Write your name here

Surname	Other names

Pearson Edexcel Award

Centre Number | | | | | |

Candidate Number | | | | |

Algebra

Level 3
Calculator NOT allowed

Tuesday 10 May 2016 – 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 6 4 4 2 A 0 1 2 4

PEARSON

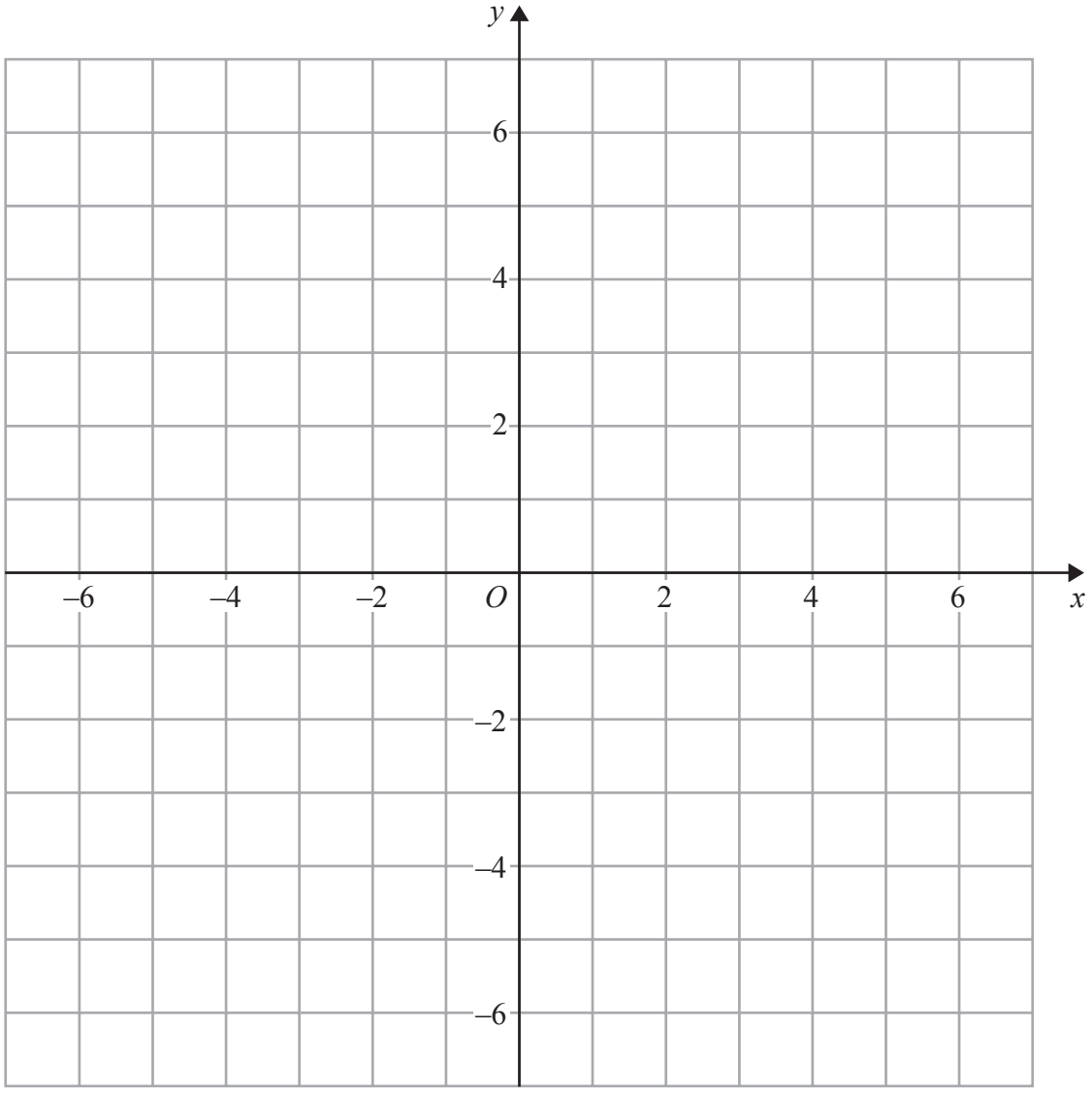
Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

You must NOT use a calculator.

1 (a) On the grid, construct the graph of $x^2 + y^2 - 25 = 0$



(2)

A is the point (3, 4)

(b) (i) Draw the tangent to the graph at the point A.

