

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Centre Number

Candidate Number

Pearson Edexcel Award

Time 2 hours

Paper
reference

AAL30/01

Algebra

Level 3

Calculator NOT allowed

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

Turn over ►

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Q:1/1/1/1/1/1/



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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) Expand and simplify $(y + 3)(2y - 3)$

.....
(2)

(b) Expand and simplify $(2 + 5x)^2$

.....
(2)

(c) Simplify $(8r^{12})^{\frac{1}{3}}$

.....
(2)

(d) Simplify $t^{-2} \times t^{-\frac{3}{4}}$

.....
(1)

(Total for Question 1 is 7 marks)

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2 Make x the subject of $w = \frac{3x^2 + 2}{x^2 + 1}$

.....
(Total for Question 2 is 3 marks)

3 Use the quadratic formula to solve the equation $3x^2 - 2x = 6$

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

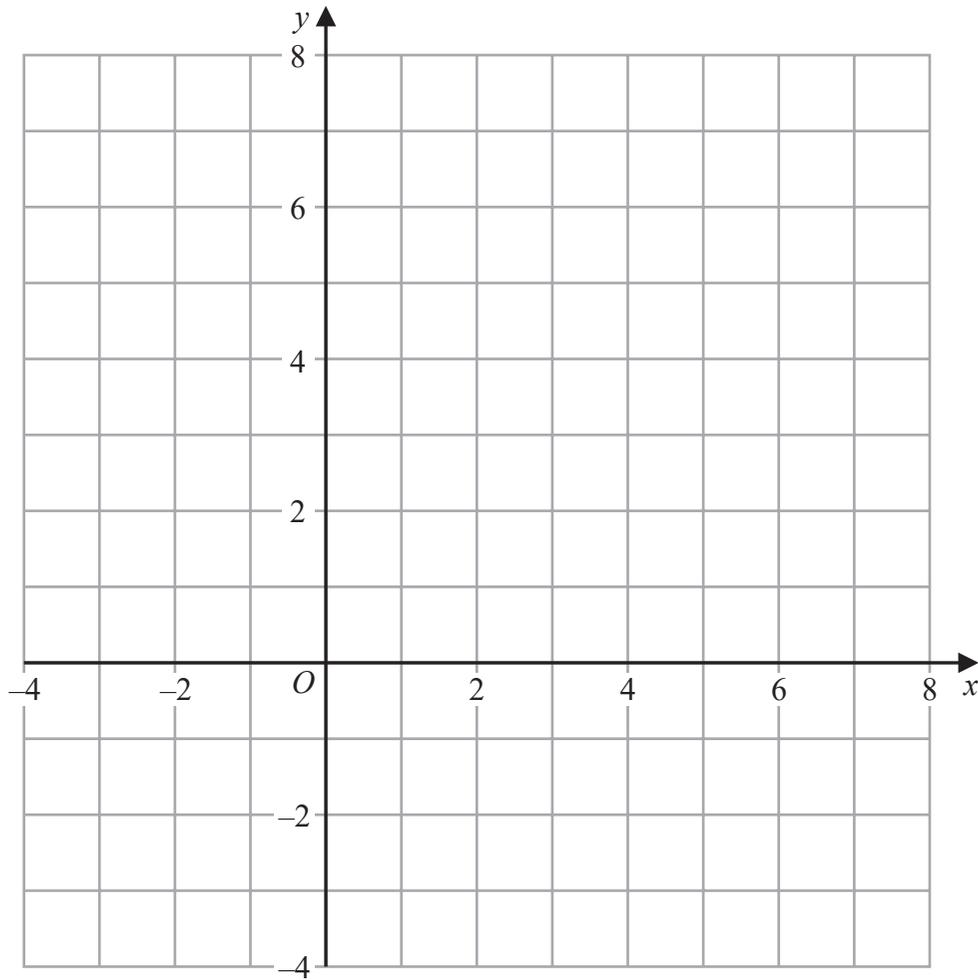
.....
(Total for Question 3 is 2 marks)



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

$$x > -2 \quad y > 1 \quad 2x + 3y < 6 \quad y < x + 4$$

Label the region **R**.

