Write your name here

Surname	Other names

Edexcel Award

Centre Number | Candidate Number

Algebra

Level 3
Calculator NOT allowed

Monday 13 May 2013 – Morning
Time: 2 hours

Paper Reference
AAL30/01

You must have: Ruler graduated in centimetres and millimetres, 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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6/6/5/5/

P 4 3 6 2 3 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 $m \times m^5$

.....

(1)

(b) Simplify $n^4 \div n^{\frac{3}{2}}$

.....

(1)

(c) Simplify $(p^{-2})^{-1}$

.....

(1)

(d) $\dfrac{d^2 - d^{\frac{1}{2}}}{d}$ can be written in the form $d^x - d^y$

Work out the value of x and the value of y.

$x =$.....

$y =$.....

(3)

(Total for Question 1 is 6 marks)

2 (a) Factorise $x^2 + 8x + 15$

.....

(1)

(b) Factorise $4y^2 - 9$

.....

(1)

(c) Factorise $pt + 2p + 7t + 14$

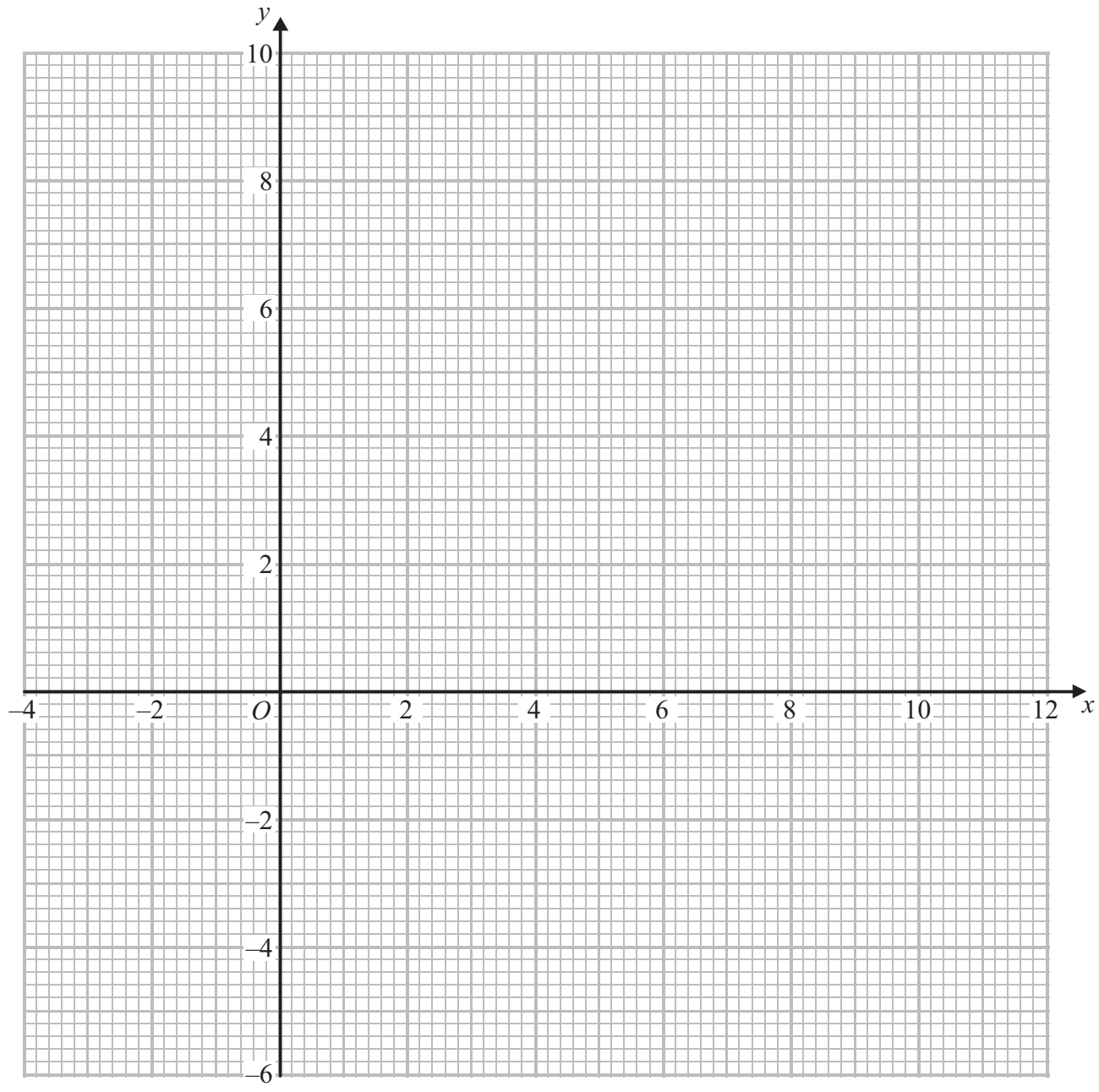
.....

(2)

(Total for Question 2 is 4 marks)

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

$x > 1$ $x + 2y < 10$ $y > 2x$



(Total for Question 3 is 5 marks)

4 $x^2 - 8x = (x + p)^2 + q$ for all values of x.

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

$p =$.....

$q =$.....

(2)

(b) Solve the equation $4(x^2 - 8x) + 63 = 0$

.....

(3)

(Total for Question 4 is 5 marks)

5 (a) Solve $7 - 2w < 4$

.....

(2)

(b) Solve $x^2 + 3x - 10 \leqslant 0$

.....

(3)

(Total for Question 5 is 5 marks)

6 Here is a quadratic equation.

$$2x^2 - 4x + 1 = 0$$

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

.....

