1. Nov/2020/Paper_13/No.18

Expand and simplify.

$$4(2m+3)-5(m-2)$$

.... [2]

2.

Solve the system of linear equations.
You must show all your working.

$$3x - 8y = 22$$
$$x + 4y = 4$$

$x =$ ....

$y =$ .... [3]

3.

Simplify.
$$a^2 \div a^6$$

.... [1]

4.
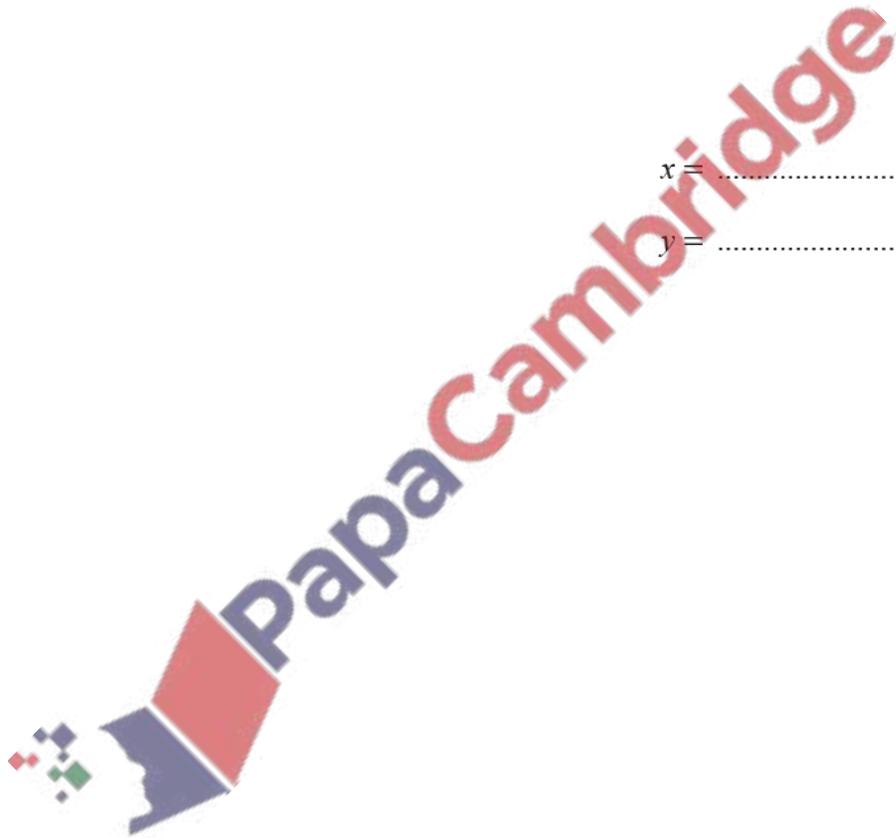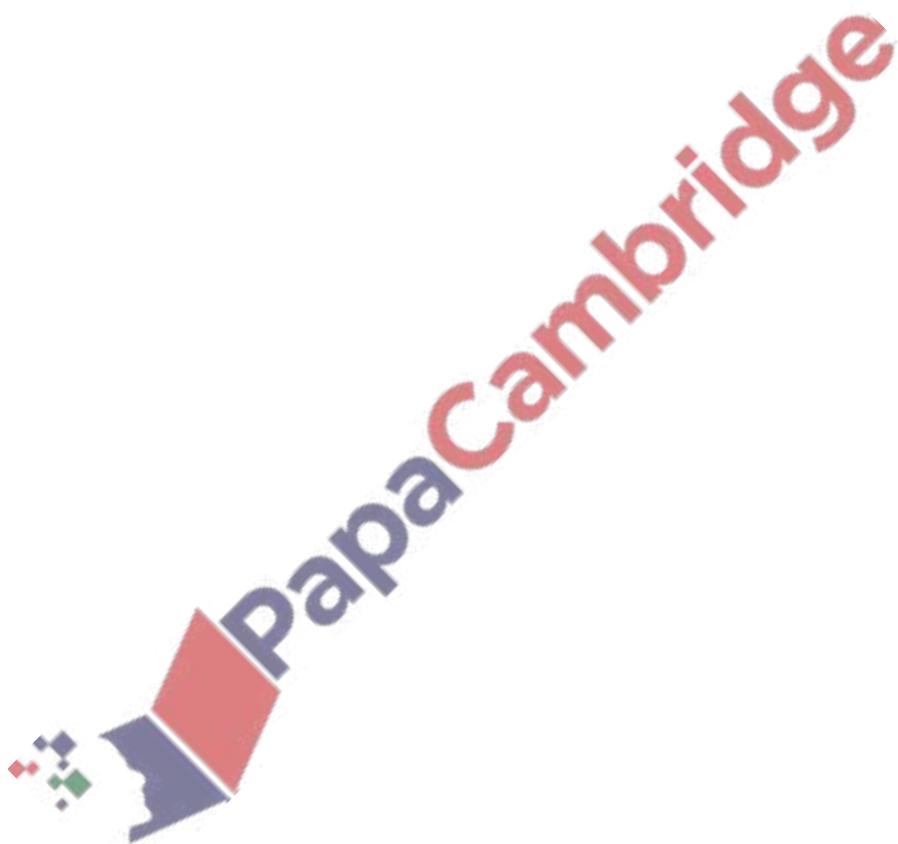
Work out $1\frac{1}{7} \times 2\frac{1}{10}$.

Give your answer as a mixed number in its simplest form.

.... [3]
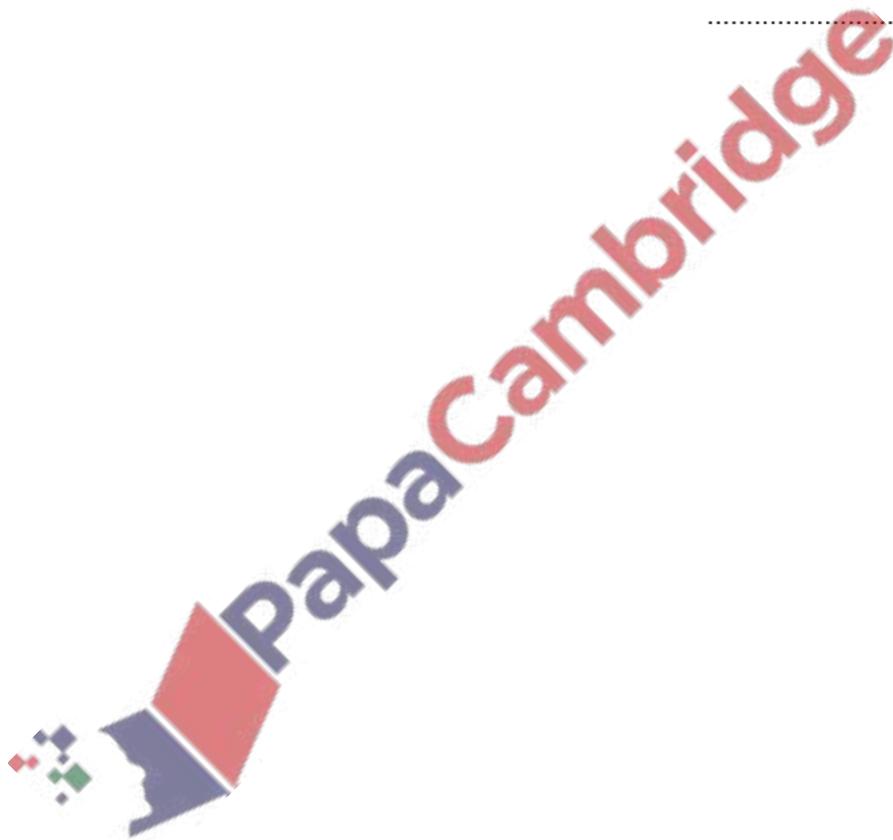
Solve the system of linear equations.
You must show all your working.

$$3x - 8y = 22$$
$$x + 4y = 4$$

$x =$ ....

$y =$ .... [3]

6.
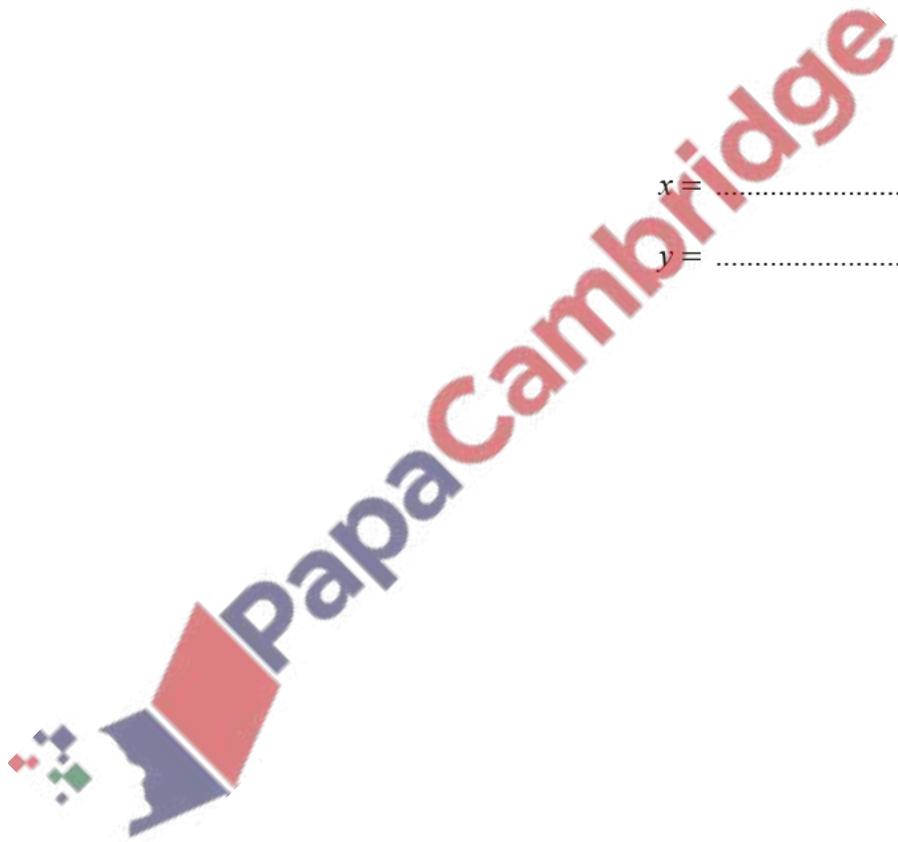
$$m = 2p + \sqrt{\frac{x}{y}}$$

Solve for x.