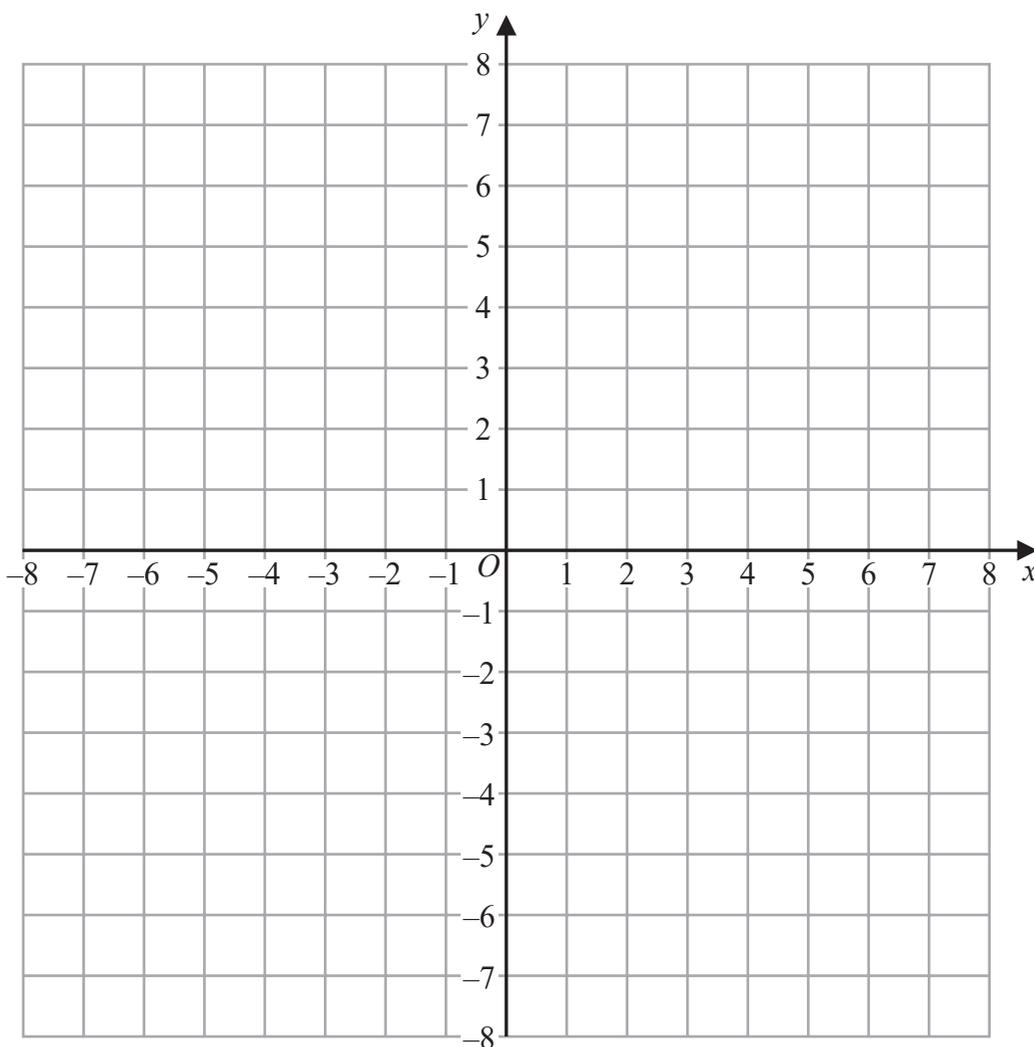


(Total for Question 4 is 5 marks)

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5 (a) On the grid, construct the graph of $x^2 + y^2 = 49$



(2)

Given that $a > 0$, the point A with coordinates $(0, a)$ lies on the graph of $x^2 + y^2 = 49$

(b) Draw a tangent to this graph at A .