(ii) Write down the size of the angle between the tangent to the graph at A and the normal to the graph at A.

.....

(2)

(Total for Question 1 is 4 marks)

2 $w = \dfrac{4t^2}{t^2 + 2}$

Make t the subject of the formula.

.....

(Total for Question 2 is 3 marks)

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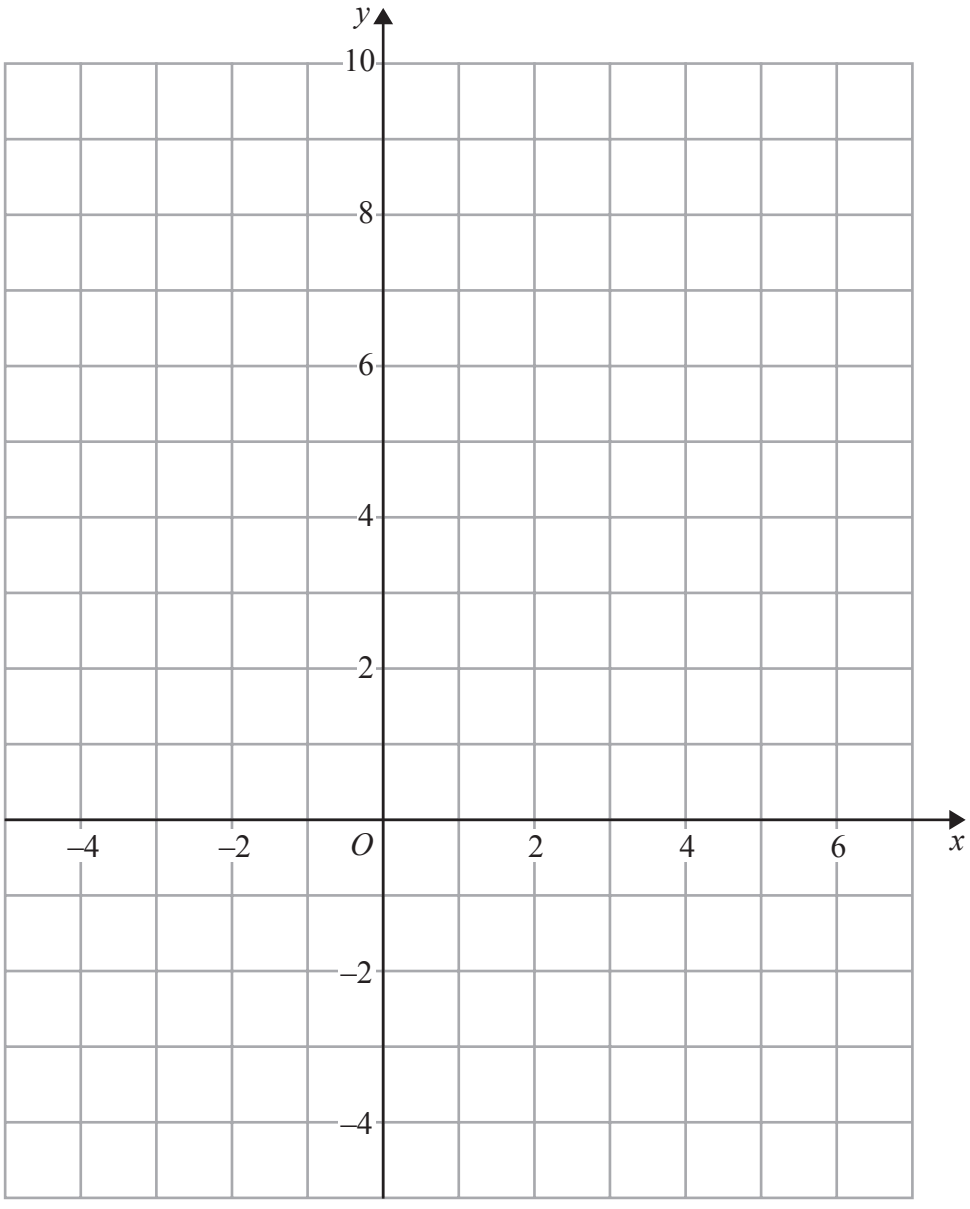
3 On the grid, shade the region that satisfies all these inequalities.

$x + y < 5$ $y > 2x + 1$ $y < -3x$

Label the region **R**.



(Total for Question 3 is 5 marks)

4 (a) Expand and simplify $(2x - 4)(x + 3)$

.....

