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, compasses.

YOU WILL BE GIVEN:
Diagram Booklet
Bumpons for Question 5(a)
Bumpons for Question 12(c)
Bumpons for Question 15
Bumpons for Question 19(a)
Bumpons for Question 20(a)
Bumpons for Question 20(b)

Total Marks

Instructions

- Write your centre number, candidate number, surname and other names on your answer paper.
- Answer ALL questions.
- Answer the questions on your answer paper or on the separate diagrams.
- CALCULATORS ARE NOT ALLOWED.

Information

- The total mark for this paper is 90
- The number of marks for EACH question are shown in brackets, for example: [2 marks] - use this as a guide as to how much time to spend on each question.
- There may be spare copies of some diagrams.

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.
- Please note: this paper contains facing pages.
  [A contents page for this examination paper will be found as a separate booklet. This is to assist the candidate in locating selected books].

Turn over ▶

Pearson

Write your answers on your answer paper.

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 marks]

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

(c) Simplify $(8r^{12})^{\frac{1}{3}}$ [2 marks]

(d) Simplify $t^{-2} \times t^{-\frac{3}{4}}$ [1 mark]

[Total for Question 1 is 7 marks]

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

[Total for Question 2 is 3 marks]

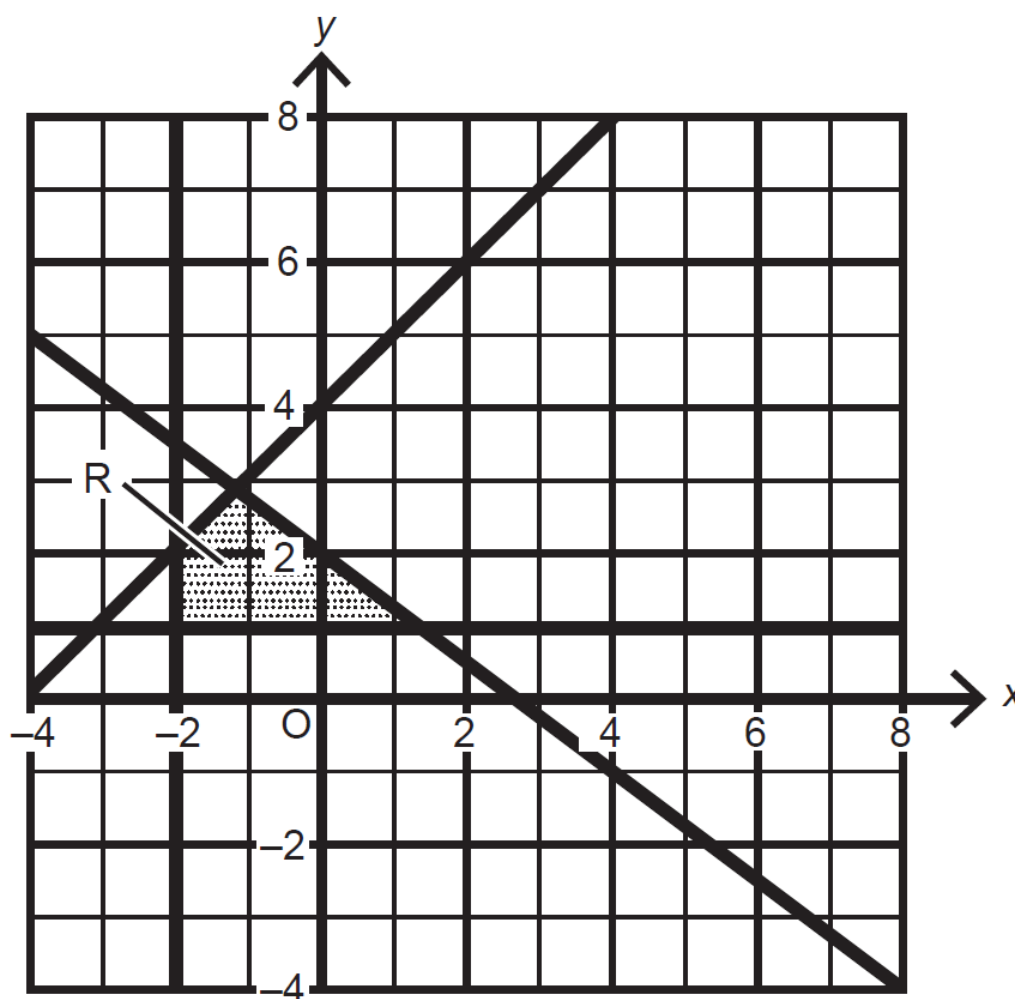**3** Use the quadratic formula to solve the equation $\quad 3x^2 - 2x = 6$

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

[Total for Question 3 is 2 marks]

4 Look at the diagram for Question 4 in the diagram booklet.
   Describe the four inequalities that have been drawn on the grid to bound the shaded region R.