(1)

(Total for Question 5 is 3 marks)

6 (a) Solve $7 - 2y < 3y - 8$

.....
(2)

(b) (i) Factorise $x^2 + x - 6$

.....
(1)

(ii) Hence solve $x^2 + x - 6 < 0$

.....
(2)

(Total for Question 6 is 5 marks)

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7 (a) Find an equation of the straight line which passes through the origin and is parallel to the straight line with equation $3x = 4y + 7$

.....
(1)

(b) Find the gradient of a line perpendicular to the line with equation $2x = 5y + 8$

.....
(2)

(Total for Question 7 is 3 marks)

8 Here is a quadratic equation.

$$9x^2 - 12x + 4 = 0$$

Use the discriminant to determine whether the equation has

- 2 real and different roots
- or** 2 real and equal roots
- or** no real roots.

.....
(Total for Question 8 is 2 marks)



9 (a) Factorise $6x^2y^2 - 9x^3y$

.....
(2)

(b) Factorise $p^4 - p^2q^2$

.....
(2)

(Total for Question 9 is 4 marks)

10 $x^2 + 6x + 13$ can be written in the form $(x + a)^2 + b$

(a) Find the value of a and the value of b .

$a =$

$b =$

(2)

The curve with equation $y = x^2 + 6x + 13$ has a turning point at the point A .

(b) Write down the coordinates of A .

.....
(1)

(Total for Question 10 is 3 marks)

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

- (a) Find an expression, in terms of n , for the n th term of the series.
Give your answer in its simplest form.

.....
(2)

The p th term of the series is 102

- (b) Work out the value of p .

.....
(1)

- (c) Find the sum of the first 100 terms of this series.

.....
(2)

(Total for Question 11 is 5 marks)



12 The average speed, v km/h, for a journey of a given distance is inversely proportional to the time, t hours, taken to complete the journey.

When $v = 60$, $t = 4$

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

(3)

(b) Calculate the value of t when $v = 80$

(2)

(c) Using the axes below, sketch the graph of v against t .



(1)

(Total for Question 12 is 6 marks)

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13 Here is a quadratic equation.

$$6x^2 + 5x - 12 = 0$$

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

.....
(1)

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

.....
(1)

(Total for Question 13 is 2 marks)

14 $V = \frac{f(wh - 3)}{3} + f$

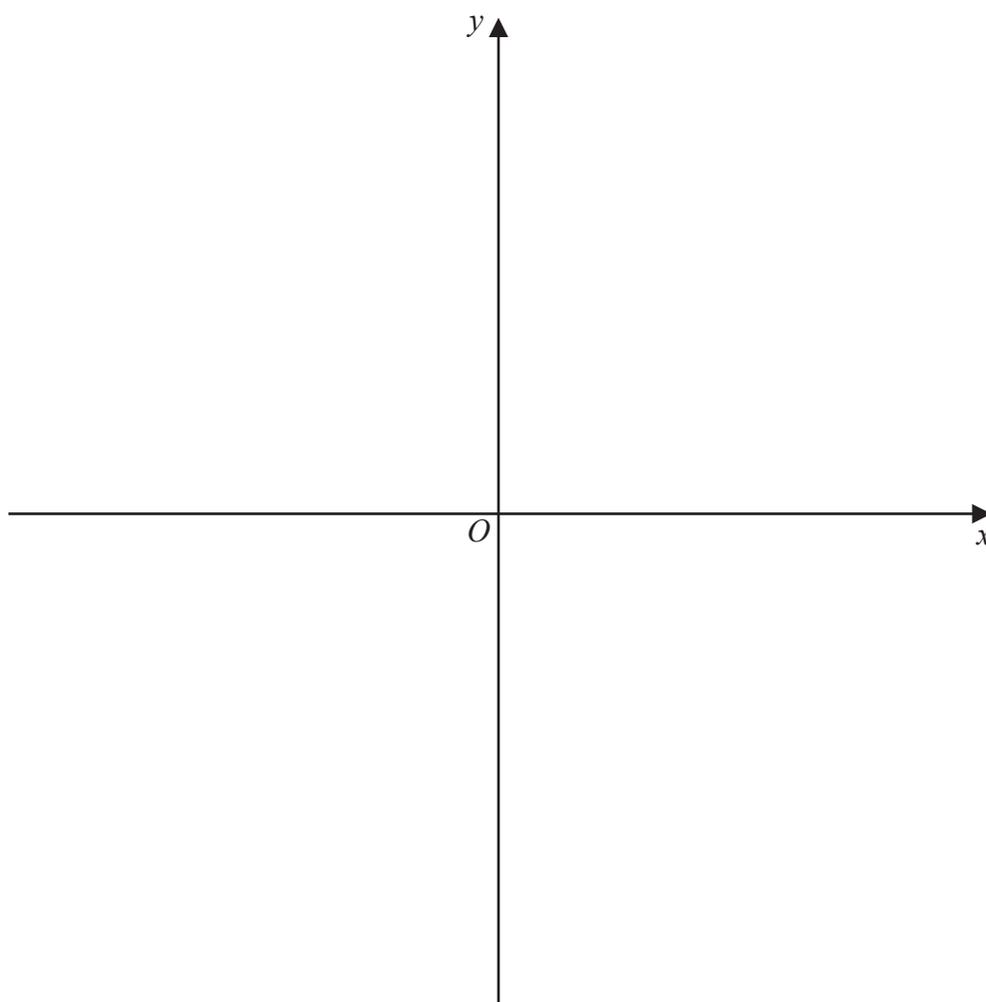
Work out the value of h when $V = 20$, $f = 12$ and $w = \frac{f}{2}$

