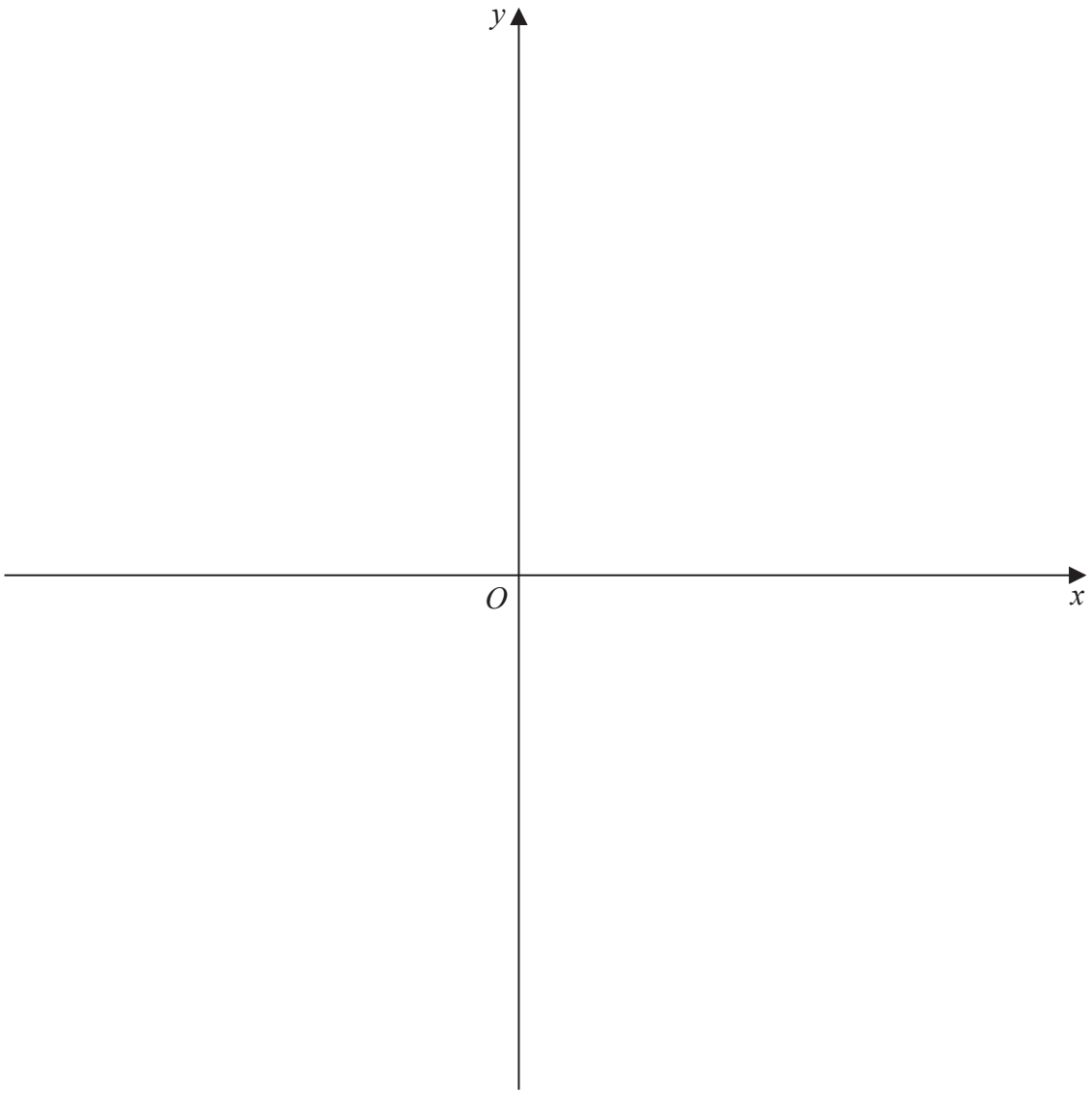
Use 3 strips of equal width.

.....