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

.....

(2)

The quadratic equation $x^2 + 6x + c = 0$ has no real roots.

(b) Find the range of possible values for c.

.....

(2)

(Total for Question 6 is 4 marks)

7 (a) Expand and simplify $(x - 6)(2x + 1)$

.....

(2)

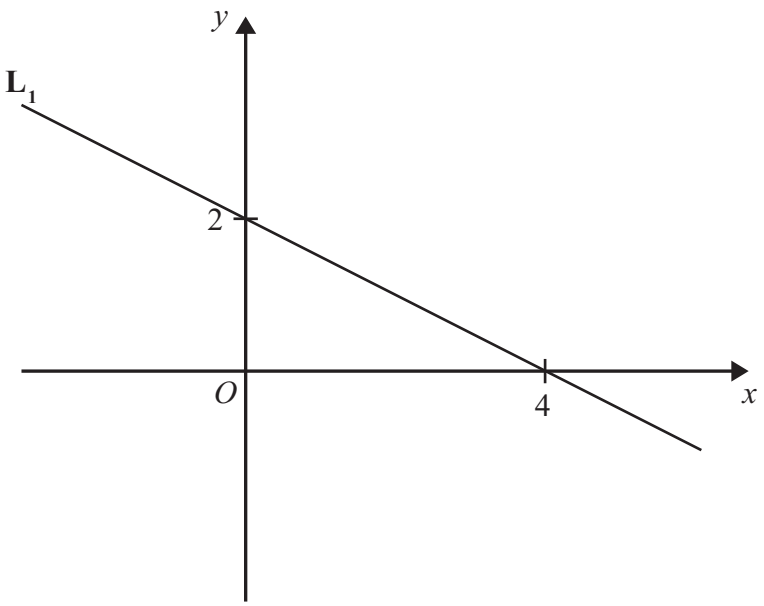
(b) Simplify $\dfrac{x^2 + 2x}{x^2 + 7x + 10}$

.....

(2)

(Total for Question 7 is 4 marks)

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



The line $\mathbf{L}_2$ is perpendicular to $\mathbf{L}_1$
$\mathbf{L}_2$ passes through the point (3, 2).

Find an equation of the line $\mathbf{L}_2$
Give your answer in the form $ax + by + c = 0$ where a, b and c are integers.

.....

(Total for Question 8 is 3 marks)

9 $y = 180 - \dfrac{360}{x}$

(a) Make x the subject of the formula.

$x =$ .....

(2)

$s = \dfrac{t}{t+2}$

(b) (i) Find the value of s when $t = -6$

.....

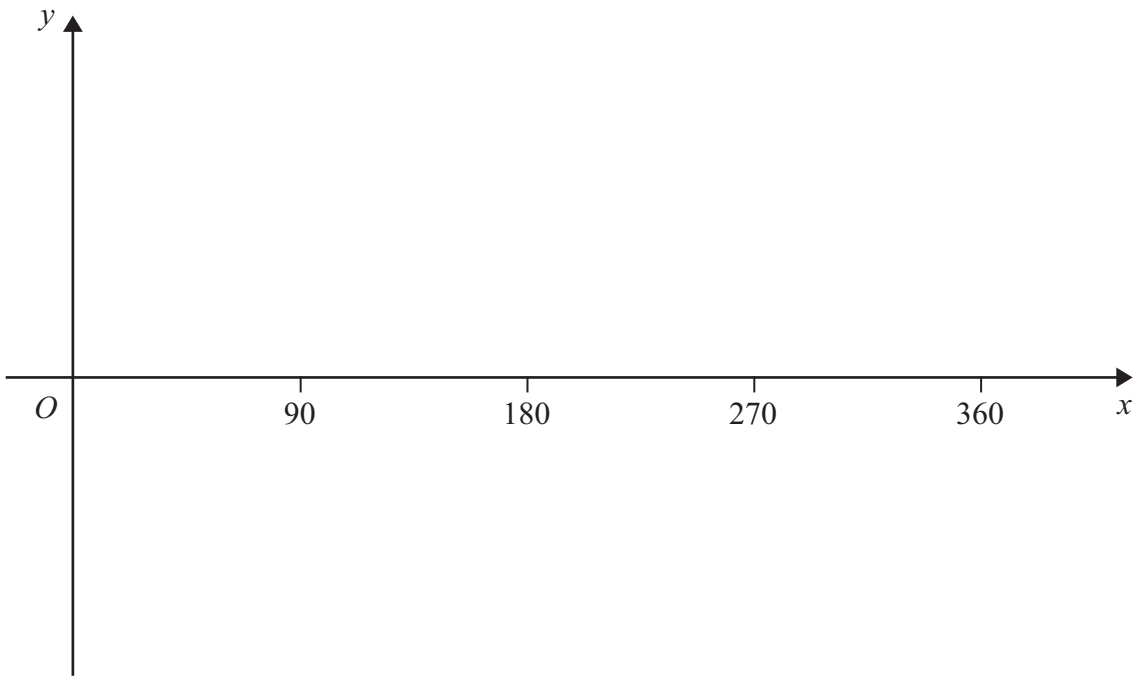
(ii) Make t the subject of the formula.

$t =$ .....

