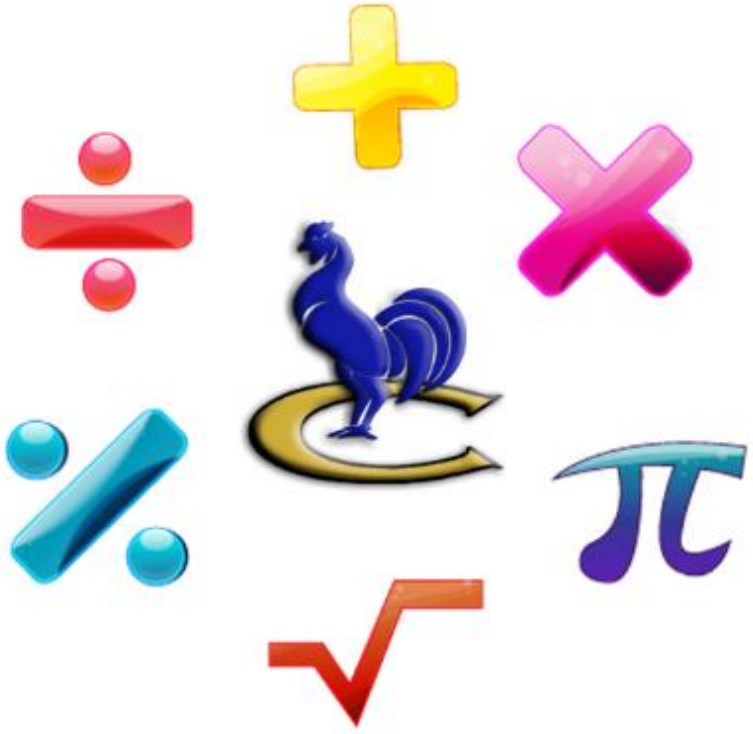
Key Stage 4

Intermediate Algebra Revision



Name:

Teacher:

(a) Calculate the value of $3x + 4y$ when $x = -6$ and $y = 5$. [2]

(b) Simplify the expression $9g - 4f - 3g - 5f$. [2]

(c) Solve the equation $3m - 7 = 8$. [2]