(3)

(Total for Question 12 is 5 marks)

13 Sketch the graph of $x = y^2 + 2$



(Total for Question 13 is 2 marks)

14 The first term of an arithmetic series is −50
The common difference of the same series is 20

(a) Work out the 51st term of this series.

.....

(2)

The common difference of a different arithmetic series is 2
The sum of the first 200 terms of this arithmetic series is 42 800

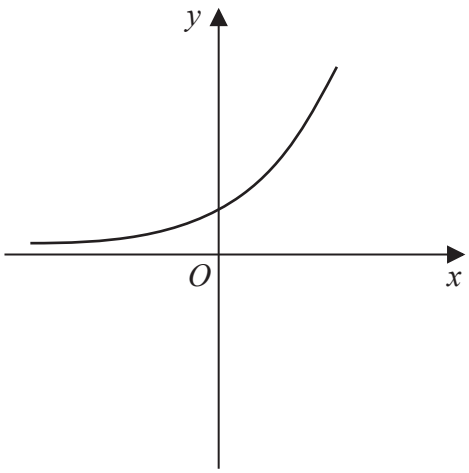
(b) Work out the first term of this series.

.....

(3)

(Total for Question 14 is 5 marks)

15 Here are three graphs.



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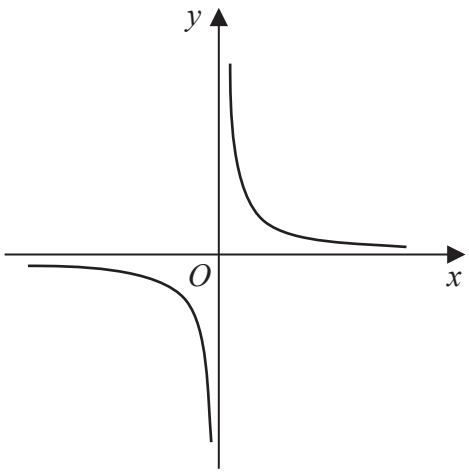

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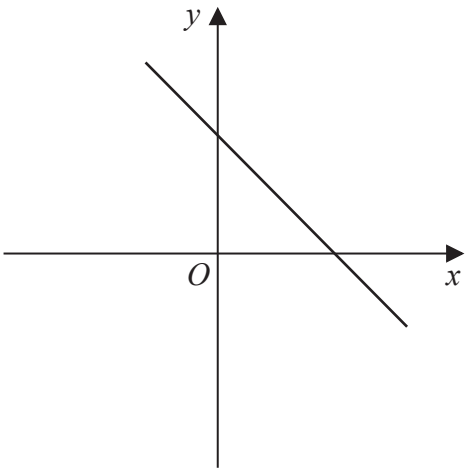


.....