(5)

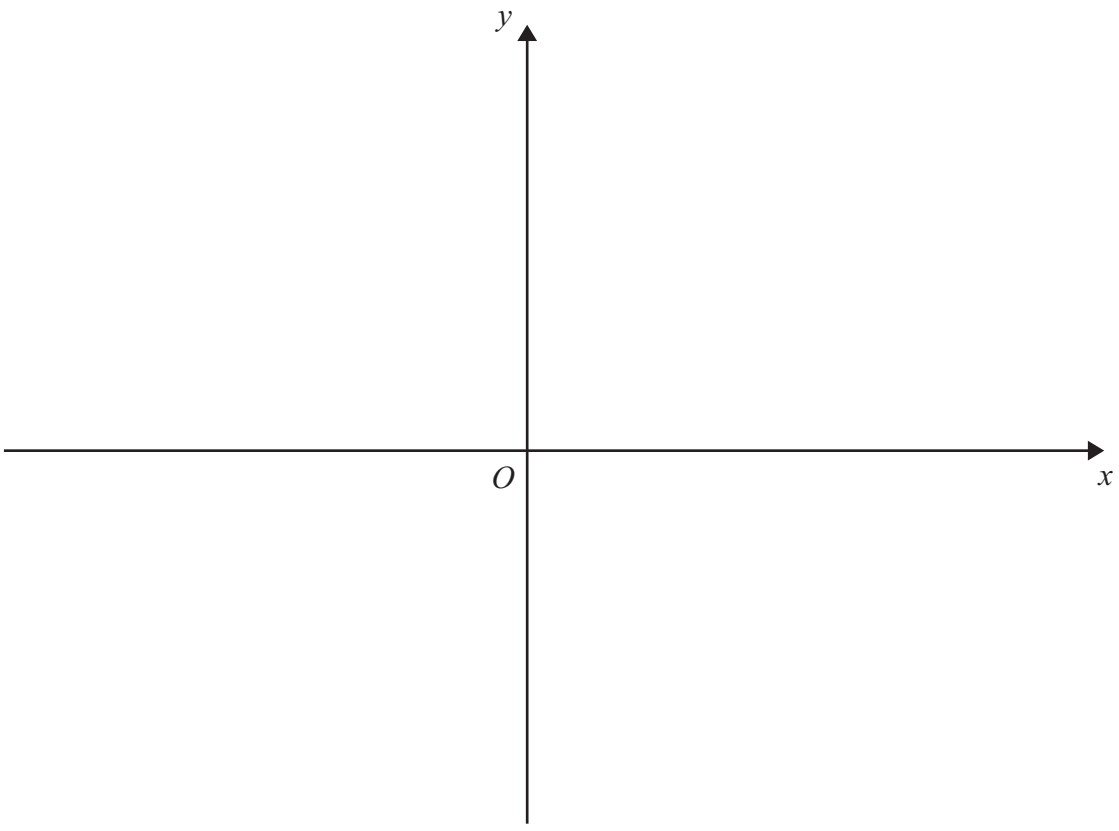
(Total for Question 9 is 7 marks)

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



(2)

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



(2)

(Total for Question 10 is 4 marks)

11 The braking distance, d metres, for a car to stop is directly proportional to the square of its speed v km/h.

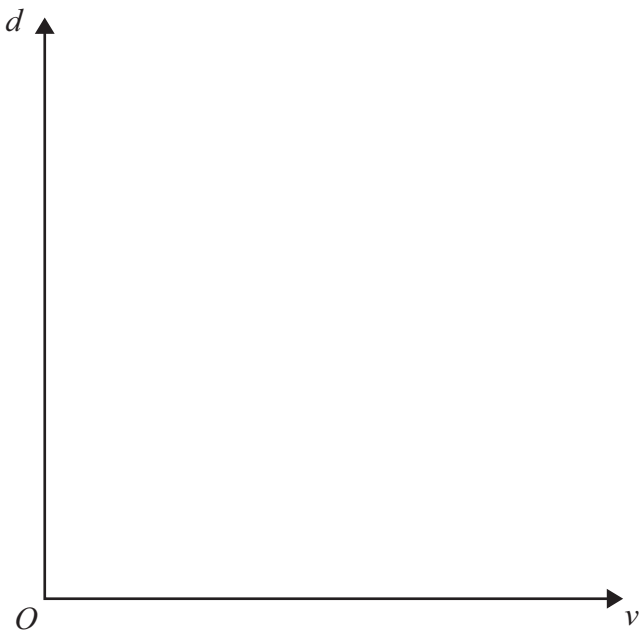
For a car travelling at 30 km/h the braking distance is 6 metres.

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

$d =$ .....

(3)

(b) Sketch the graph of d against v.



(1)

(c) Calculate the value of d when $v = 60$

.....

(2)