Diagram for Question 4

[Total for Question 4 is 5 marks]

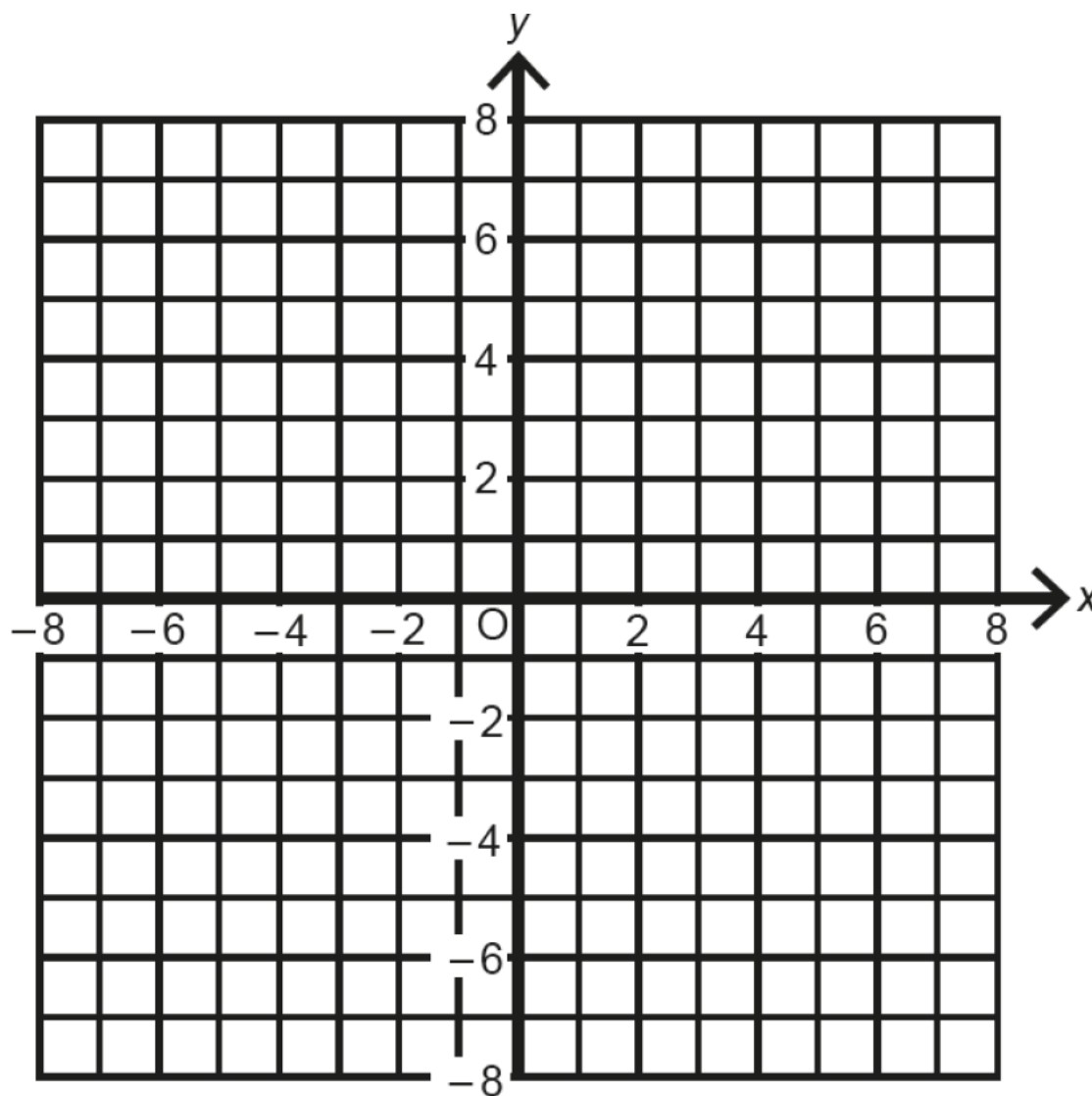**5** (a) Look at the diagram for Question 5 in the diagram booklet.
On the grid in the diagram booklet, construct the graph of $x^2 + y^2 = 49$
Drawing film and bumpons are provided if you wish to use them. [2 marks]

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

(b) Write the equation of the tangent to this graph at A. [1 mark]

Diagram for Question 5(a)

[Total for Question 5 is 3 marks]

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

(b) (i) Factorise $x^2 + x - 6$ [1 mark]

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

[Total for Question 6 is 5 marks]

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 mark]

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

[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 marks]

(b) Factorise $p^4 - p^2q^2$ [2 marks]

[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.   [2 marks]

$a = \underline{}$

$b = \underline{}$

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 mark]

[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 nth term of the series.