$x =$ .... [3]

$$m = 2p + \sqrt{\frac{x}{y}}$$

7.
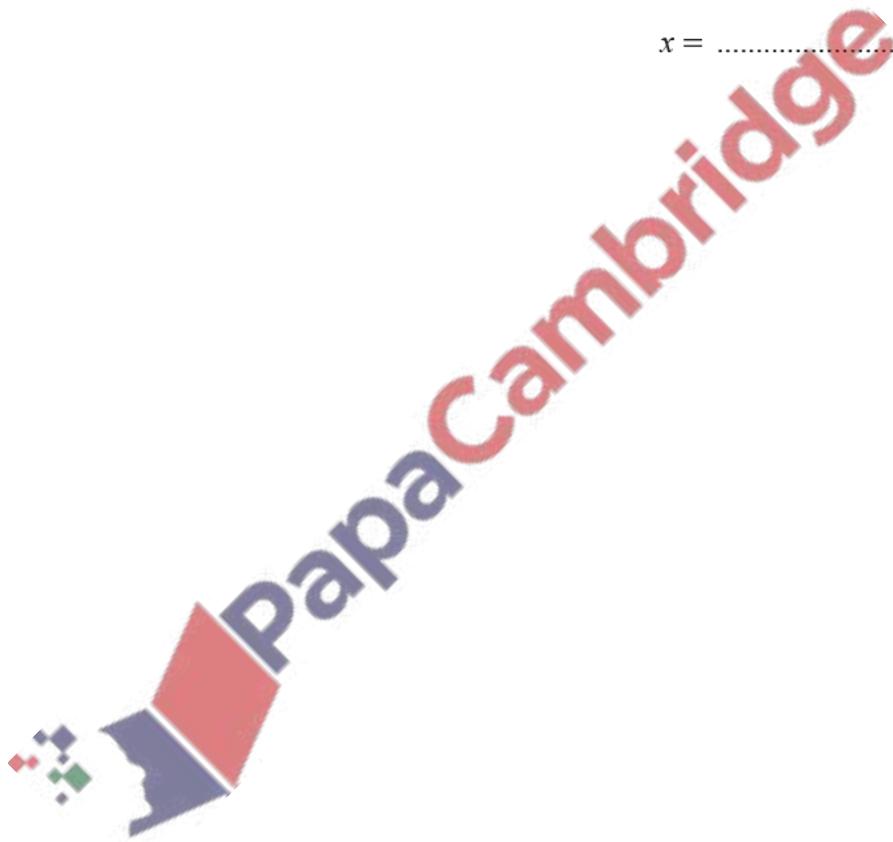
(a) Simplify.
$$\left(4xy^2\right)^3$$

.... [2]

(b) $25 = 125^k$

Find the value of k.

$k =$ .... [1]

8.
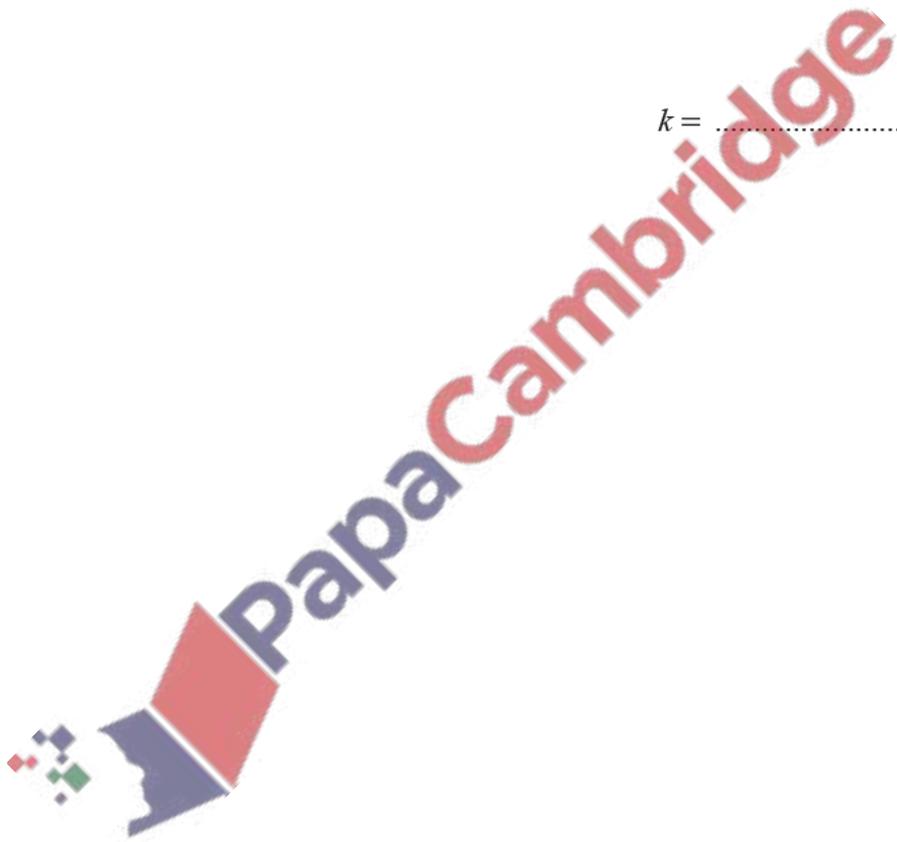
Robert makes model cars.
The cost, C(n), in dollars, of making n cars is given by the function $C(n) = 20 + 15n$.

(a) In one week, he makes at least 1 car and at most 5 cars.

Write down the domain and range of C(n).

Domain = ...

Range = ... [2]
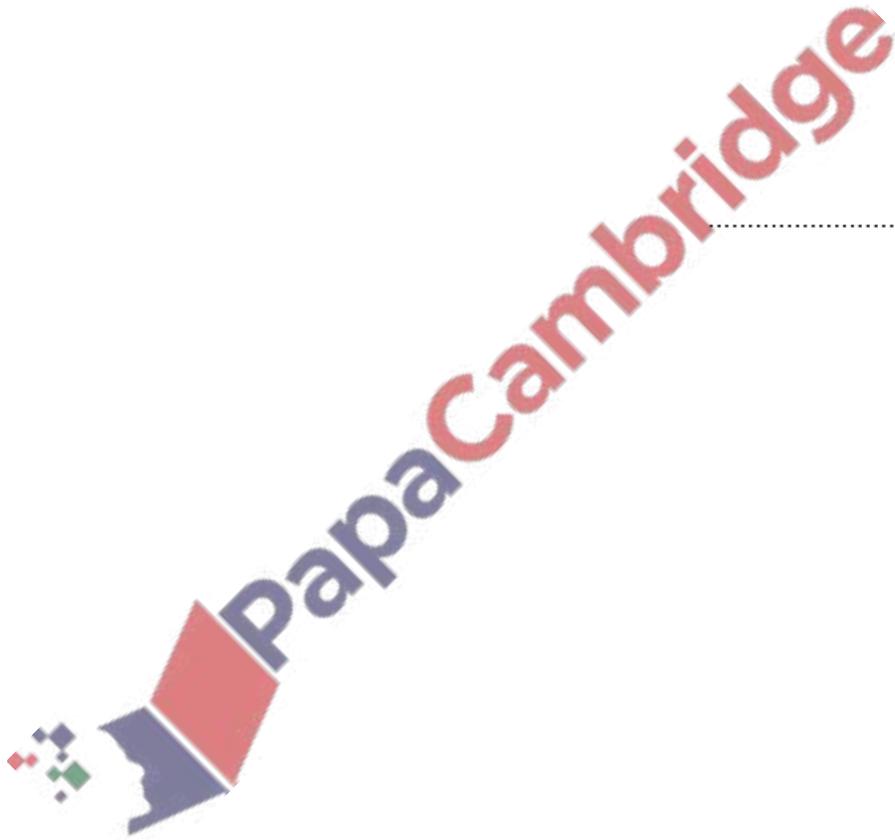
(b) By selling n cars, Robert receives $22n$.

Find the smallest number of cars he must sell to make a profit.

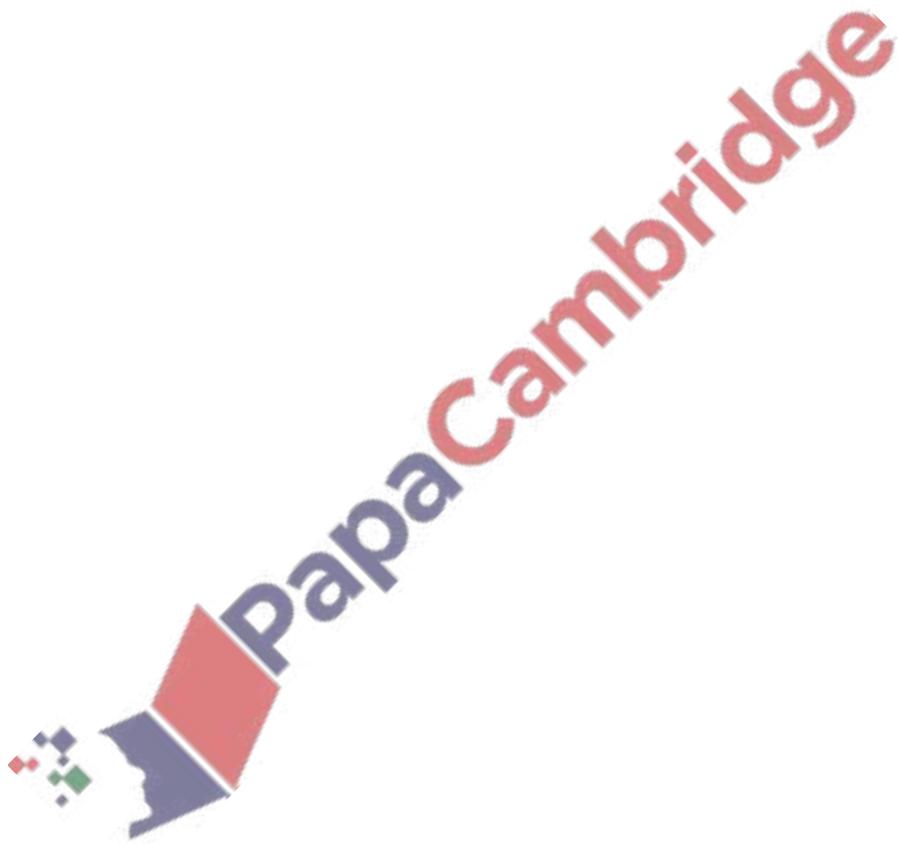.. [3]

9.