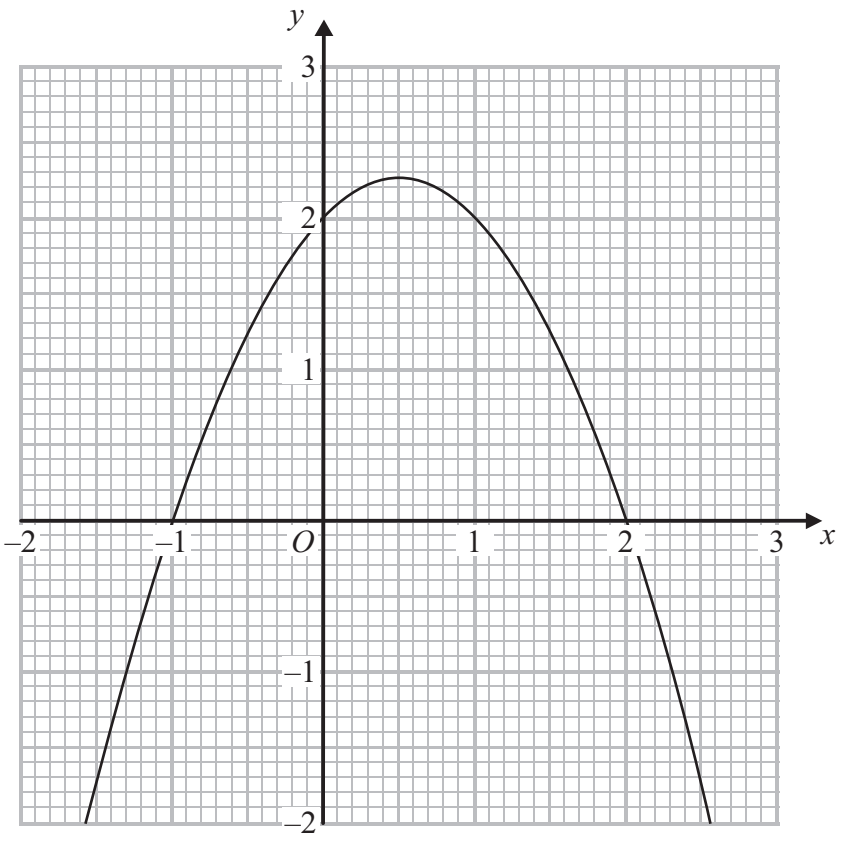
(d) Calculate the value of v when $d = 96$

.....

(2)

(Total for Question 11 is 8 marks)

12 Here is a graph of $y = 2 + x - x^2$



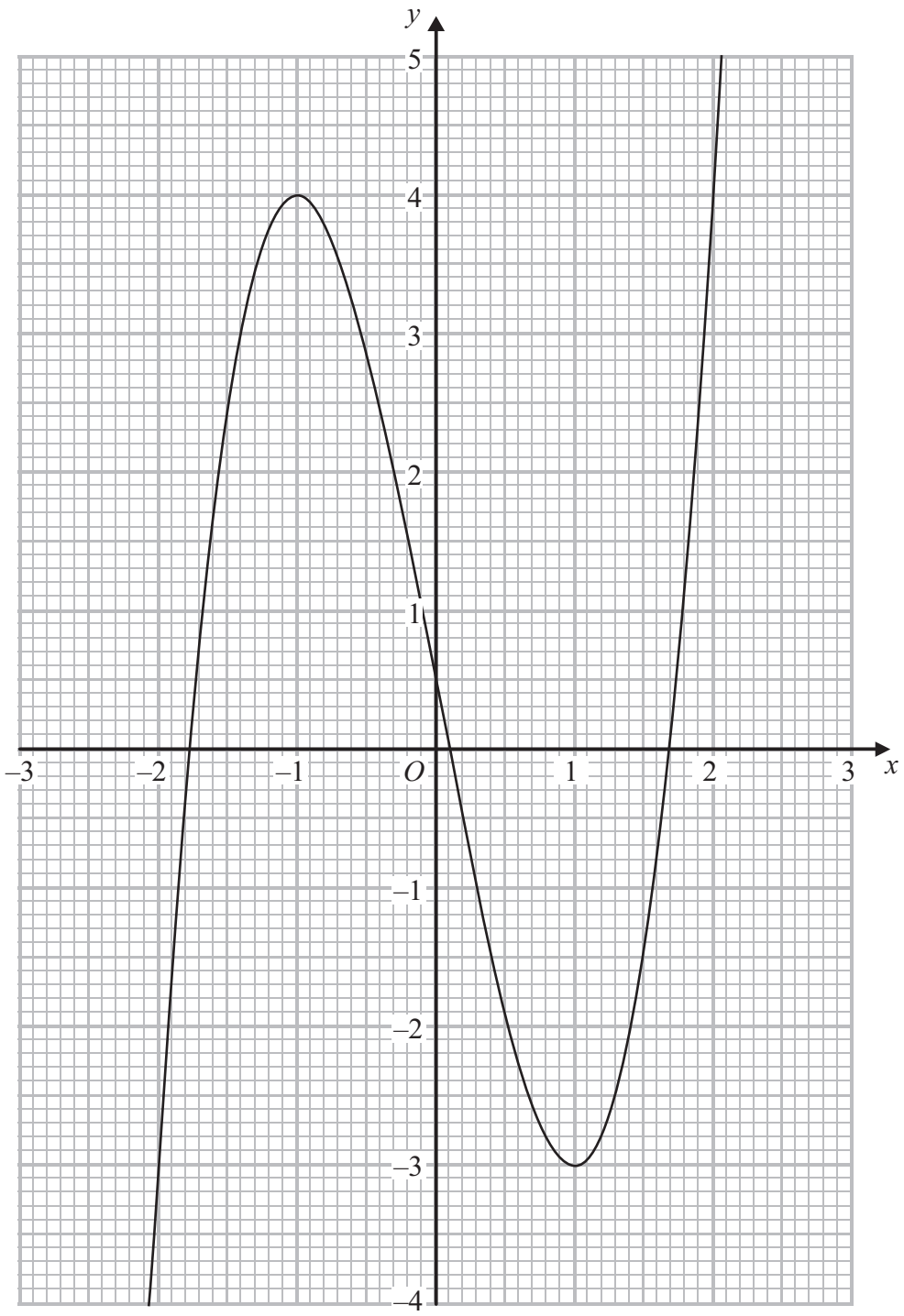
(a) (i) On the grid, draw the tangent to the curve at the point where $x = 1$

(ii) Use the graph to find estimates for the solutions of $1 + x - x^2 = 0$

.....

(3)

Here is a cubic graph.



(b) On the graph, mark with a cross (×) any turning points.