(d) Expand $4(3x - 5)$. [1]

Factorise $10a - 15$. [1]

Solve the following equations.

(i) $\frac{x}{7} = 21$ [1]

(ii) $13f + 2 = 6f + 5$. [3]

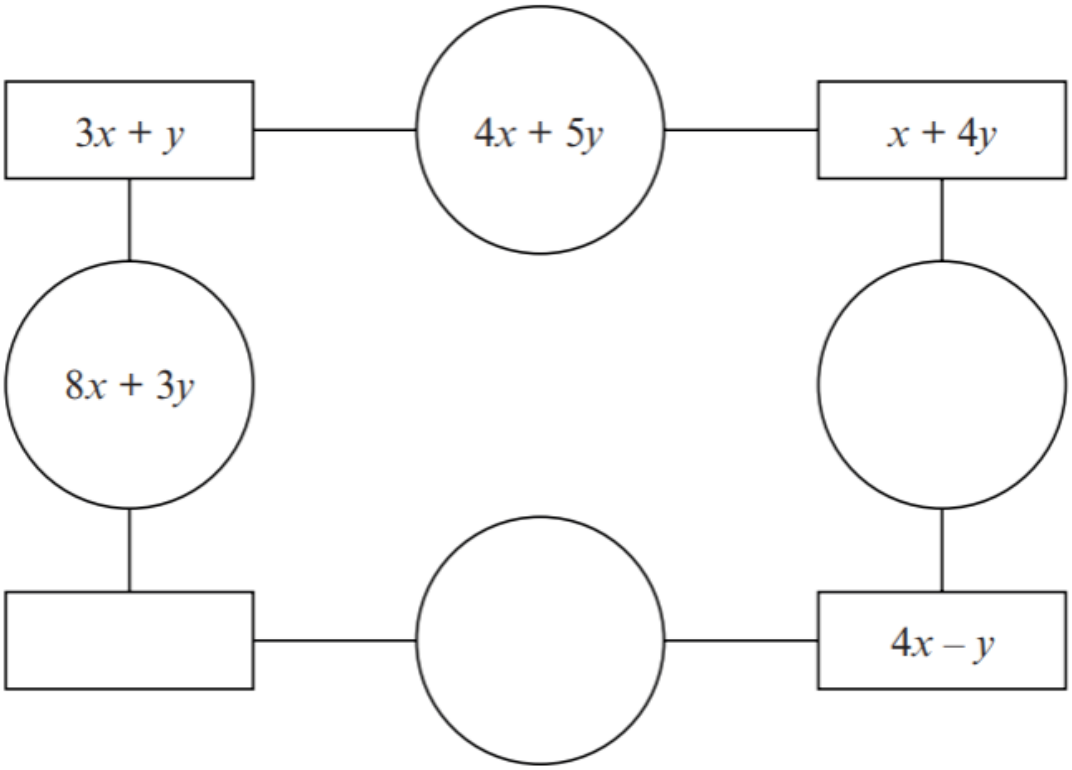
Find the value of $2x + 7y$ when $x = -3$ and $y = 10$. [2]