Factor.

$$3x + 8y - 6ax - 16ay$$

.... [2]

Simplify.

$$\frac{x^2 - 25}{x^2 - 17x + 60}$$

.... [4]
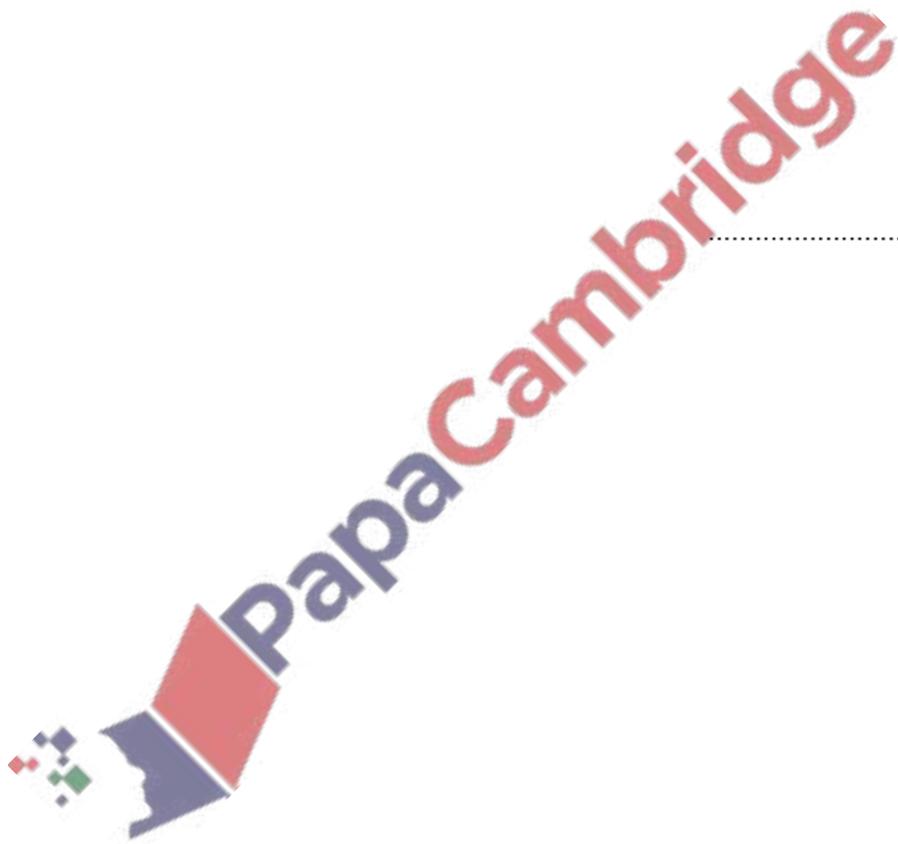
(a) Complete the table of values for $y = 1 + 5x - x^2$.

x	-1	0	1	2	3	4	5
y		1	5		7		1

[2]

(b) On the grid, draw the graph of $y = 1 + 5x - x^2$ for $-1 \leqslant x \leqslant 5$.
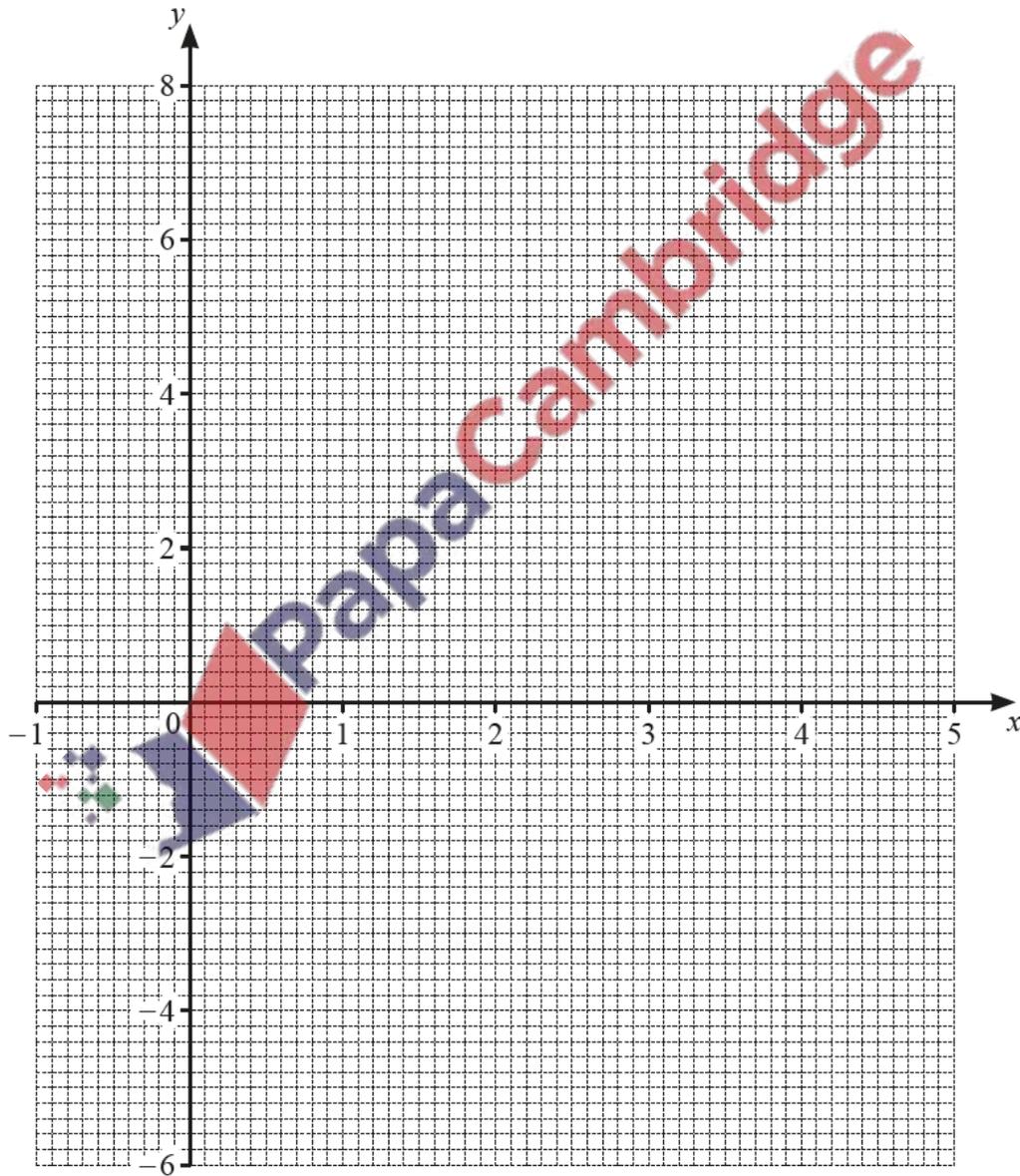
[4]

(c) (i) On the grid, draw the line $y = 3$. [1]

(ii) Use your line to solve the equation $1 + 5x - x^2 = 3$.

$x = $ .... or $x = $ .... [2]

12.
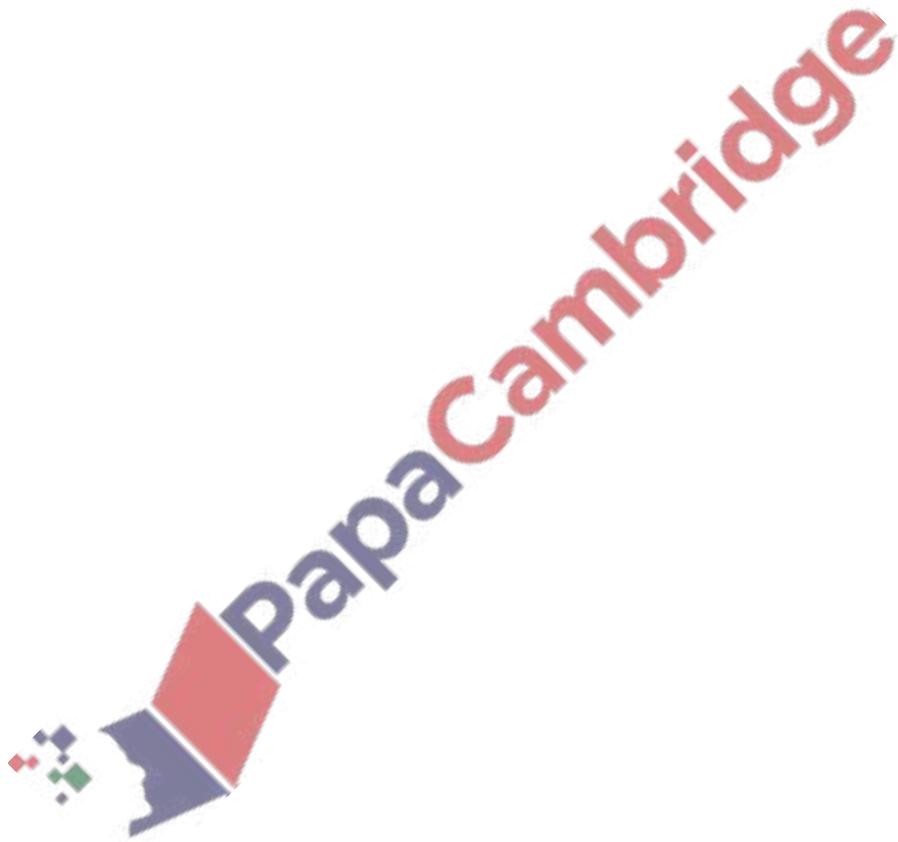
(a) $W = 3a + 5c$

Find the value of W when $a = 6$ and $c = 2$.

$W =$ .... [2]

(b) Factor completely.
$$12b + 8b^2$$

.... [2]

(c) Solve for m.
$$y = 4m - p$$

$m =$ .... [2]

(d) Find the value of x when $5^x \times 5^3 = 5^{12}$.

$x =$ .... [1]

13
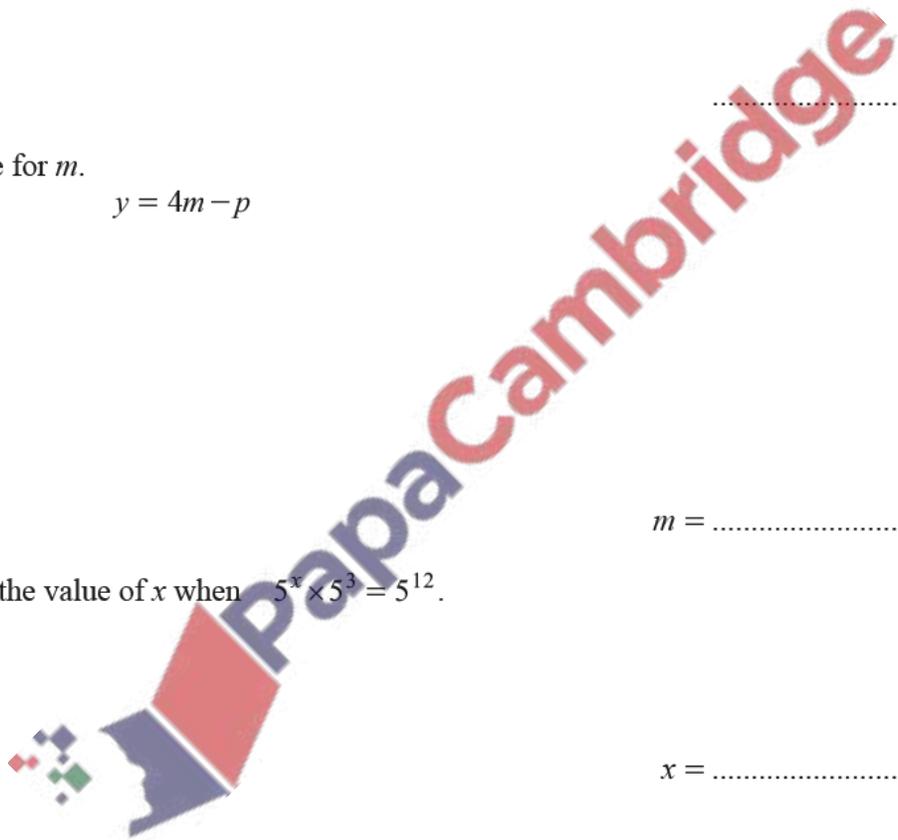
(e) Find the value of

(i) 3^0,

.... [1]

(ii) 5^{-2}.