(1)

(Total for Question 12 is 4 marks)

13 (a) Simplify $(3\sqrt{5})^2$

.....

(1)

(b) Express $\sqrt{98} + \sqrt{18}$ in the form $n\sqrt{2}$ where n is an integer.

.....

(2)

(c) Rationalise the denominator of $\dfrac{1}{5 - \sqrt{2}}$

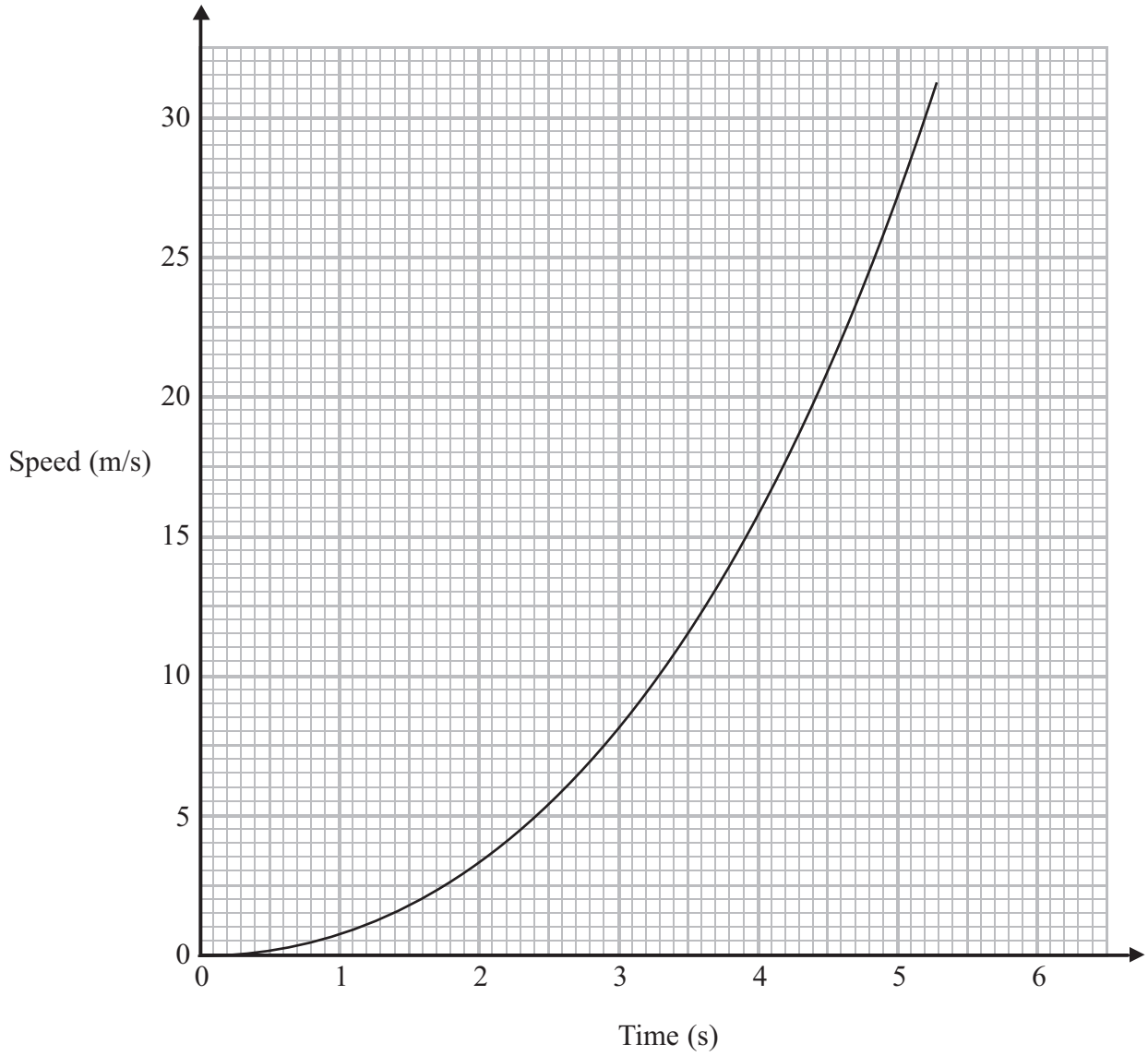
Give your answer in the form $\dfrac{a + \sqrt{b}}{c}$ where a, b and c are integers.

.....

(2)

(Total for Question 13 is 5 marks)

14 Here is a speed-time graph.



Use the trapezium rule to find an estimate for the distance travelled between 2 seconds and 5 seconds.
Use 3 strips of equal width.

..... metres

(Total for Question 14 is 4 marks)

15 Solve the simultaneous equations

$$y = x^2 - x - 7$$
$$2x - y = 3$$

.....

(Total for Question 15 is 5 marks)

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

2 10 18 26 34

(a) (i) Write down the common difference of this series.

.....

(ii) Work out the sum of the first 26 terms of this series.

.....