Simplify the expression $8k + 3m - 2k - 8m$. [2]

Simplify the expression $10g - 5f - 3g + 3f$. [2]

Using the formula $2T = M + 3K$, find the value of K when $T = 11$ and $M = 4$. [2]

Look at the diagram below.
The expression in each circle is found by **adding** the expressions in the rectangles on either side of the circle.
Complete the diagram by writing expressions in the blank circles and the blank rectangle.
You must simplify your expressions. [3]



Solve each of the following equations.

(a) $\frac{w}{5} = 10$ [1]

(b) $\frac{42}{x} = 7$ [1]

(c) $13y - 5 = 9y + 27$ [3]

(a) Make m the subject of the formula $y = 6m + 7$. [2]

(b) Factorise $6x^2 - 12x$. [2]

Use the formula $x = 4a + 3b$ to find the value of x when $a = 7{\cdot}2$ and $b = -4{\cdot}6$. [2]

Solve the following equations.

(i) $\frac{x}{9} = 4$ [1]

(ii) $4(3x + 2) = 12$ [3]

Factorise each of the following.

(i) $14a + 21$ [1]

(ii) $f^2 - f$ [1]

(a) Solve the equation $4x + 7 = 10$. [2]

(b) Simplify $8d - 6e - 3d + 4e$. [2]

(a) Factorise $7ab + 11a$. [1]

(b) Factorise $x^2 - 8x$. [1]

(c) Expand $4y(2 - 3y)$. [2]

Make t the subject of the formula $r = 3t - 8$. [2]

(a) Factorise $x^3 - 5x$. [1]

(b) Expand and simplify $(2x - 3)(x + 4)$. [2]

(c) Factorise $x^2 - 3x - 28$. [2]

Solve the equation $3x - 2 = 10$. [2]

$x^3 \times x^6 =$ [1]

x^{36} $x^{0.5}$ x^2 x^9 x^{18}

$(7x - 5y) - (3x + 2y) =$ [1]

$4x - 3y$ $4x - 7y$ $4x + 3y$ $-4x + 7y$ $-4x - 7y$

A car travels x miles in 30 minutes.
Its average speed in miles per hour is [1]

$\frac{x}{2}$ $\frac{x}{30}$ $2x$ $\frac{2}{x}$ $30x$

(a) Factorise $x^2 - 7x + 12$, and hence solve $x^2 - 7x + 12 = 0$. [3]

(b) Expand and simplify $(5x - 2)^2$. [2]

(a) Solve $5(2x + 3) = 20$. [3]

(b) Factorise $7a + 21$. [1]

Write down an expression for the nth term of the following sequence. [2]

5, 11, 17, 23, ...