.... [1]

(f) In this part, all measurements are in centimeters.

$(3x - 1)$ NOT TO SCALE

$(2x + 5)$

The diagram shows a kite with sides $(2x+5)$ and $(3x-1)$.
The perimeter of the kite is 33 cm.

Work out the length of a shorter side.
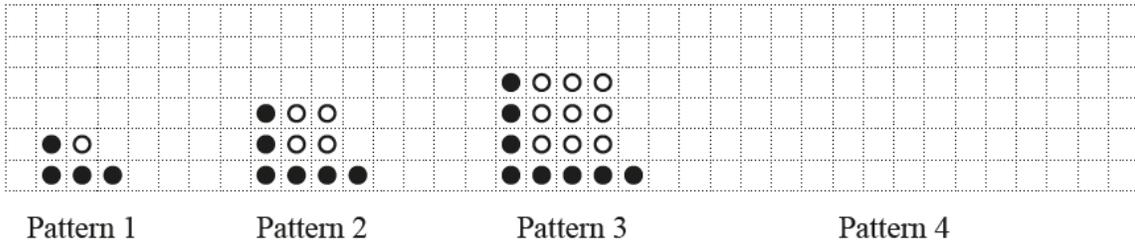
.... cm [5]

A sequence of patterns is made using black counters and white counters.

Pattern 1   Pattern 2   Pattern 3   Pattern 4

(a) Draw Pattern 4. [1]

(b) Complete the table.

Pattern	1	2	3	4	5
Number of black counters	4	6	8		
Number of white counters	1	4	9		

[2]

(c) Write an expression, in terms of n, for

    (i) the number of black counters in Pattern n,

        .... [2]

    (ii) the number of white counters in Pattern n.

        .... [1]
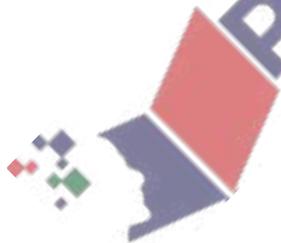
(d) Elena has 30 black counters and 140 white counters.

    Can she make Pattern 12 using her counters?
    Explain your answer.

    .... because ....

    .... [2]

(a) Find the integer values that satisfy the inequality $2 < 2x \leqslant 10$.

.... [2]

(b) Factor.

    (i) $6y^2 - 15xy$

.... [2]

    (ii) $y^2 - 9x^2$

.... [2]

(c) Simplify.

$$\frac{3}{x-1} - \frac{2}{2x+1}$$

.... [3]
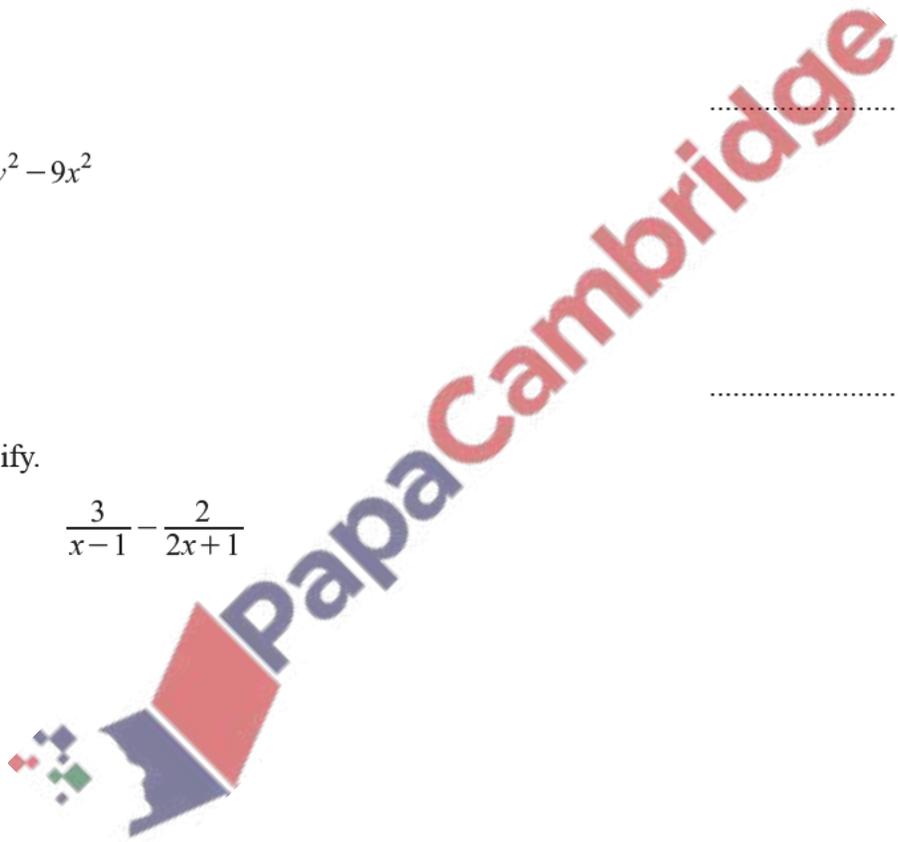
    (a) **(i)** Factor $24 + 5x - x^2$.

                    .... [2]

       (ii) The diagram shows a sketch of $y = 24 + 5x - x^2$.
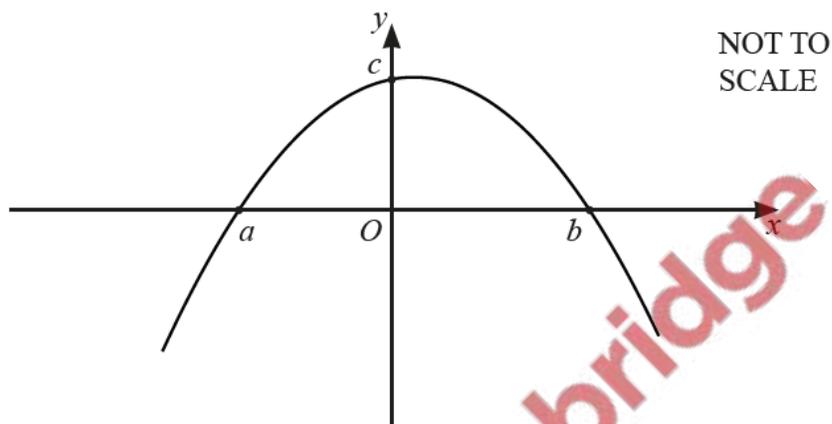
          Work out the values of a, b, and c.

                              $a = $ ....

                              $b = $ ....

                              $c = $ .... [3]

      (iii) The line $y = 18$ intersects the graph of $y = 24 + 5x - x^2$ at P and Q.

          Find the length of PQ.

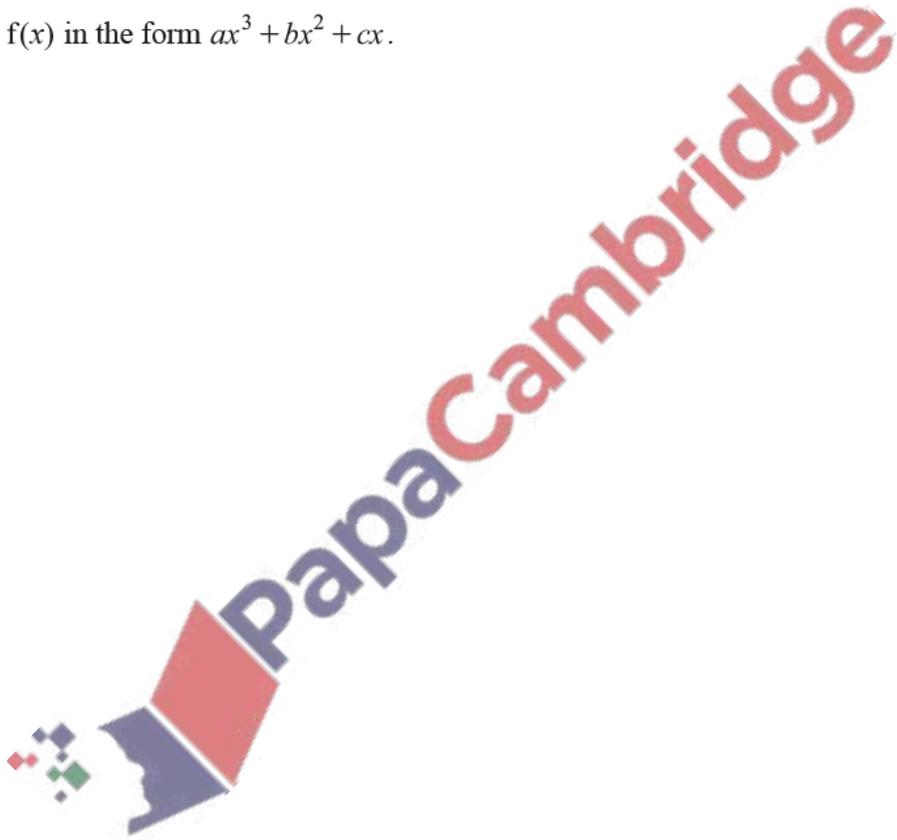 $PQ = $ .... [4]