Give your answer in its simplest form. [2 marks]

The pth term of the series is 102

(b) Work out the value of p. [1 mark]

(c) Find the sum of the first 100 terms of this series. [2 marks]

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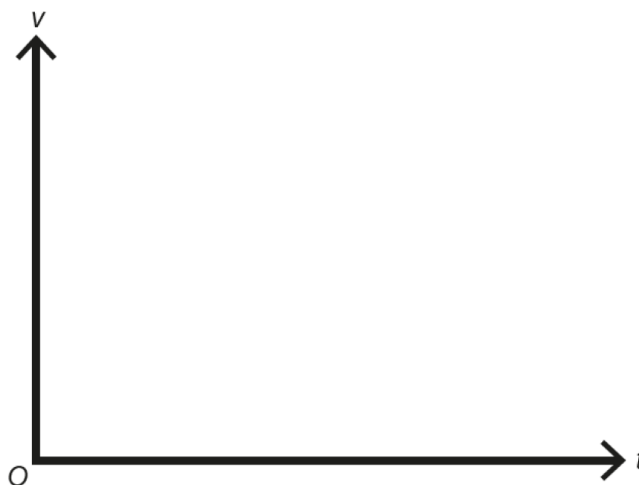
When $v = 60$, $t = 4$

(a) Find a formula for v in terms of t. [3 marks]

(b) Calculate the value of t when $v = 80$ [2 marks]

(c) Look at the diagram for Question 12(c) in the diagram booklet.
Using the axes in the diagram booklet, sketch the graph of v against t.
Drawing film and bumpons are provided if you wish to use them. [1 mark]

Diagram for Question 12(c)

[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 mark]

(ii) Write down the product of the roots of this equation. [1 mark]

[Total for Question 13 is 2 marks]

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

Work out the value of h when $V = 20$, $f = 12$ and $w = \dfrac{f}{2}$
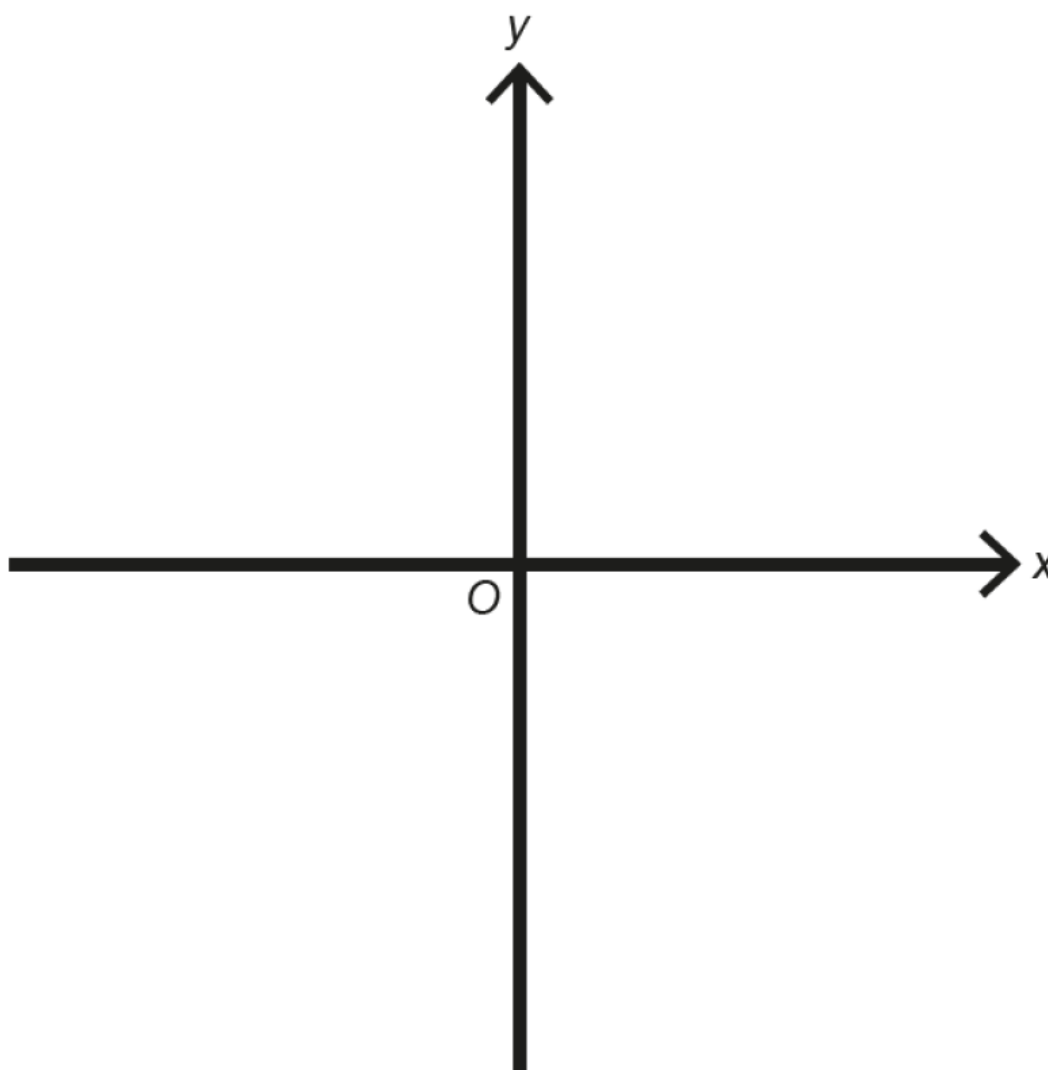
[Total for Question 14 is 3 marks]