.....

n is an integer.

Tick the correct statement below.
You must give an explanation for your decision. [1]

$5n - 3$ is always an even number.	$5n - 3$ is always an odd number.	$5n - 3$ can be an even number or an odd number.

Explanation: .....

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(a) Write down the first three terms of the sequence whose nth term is given by $2n - 5$. [2]

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The first three terms are ....., ... and .....

(b) Write down an expression for the nth term of the following sequence. [2]

7, 11, 15, 19, ...

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(a) Write down the nth term of the following sequence. [2]

3, 4, 5, 6, ...

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(b) The nth term of a different sequence is given by $n^2 + 7$.

(i) Write down the first three terms of this sequence. [2]

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1st term = ... 2nd term = ... 3rd term = ...

(ii) Which **term** in this sequence is the first that has a value greater than 85? [2]

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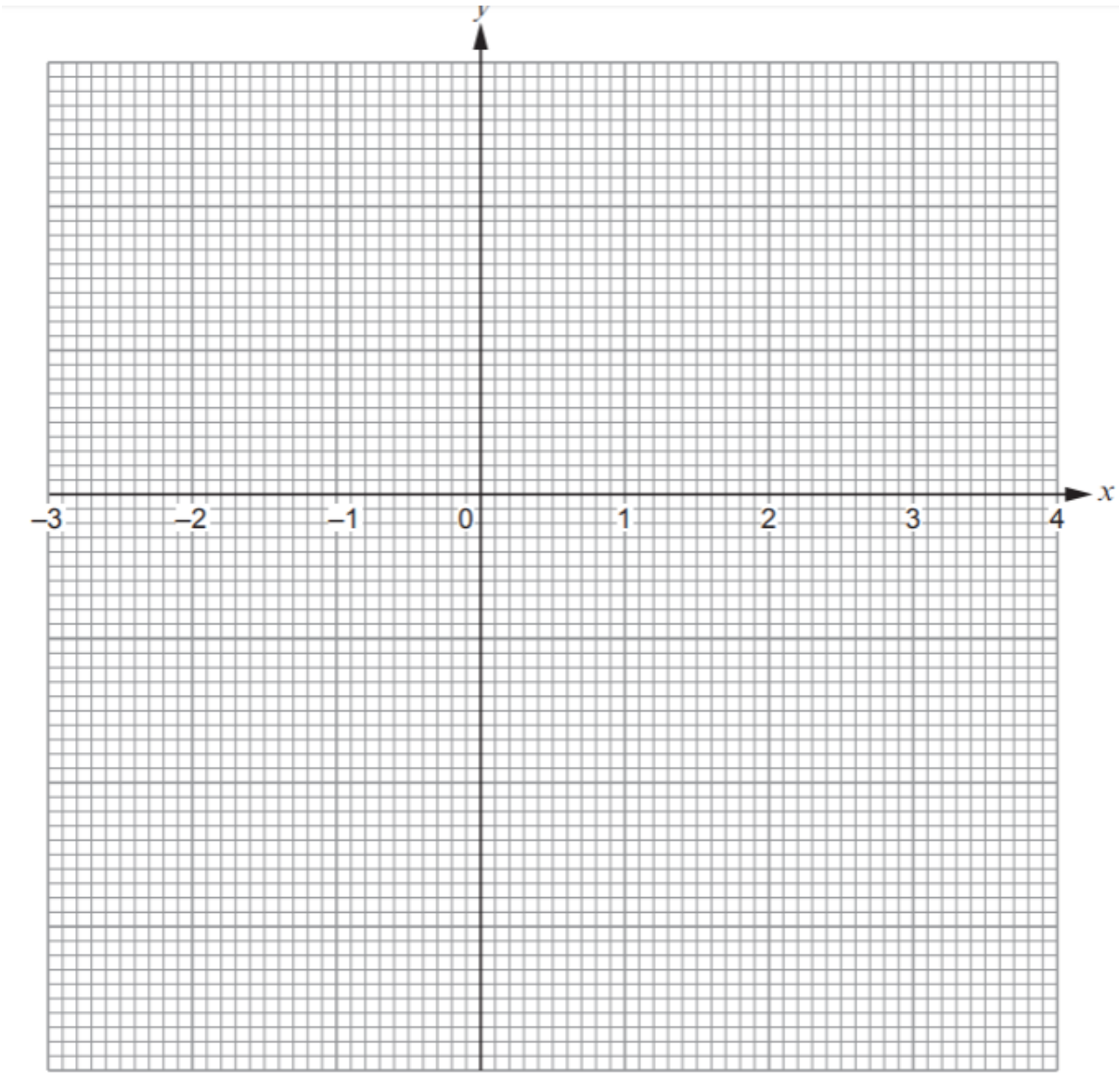
Answer = ... term.

