Write your name here

Surname	Other names

Pearson Edexcel Award

Centre Number	Candidate Number

Algebra

Level 3
Calculator NOT allowed

Monday 8 May 2017 – 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 8 3 7 5 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 $35x^2y^2 + 14xy$

.....

(2)

(b) Factorise $de - 3d + 3e - 9$

.....

(2)

(c) Factorise $4x^2 - 25$

.....

(1)

(Total for Question 1 is 5 marks)

2 (a) Expand and simplify $(2x - 3)(7x + 5)$

.....

(2)

(b) Write $\frac{x}{3x + 4} + \frac{x - 3}{2x - 1}$ as a single fraction.

Give your answer in its simplest form.

.....

(3)

(Total for Question 2 is 5 marks)

3 (a) Simplify $(2t^3)^4$

.....

(1)

(b) Simplify $w^2 \times w^{\frac{1}{2}}$

.....

(1)

(c) Simplify $p^{-2} \div p^{-4}$

.....

(1)

$\dfrac{3q^3 - q^{\frac{3}{2}}}{q}$ can be written in the form $q^a(3q^b - 1)$

(d) Work out the value of a and the value of b.

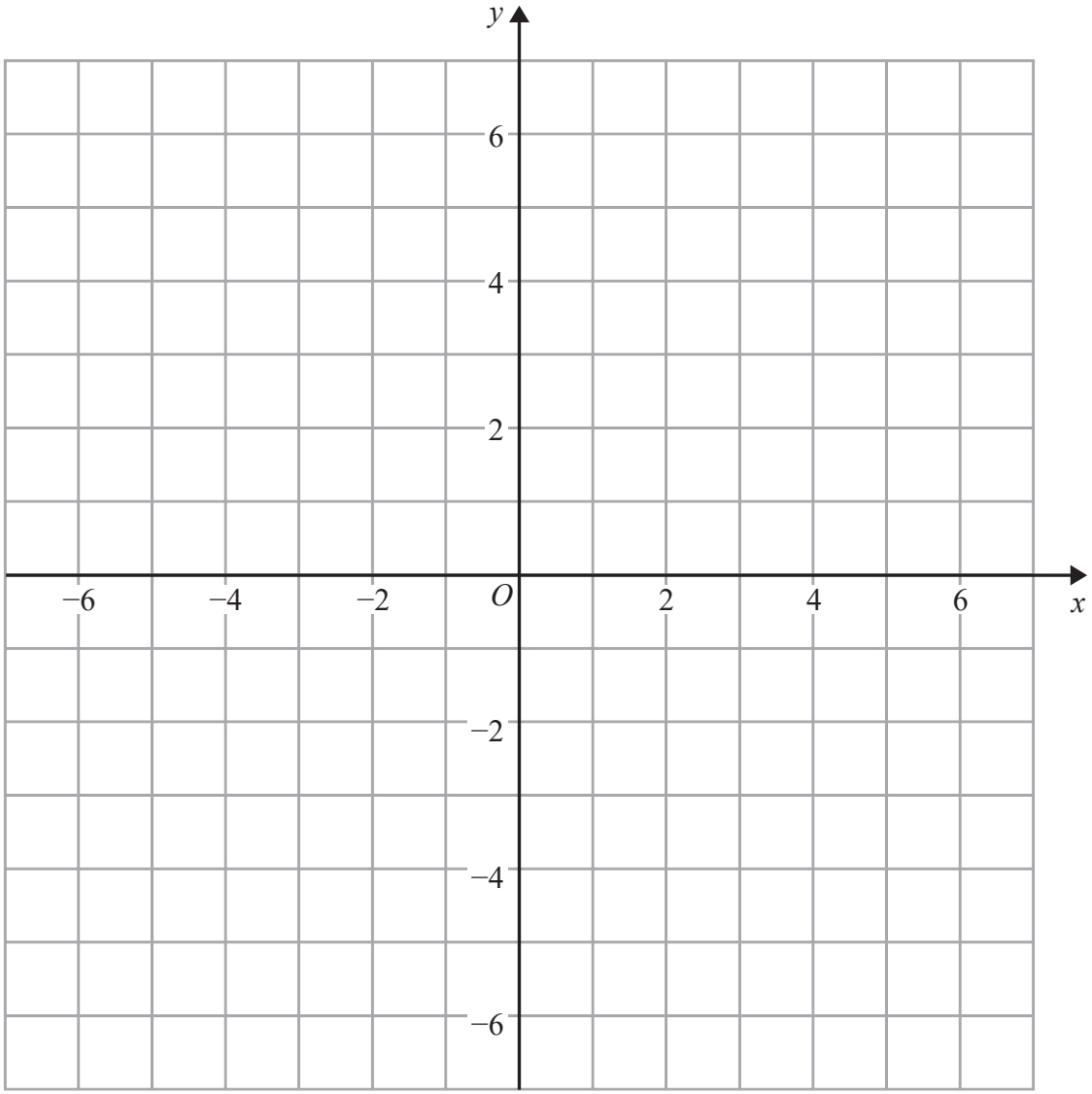
$a =$ .....

