

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/

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  $3x^2 - 2x = 6$

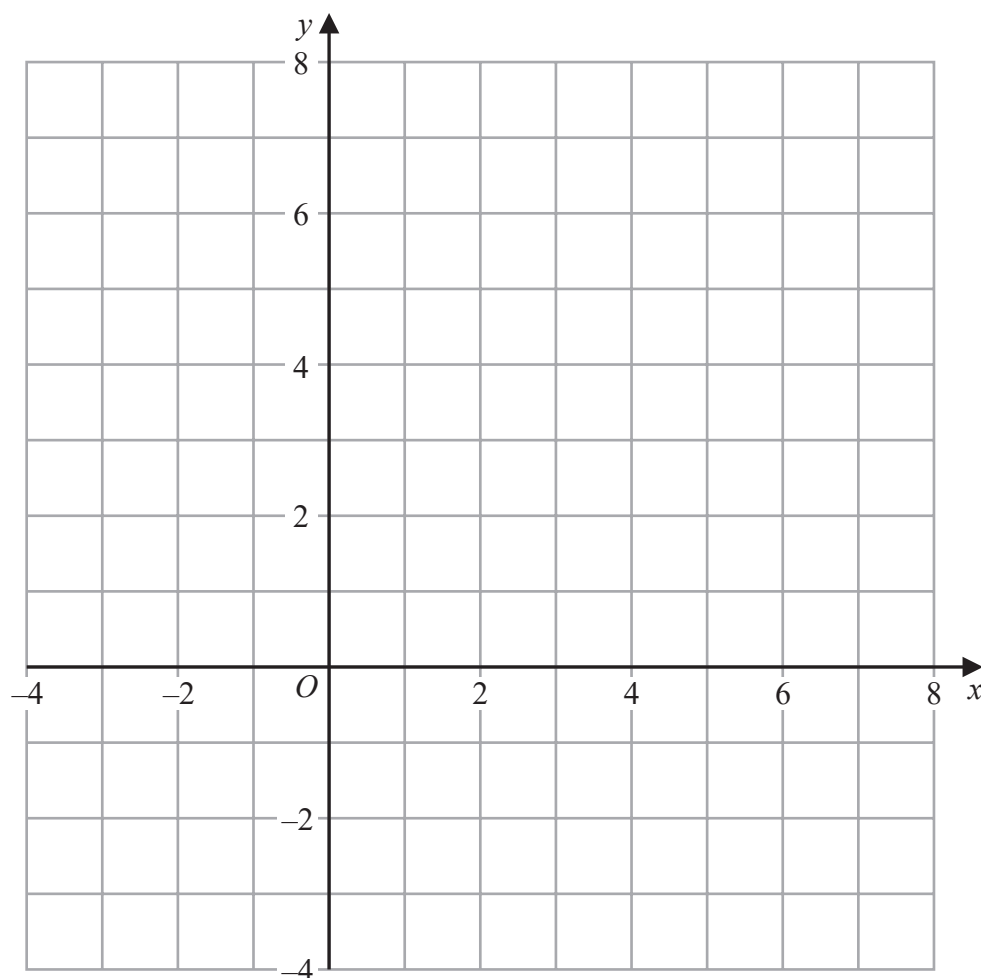
Give your answer in the form  $\frac{p \pm \sqrt{q}}{r}$  where  $p$ ,  $q$  and  $r$  are integers.