(b)
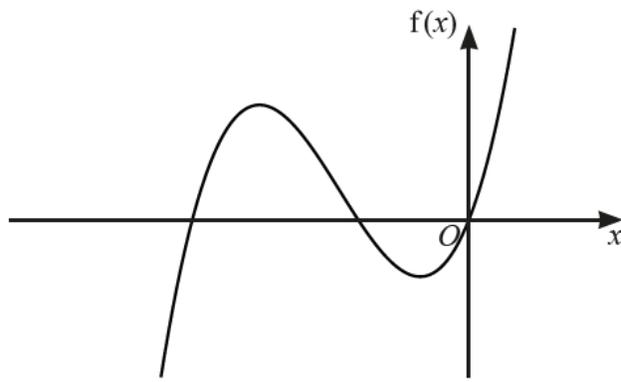
NOT TO SCALE

The diagram shows a sketch of the graph of a cubic function f(x).
The graph passes through the points $(-5, 0)$, $(-2, 0)$, $(0, 0)$, and $(1, 36)$.
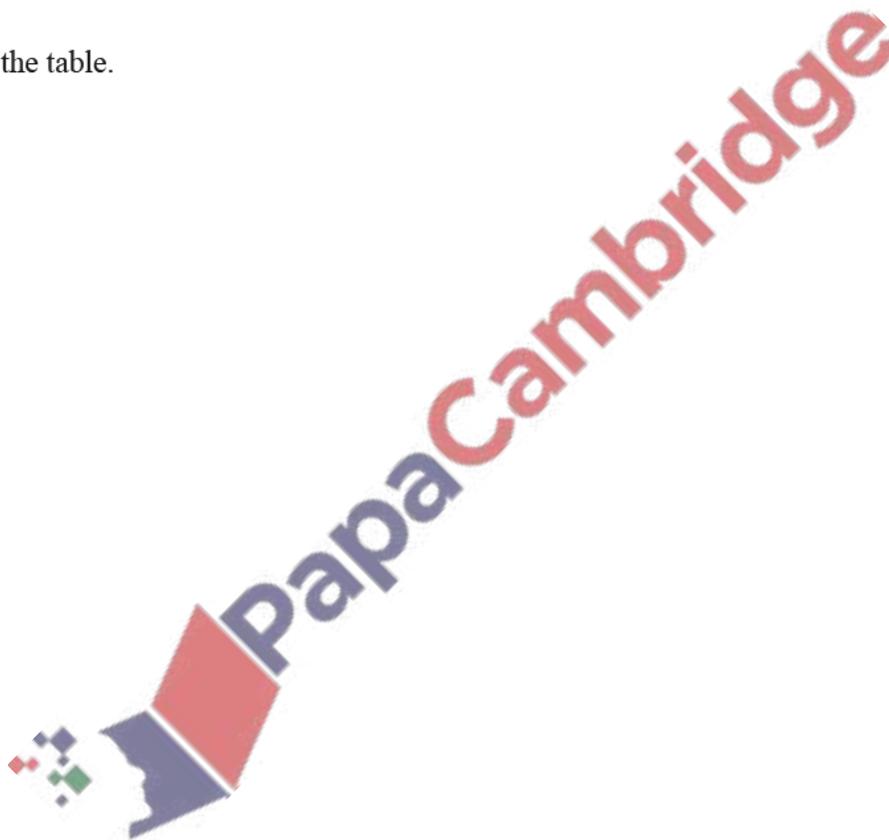
Find f(x) in the form $ax^3 + bx^2 + cx$.

.... [6]

The table shows the first four terms in sequences A, B, C and D.

Sequence	1st term	2nd term	3rd term	4th term	5th term		nth term
A	4	9	14	19			
B	3	10	29	66			
C	1	4	16	64			
D	$\dfrac{3}{17}$	$\dfrac{4}{26}$	$\dfrac{5}{37}$	$\dfrac{6}{50}$			

Complete the table.

[12]

17.

   (a) The nth term of a sequence is $60 - 8n$.

      Find the largest number in this sequence.

      .... [1]

   (b) Here are the first five terms of a different sequence.

$$12 \qquad 19 \qquad 26 \qquad 33 \qquad 40$$

      Find an expression for the nth term of this sequence.

      .... [2]

18.
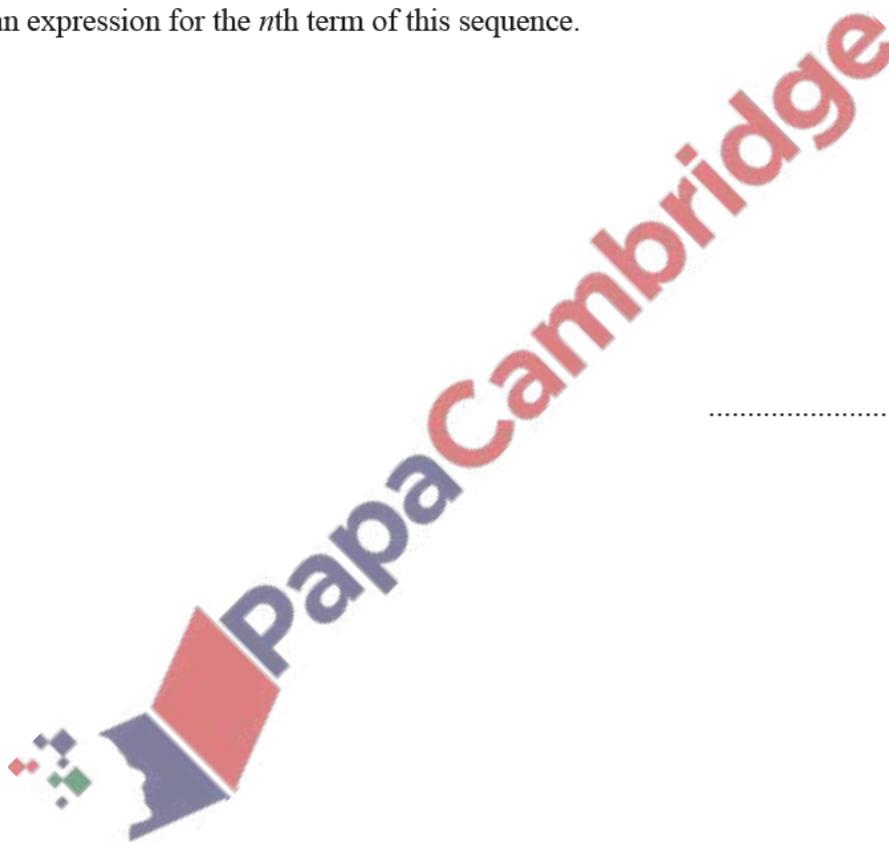
Factor completely.
$$21a^2 + 28ab$$

.... [2]
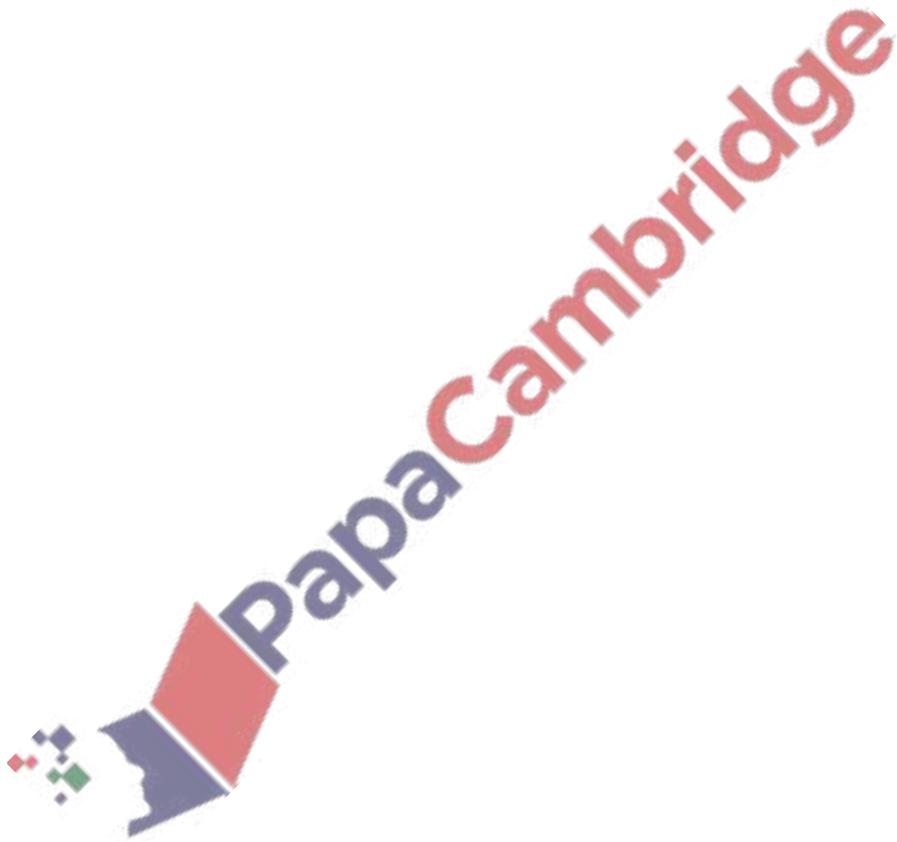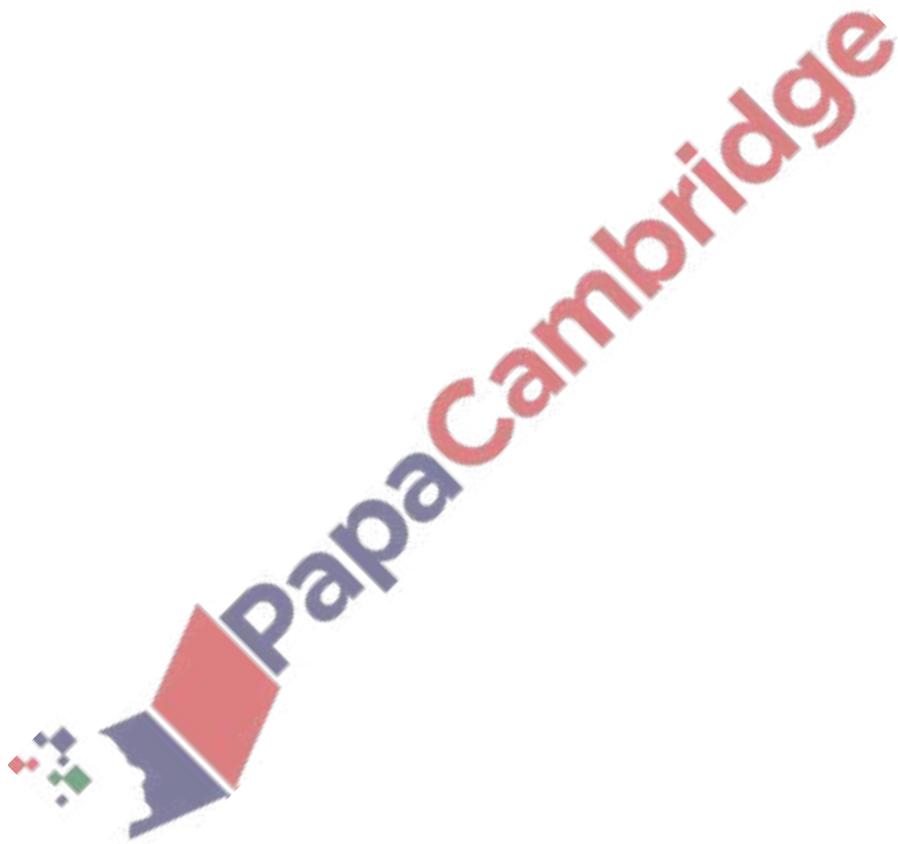
Simplify.
$$p^5 q^3 \times p^2 q^{-4}$$

.... [2]

20.

Solve for x.
$$y = 2x - 5$$

$x =$ .... [2]

(a) The nth term of a sequence is $60 - 8n$.

Find the largest number in this sequence.