$b =$ .....

(3)

(Total for Question 3 is 6 marks)

4 On the grid of centimetre squares, construct the locus of points that are 3 cm from the point (2, 0)



(Total for Question 4 is 2 marks)

5 $h = k^3 - \frac{6m^2}{k}$

(a) Find the value of h when $k = -1$ and $m = 2$

.....

(2)

$p = \frac{a(b + c)}{2c}$

(b) Make c the subject of this formula.

.....

(3)

(Total for Question 5 is 5 marks)

6 $4x^2 + 9x - 5 = 0$ is a quadratic equation.

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

sum of roots .....

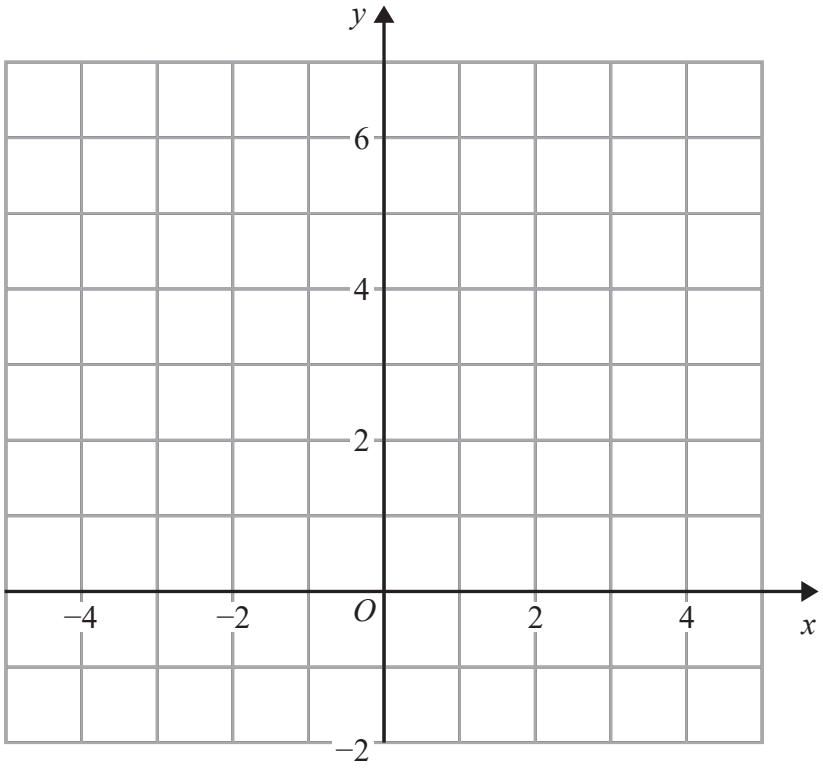
product of roots .....

(Total for Question 6 is 3 marks)

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

$$2x + y > 3 \qquad y < 5 \qquad y > x + 3$$

Label the region **R**.