Complete the table below.
Draw the graph of $y = 3x^2 - 25$ for values of x between −3 and 4.
Use the graph paper below.
You must choose a suitable scale for the y-axis. [4]

x	–3	–2	–1	0	1	2	3	4
$y = 3x^2 - 25$	2		–22	–25	–22	–13	2	23

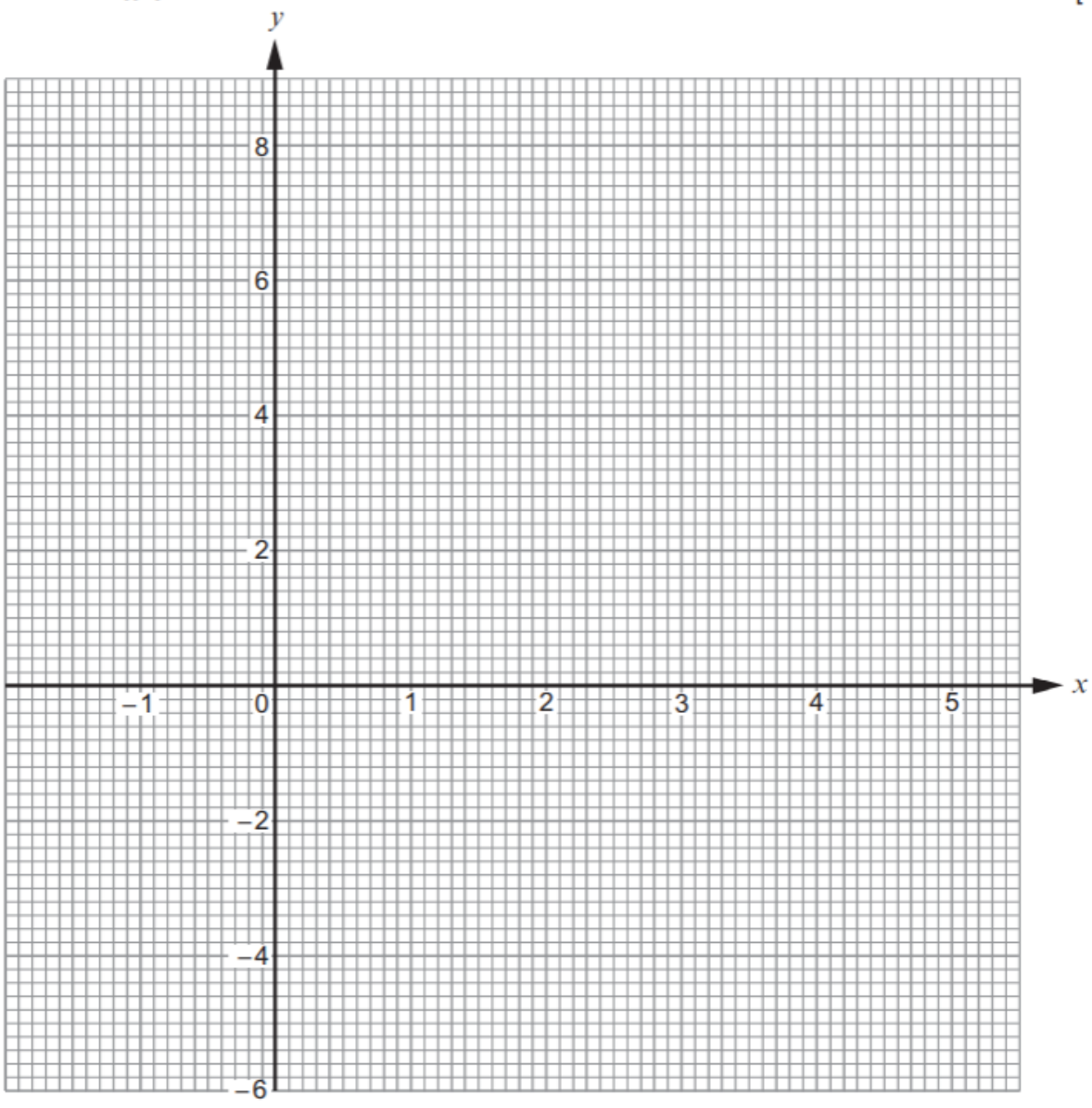


. The table below shows some of the values of $y = x^2 - 5x + 2$, for values of x from –1 to 5.

x	–1	0	1	2	3	4	5
$y = x^2 - 5x + 2$	8	2	–2	–4		–2	2

(a) Complete the table above. [1]

(b) On the graph paper below, draw the graph of $y = x^2 - 5x + 2$ for values of x from –1 to 5. [2]



(c) Draw the line $y = -3$ on the graph paper.

Write down the values of x where the line $y = -3$ cuts the curve $y = x^2 - 5x + 2$.
Give your answers correct to 1 decimal place. [2]

Values of x are ..... and .....

1. *(a)* The table below shows some of the values of $y = 2x^2 - 5x - 1$ for values of x from –2 to 4.

Complete the table by finding the value of y for $x = -1$ and for $x = 2$. [2]