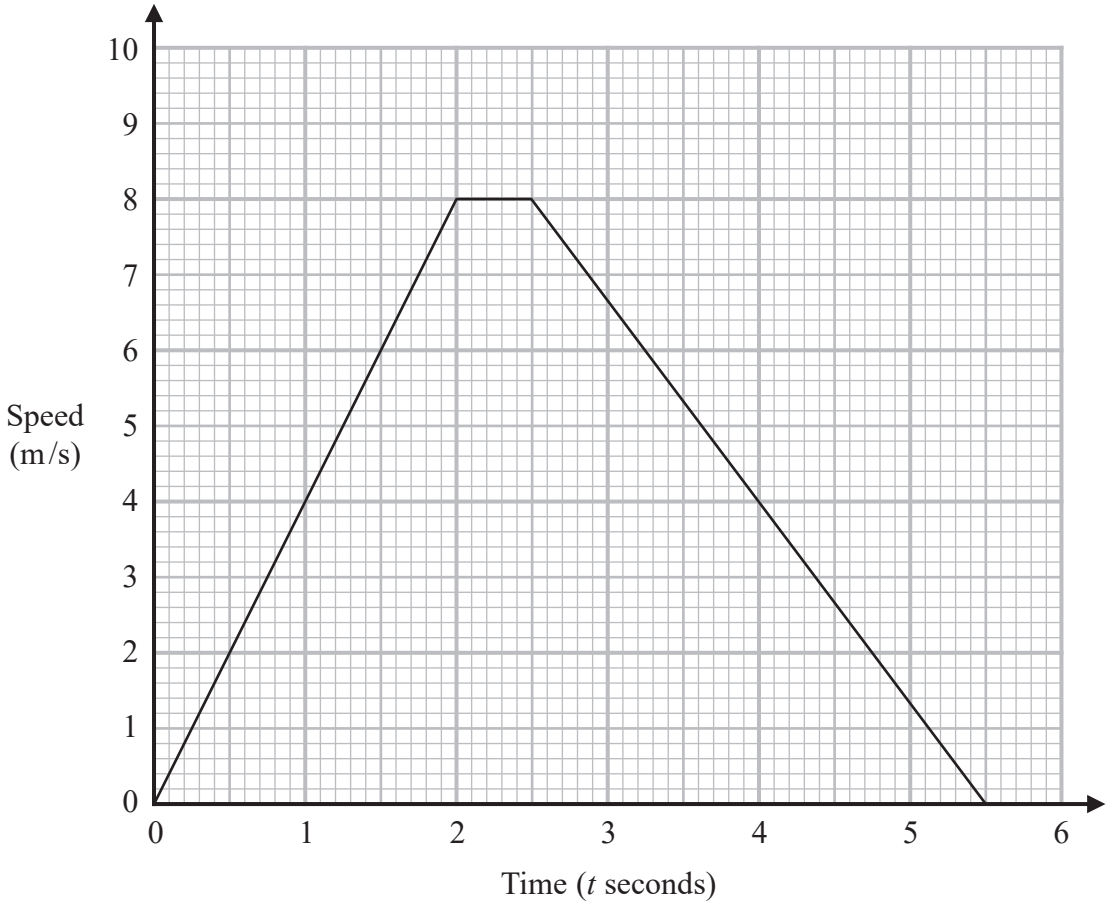
Here is a list of words.

circular linear exponential quadratic reciprocal

On the dotted line under each graph write the word from the list that can be used to describe the graph.

(Total for Question 15 is 3 marks)

16 Here is a speed-time graph for a particle.



(a) Work out the total distance travelled by the particle between $t = 0$ and $t = 2.5$

..... m

(3)

