Write your name here

Surname	Other names

Pearson Edexcel Award

Centre Number	Candidate Number

Algebra

Level 3
Calculator NOT allowed

Thursday 15 January 2015 – Morning **Time: 2 hours**	Paper Reference **AAL30/01**

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.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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P 4 5 8 0 8 A 0 1 2 4

PEARSON

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

You must NOT use a calculator.

1 (a) Simplify $(p^2)^4$

.....

(1)

(b) Simplify $q^{-\frac{1}{2}} \times q^3$

.....

(1)

(c) Simplify $t^{-3} \div t^{-5}$

.....

(1)

(d) $\dfrac{w - w^{\frac{1}{3}}}{w}$ can be written in the form $a - w^b$

Work out the value of a and the value of b.

$a =$.....

$b =$.....

(3)

(Total for Question 1 is 6 marks)

2 (a) Factorise $x^2 - 10x + 25$

.....

(1)

(b) Factorise $9 - 9y^2$

.....

(2)

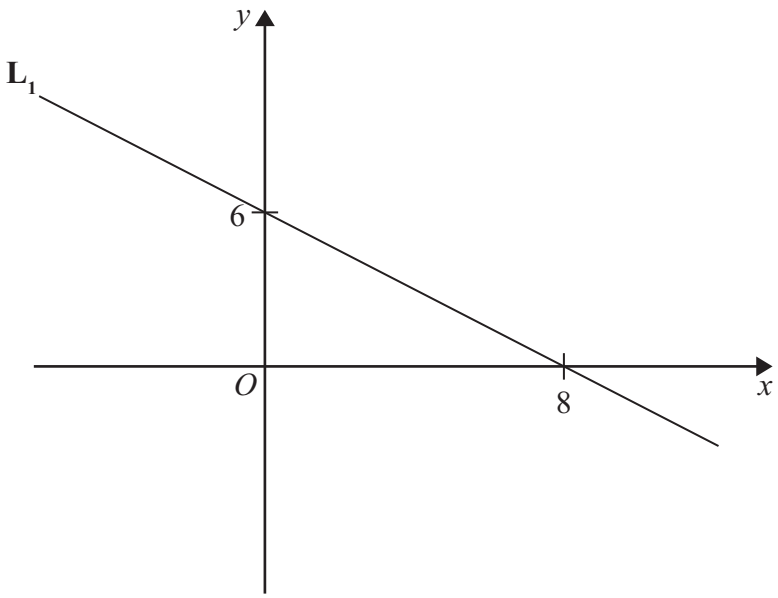
(c) Factorise $vt + 3t - 2v - 6$

.....

(2)

(Total for Question 2 is 5 marks)

3 The diagram shows a straight line $\mathbf{L}_1$



The line $\mathbf{L}_2$ is parallel to $\mathbf{L}_1$ and passes through the point (2, 1).

(a) Find an equation of the line $\mathbf{L}_2$
Give your answer in the form $y = mx + c$

.....

(3)

The line $\mathbf{L_3}$ is perpendicular to $\mathbf{L_1}$ and passes through the point $(0, -5)$.