(2)

(b) Factorise $10d^2e^2 + 15de^3$

.....

(2)

(c) Factorise $3p^2 - 12q^2$

.....

(2)

(Total for Question 4 is 6 marks)

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5 The straight line **L** passes through the points A and B with coordinates (1, 3) and (–1, –1) respectively.

(a) Find an equation for **L** in the form $ax + by + c = 0$ where a, b and c are integers.

.....

(3)

(b) Find an equation of a straight line which is perpendicular to the line $4y = x + 8$

.....

(2)

(Total for Question 5 is 5 marks)

6 T is inversely proportional to the cube of x.

When $x = 3$, $T = \frac{1}{54}$

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

.....

(3)

(b) Calculate the value of x when $T = 4$

.....

(2)

(Total for Question 6 is 5 marks)

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7 (a) Simplify $e^2 \times e^{-3}$

.....

(1)

(b) Simplify $\left(\frac{2}{n^3}\right)^{-2}$

.....

(2)

(c) Express $\frac{2x}{x+3} + \frac{7}{x-3}$ as a single fraction.

Give your answer in its simplest form.

.....

(3)

(Total for Question 7 is 6 marks)

8 Solve, algebraically, the simultaneous equations

$$y = x^2 - x - 6$$
$$x - y = 3$$

(Total for Question 8 is 5 marks)

9 Use the quadratic formula to solve the equation $3x^2 + 4x - 5 = 0$

Give your solutions in the form $\frac{p \pm \sqrt{q}}{r}$ where p, q and r are integers.

(Total for Question 9 is 2 marks)

10 (a) Solve $8 - 3y < 11$

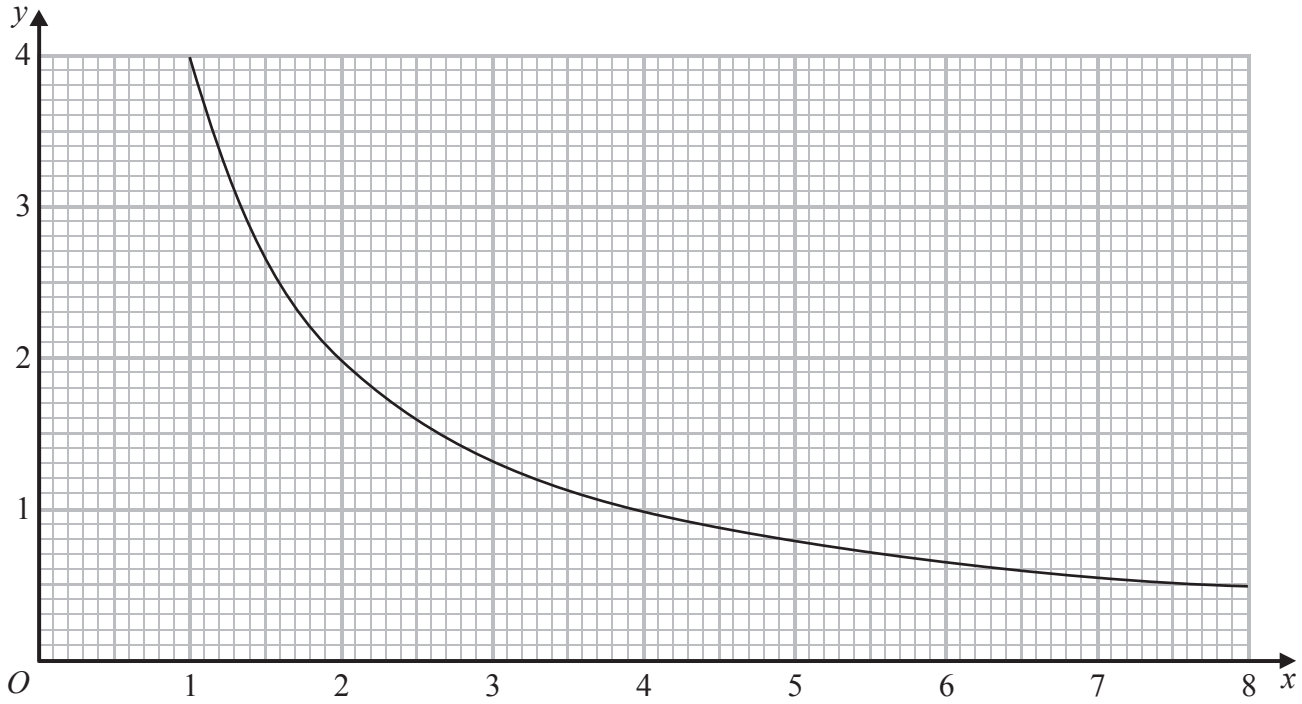
(2)

(b) Solve $x^2 + 3x - 4 < 0$

(3)

(Total for Question 10 is 5 marks)

11 Here is a graph for values of x from 1 to 8



Use the trapezium rule to find an estimate of the area of the region under the curve, between $x = 2$ and $x = 6$, and above $y = 0$

Use 4 strips of equal width.