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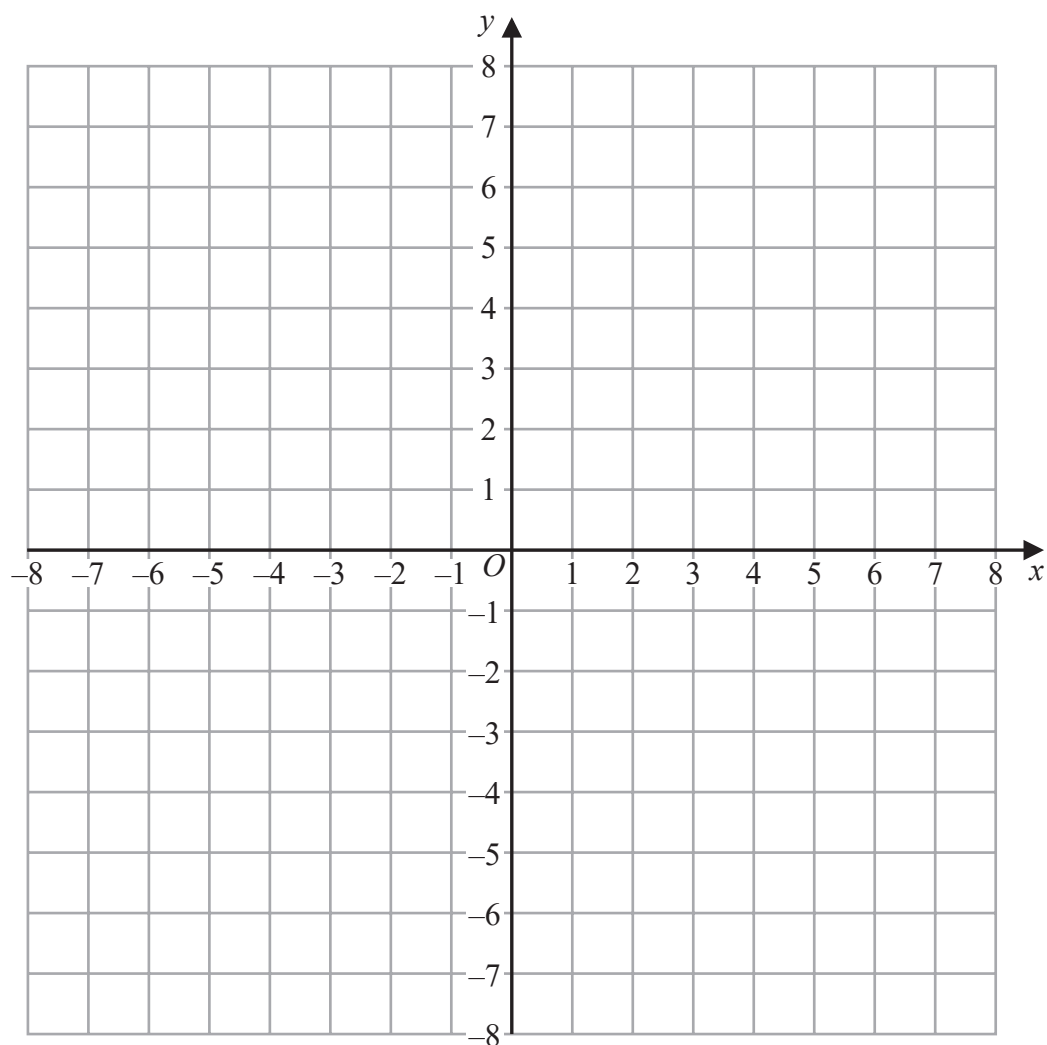
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- 5 (a) On the grid, construct the graph of  $x^2 + y^2 = 49$



(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)





- 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  $v = 60$ ,  $t = 4$

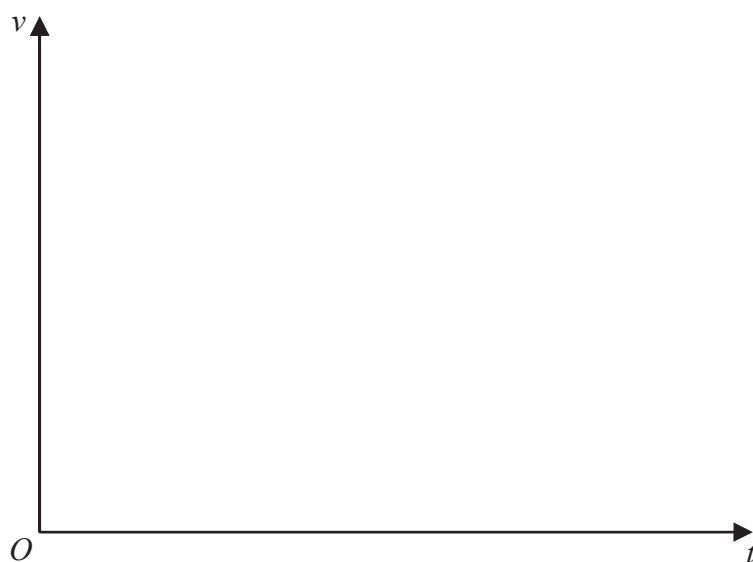
- (a) Find a formula for  $v$  in terms of  $t$ .