x	–2	–1	0	1	2	3	4
$y = 2x^2 - 5x - 1$	17		–1	–4		2	11

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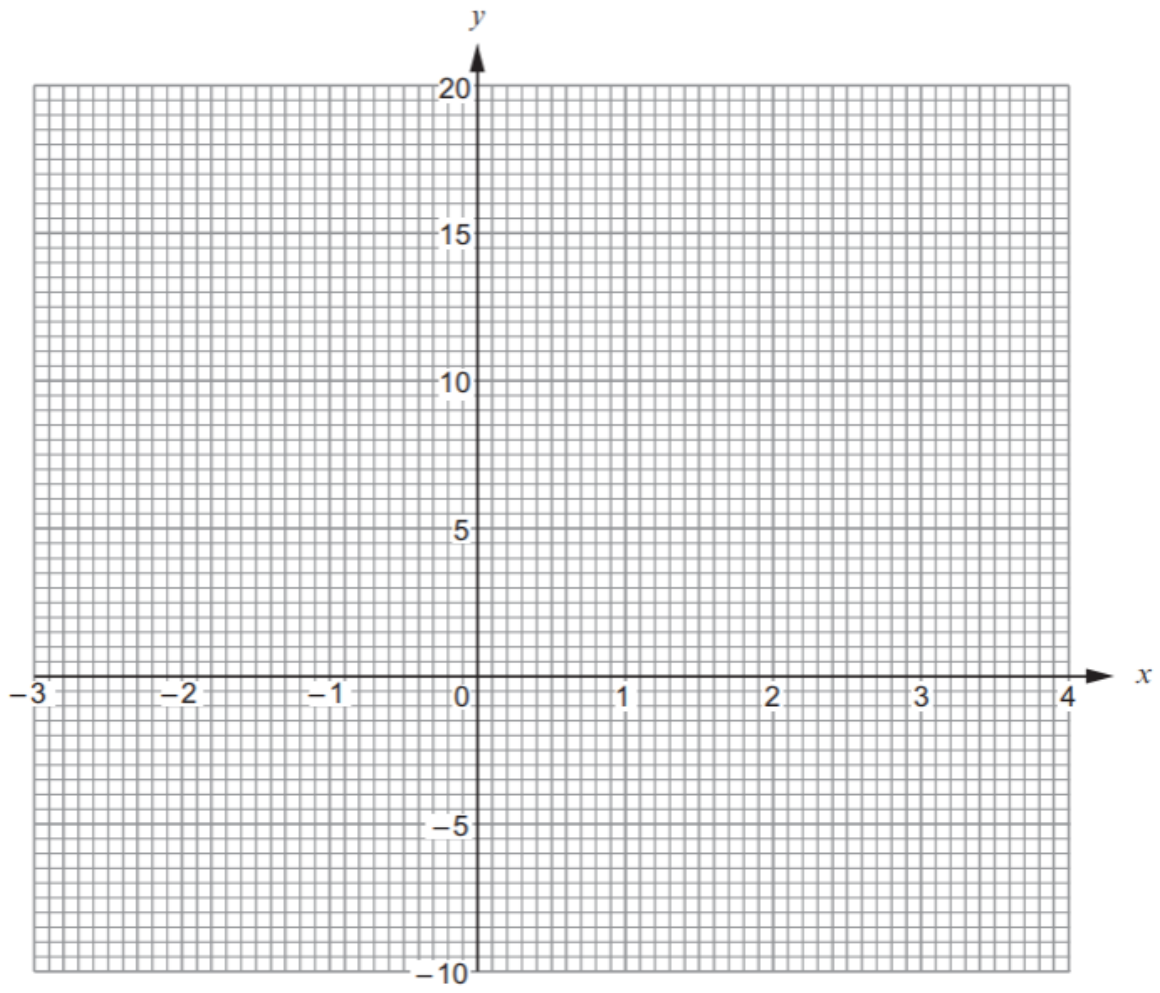
(b) On the graph paper below, draw the graph of $y = 2x^2 - 5x - 1$ for values of x from –2 to 4. [2]



(c) Draw the line $y = 5$ on the graph paper.

Write down the values of x where the line $y = 5$ cuts the curve $y = 2x^2 - 5x - 1$.
Give your answers correct to 1 decimal place. [2]

Values of x are ..... and .....

(d) Circle the equation below whose solutions are the values you have given in *(c)*. [1]

$2x^2 - 5x - 1 = 0$ $\quad$ $2x^2 - 5x - 6 = 0$ $\quad$ $2x^2 - 5x - 5 = 0$

$2x^2 - x - 1 = 0$ $\quad$ $2x^2 - 5x + 4 = 0$

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12. The table below shows some of the values of $y = x^2 - 2x - 4$ for values of x from –3 to 4.

x	−3	−2	−1	0	1	2	3	4
$y = x^2 - 2x - 4$	11	4	−1	−4		−4	–1	4

(a) Complete the table by finding the value of y when $x = 1$. [1]

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(b) On the graph paper opposite, draw the graph of $y = x^2 - 2x - 4$ for values of x from –3 to 4. [2]

(c) (i) Draw the line $y + x = 4$ on the graph paper. [2]