.....
(Total for Question 14 is 3 marks)



15 Using the axes below, sketch the graph $y = \frac{1}{x - 2}$

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



(Total for Question 15 is 4 marks)

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16 Solve the simultaneous equations

$$y = 3x^2 + 6x - 1$$
$$y - 1 = x$$

.....
(Total for Question 16 is 4 marks)



17 (a) Expand and simplify $(3 + \sqrt{12})(5 - 3\sqrt{3})$

.....
(3)

(b) Rationalise the denominator of $\frac{2 - \sqrt{13}}{1 - \sqrt{13}}$

Give your answer in the form $\frac{p - \sqrt{13}}{q}$ where p and q are integers.

.....
(3)

(Total for Question 17 is 6 marks)

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18 The straight line **L** passes through the points *A* and *B*.

The coordinates of *A* are (3, -8)

The coordinates of *B* are (-1, 7)

Find an equation for **L**

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

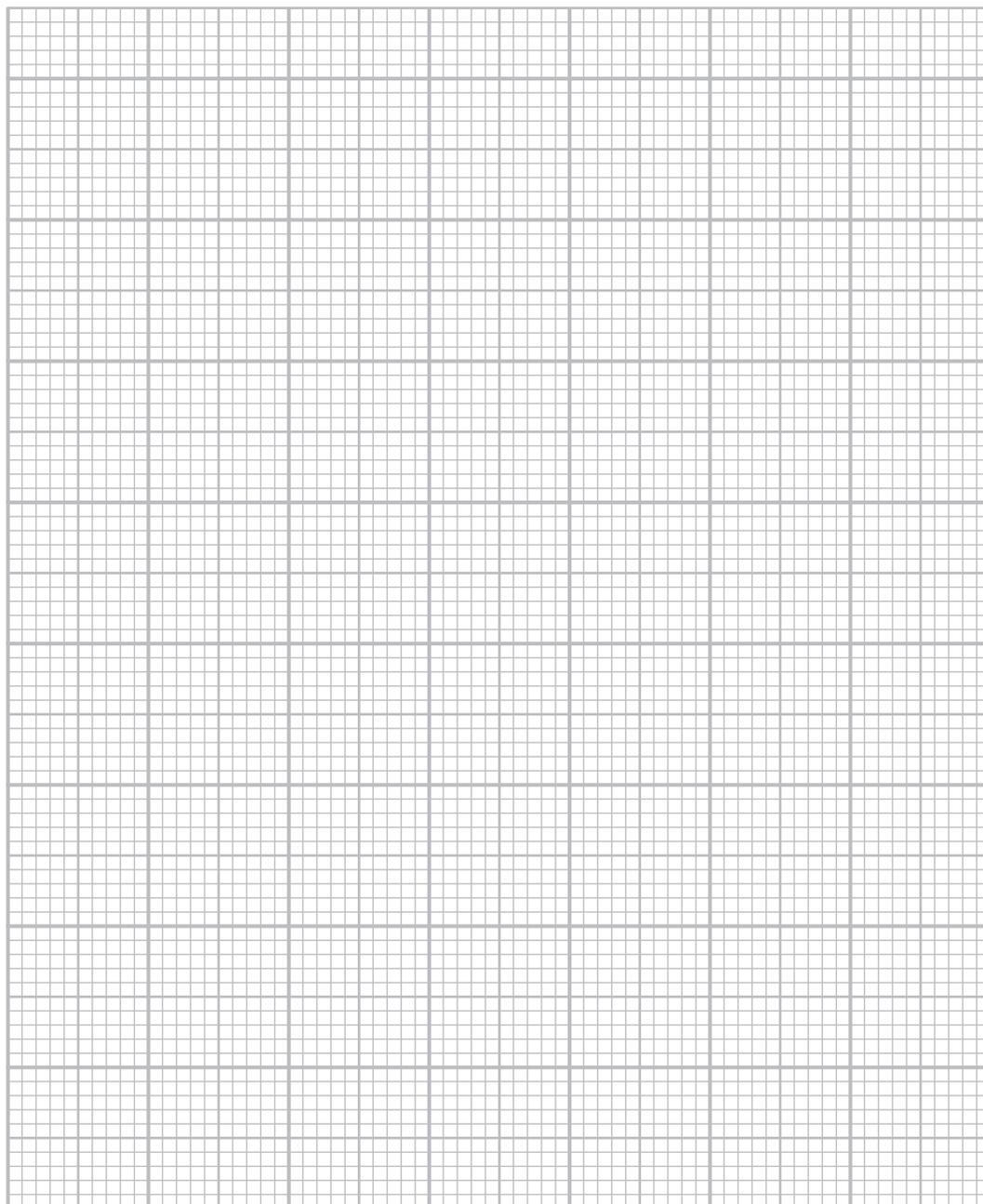
.....
(Total for Question 18 is 3 marks)



19 The table shows the values of $y = 2^{x-1}$ for integer values of x from -2 to 4

x	-2	-1	0	1	2	3	4
y	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	1	2	4	8

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



(2)

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(b) Use your graph to find an estimate, to one decimal place, for the solution of $2^x = 12$

.....
(2)

