

Write your name here

Surname

Other names

Pearson
Edexcel Award

Centre Number

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Candidate Number

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Algebra
Level 3
Calculator NOT allowed

Monday 11 May 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

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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.

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Turn over ►

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) Factorise $24x^2y^2 + 12xy$

.....
(2)

(b) Factorise $ef - 4e + 3f - 12$

.....
(2)

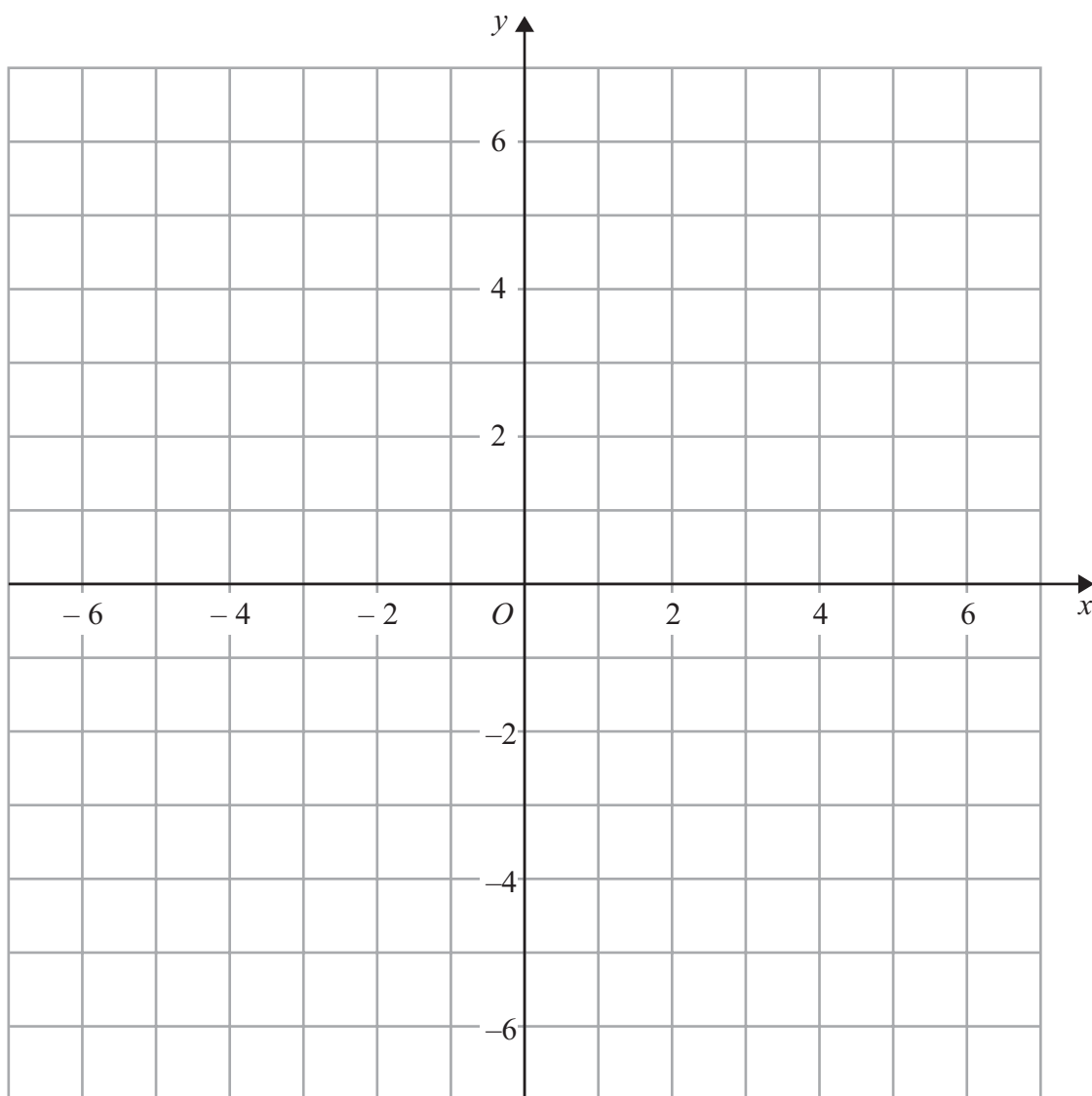
(c) Factorise $x^2 - 16$

.....
(1)

(Total for Question 1 is 5 marks)



- 2 On the grid of centimetre squares, construct the locus of points that are 5 cm from the point (0,1).