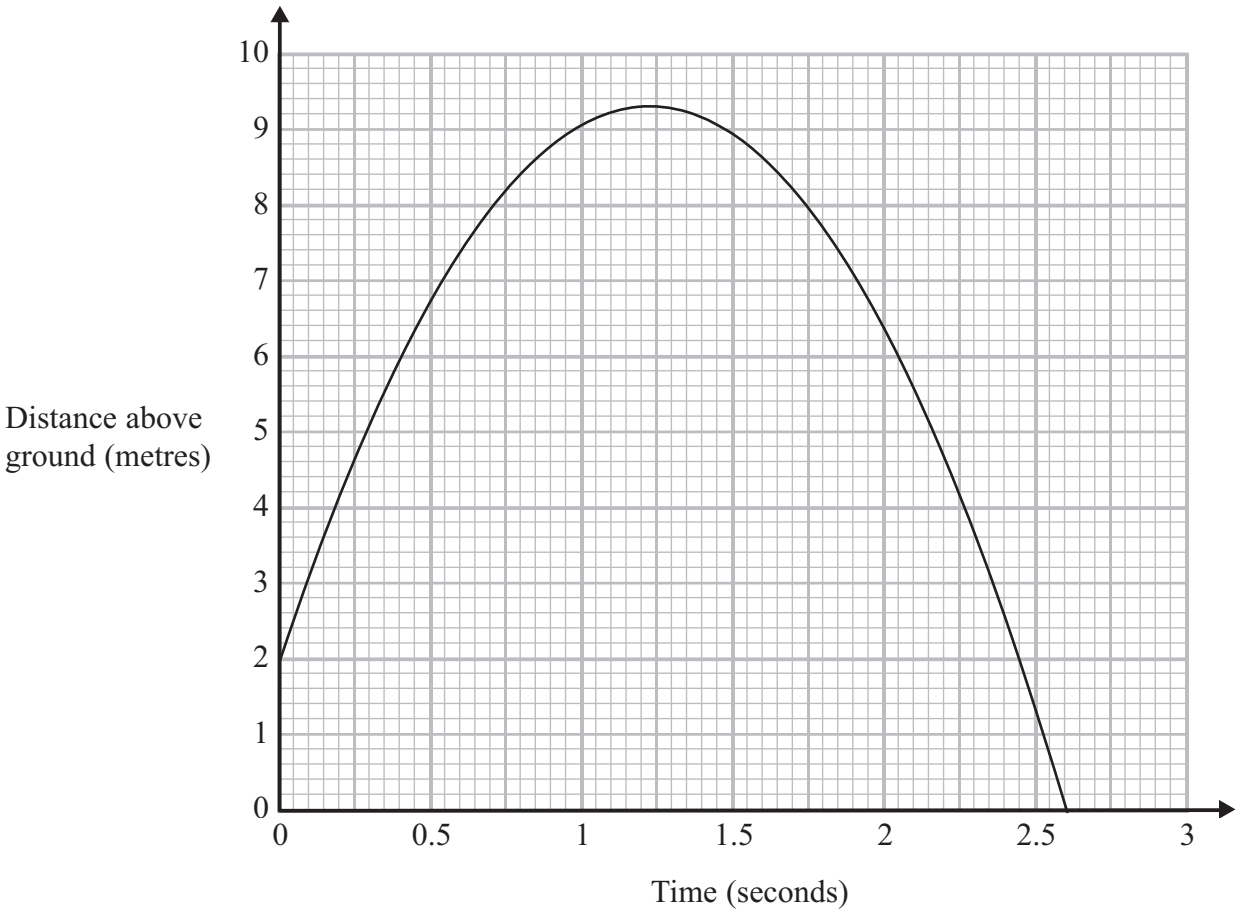
(b) Find an equation of the line $\mathbf{L_3}$
Give your answer in the form $ax + by + c = 0$ where a, b and c are integers.

.....

(3)

(Total for Question 3 is 6 marks)

4 Here is the distance-time graph for a ball which is thrown vertically upwards.



The ball is thrown from a point above the ground.

(a) How far above the ground is this point?

..... m

(1)

(b) Write down the time when the speed of the ball is zero.

..... s

(1)

(c) Work out the total distance, in metres, travelled by the ball.

..... m

(2)

(Total for Question 4 is 4 marks)

5 (a) Solve $\frac{5-n}{3} > 6$

.....

(2)

(b) Solve $x(4-x) \leqslant 0$

.....

(2)

(Total for Question 5 is 4 marks)

6 (a) Expand and simplify $(3x - 5)(x - 2)$

.....

(2)

(b) Simplify $\dfrac{6x - 10}{6x^2 - 22x + 20}$

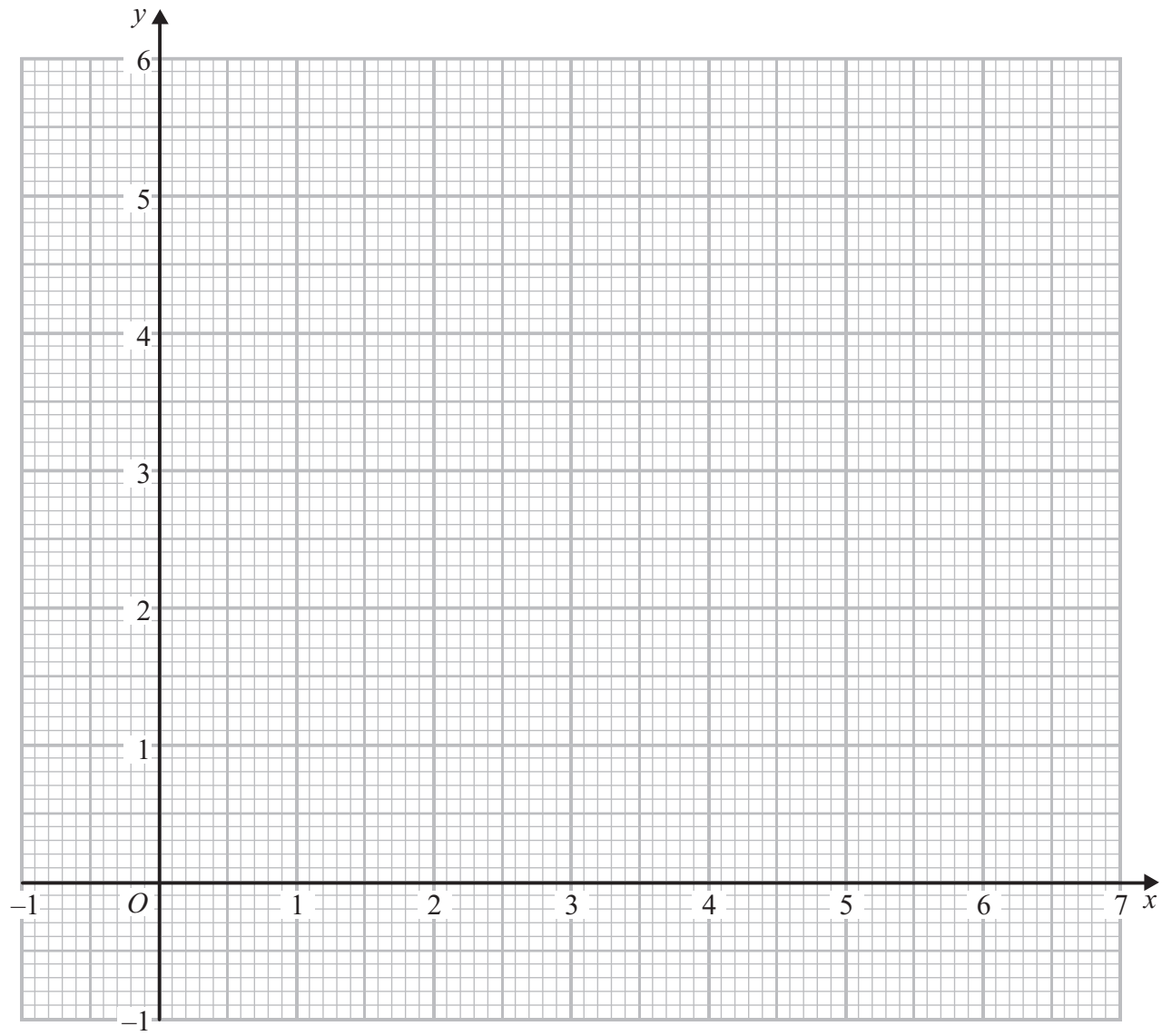
.....