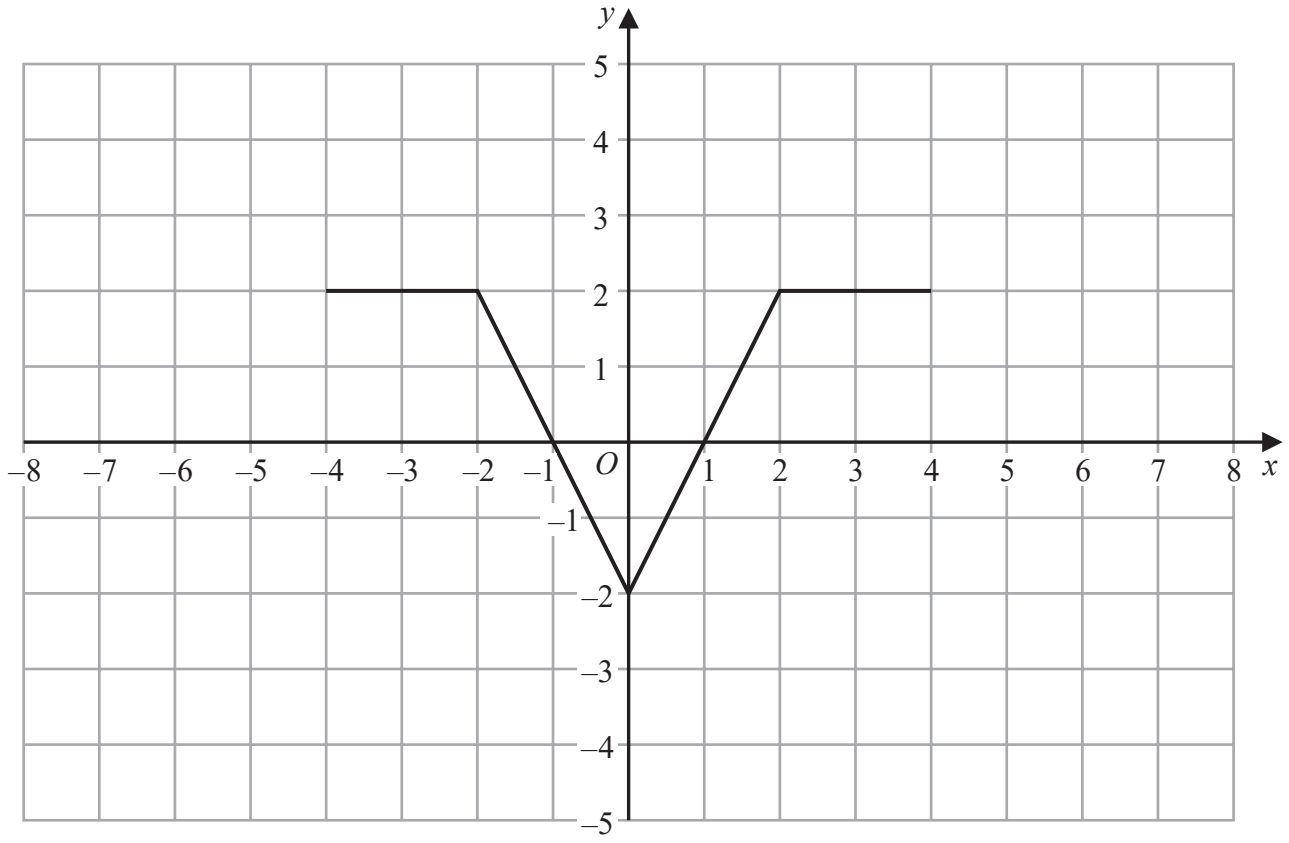
(b) Work out the deceleration of the particle