(Total for Question 7 is 5 marks)

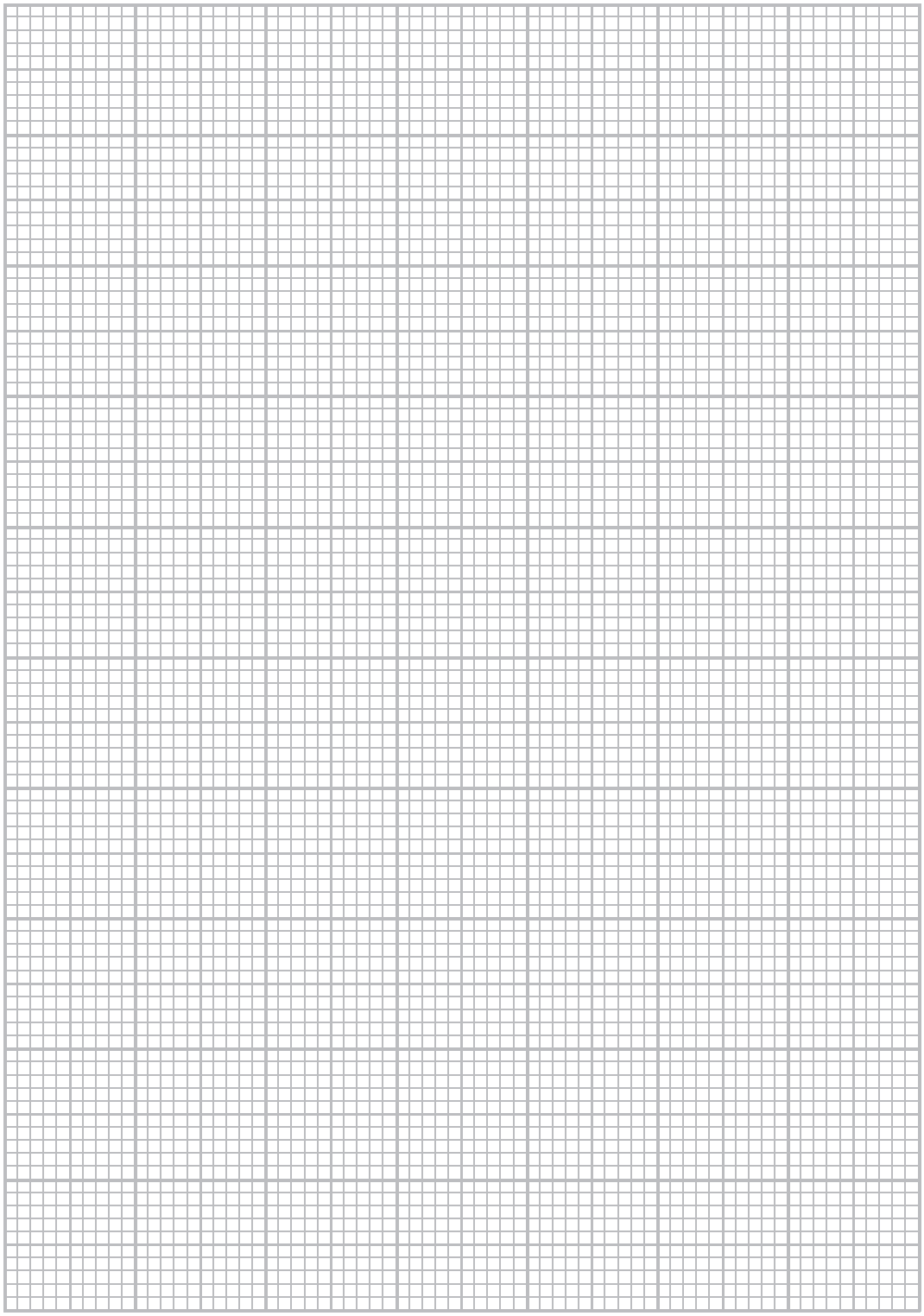
8 Solve algebraically the simultaneous equations

$$2x^2 - 2y = 15$$
$$2y + 12 + 5x = 0$$

.....

(Total for Question 8 is 5 marks)

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



(4)

(b) Use your graph to find an estimate for one of the solutions of $x^3 - 3x^2 + 1 = 0$

.....

(2)

(Total for Question 9 is 6 marks)

10 Here is an identity.

$$2x^2 + 8x - 35 = a(x + b)^2 + c \qquad \text{where } a, b \text{ and } c \text{ are integers.}$$

(a) (i) Find the values of a, b and c.

$a =$ .....

$b =$ .....

$c =$ .....