(2)

(Total for Question 6 is 4 marks)

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

$$y \leqslant x \qquad 2x + 3y \leqslant 12 \qquad y \geqslant \frac{1}{4}x + 1$$



(5)

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

$$y \leqslant x \quad \text{and} \quad 2x + 3y \leqslant 12 \quad \text{and} \quad y \geqslant \frac{1}{4}x + 1$$

.....

(1)

(Total for Question 7 is 6 marks)

8 $v^2 = u^2 + 2as$

(a) Find the value of s when $u = -4$, $v = 5$ and $a = 10$

.....

(2)

$$f = \sqrt{\frac{g}{g+1}}$$

(b) Make g the subject of the formula.

.....

(3)

(Total for Question 8 is 5 marks)

9 Here is a quadratic equation.

$$16x^2 - 8x - 3 = 0$$

(a) (i) Write down the sum of the roots of this equation.

.....

(ii) Write down the product of the roots of this equation.

.....

(2)

(b) Solve the equation

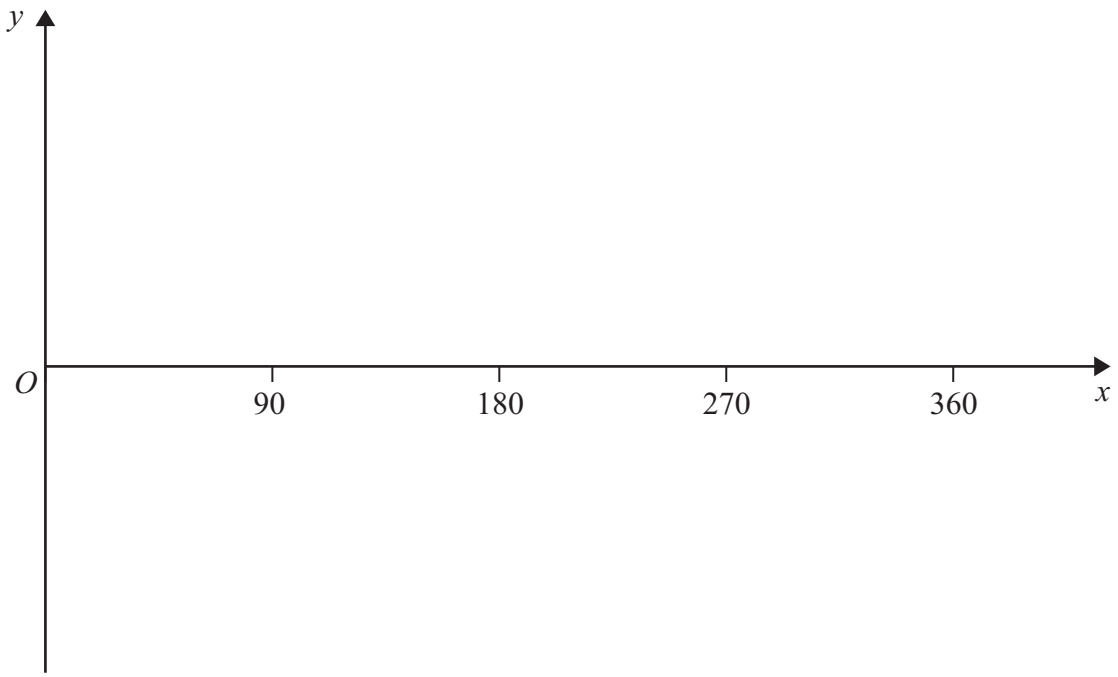
$$32x^2 - 16x - 6 = 0$$

.....