(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)

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)

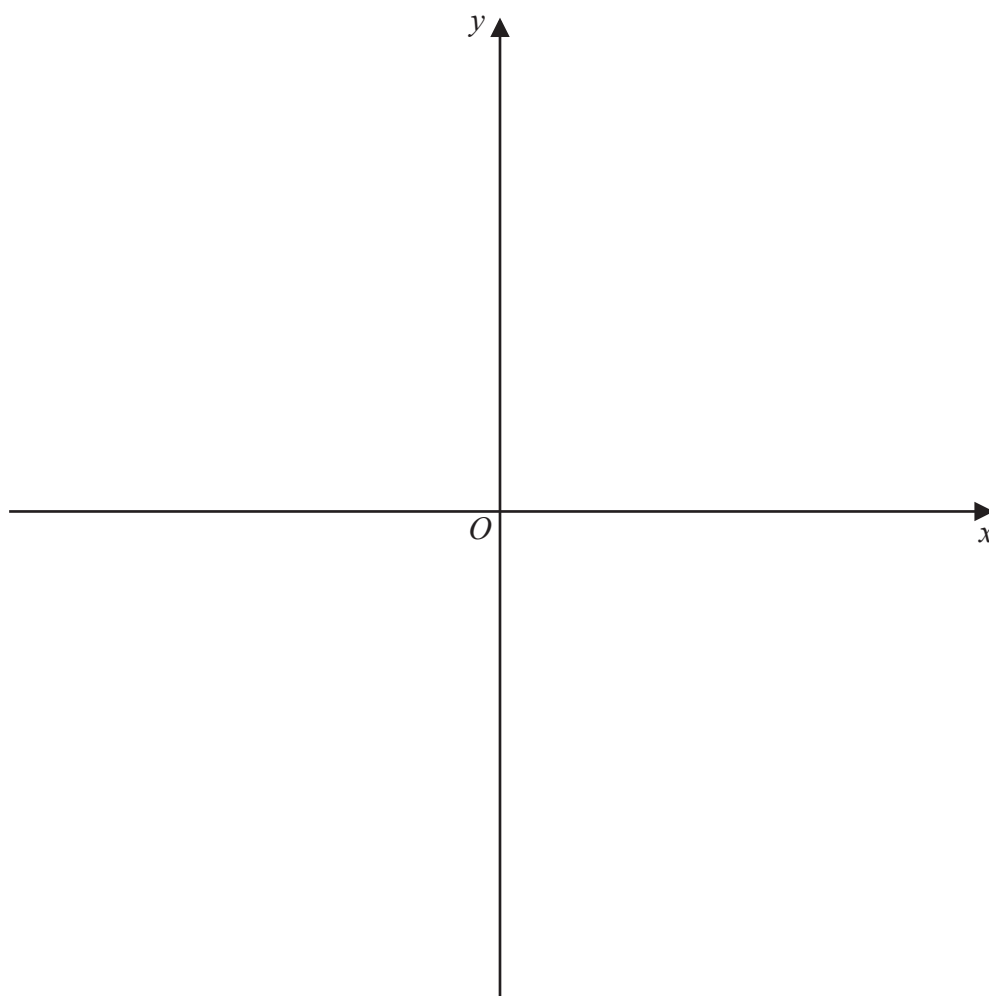
14  $V = \frac{f(wh - 3)}{3} + f$

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  $(3 + \sqrt{12})(5 - 3\sqrt{3})$

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(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.