15 Look at the diagram for Question 15 in the diagram booklet.
Using the axes in the diagram booklet, sketch the graph $y = \dfrac{1}{x-2}$

Drawing film and bumpons are provided if you wish to use them.

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

Diagram for Question 15

[Total for Question 15 is 4 marks]

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 marks]

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

Give your answer in the form $\dfrac{p - \sqrt{13}}{q}$ where p and q are integers. [3 marks]

[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]

DO NOT WRITE IN THIS AREA

19 Look at the diagram for Question 19 in the diagram booklet. It shows a graph.

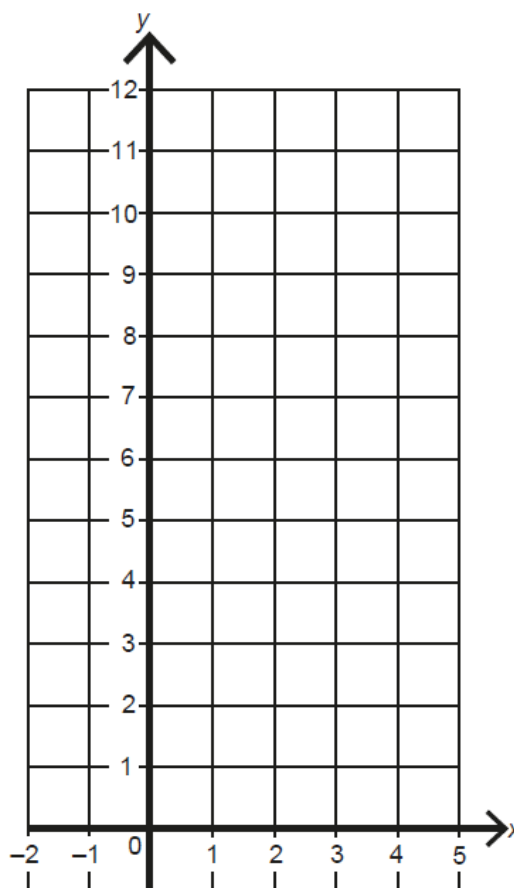The table on the facing page shows the values of $y = 2^{x-1}$ for integer values of x from -2 to 4

x   y
-2 …. $\dfrac{1}{8}$
-1 …. $\dfrac{1}{4}$
0 … $\dfrac{1}{2}$
1 …...1
2 ….. 2
3 ….. 4
4 ….. 8

(a) On the grid in the diagram booklet, plot the points for the graph of $y = 2^{x-1}$ for values of x from -2 to 4.
Bumpons are provided if you wish to use them. [2 marks]