(2)

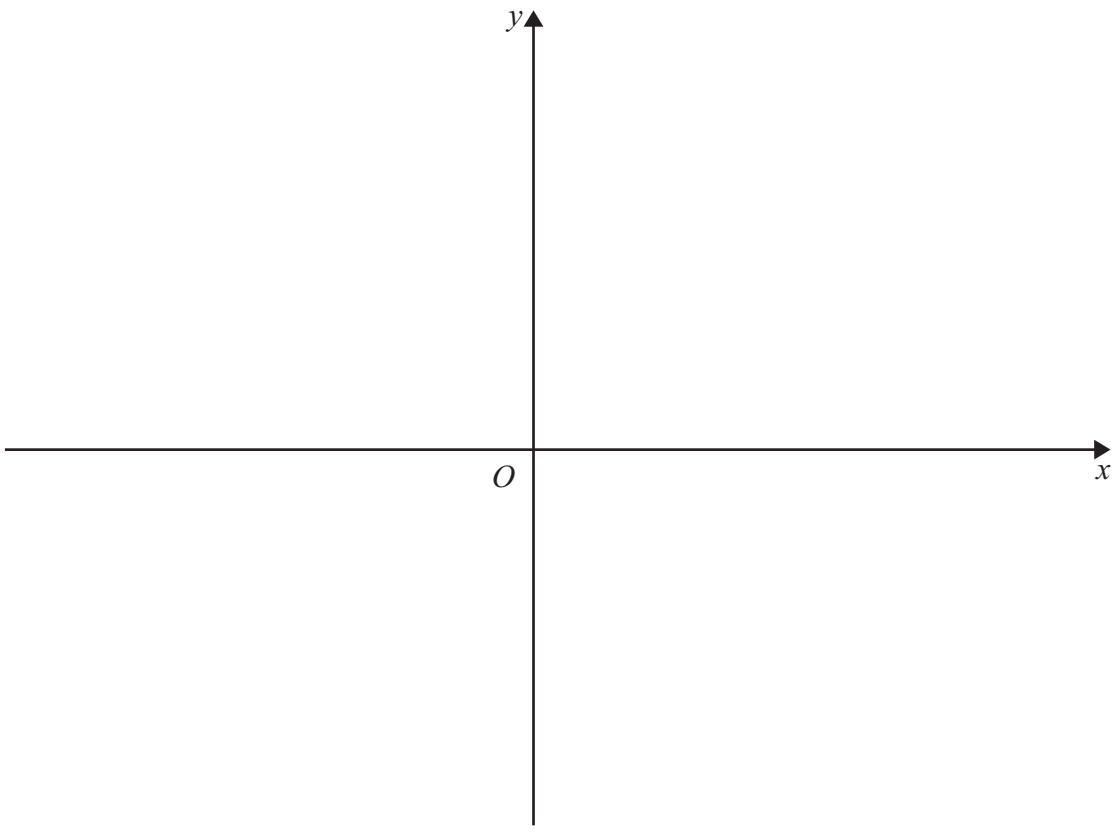
(Total for Question 9 is 4 marks)

10 (a) Sketch the graph of $y = \cos x°$ for $0 \leqslant x \leqslant 360$



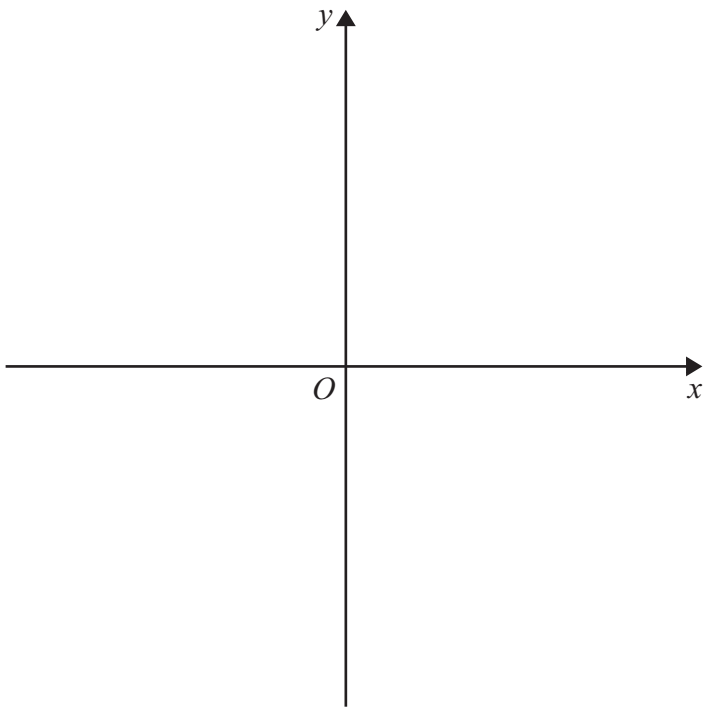
(2)

(b) Sketch the graph of $x = y^2$



(2)

(c) Sketch the graph of $x^2 + y^2 = 1$



(1)

(Total for Question 10 is 5 marks)

11 (a) Write the quadratic expression $x^2 + 4x + 7$ in the form $(x + m)^2 + n$ where m and n are integers.