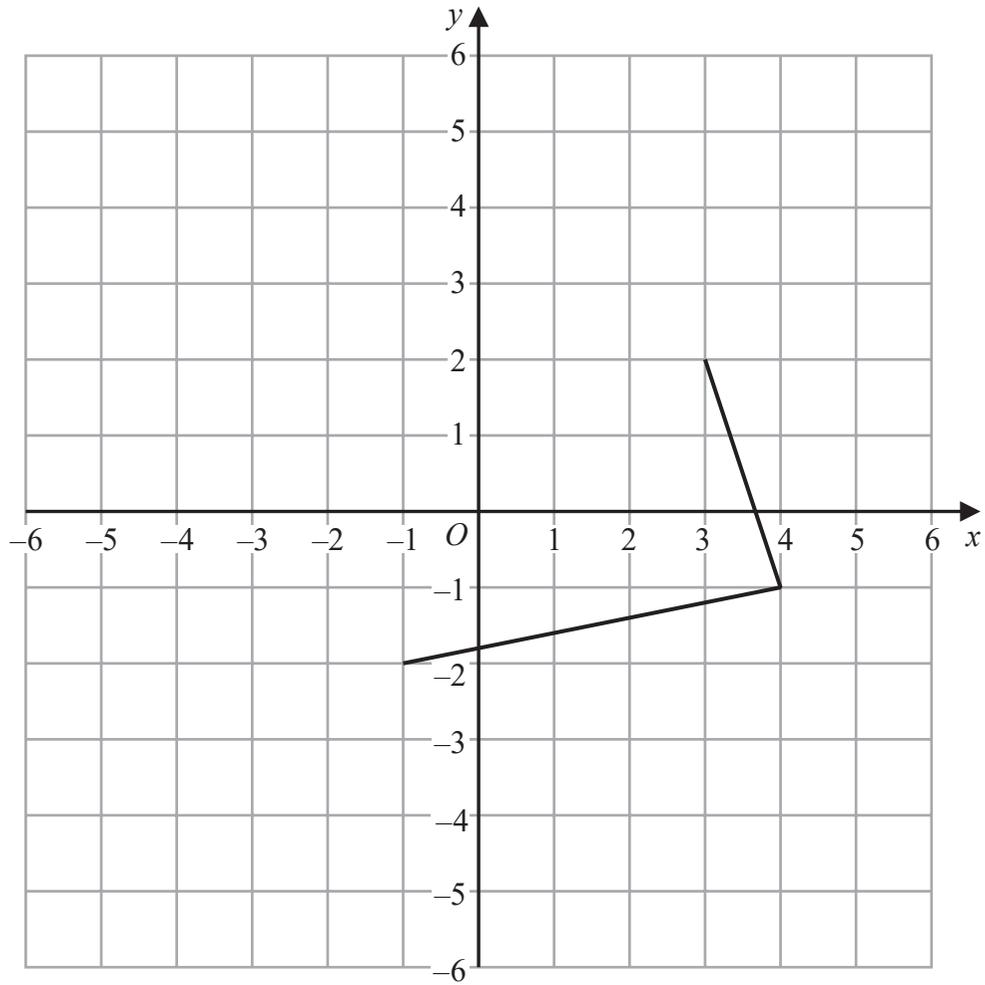
(c) Use the trapezium rule to find an estimate for the area of the region under the curve and between $x = 1$, $x = 4$ and the x -axis.
Use 3 strips of equal width.