between $t = 2.5$ and $t = 5.5$

..... m/s^2

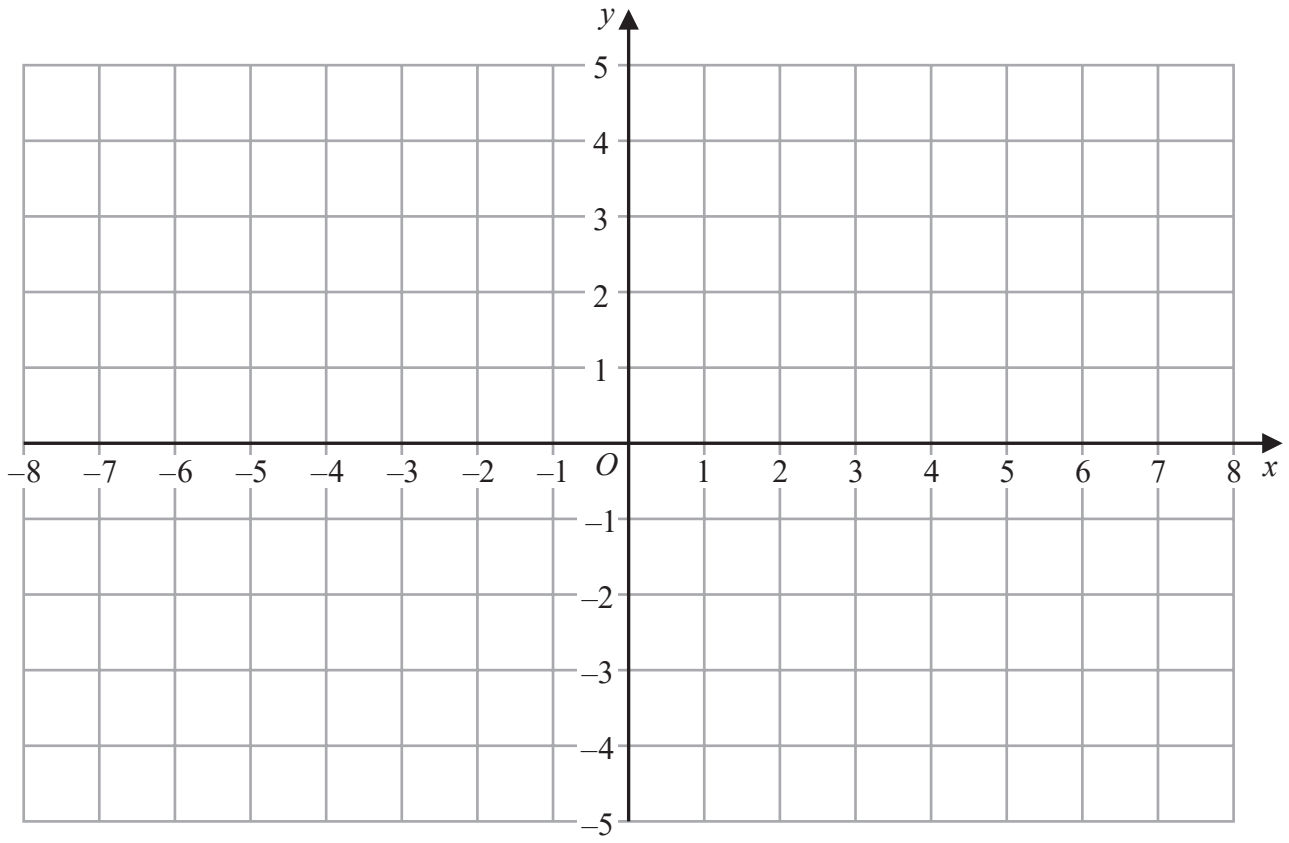
(2)