.... [1]
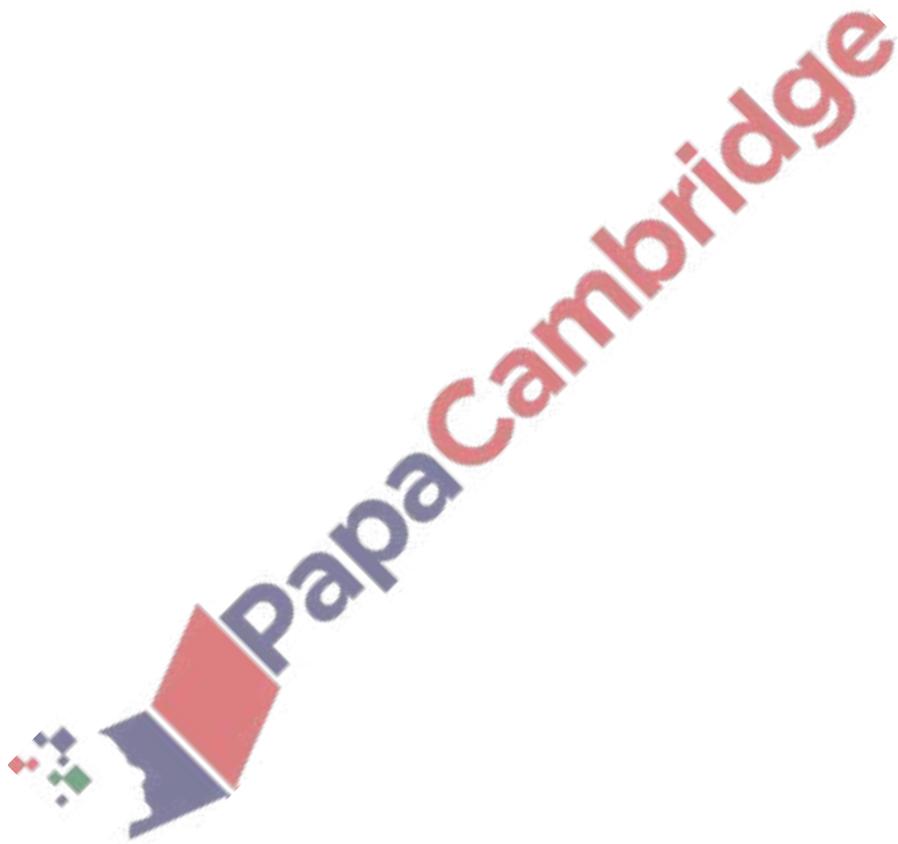
(b) Here are the first five terms of a different sequence.

$$12 \qquad 19 \qquad 26 \qquad 33 \qquad 40$$

Find an expression for the nth term of this sequence.

.... [2]

22.
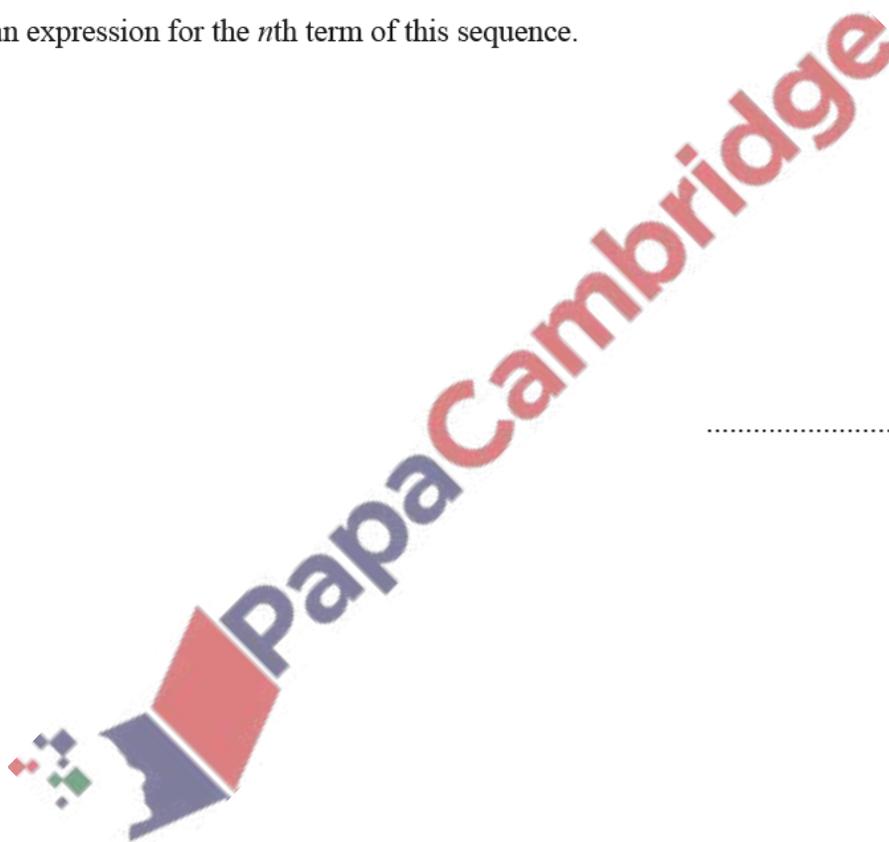
Factor completely.

(a) $21a^2 + 28ab$

.... [2]

(b) $20x^2 - 45y^2$

.... [3]

23.
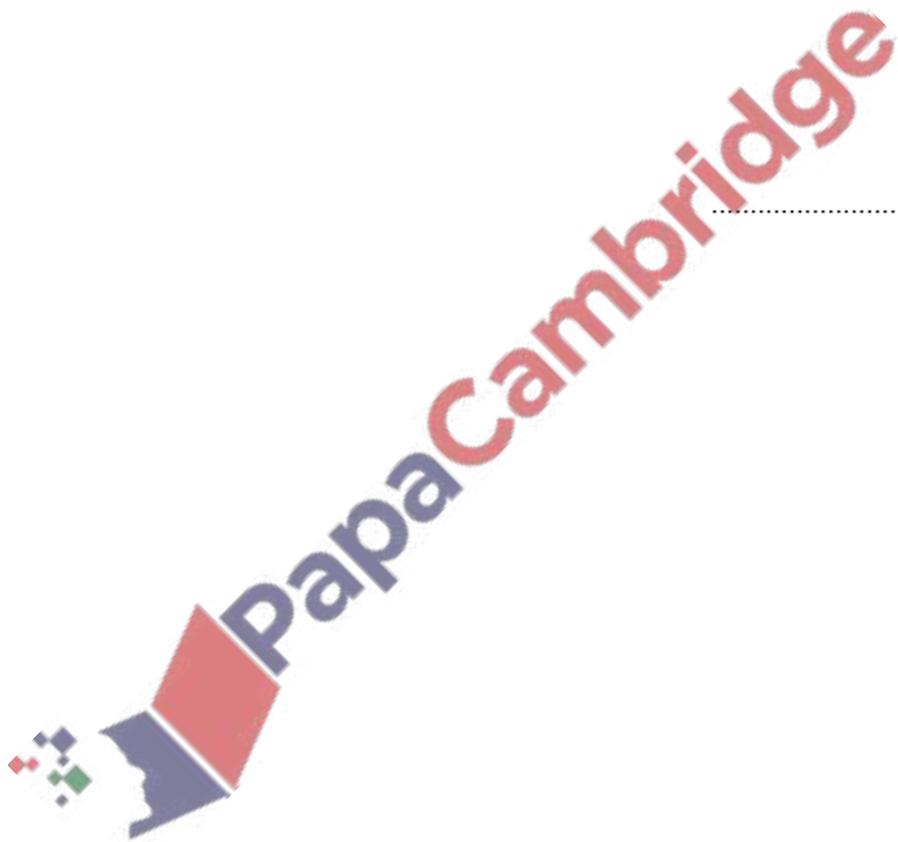
Simplify. $\dfrac{x-8-ax+8a}{x^2-15x+56}$

.... [5]

24.
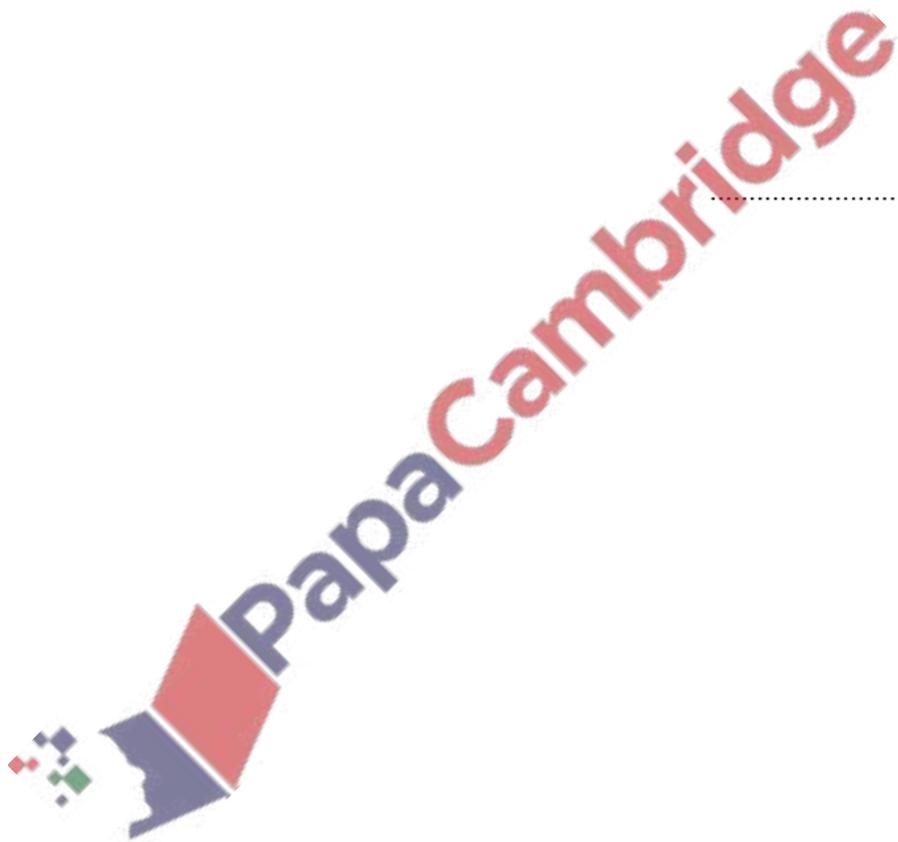
(a) Complete the table of values for $y = 7 + 2x - x^2$.

x	−2	−1	0	1	2	3	4
y	−1			8	7		−1

[2]