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(Total for Question 17 is 6 marks)

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**

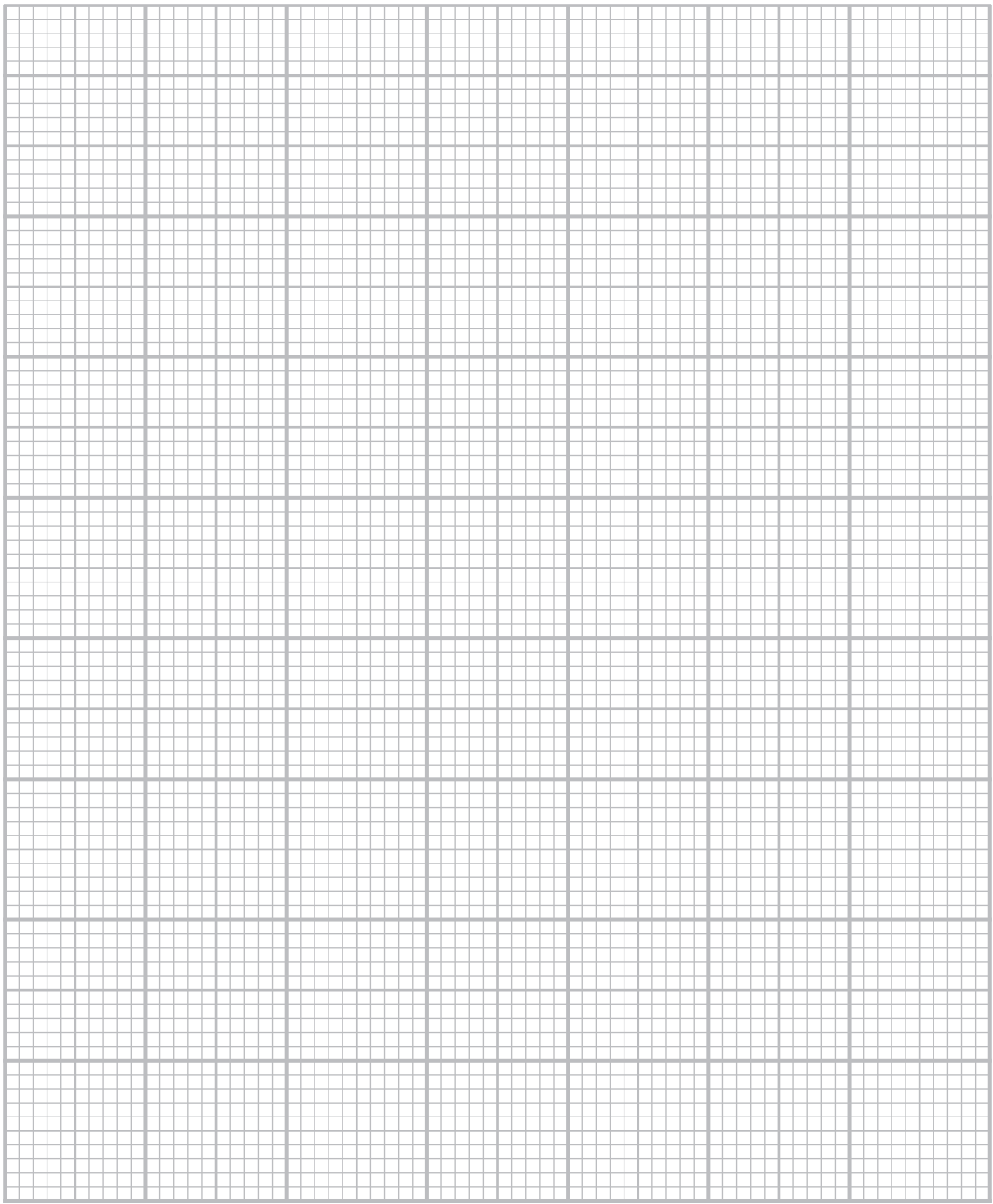
Give your answer in the form  $ax + by + c = 0$  where *a*, *b* and *c* are integers.