(Total for Question 2 is 2 marks)



3 T is proportional to the square of v .

When $v = 3$, $T = 117$

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

.....
(3)

(b) Calculate the possible values of v when $T = 52$

.....
(3)

(Total for Question 3 is 6 marks)



4 $w = \frac{3x + 2}{2x}$

(a) Make x the subject of the formula.

.....
(3)

$$k = \frac{(2x - 7)^2}{x}$$

(b) Work out the value of k when $x = \frac{1}{2}$

.....
(2)

(Total for Question 4 is 5 marks)



5 A graph has the equation $y = \frac{1}{x+3}$

(a) Find the coordinates of the point where the graph of $y = \frac{1}{x+3}$ intersects the y -axis.

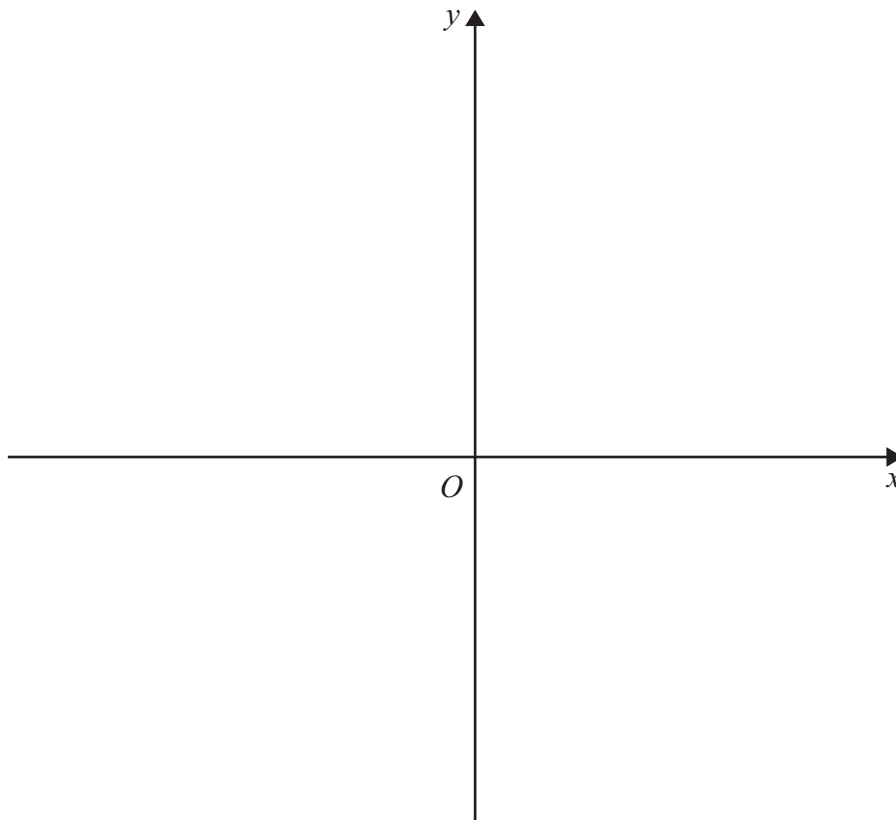
.....
(1)

The graph of $y = \frac{1}{x+3}$ has two asymptotes.

(b) Write down the equation of each asymptote.

.....
.....
(2)

(c) Sketch the graph of $y = \frac{1}{x+3}$



(2)

(Total for Question 5 is 5 marks)



6 (a) Use the quadratic formula to solve $x^2 - 6x + 6 = 0$

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

.....
(3)