(3)

The second term of a different arithmetic series is 40
The sixth term of this series is 12

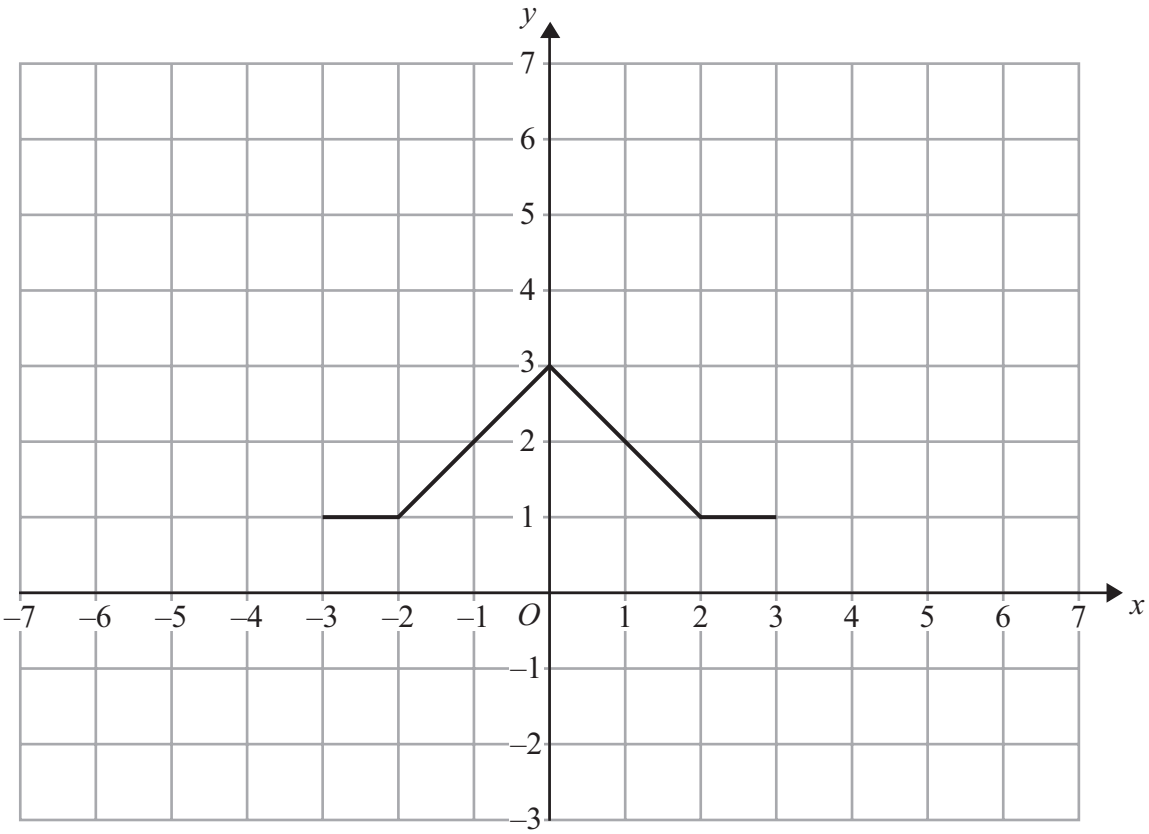
(b) Work out the 15th term of this series.

.....

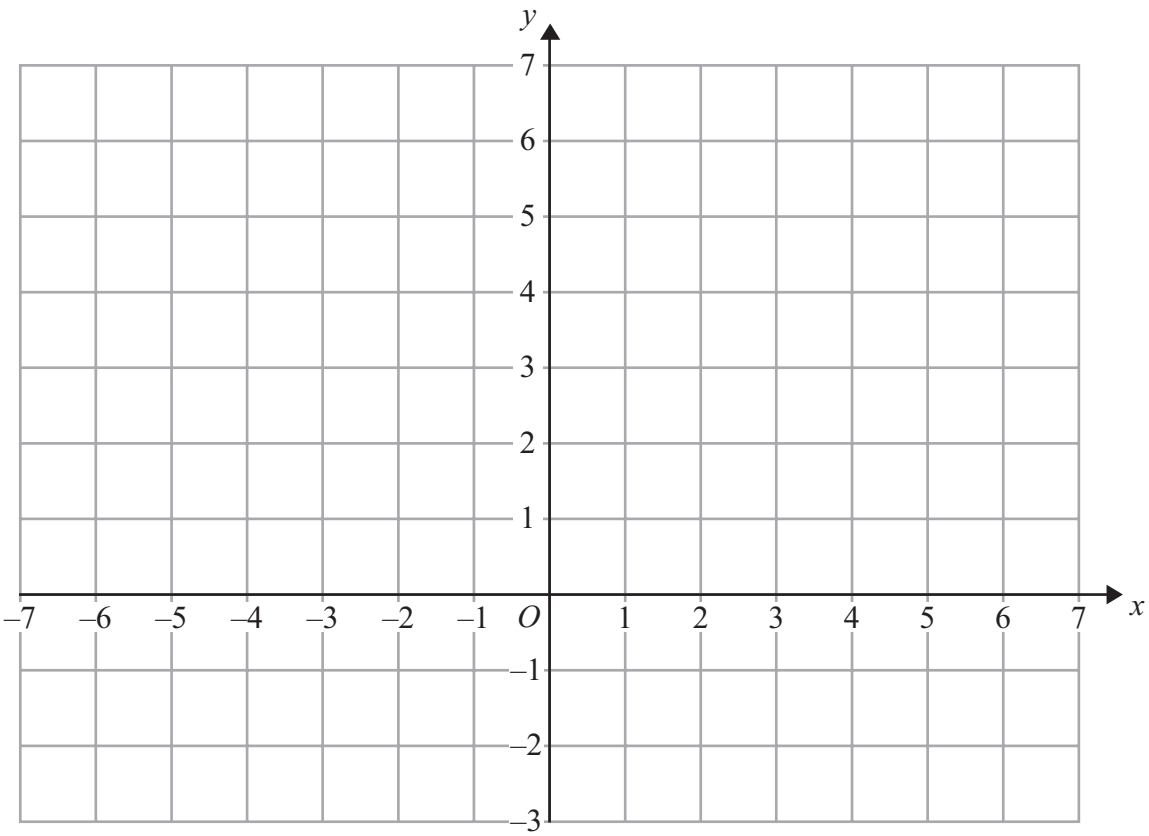
(3)