(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  $2^x = 12$

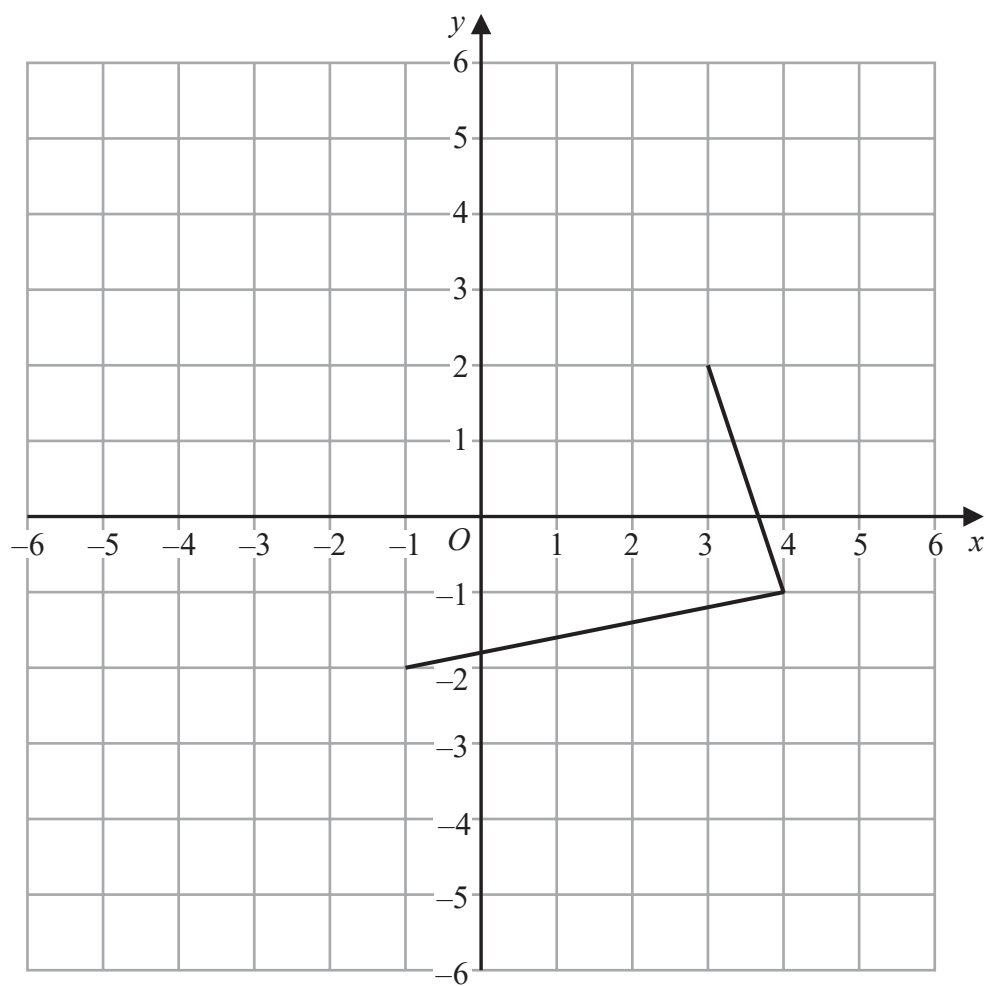
.....  
(2)

(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)