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

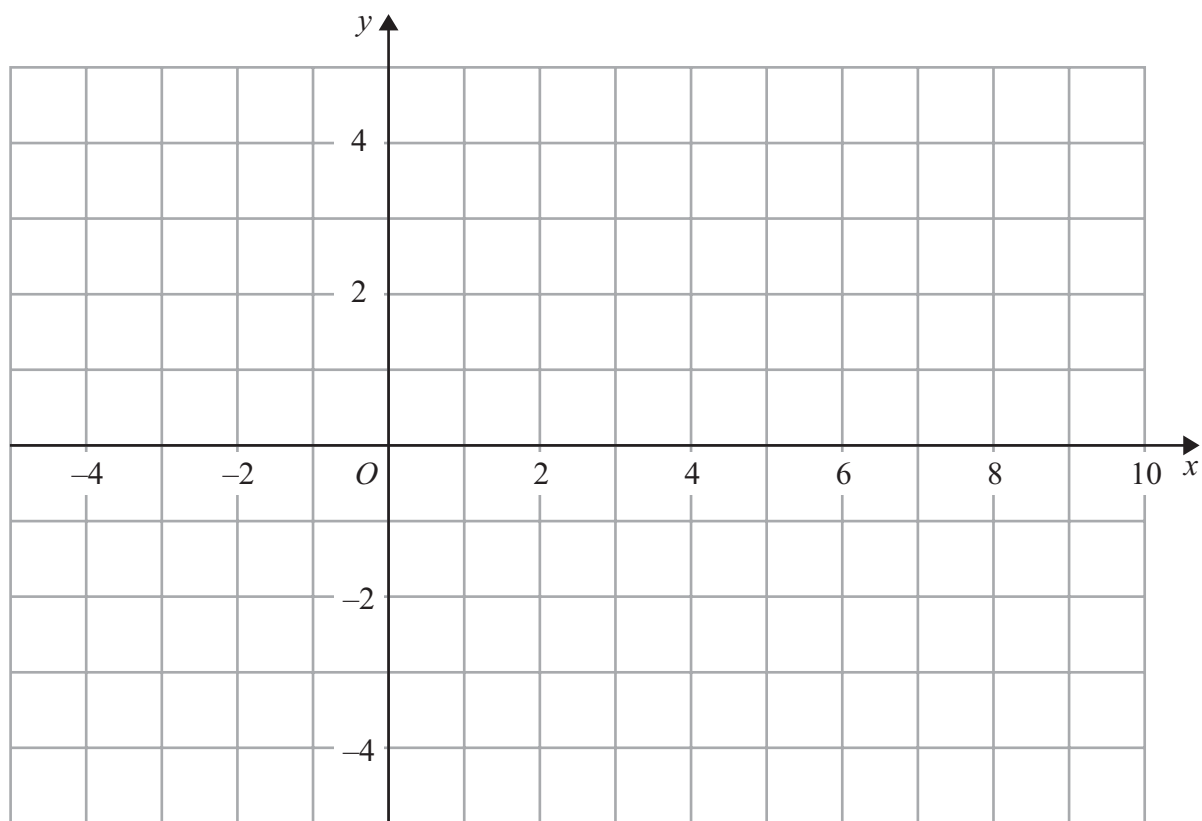
.....
(2)

(Total for Question 6 is 5 marks)



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

$$x + y < 3 \quad y > -2 \quad y < 2x - 2$$



(Total for Question 7 is 5 marks)