(ii) Hence solve the equation $2x^2 + 8x - 35 = 0$

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

.....

(5)

The graph of $y = 2x^2 + 8x - 35$ has a turning point at the point A.

(b) Write down the coordinates of A.

.....

(1)

(Total for Question 10 is 6 marks)

11 W is inversely proportional to the square of t.

When $t = 2$, $W = 63$

(a) Find a formula for W in terms of t.

.....

(3)

(b) Calculate the possible values of t when $W = 28$

.....

(2)

(Total for Question 11 is 5 marks)

12 The quadratic equation $ax^2 + bx + c = 0$ can be solved using the quadratic formula.

(a) State the quadratic formula for the equation $ax^2 + bx + c = 0$

.....

(1)

(b) Solve the quadratic equation for which

$$a = 3 \qquad b = -3 \qquad c = -7$$

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

.....

(2)

The quadratic equation $dx^2 + 12x + 9 = 0$ has two equal roots.

(c) Find the value of d.

.....

(2)

(Total for Question 12 is 5 marks)

13 The line **T** has equation $y - 4x = 6$

(a) Write down the gradient of a line that is perpendicular to **T**.

.....

(2)

(b) Find an equation of the line that is parallel to **T** and passes through the point $(\frac{1}{3}, 5)$

Give your answer in the form $ax + by + c = 0$ where a, b and c are integers.

.....

(3)

(Total for Question 13 is 5 marks)

14 (a) Sketch the graph of $y = (x - 2)(x + 3)$

You must label, with coordinates, the points of intersection with the axes.

(3)

(b) Solve $x^2 + x - 6 > 0$

.....

(2)

(Total for Question 14 is 5 marks)

15 Solve $\frac{5 - 2n}{9} < 3$

.....

(Total for Question 15 is 2 marks)

16 Here are the first 4 terms of an arithmetic series.

4.5 6 7.5 9

(a) Find the 25th term of this series.

.....

(2)

The nth term of a different arithmetic series is $7n - 3$

(b) Find the sum of the first 40 terms of this series.

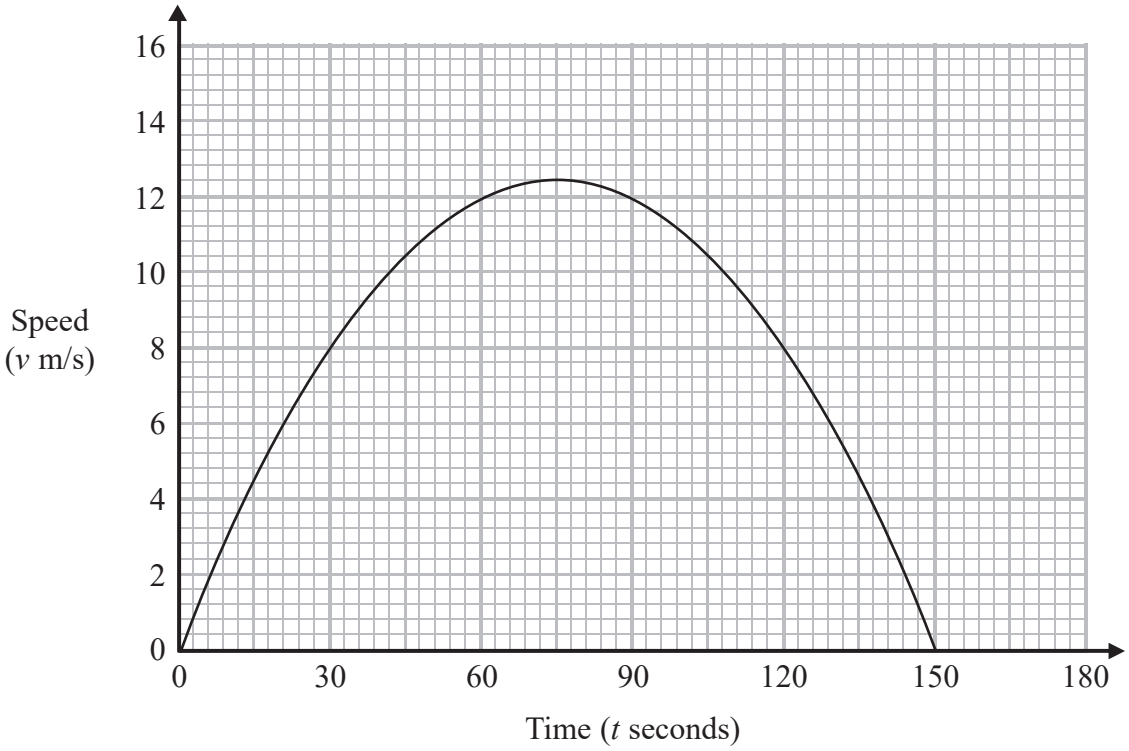
.....