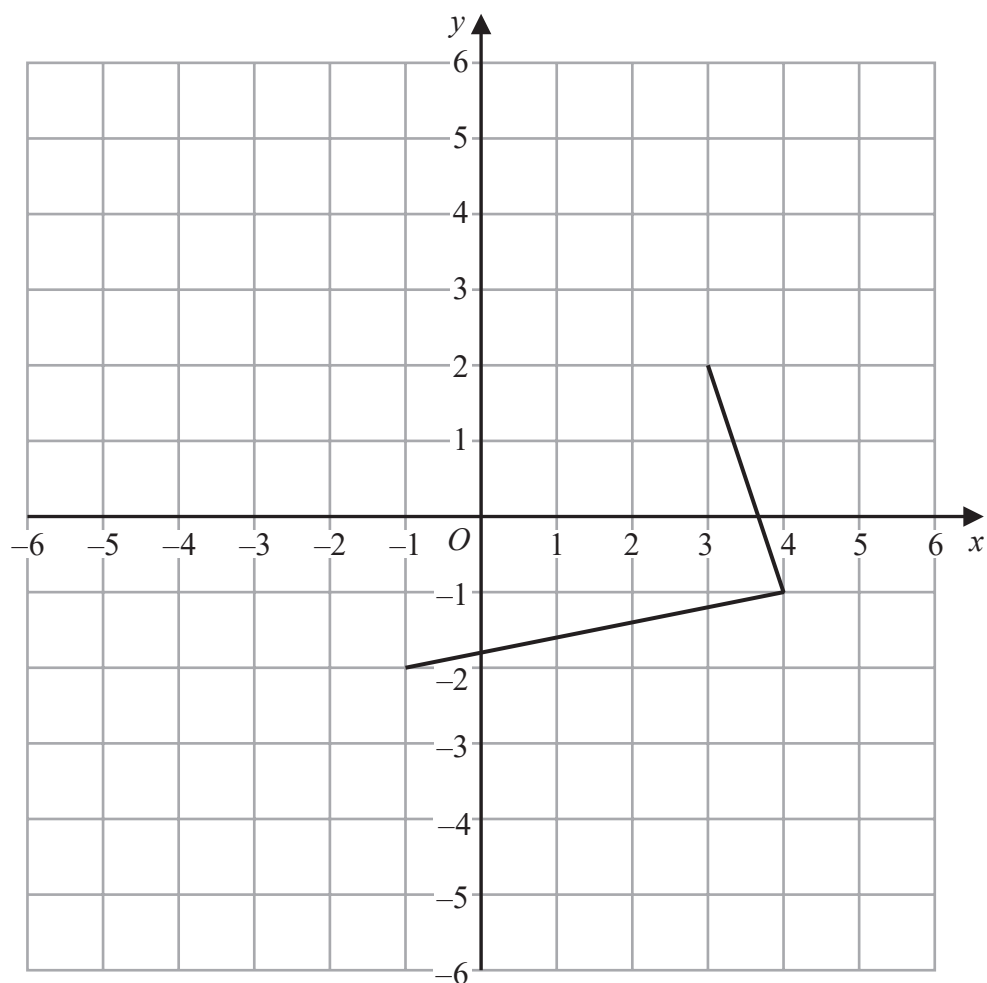
20 Here is the graph of  $y = f(x)$



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

(2)

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.

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

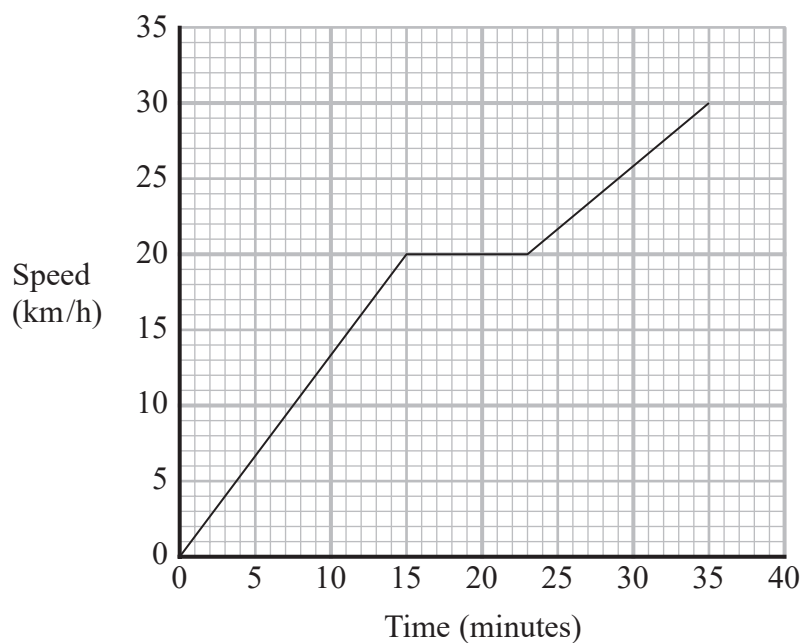
(3)

(3)

(Total for Question 21 is 6 marks)



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  $\text{km/h}^2$

.....  $\text{km/h}^2$   
(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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