8 Solve algebraically the simultaneous equations

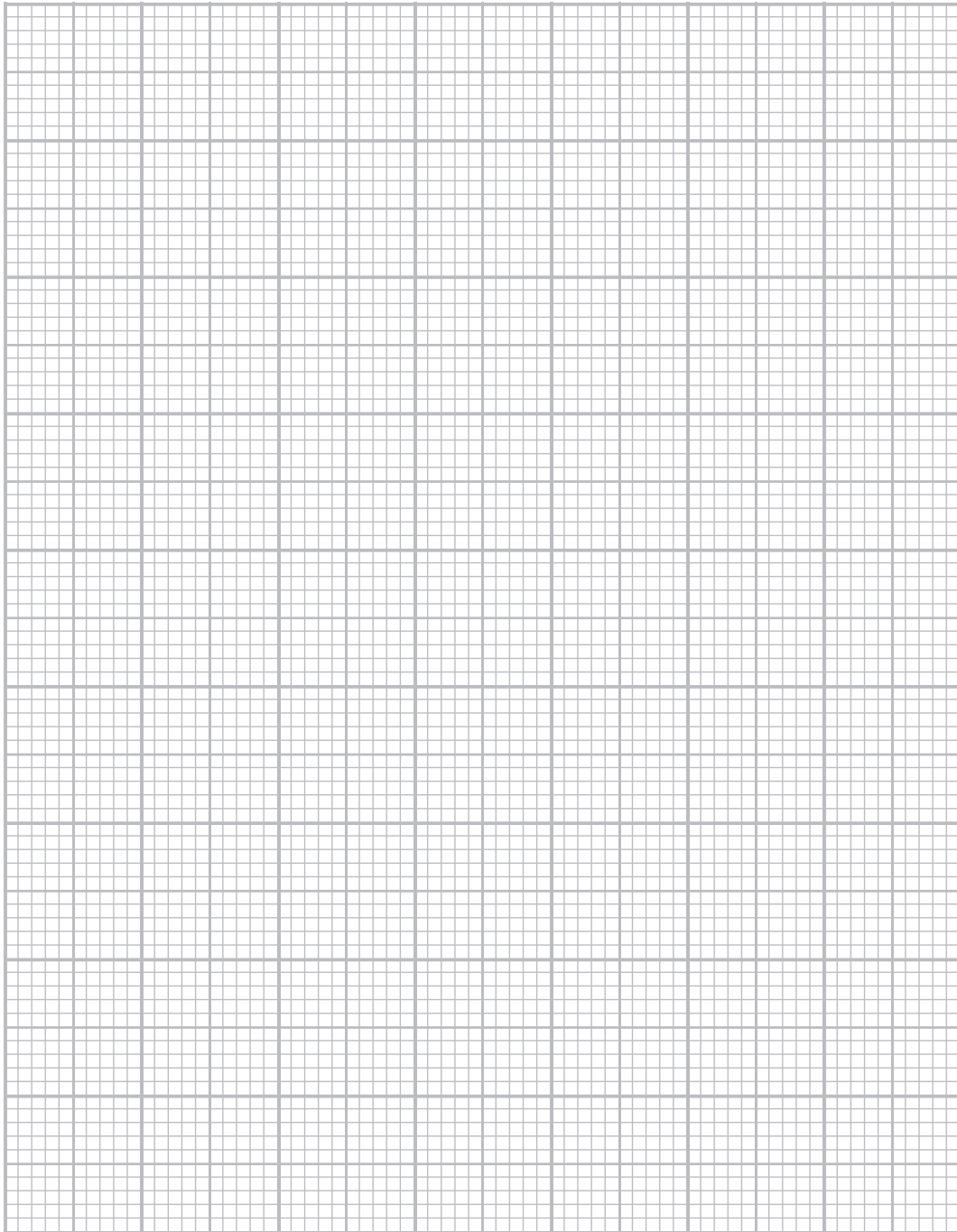
$$2x^2 + 3y = -1$$

$$y + 2x = 1$$

(Total for Question 8 is 5 marks)



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



(4)



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

.....
(2)

(Total for Question 9 is 6 marks)

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

.....
(2)

(b) Simplify $(x^{-3})^3$

.....
(1)

(c) Simplify $(4y^4)^{\frac{1}{2}}$

.....
(1)

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

Give your answer in its simplest form.

.....
(3)

(Total for Question 10 is 7 marks)



11 The first term of an arithmetic series is 7
The common difference is 4

(a) Find the 60th term of this series.

.....
(2)

The first term of a different arithmetic series is 3
The sum of the first 30 terms of this series is -780

(b) Work out the common difference of this series.

.....
(3)

(Total for Question 11 is 5 marks)



12 (a) (i) Write the quadratic expression $x^2 + 6x + 7$ in the form $(x + a)^2 + b$ where a and b are integers.

.....
(ii) Hence solve the equation $x^2 + 6x + 7 = 0$
Give your answer in the form $p \pm \sqrt{q}$ where p and q are integers.

.....
(4)

(b) Sketch the graph of $y = x^2 + 6x + 7$
You must label, with coordinates, the points of intersection with the axes and any turning points.

(3)

(Total for Question 12 is 7 marks)



13 Find the value of a such that the equation $ax^2 + 12x = -9$ has two equal roots.

.....
(Total for Question 13 is 2 marks)

14 The line L has equation $7y - 2x = 6$

(a) Find the gradient of any line that is parallel to L .

.....
(2)

(b) Find an equation of the line that is perpendicular to L and passes through the point $(4, -2)$.