.....
(2)

(Total for Question 19 is 6 marks)



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



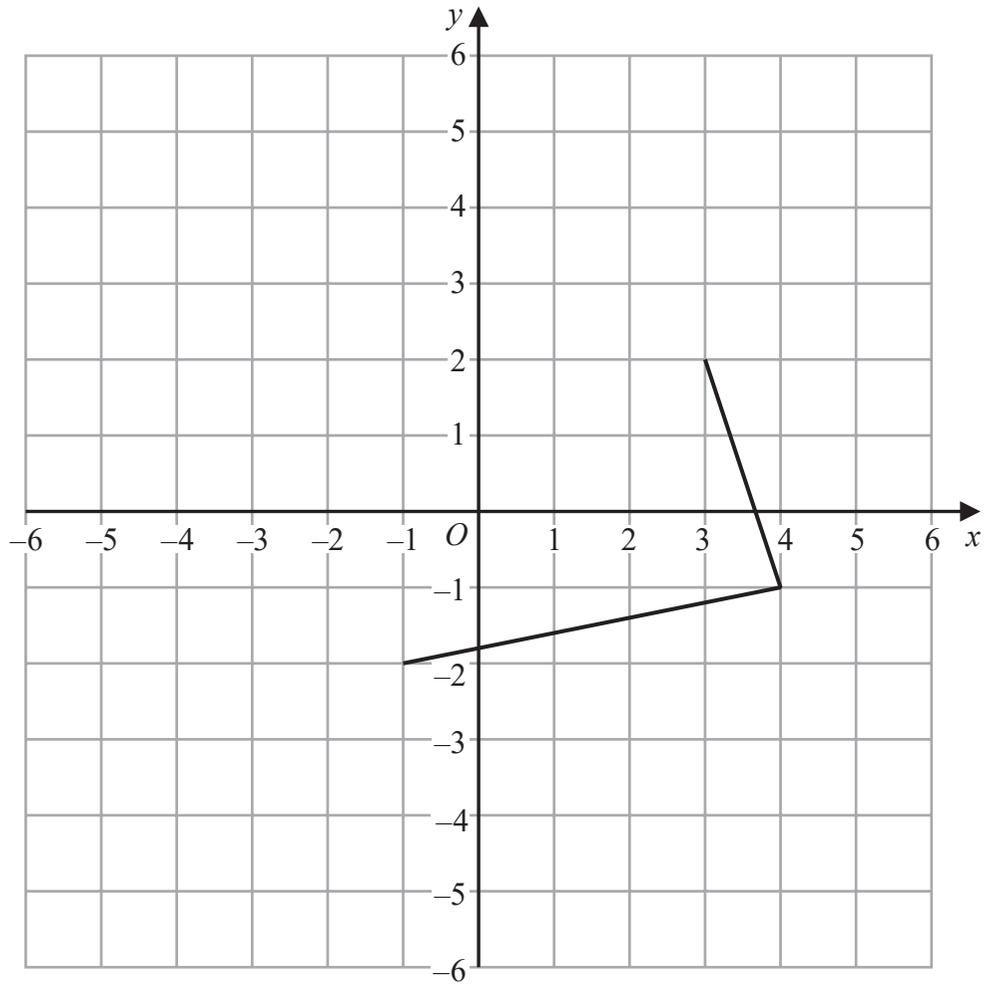
(a) On the grid above, draw the graph of $y = f(x) - 2$