(Total for Question 16 is 5 marks)

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

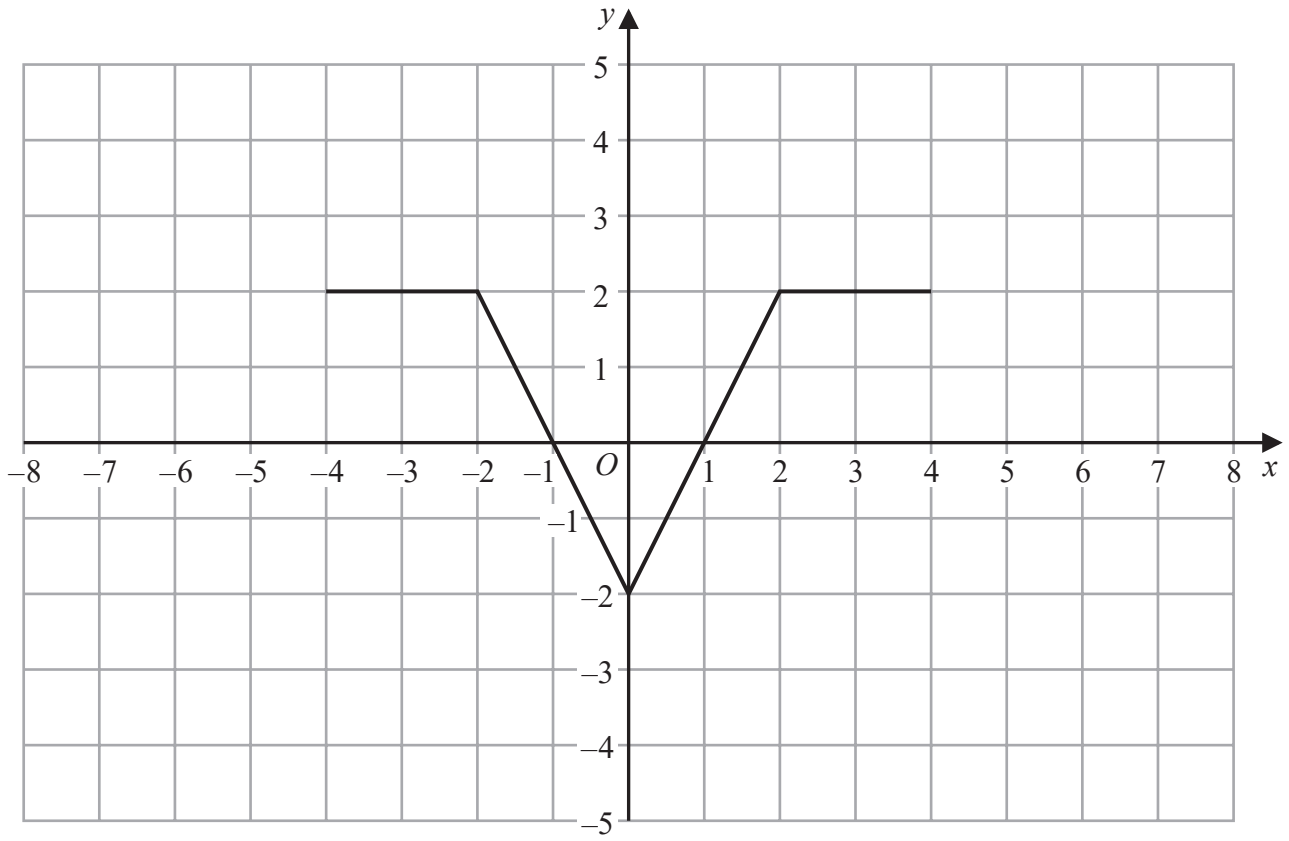


(a) On the grid below, draw the graph of $y = f(x) - 3$

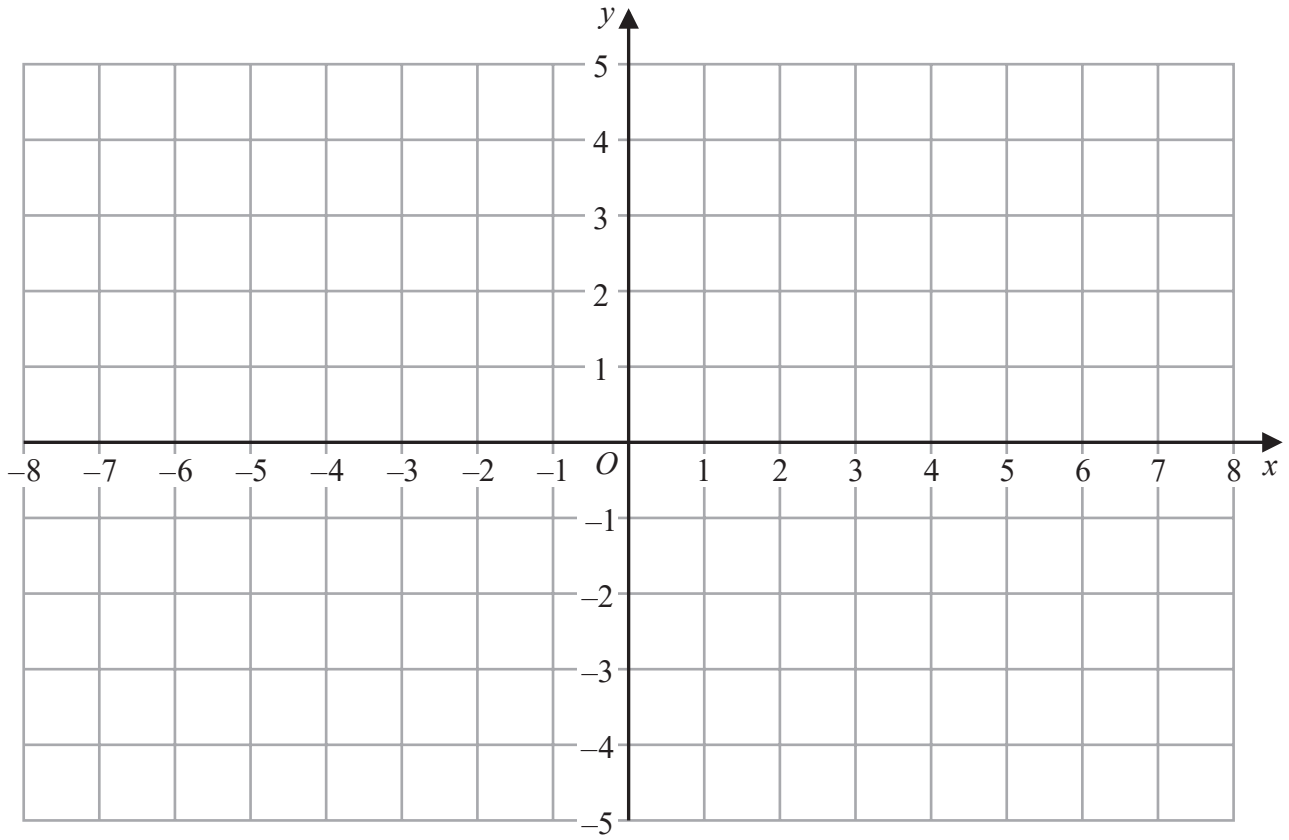


(2)

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



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



(2)

(Total for Question 17 is 4 marks)

18 Solve, algebraically, the simultaneous equations

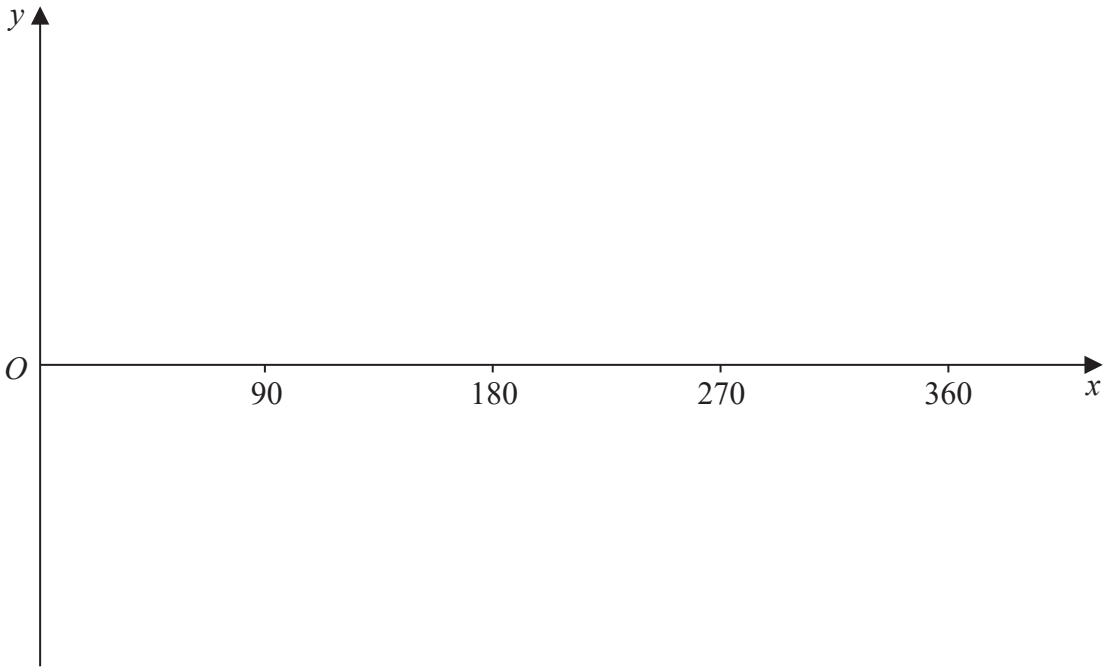
$$x^2 - y^2 = 8$$
$$4x + 5y = 0$$

Give each solution in the form $\frac{a\sqrt{2}}{c}$ where a and c are integers.

.....

(Total for Question 18 is 5 marks)

19 Sketch the graph of $y = \sin x°$ for $0 \leqslant x \leqslant 360$



(Total for Question 19 is 2 marks)

20 The equation $tx^2 + tx - 9 = 0$ has no real roots.

(a) Show that $t(t + 36) < 0$

(3)

(b) Solve $t(t + 36) < 0$

.....

(2)

(Total for Question 20 is 5 marks)

TOTAL FOR PAPER IS 90 MARKS

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