Give your answer in the form $y = mx + c$.

.....
(3)

(Total for Question 14 is 5 marks)



15 $3x^2 + 7x - 6 = 0$ is a quadratic equation.

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

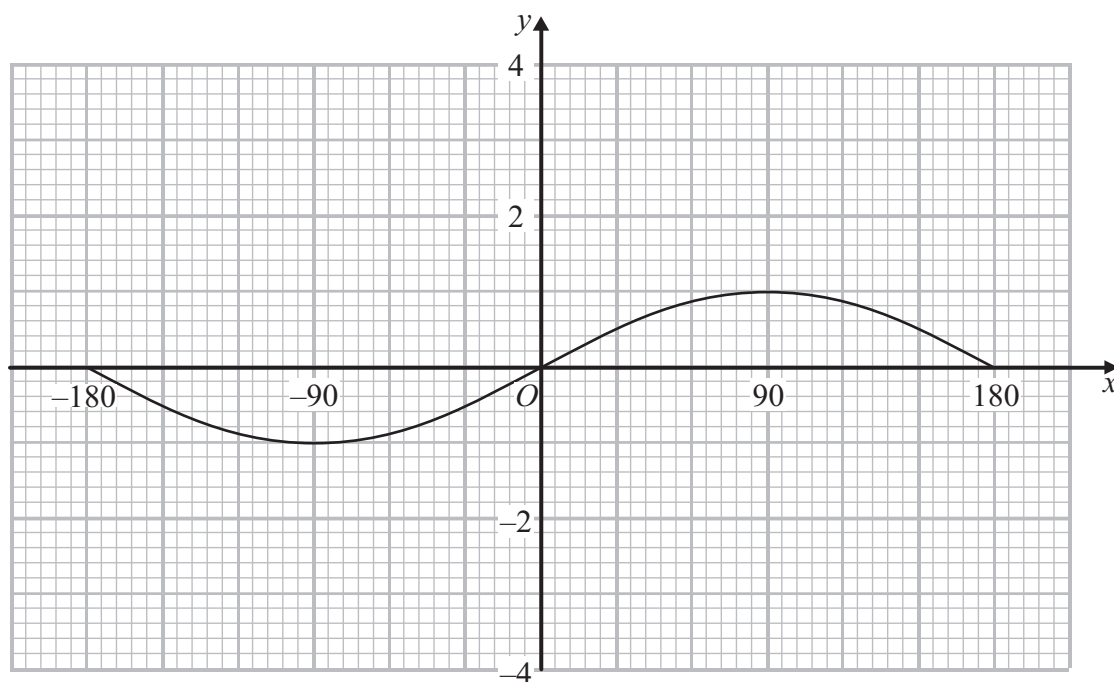
sum of roots

product of roots

(Total for Question 15 is 3 marks)



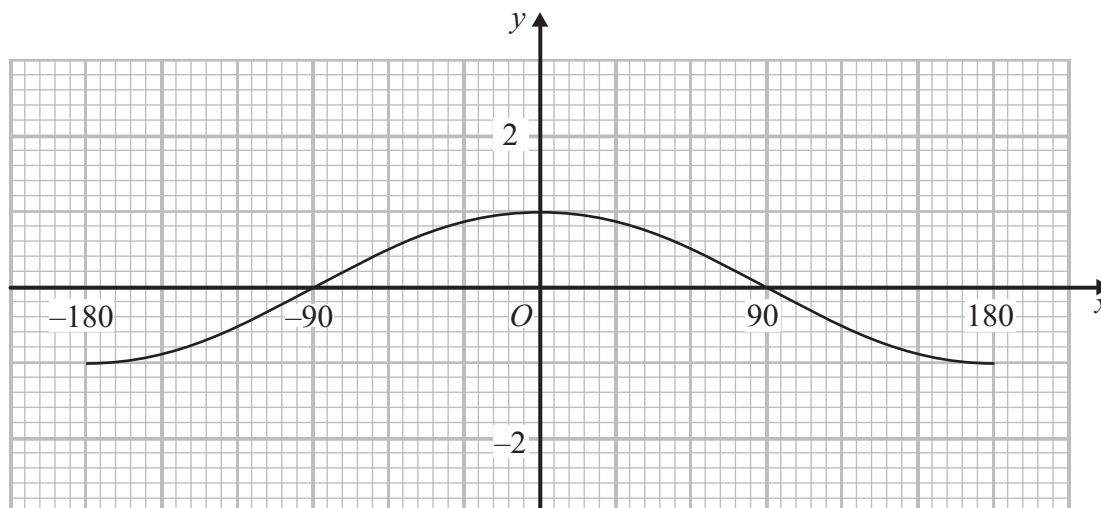
16 Here is the graph of $y = \sin x^\circ$ for $-180 \leq x \leq 180$