.....

(2)

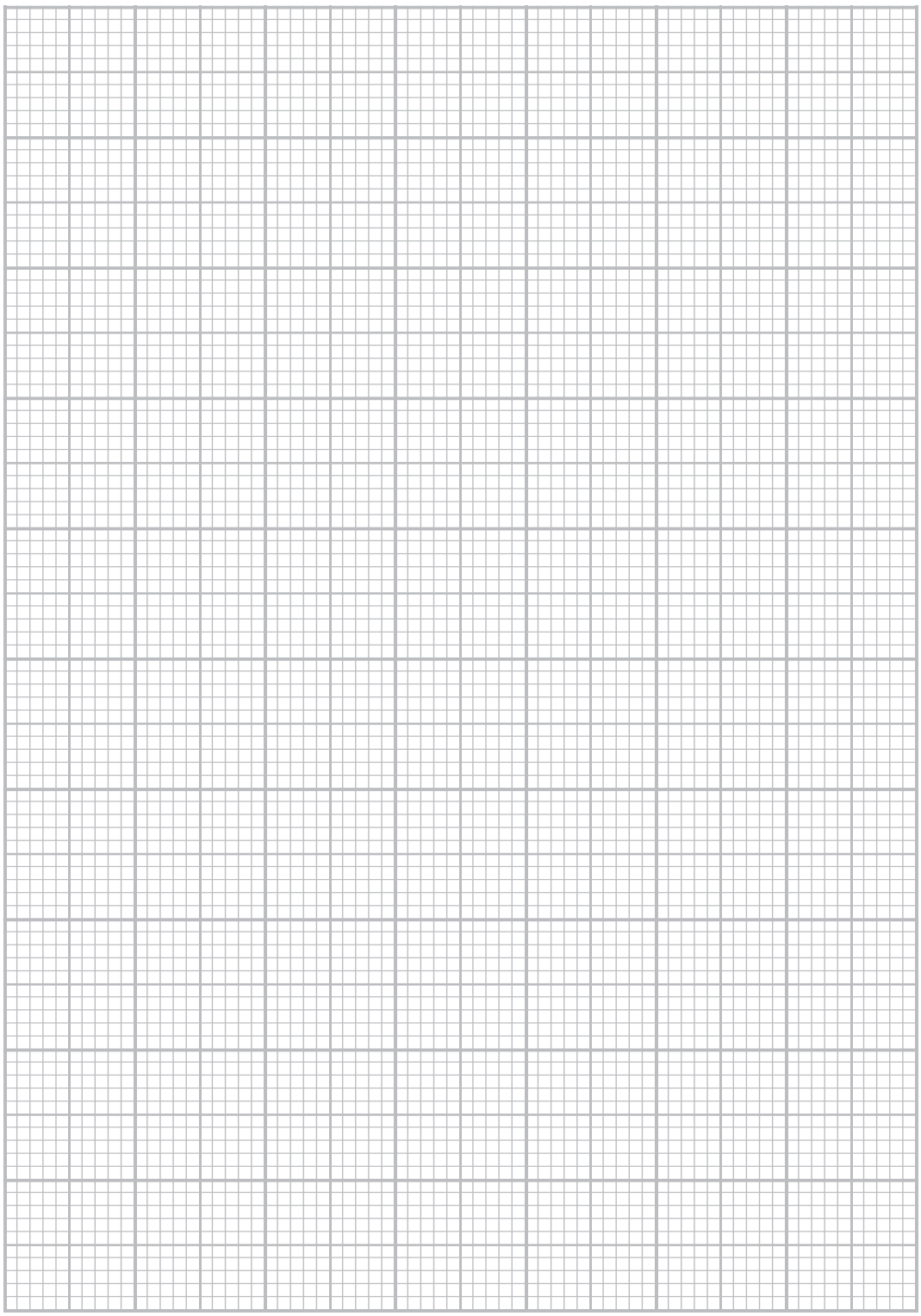
(b) Write down the coordinates of the turning point of the graph of $y = x^2 + 4x + 7$

.....

(1)

(Total for Question 11 is 3 marks)

12 (a) On the grid, draw the graph of $y = 1 + 3x - x^3$ for values of x from -3 to 3



(4)

(b) Use your graph to find estimates for the solutions of $3x - x^3 = 0$
Give your estimates correct to one decimal place.

.....