.....

(Total for Question 11 is 3 marks)

12 (a) Find the value of $(2\sqrt{7})^2$

(1)

(b) Express $\sqrt{432} - \sqrt{27}$ in the form $a\sqrt{3}$ where a is an integer.

(2)

(c) Rationalise the denominator of $\dfrac{2}{7+\sqrt{3}}$

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

(3)

(Total for Question 12 is 6 marks)

13 The sum of the first three terms of an arithmetic series is 39
The ninth term of this series is 41

(a) Find the first term of the series and the common difference of the series.

first term .....

common difference .....

(3)

The nth term of a different arithmetic series is $13n - 6$

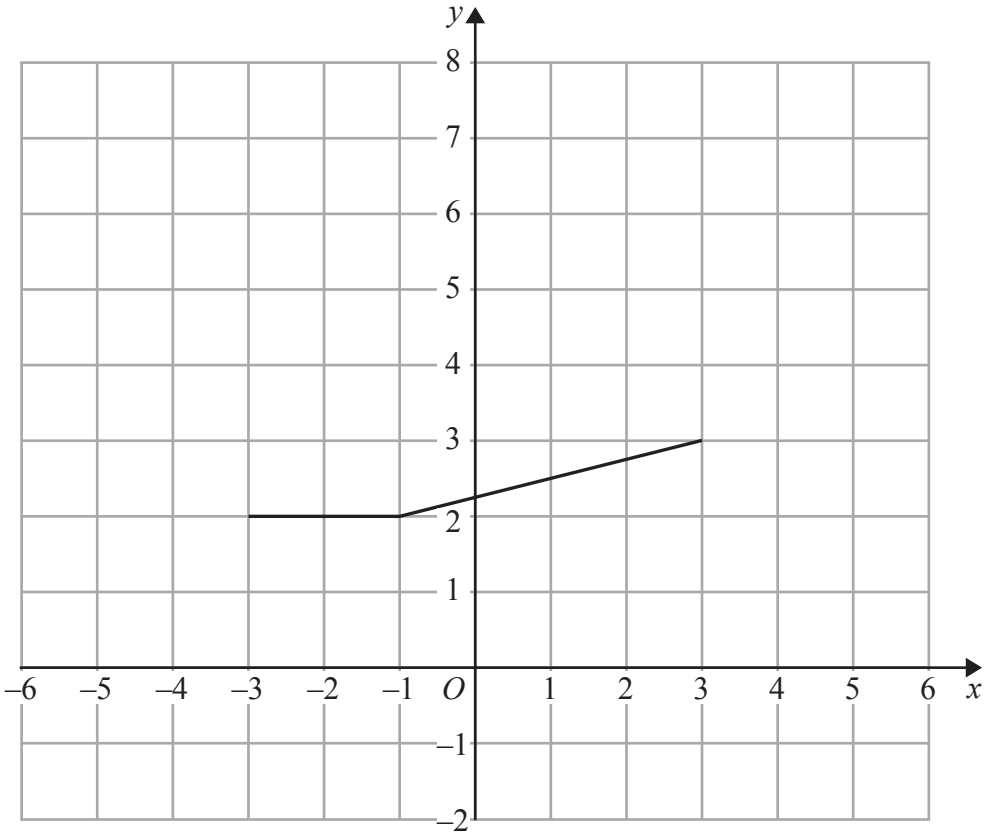
(b) Find an expression, in terms of n, for the sum of the first n terms of this series.
Give your answer in its simplest form.

.....