(a) On the grid above, sketch the graph of $y = 3\sin x^\circ$ for $-180 \leq x \leq 180$

(2)

Here is the graph of $y = \cos x^\circ$ for $-180 \leq x \leq 180$



(b) On the grid above, sketch the graph of $y = \cos 2x^\circ$ for $-180 \leq x \leq 180$

(2)

(Total for Question 16 is 4 marks)



17 (a) Simplify $\sqrt{3}\left(2\sqrt{3} + \frac{1}{\sqrt{3}}\right)$

.....
(2)

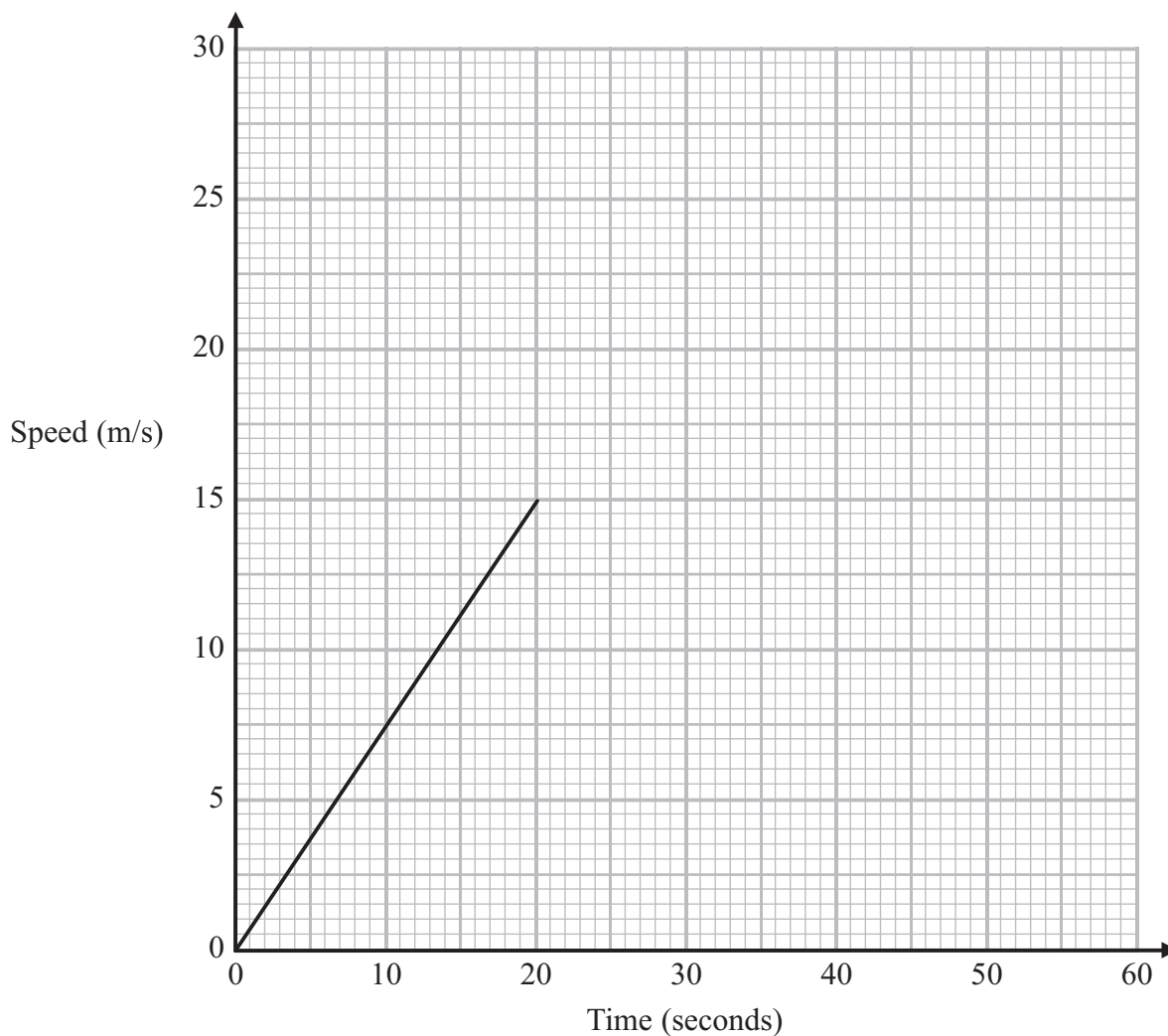
(b) Rationalise the denominator of $\frac{15}{5 - \sqrt{7}}$
Give your answer in its simplest form.