(2)

(Total for Question 12 is 6 marks)

13 The table shows five quadratic equations.

Equation	2 real and different roots	2 real and equal roots	no real roots
$x^2 + 4x + 1 = 0$			
$2x^2 + 3x + 2 = 0$			
$x^2 - 22 = 0$			
$9x^2 - 12x + 4 = 0$			
$25x^2 - 10x - 1 = 0$			

Place one tick in each row to show whether the equation has **2 real and different roots**, **2 real and equal roots** or **no real roots**.

(Total for Question 13 is 3 marks)

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

3 5.5 8 10.5 13

(a) Write down an expression, in terms of n, for the nth term of this series.

.....

(1)

100.5 is a term in this series.

(b) Work out the sum of all the terms in this series up to and including 100.5

.....

(3)

(Total for Question 14 is 4 marks)

15 Solve

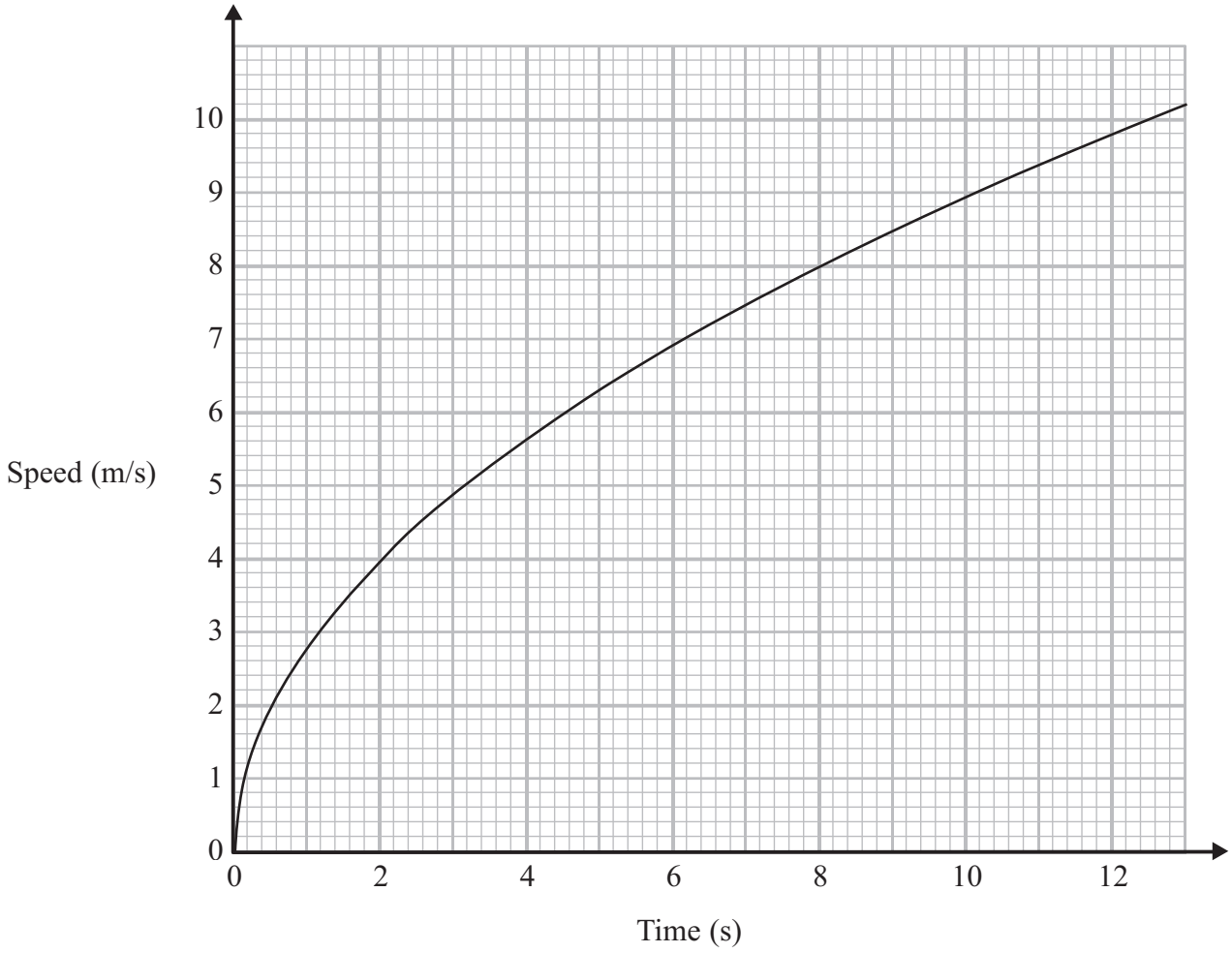
$$\frac{1}{x} - \frac{1}{x+1} = 2$$

Give your solutions in the form $a + b\sqrt{3}$ where a and b are fractions.

.....