(b) On the grid, draw the graph of $y = 7 + 2x - x^2$ for $-2 \leqslant x \leqslant 4$.
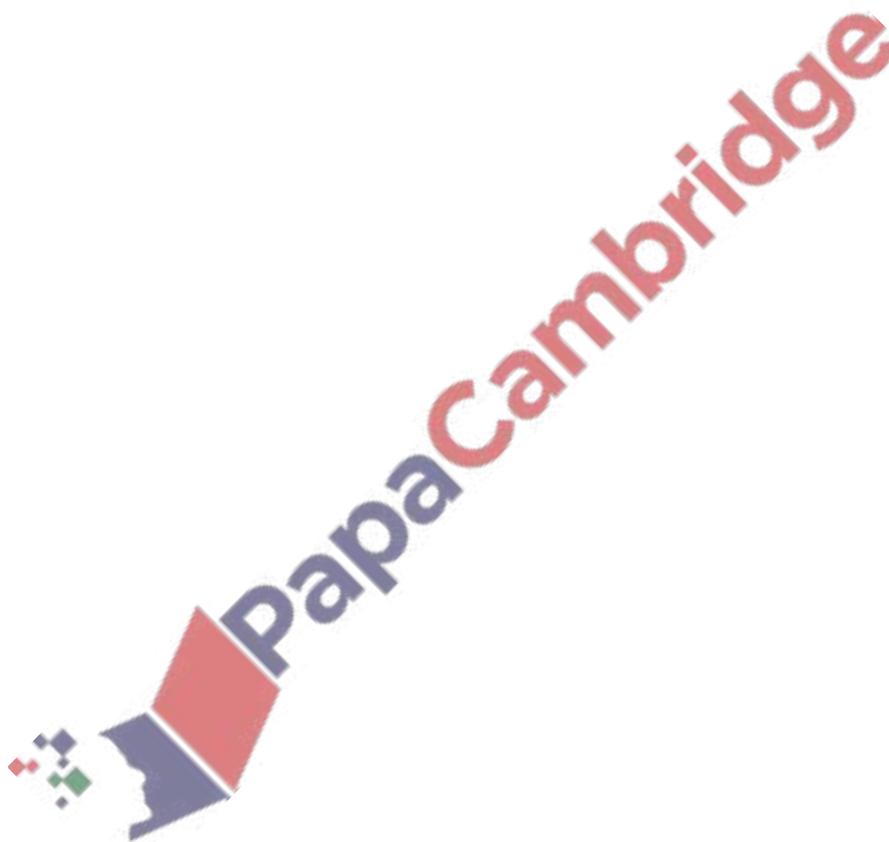
[4]

(c) Write down the equation of the line of symmetry of the graph.

.... [1]

(d) Use your graph to solve the equation $7 + 2x - x^2 = 0$.

$x =$ .... or $x =$ .... [2]
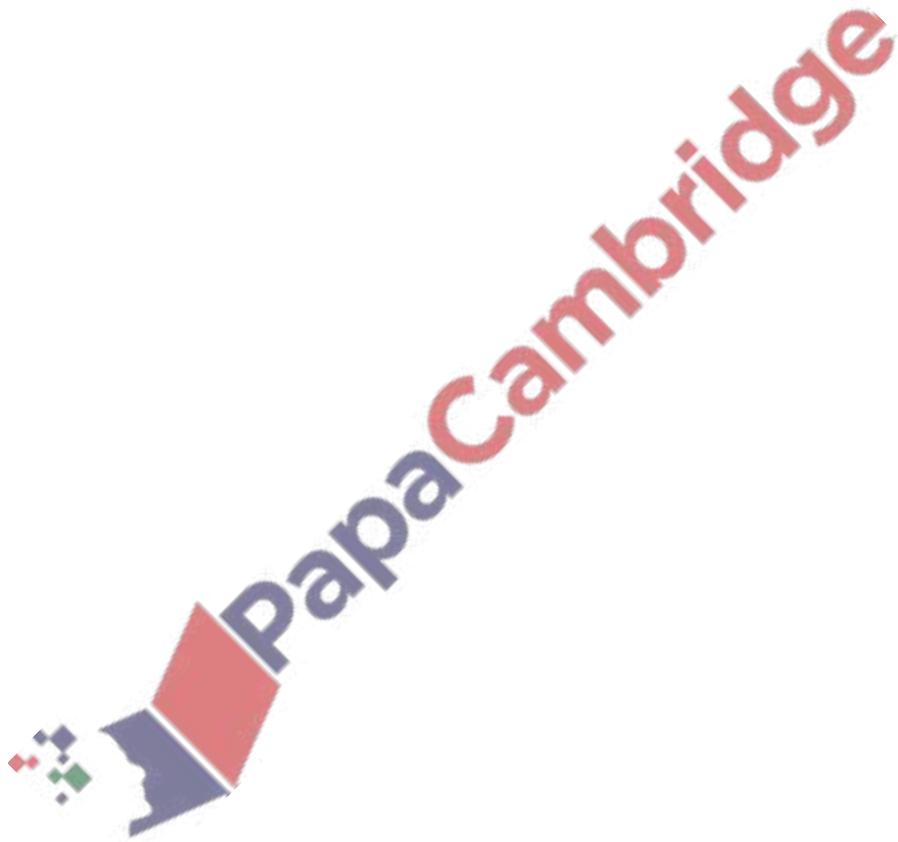
(a) Simplify $3c - 5d - c + 2d$.

.... [2]

(b) Solve the equation $12x - 7 = 23$.

$x =$ .... [2]

(c) Expand.

$$9(3 - x)$$

.... [1]

(d) $A = \dfrac{(a+b)h}{2}$

Work out the value of h when $A = 38.64$, $a = 5.5$, and $b = 3.7$.

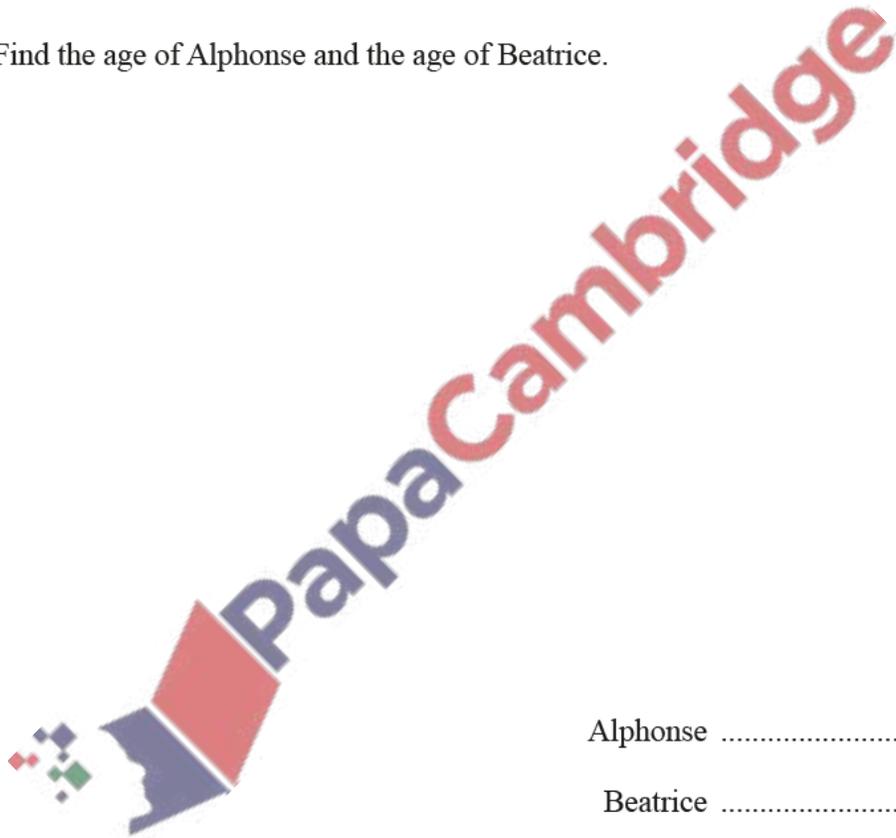$h =$ .... [3]
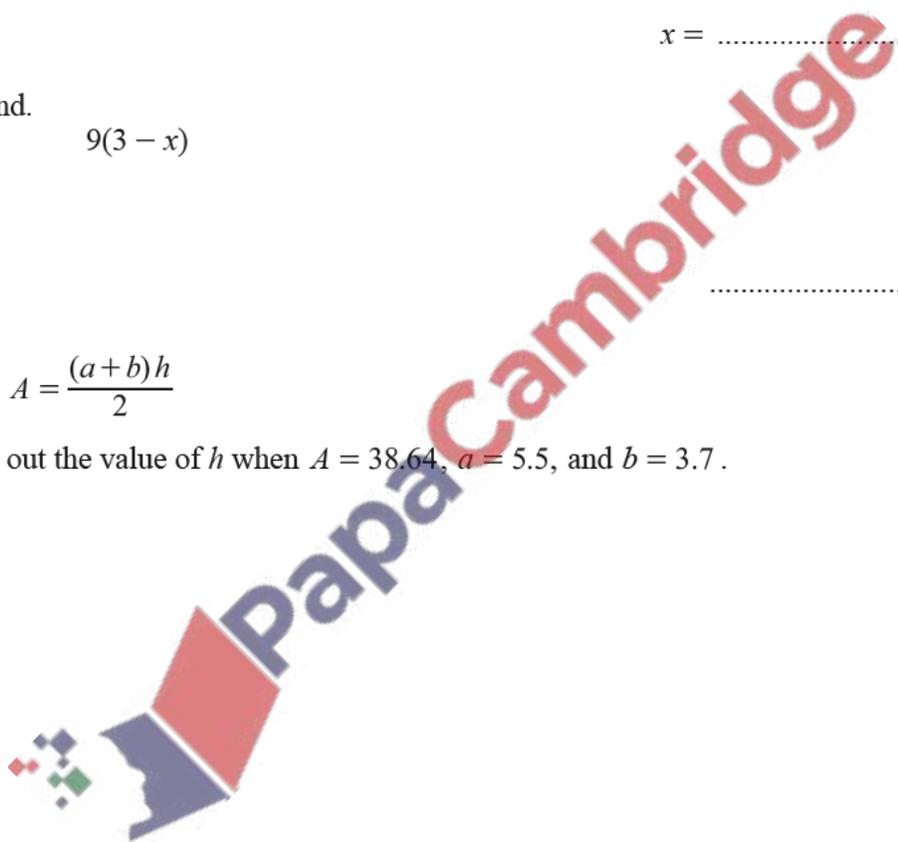
(e) Alphonse is x years old and Beatrice is y years old.
Three times Alphonse's age is equal to 5 times Beatrice's age.
Twice Beatrice's age is 4 years more than Alphonse's age.

(i) Use this information to write down two equations in x and y.

....

.... [2]

(ii) Find the age of Alphonse and the age of Beatrice.

Alphonse .... years old

Beatrice .... years old [3]

(a) $s = ut + \frac{1}{2}at^2$

Find the value of s when $u = 5.2$, $t = 7$ and $a = 1.6$.

$s =$ .... [2]

(b) Simplify.

    (i) $3a - 5b - a + 2b$

.... [2]

    (ii) $\dfrac{5}{3x} \times \dfrac{9x}{20}$

.... [2]

(c) Solve.