.....
(3)

(Total for Question 17 is 5 marks)



18 Here is part of a speed-time graph for a cart.



(a) Work out the acceleration of the cart during the first 20 seconds.

..... m/s^2
(2)

When the cart has reached a speed of 15 m/s, it moves at this constant speed for 15 seconds.

(b) Show this information on the graph.

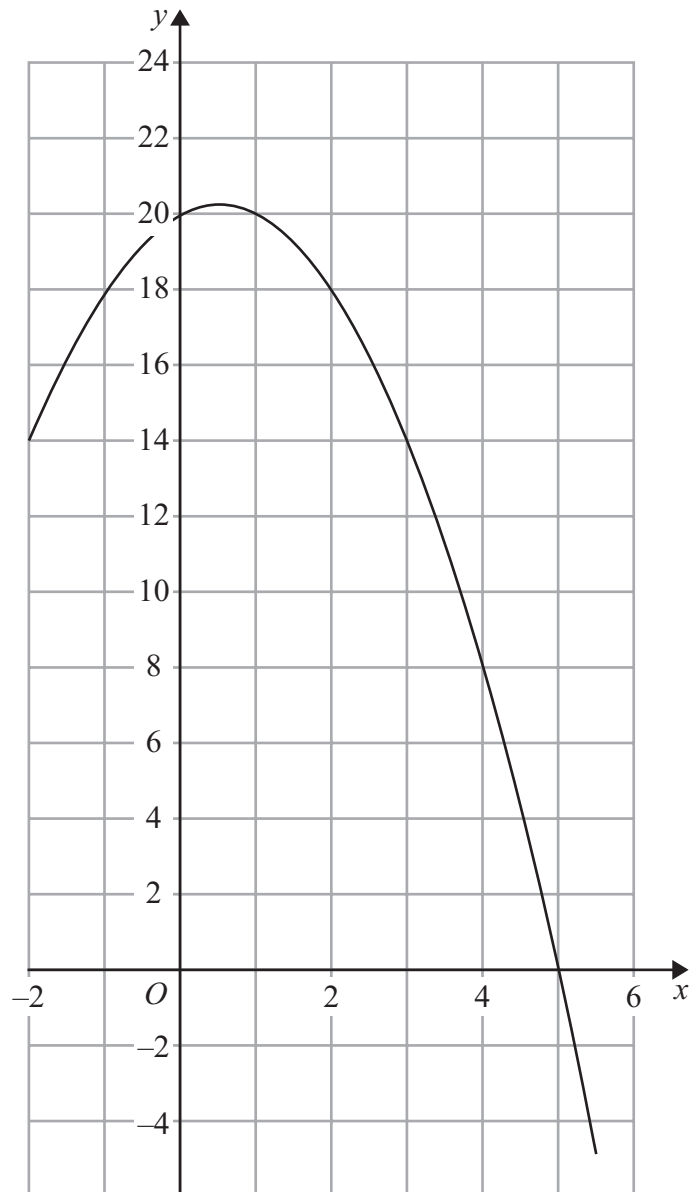
(1)

(c) Work out the total distance travelled by the cart in the first 10 seconds.

..... m
(2)

(Total for Question 18 is 5 marks)





Use the trapezium rule to find an estimate of the area of the region under the curve and between $x = 1$, $y = 0$ and $x = 5$

Use 4 strips of equal width.

(Total for Question 19 is 3 marks)

TOTAL FOR PAPER IS 90 MARKS



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