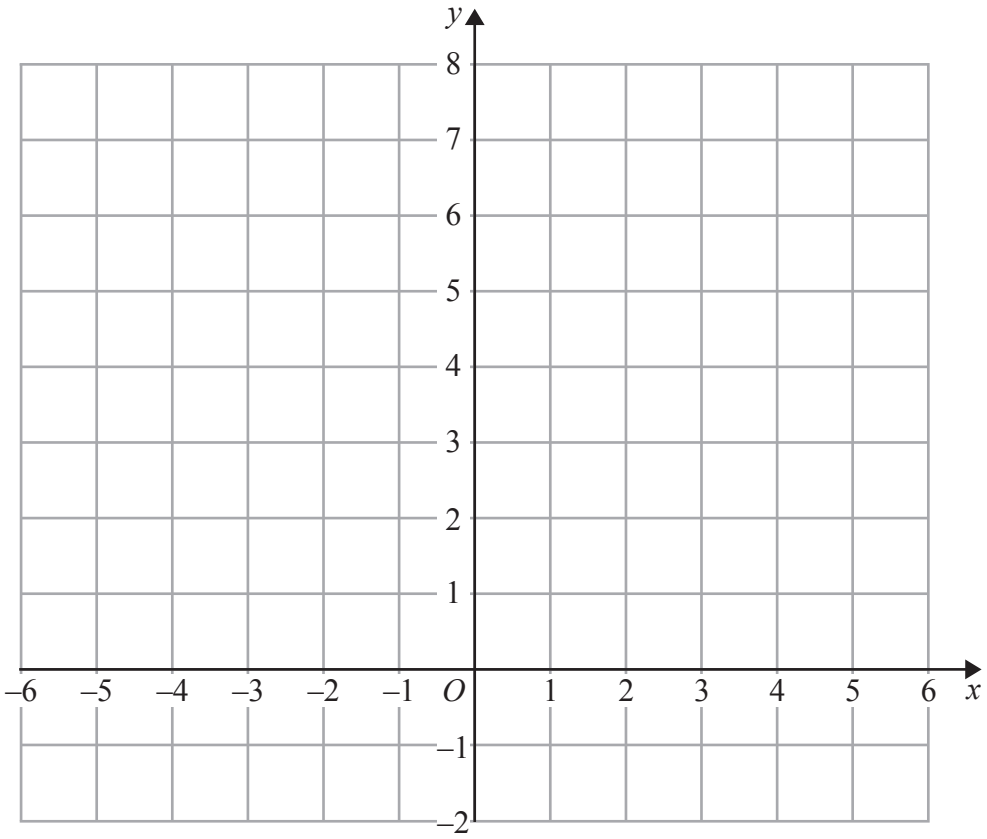
(3)

(Total for Question 13 is 6 marks)