(3)

(Total for Question 16 is 5 marks)

17 A car is moving so that its speed is v m/s at time t seconds after starting from rest.

Here is the speed-time graph for the car.



(a) Find the speed of the car when $t = 99$

..... m/s

(1)

Sophia draws a tangent to the curve at the point where $t = 50$

(b) What does the gradient of this tangent represent?

.....

(1)

(c) Use the trapezium rule to find an estimate of the area of the region under the curve and between $t = 30$, $t = 120$ and the time axis.
Use 3 strips of equal width.

.....

(3)

(d) What does this area represent?

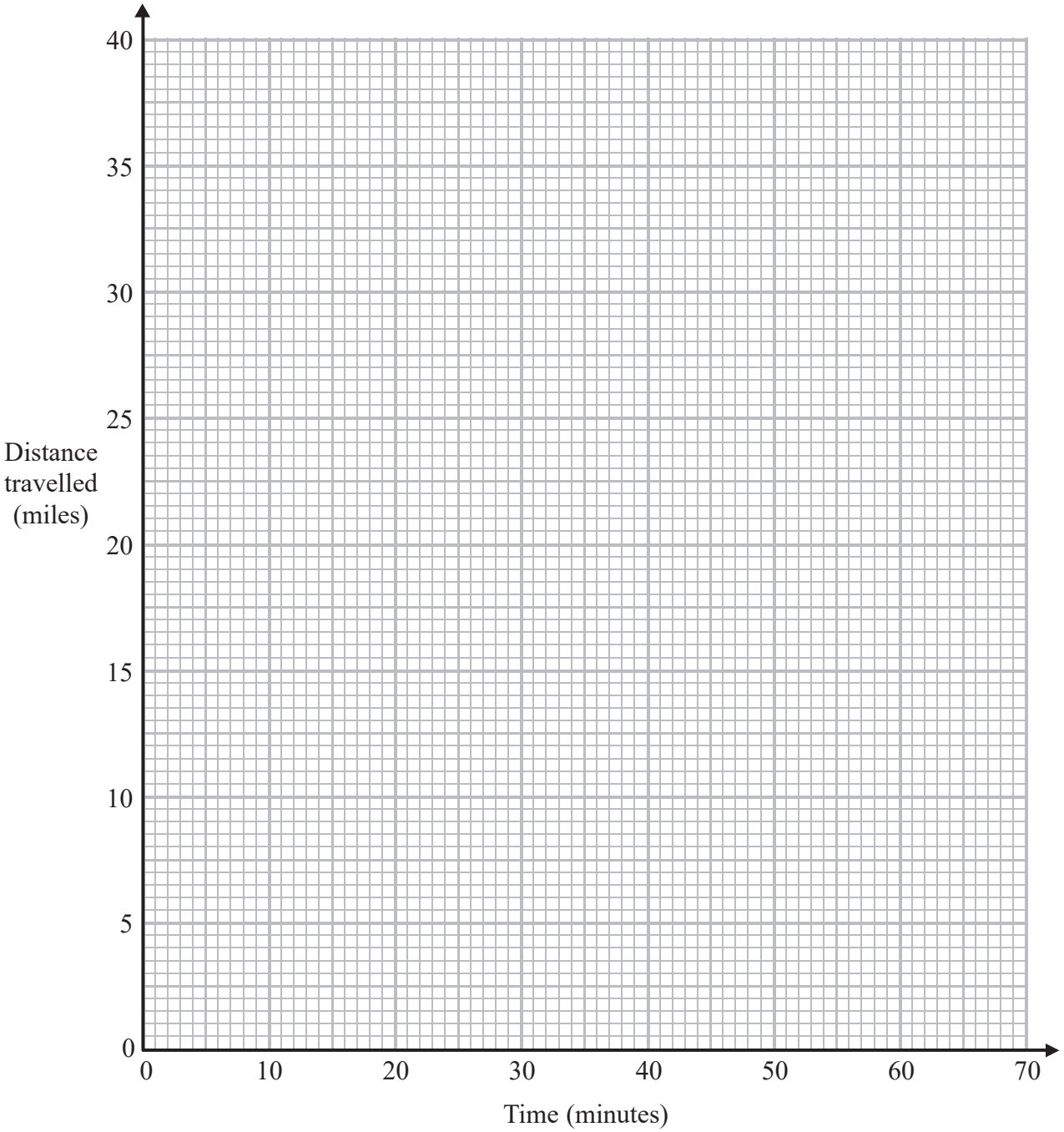
.....