(Total for Question 15 is 5 marks)

16 Here is a speed-time graph.



(a) Use the trapezium rule to find the area under the graph between 2 seconds and 10 seconds. Use 4 strips of equal width.

.....

(3)

(b) What does this area represent?

.....

(1)

(Total for Question 16 is 4 marks)

17 f is inversely proportional to d.

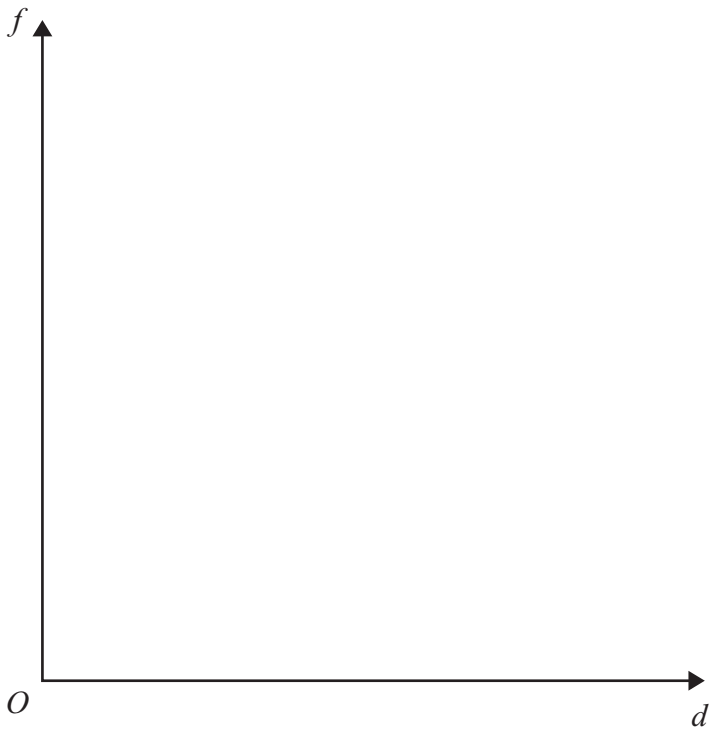
When $d = 20$, $f = 64$

(a) Find a formula for f in terms of d.

.....

(3)

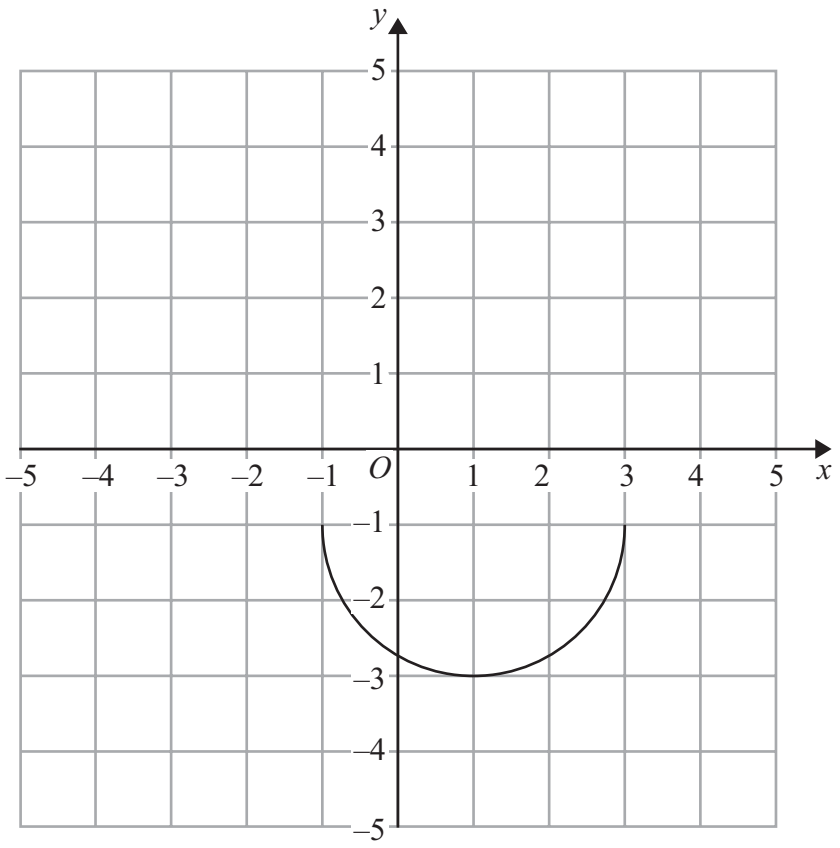
(b) Sketch the graph of f against d for positive values of d.