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

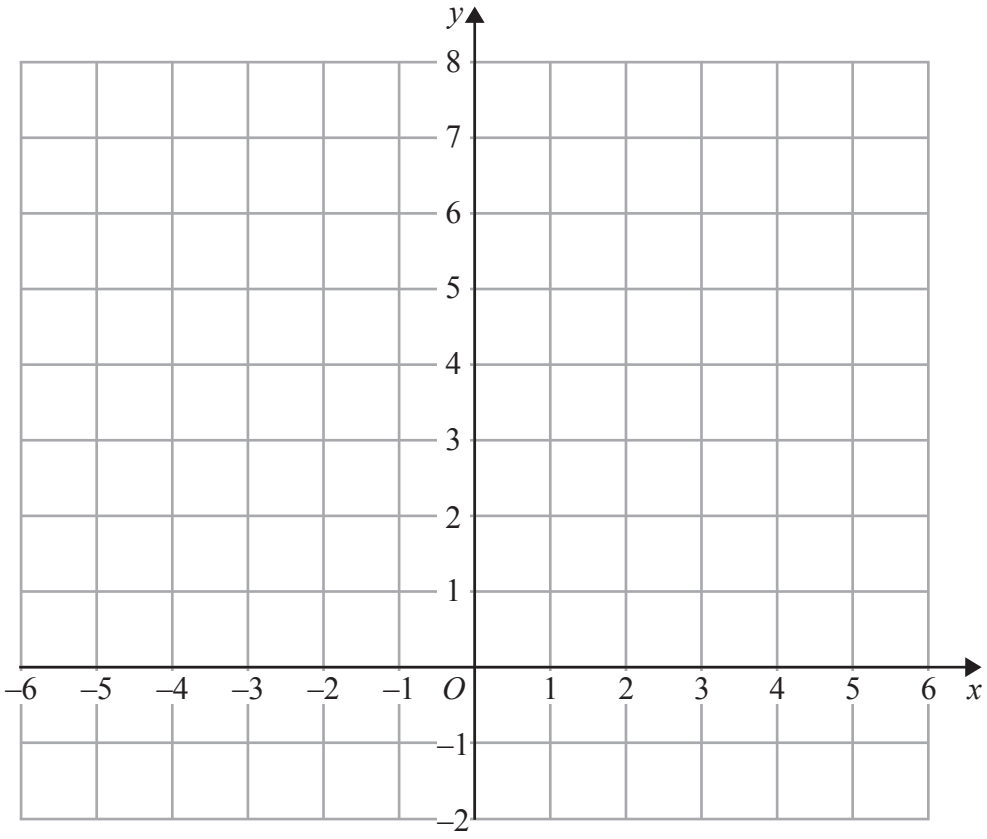


(a) On the grid below, draw the graph of $y = f(x) + 3$



(2)

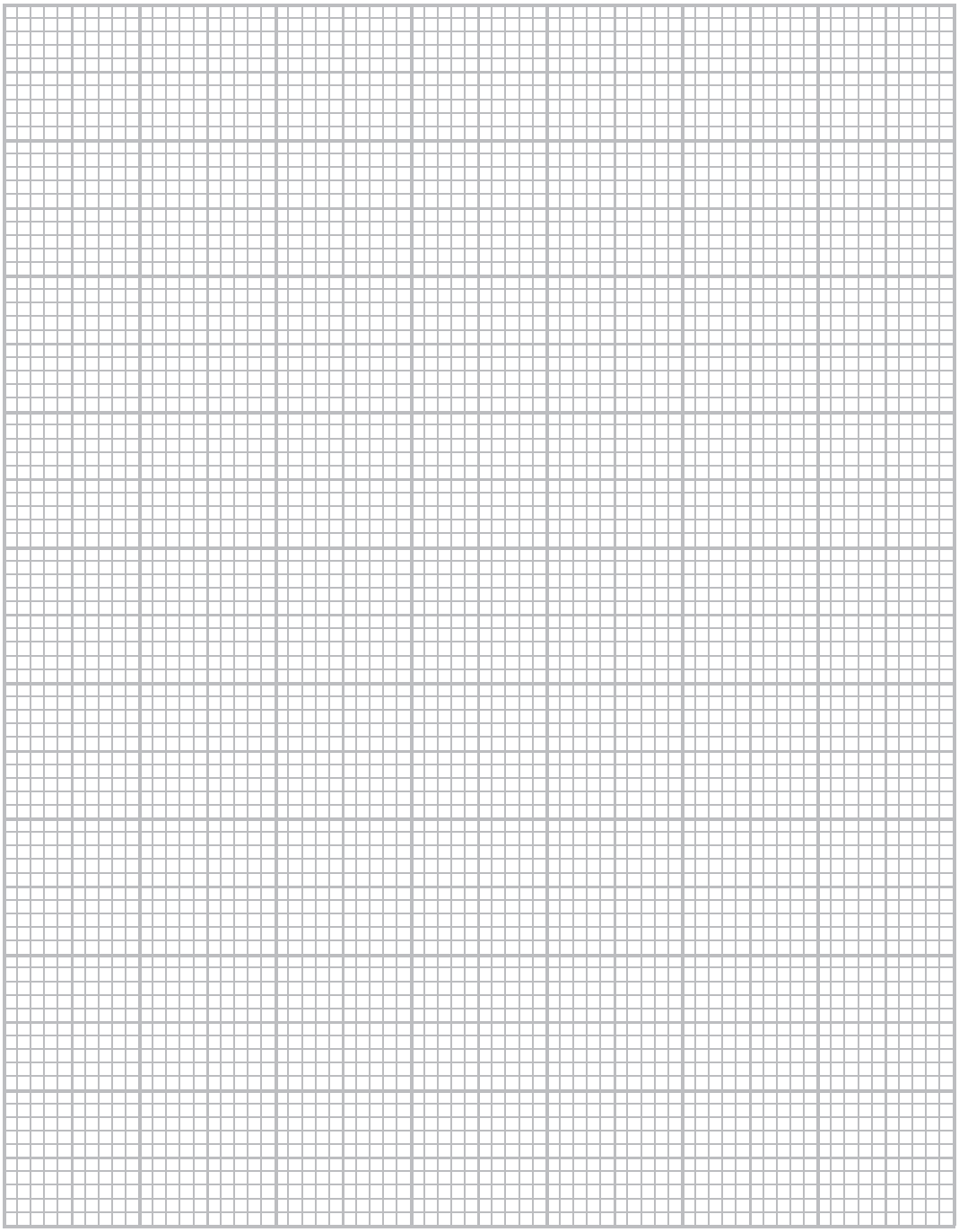
(b) On the grid below, draw the graph of $y = f(x - 2)$



(2)

(Total for Question 14 is 4 marks)

15 (a) On the grid below, draw the graph of $y = 2^{x+1}$ for values of x from -4 to 3



(4)

(b) Use your graph to find an estimate for the solution of $2^{x+1} = 12$
Give your answer to 1 decimal place.