(1)

(Total for Question 17 is 6 marks)

18 A train travels at a constant speed of 40 mph for 30 minutes.
It then travels at a constant speed of 30 mph for a further 20 minutes.

On the grid below, draw a distance-time graph for the train's journey.



(Total for Question 18 is 2 marks)

19 Rationalise the denominator of $\frac{4}{3-\sqrt{5}}$

Give your answer in its simplest form.

.....

(Total for Question 19 is 3 marks)

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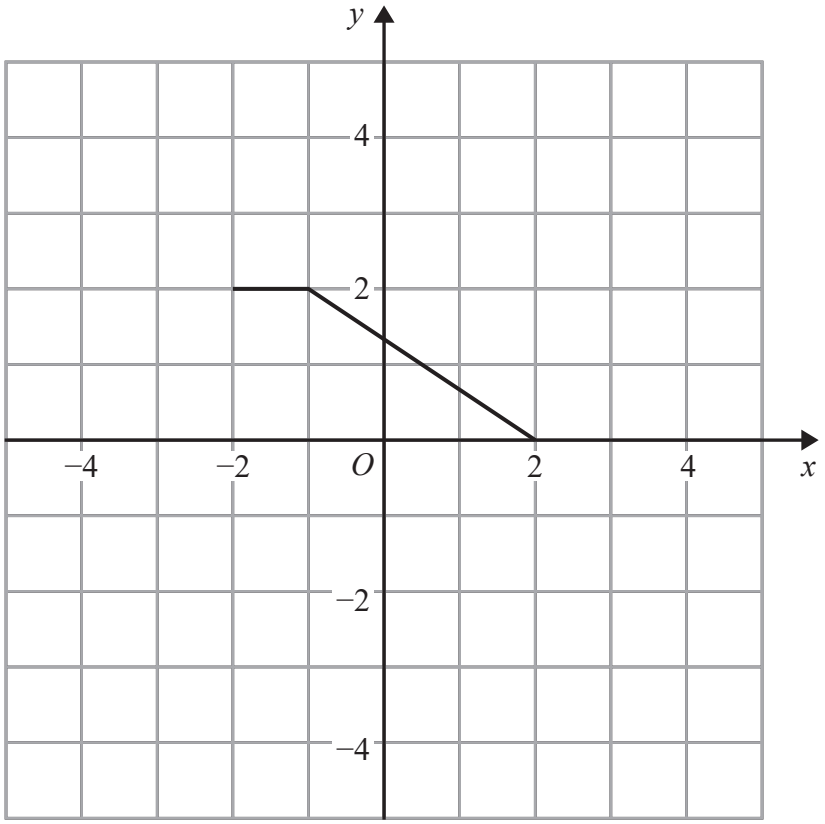
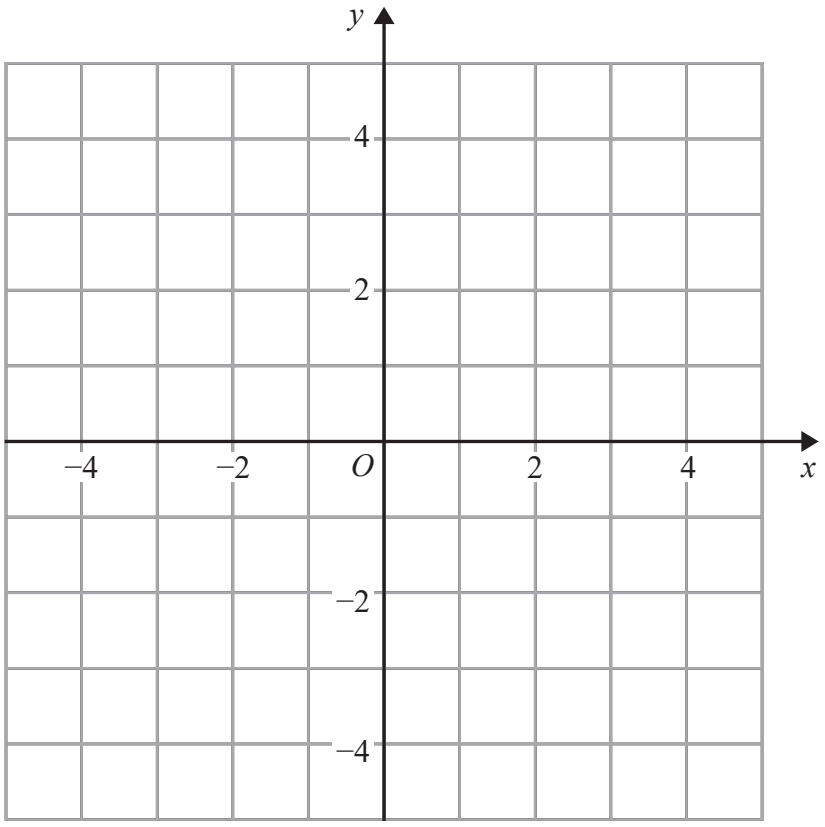
20 Here is the graph of $y = f(x)$