(Total for Question 16 is 6 marks)

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

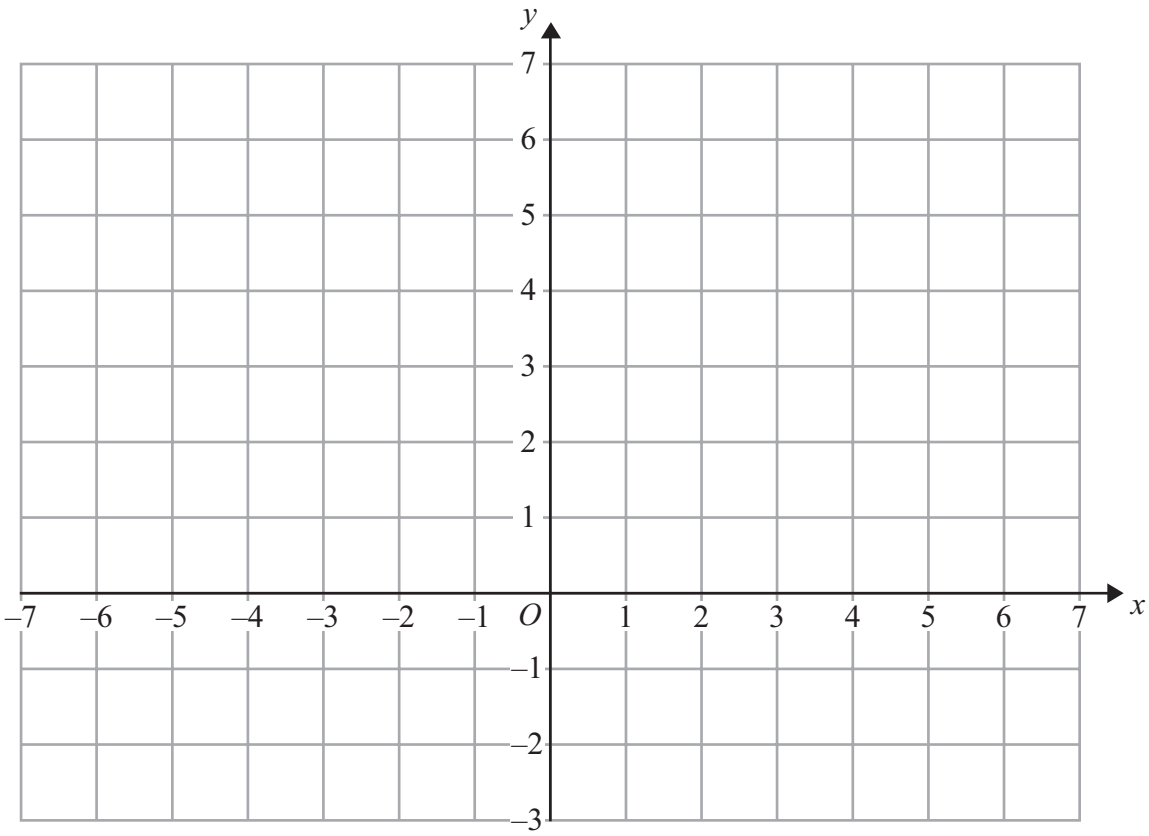


(a) On the grid below, draw the graph of $y = 2f(x)$.



(2)

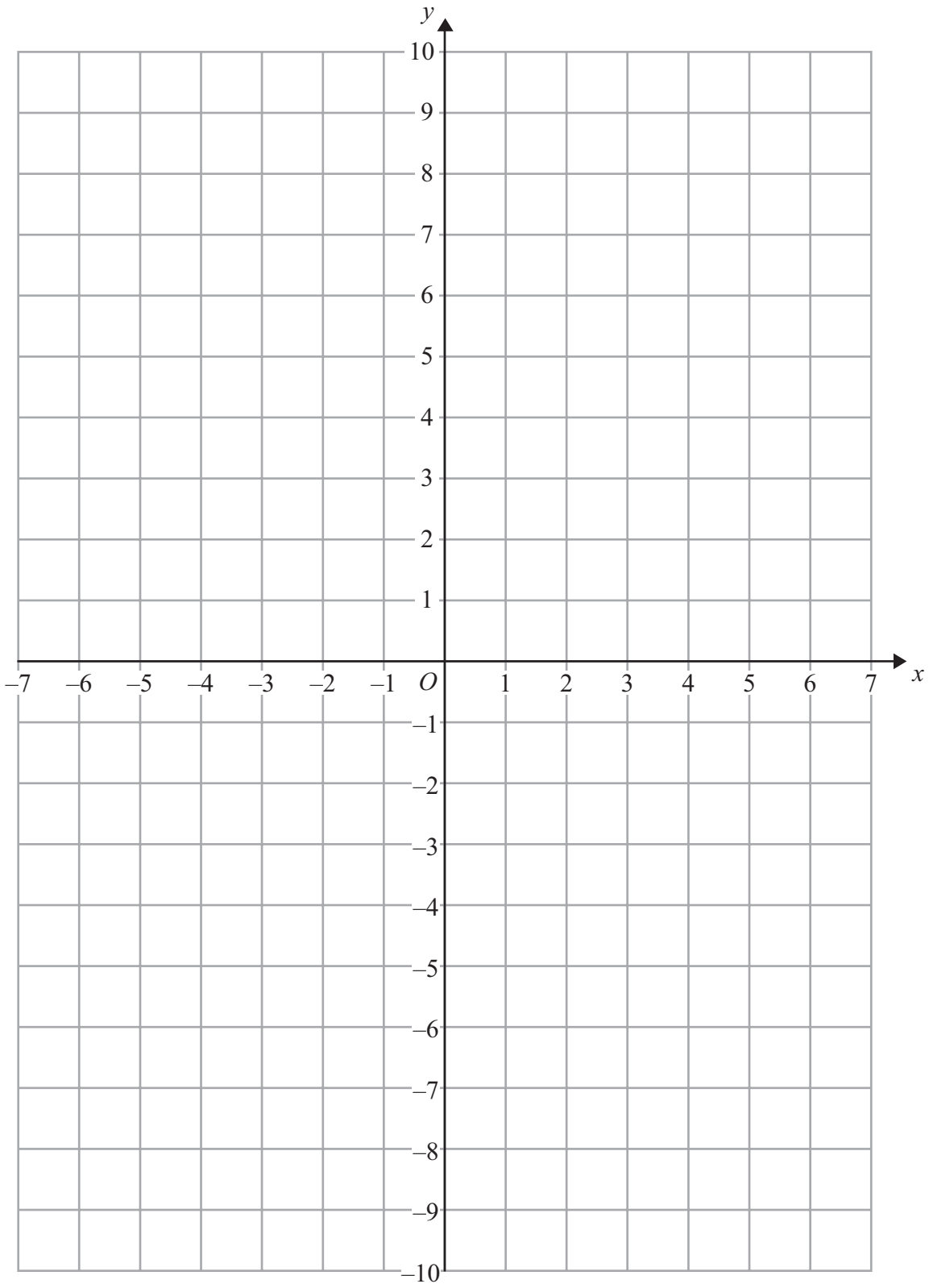
(b) On this grid, draw the graph of $y = f(x - 3)$.