.....

(1)

(Total for Question 15 is 5 marks)

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16 The equation $x^2 + 4x + c = 0$ has real roots.

(a) Find the range of possible values of c.

(2)

(b) Sketch the graph of $y = (x - 3)^2$

You must label the coordinates of any points at which the graph meets the coordinate axes.

(3)

(Total for Question 16 is 5 marks)

17 $x^2 + 4x + 1 = (x + p)^2 + q$ for all values of x.

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

$p =$ .....

$q =$ .....

(2)

(b) Solve the equation $2x^2 - 5x - 3 = 0$

.....

(2)

(Total for Question 17 is 4 marks)

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18 $7x^2 + 6x - 3 = 0$ is a quadratic equation.

For this quadratic equation, write down the sum of its roots and the product of its roots.

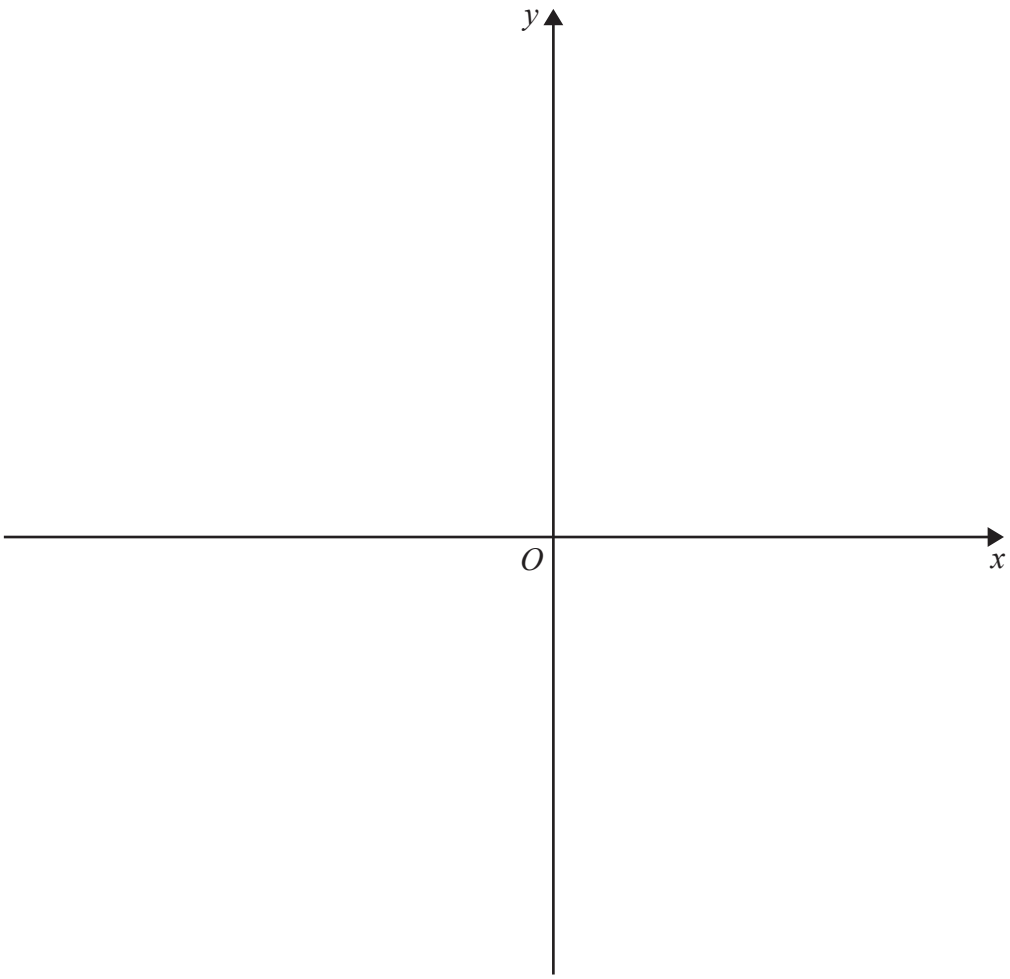
sum of roots .....

product of roots .....