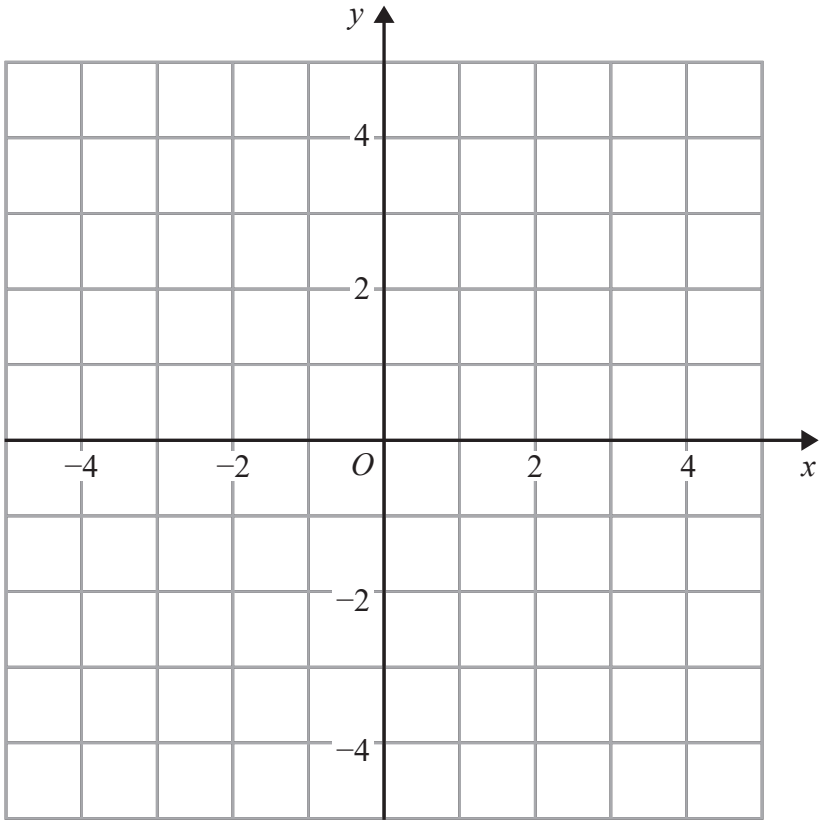


(a) On the grid below, sketch the graph of $y = f(x) - 3$



(2)

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



(2)

(Total for Question 20 is 4 marks)

TOTAL FOR PAPER IS 90 MARKS

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