(2)

(Total for Question 17 is 4 marks)

18 (a) On the grid, construct the graph of $x^2 + y^2 = 25$



(2)

(b) Find the number of points of intersection of the curve $y = 9 - x^2$ and $x^2 + y^2 = 25$
Show clearly how you get your answer.

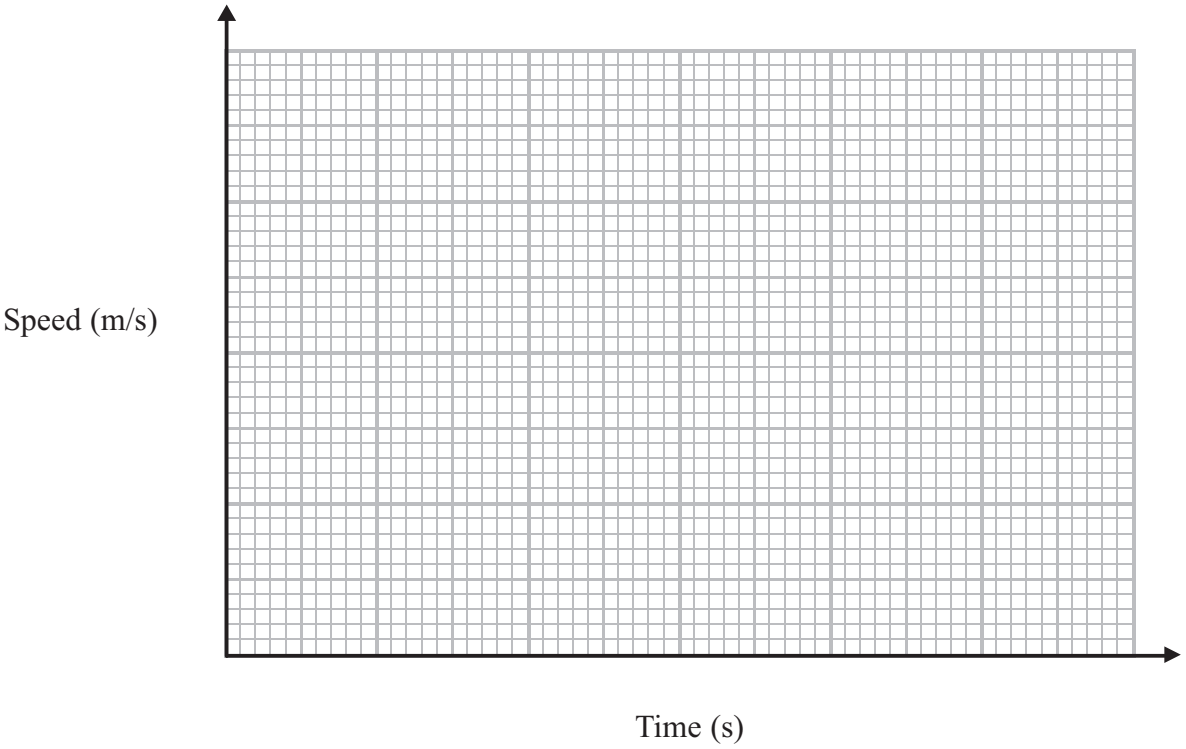
(2)

(Total for Question 18 is 4 marks)

19 A rocket is launched vertically upwards.

It accelerates from a speed of 0 m/s at a rate of 30 m/s^2 for 1.2 seconds.
The rocket runs out of fuel 1.2 seconds after it was launched.
The rocket then decelerates at a constant rate for 3.8 seconds to reach its greatest height.

Show this information on a speed-time graph.



(Total for Question 19 is 3 marks)

TOTAL FOR PAPER IS 90 MARKS