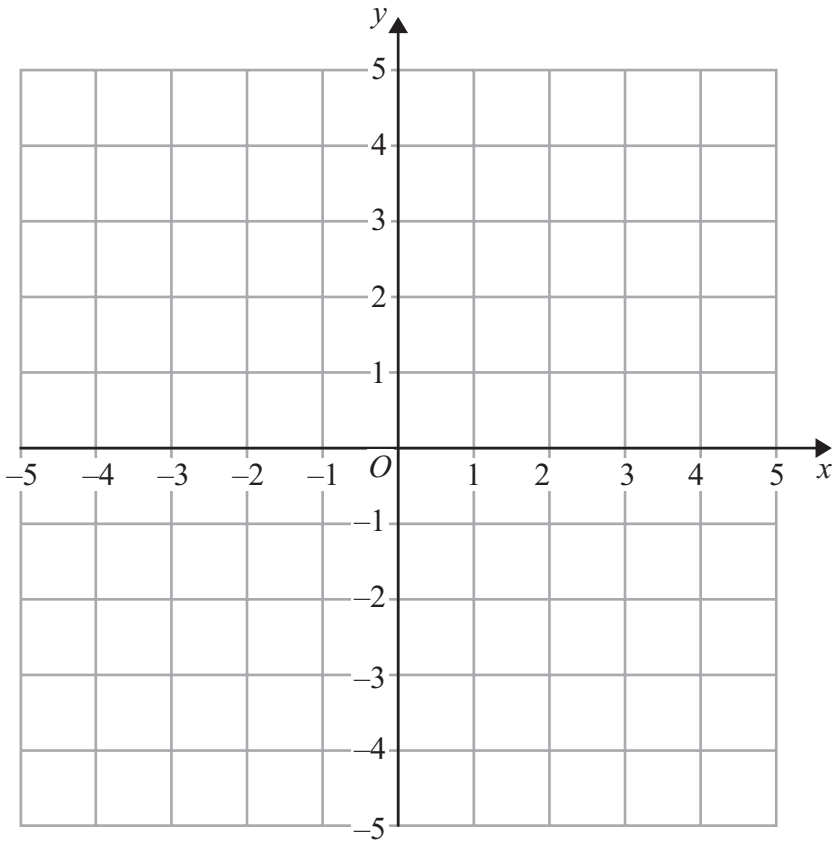
(1)

(Total for Question 17 is 4 marks)

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

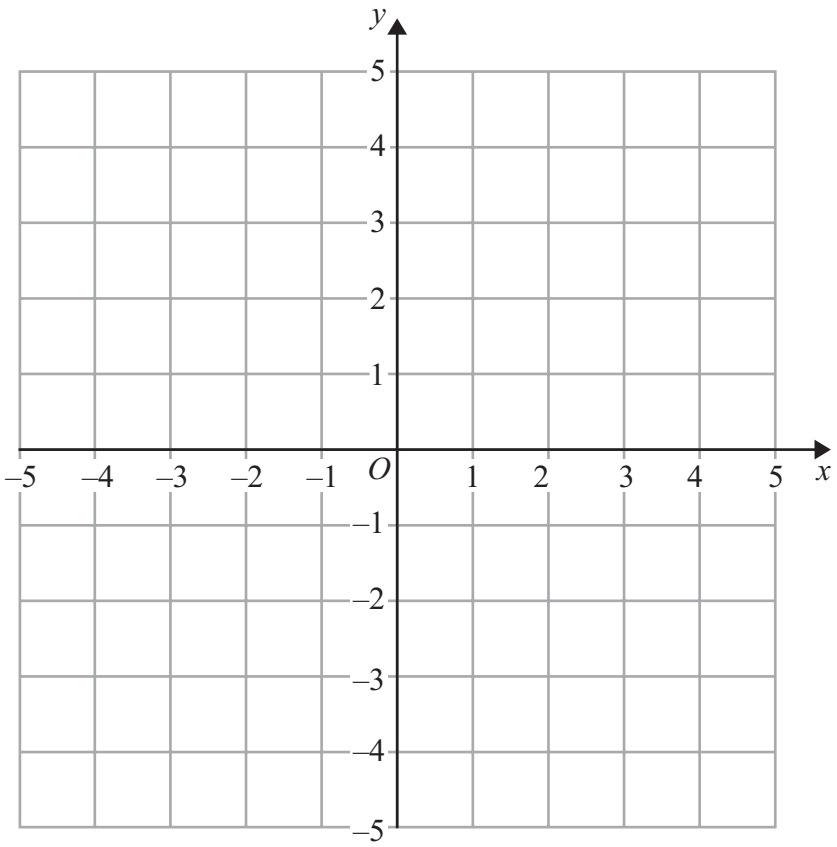


(a) On the grid below, draw the graph of $y = -f(x)$.



(2)

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



(2)

(Total for Question 18 is 4 marks)

19 Rationalise the denominator of $\dfrac{5+\sqrt{5}}{5-\sqrt{5}}$

Give your answer in the form $\dfrac{a+\sqrt{5}}{b}$ where a and b are integers.

.....

(Total for Question 19 is 4 marks)

20 Solve, algebraically, the simultaneous equations

$$(x - 2)^2 + y^2 = 8$$
$$y = x - 6$$

.....

(Total for Question 20 is 4 marks)

TOTAL FOR PAPER IS 90 MARKS

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