Diagram for Question 19

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

(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.
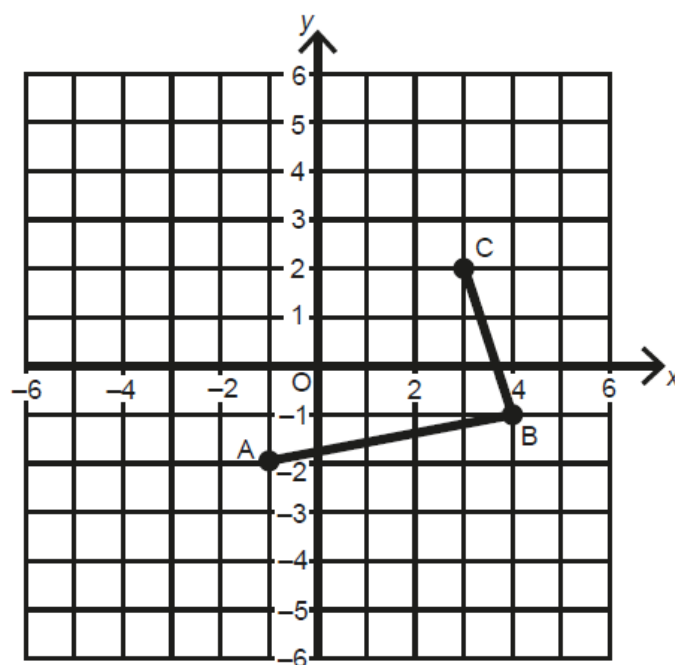Use 3 strips of equal width. [2 marks]

[Total for Question 19 is 6 marks]

Turn over ▶

20 Look at the diagram for Question 20(a) in the diagram booklet. It shows the graph of y = f (x)
3 distinct points have been labelled A, B and C.

Diagram for Question 20(a)

[Please note: the first cell has been removed from the minus signs.]

(a) On the grid in the diagram booklet, plot the positions of A_1, B_1 and C_1 for
the graph of $y = f(x) - 2$
Bumpons are provided if you wish to use them. [2 marks]

(b) Look at the diagram for Question 20(b) in the diagram booklet. It shows the graph of
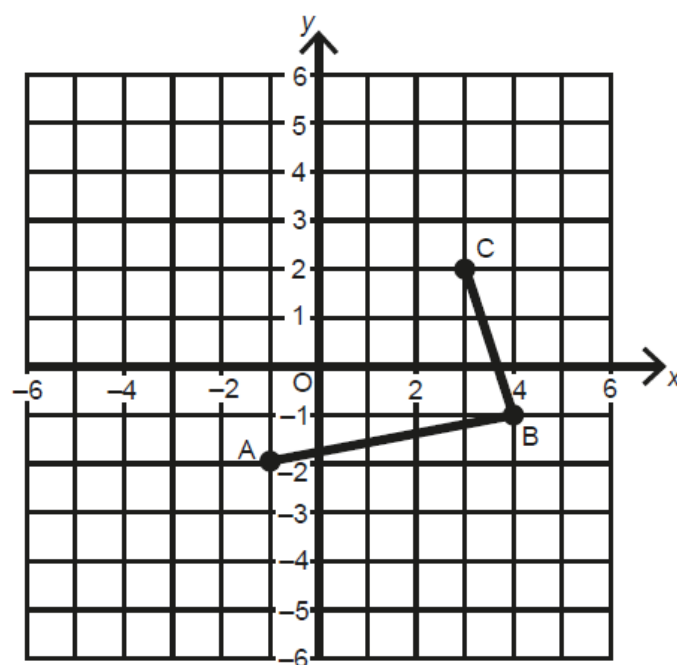
$y = f(x)$

3 distinct points have been labelled A, B and C
On the grid in the diagram booklet, plot the positions of A_2, B_2 and C_2 for the graph of
$y = f(2x)$
Bumpons are provided if you wish to use them. [2 marks]

Diagram for Question 20(b)

[Please note: the first cell has been removed from the minus signs.]

[Total for Question 20 is 4 marks]

P 6 6 3 2 5 A 0 1 9 2 4

21 (a) Express $\dfrac{3}{x+4} + \dfrac{1}{x-4}$ as a single fraction.

Give your answer in its simplest form. [3 marks]

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

[Total for Question 21 is 6 marks]

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22 Look at the diagram for Question 22 in the diagram booklet.
It shows a speed-time graph for the first 35 minutes of a training ride for a cyclist.

Diagram for Question 22

(a) For how many minutes is the cyclist accelerating?   [1 mark]

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

(c) What does the area under the graph represent? [1 mark]

[Total for Question 22 is 4 marks]

END OF PAPER   TOTAL FOR PAPER IS 90 MARKS

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P 6 6 3 2 5 A 0 2 4 2 4