(Total for Question 18 is 2 marks)

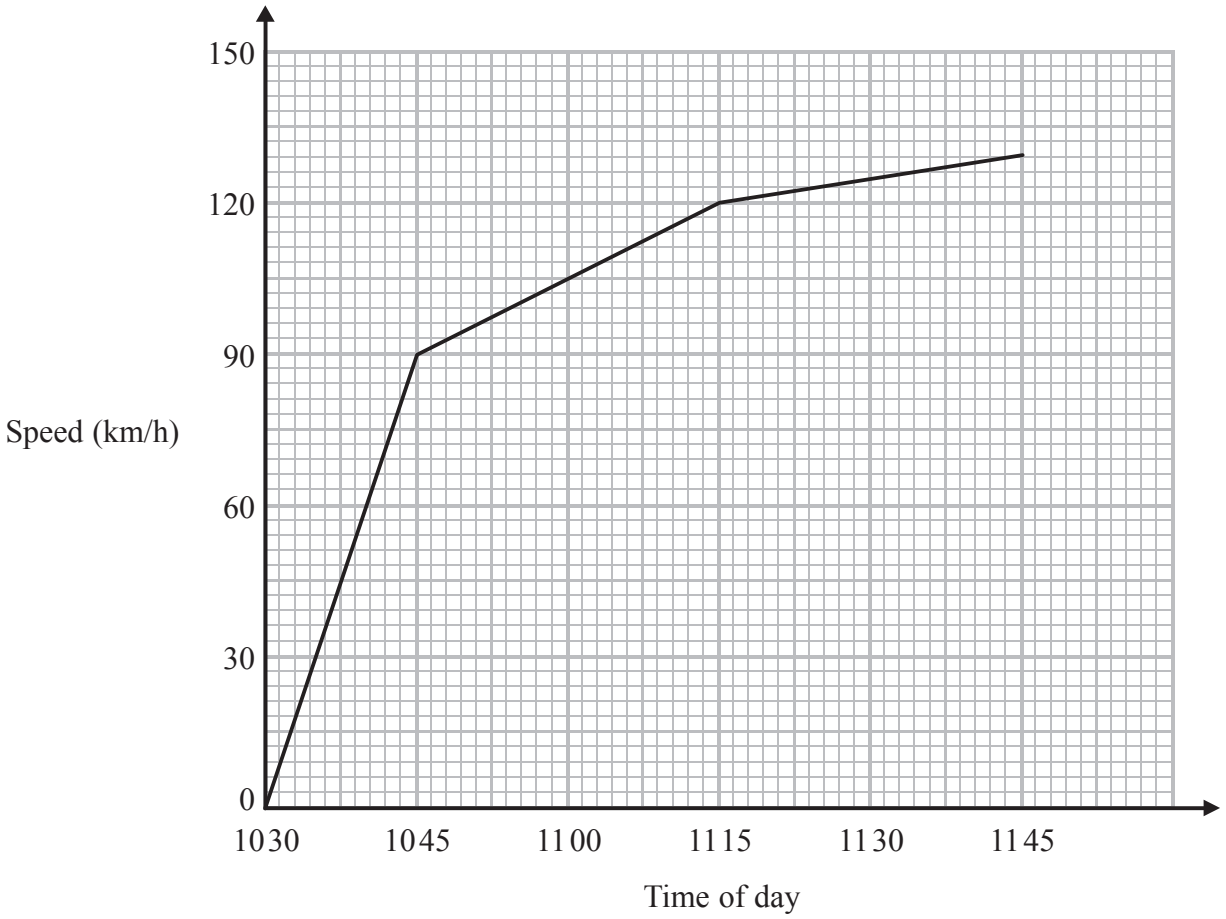
19 On the axes below, sketch the graph of $y = \dfrac{1}{x + 2}$

Show clearly any asymptotes and the coordinates of any points of intersection of the graph with the axes.



(Total for Question 19 is 4 marks)

20 Here is a speed-time graph for part of a journey.



(a) Between which two times is the acceleration greatest?

.....

(1)

(b) Calculate the acceleration, in km/h², in the first 15 minutes of the journey.

..... km/h²

(2)

(c) Work out the total distance travelled in the first 45 minutes of the journey.

..... km

(2)

(Total for Question 20 is 5 marks)

TOTAL FOR PAPER IS 90 MARKS

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