(2)

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



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

(2)

(Total for Question 20 is 4 marks)

- 21 (a) Express $\frac{3}{x+4} + \frac{1}{x-4}$ as a single fraction.
Give your answer in its simplest form.

(b) Hence, or otherwise, solve $\frac{3}{x+4} + \frac{1}{x-4} = \frac{4}{5}$

.....
(3)

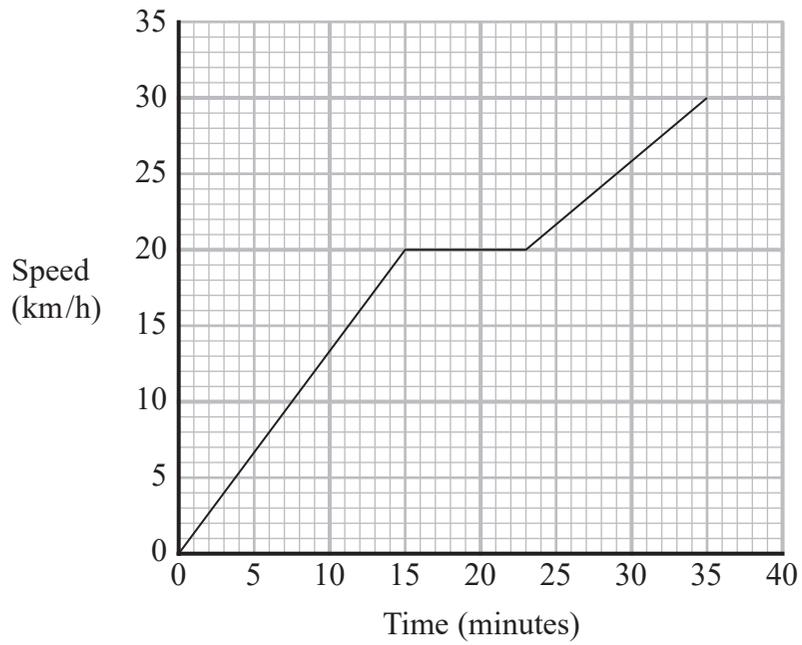
.....
(3)

(Total for Question 21 is 6 marks)



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22 Here is a speed-time graph for the first 35 minutes of a training ride for a cyclist.



(a) For how many minutes is the cyclist accelerating?

..... minutes
(1)

(b) Work out the greatest acceleration of the cyclist.
Give your answer in km/h^2

..... km/h^2
(2)

(c) What does the area under the graph represent?

.....
(1)

(Total for Question 22 is 4 marks)

TOTAL FOR PAPER IS 90 MARKS



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