    (i) $\dfrac{15}{x} = -3$

$x =$ .... [1]

    (ii) $4(5 - 3x) = 23$

$x =$ .... [3]
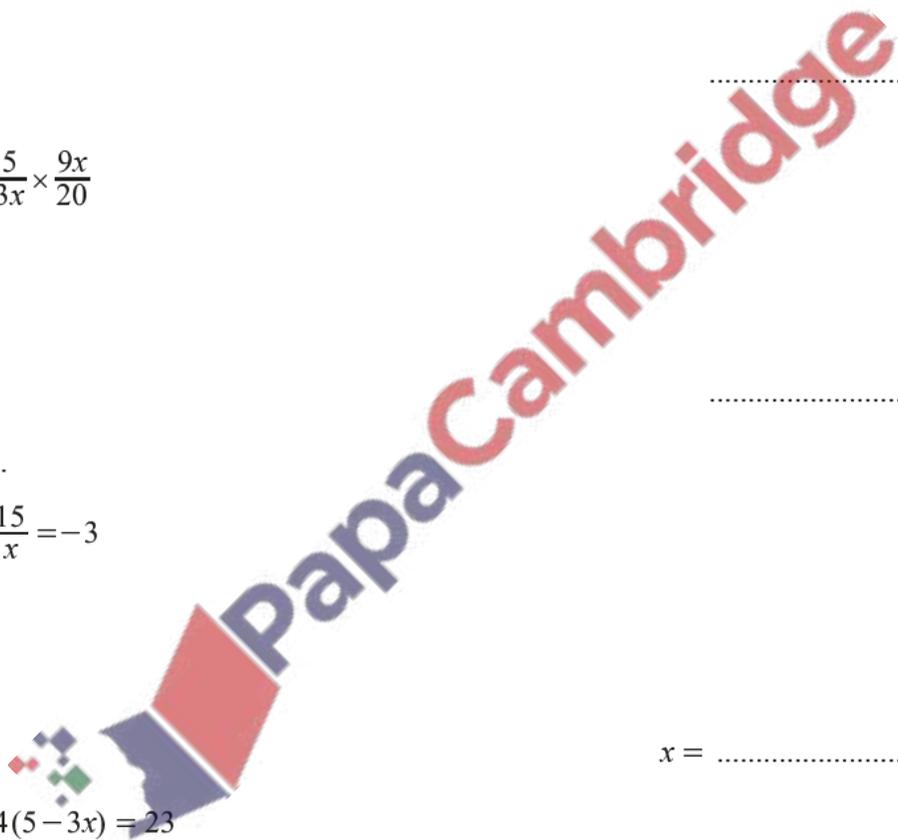
(d) Simplify.
$$(27x^9)^{\frac{2}{3}}$$

.... [2]

(e) Expand and simplify.
$$(3x - 5y)(2x + y)$$

.... [2]
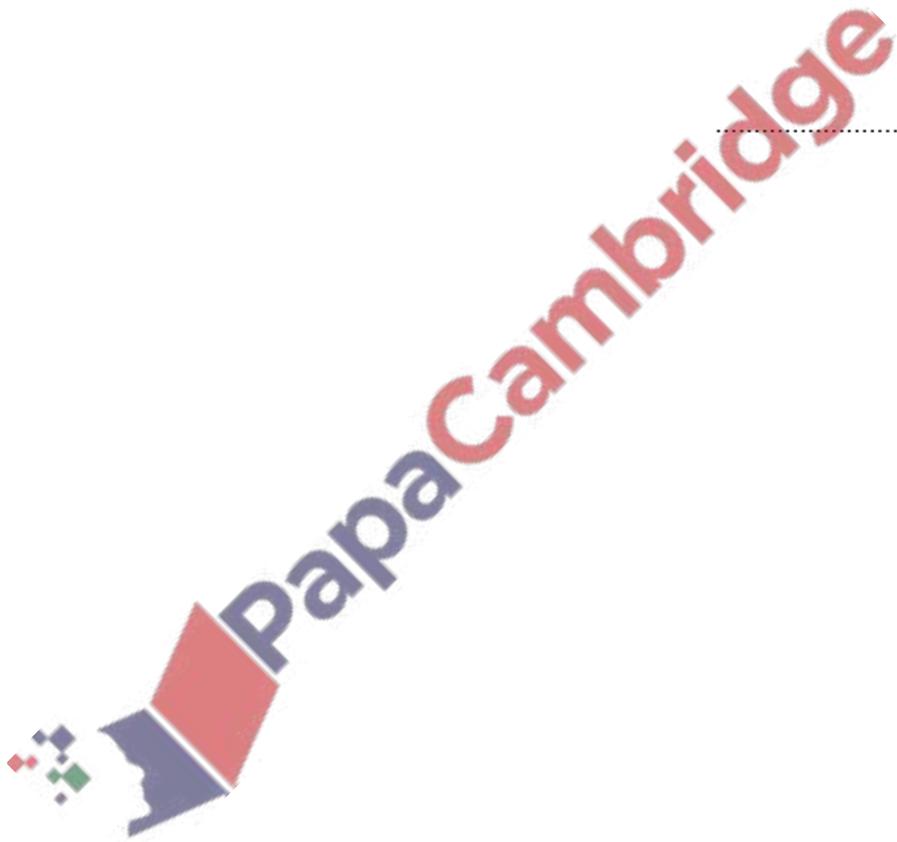
(b) (i) Write $x^2 + 10x + 14$ in the form $(x+a)^2 + b$.

.... [2]

(ii) Write down the coordinates of the minimum point on the graph of $y = x^2 + 10x + 14$.

(....................., ...) [2]

(iii) On the axes, sketch the graph of $y = x^2 + 10x + 14$.
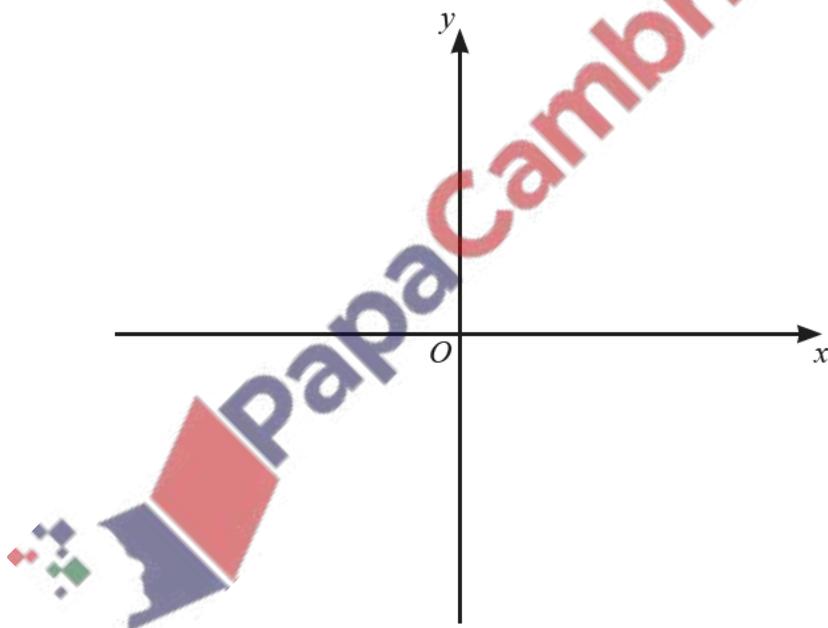
[1]
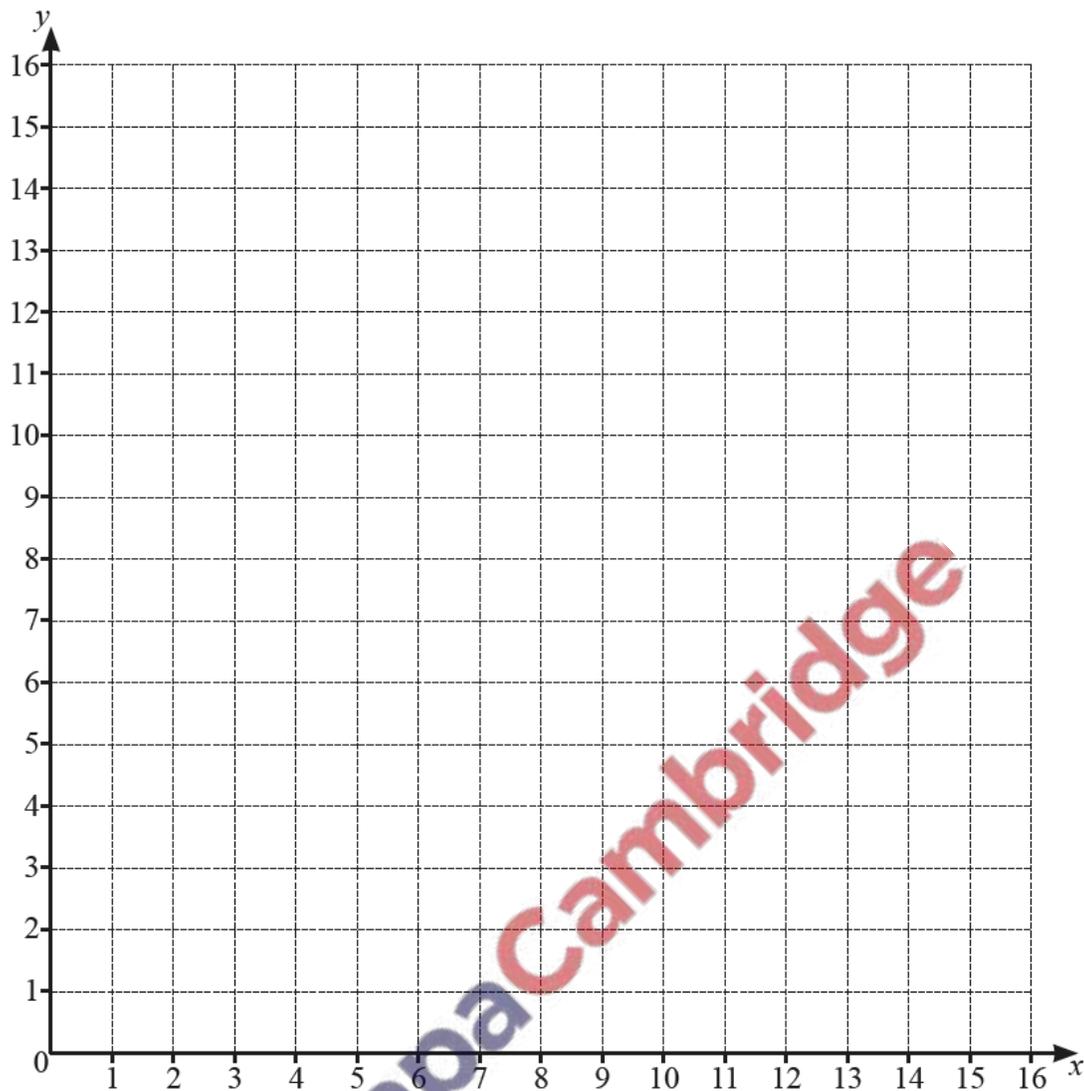
(a) On the grid, draw the lines $y = 4$, $y = 10$, $y = x$ and $3x + 2y = 30$. [5]

(b) Label the region R where $x \geqslant 0$, $y \geqslant 4$, $y \leqslant 10$, $y \geqslant x$ and $3x + 2y \leqslant 30$. [1]

(c) For points in the region R, find

    (i) the smallest value of $x + y$,

        .... [1]

    (ii) the largest value of $x + y$ when x and y are integers.

        .... [1]

(d) Label the region S where $y \geqslant 10$, $y \geqslant x$ and $3x + 2y \geqslant 30$. [1]

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