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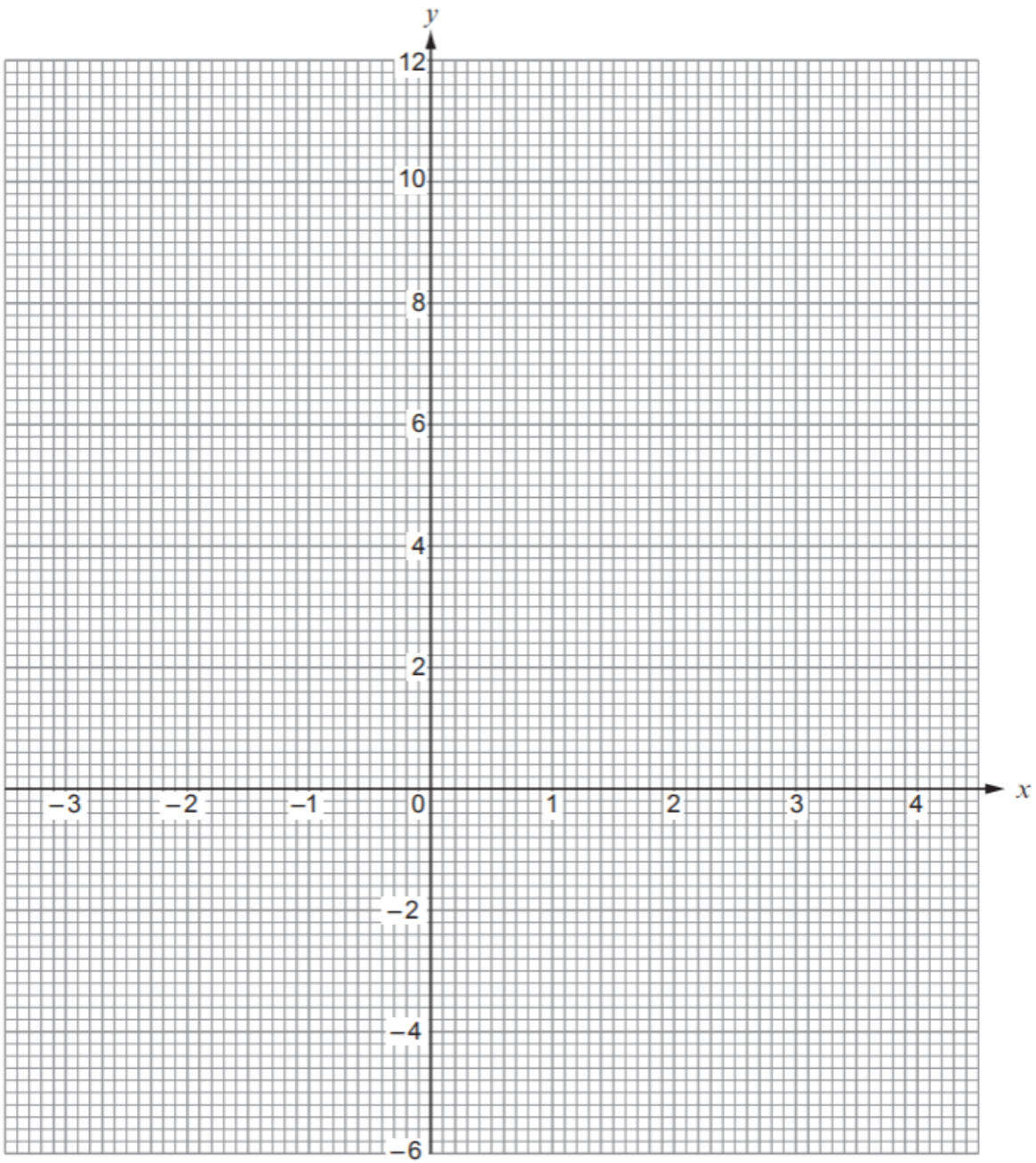
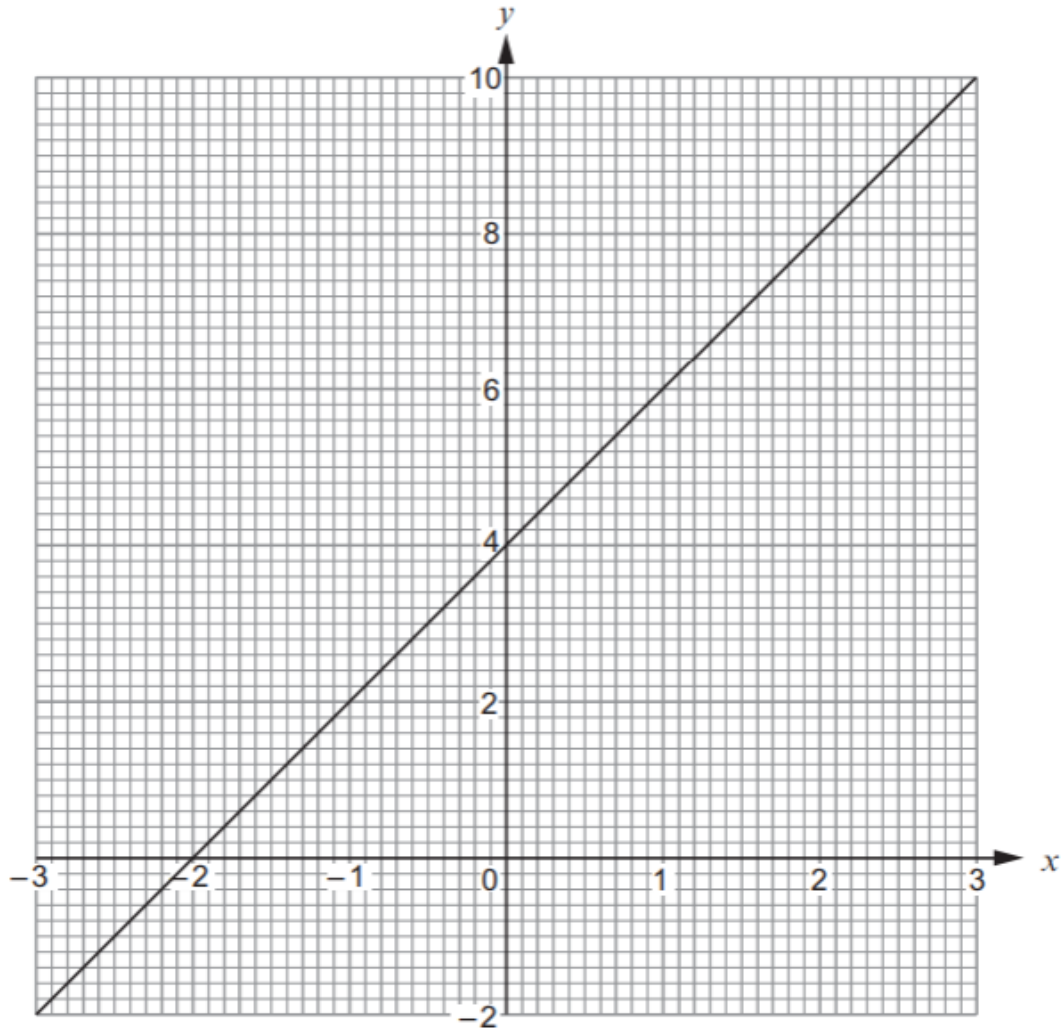
(ii) Write down the values of x where the line $y + x = 4$ cuts the curve $y = x^2 - 2x - 4$. [1]

Values of x are ..... and .....


y
12
10
8
6
4
2
−3
−2
−1
0
1
2
3
4
x
−2
−4
−6

The diagram below shows the graph of a straight line for values of x from −3 to 3.



(i) Write down the gradient of the above line. [1]

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(ii) Write down the equation of the line in the form $y = mx + c$, where m and c are whole numbers. [2]

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(b) Without drawing, show that the line $2y = 5x - 3$ is parallel to the line $4y = 10x + 7$. You must show working to support your answer. [2]

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14. The table below shows some of the values of $y = x^2 - 4x - 3$ for values of x from –2 to 5.

x	−2	–1	0	1	2	3	4	5
$y = x^2 - 4x - 3$		2	−3	−6		−6	−3	2

(a) Complete the table by finding the value of y for $x = -2$ and the value of y for $x = 2$. [2]

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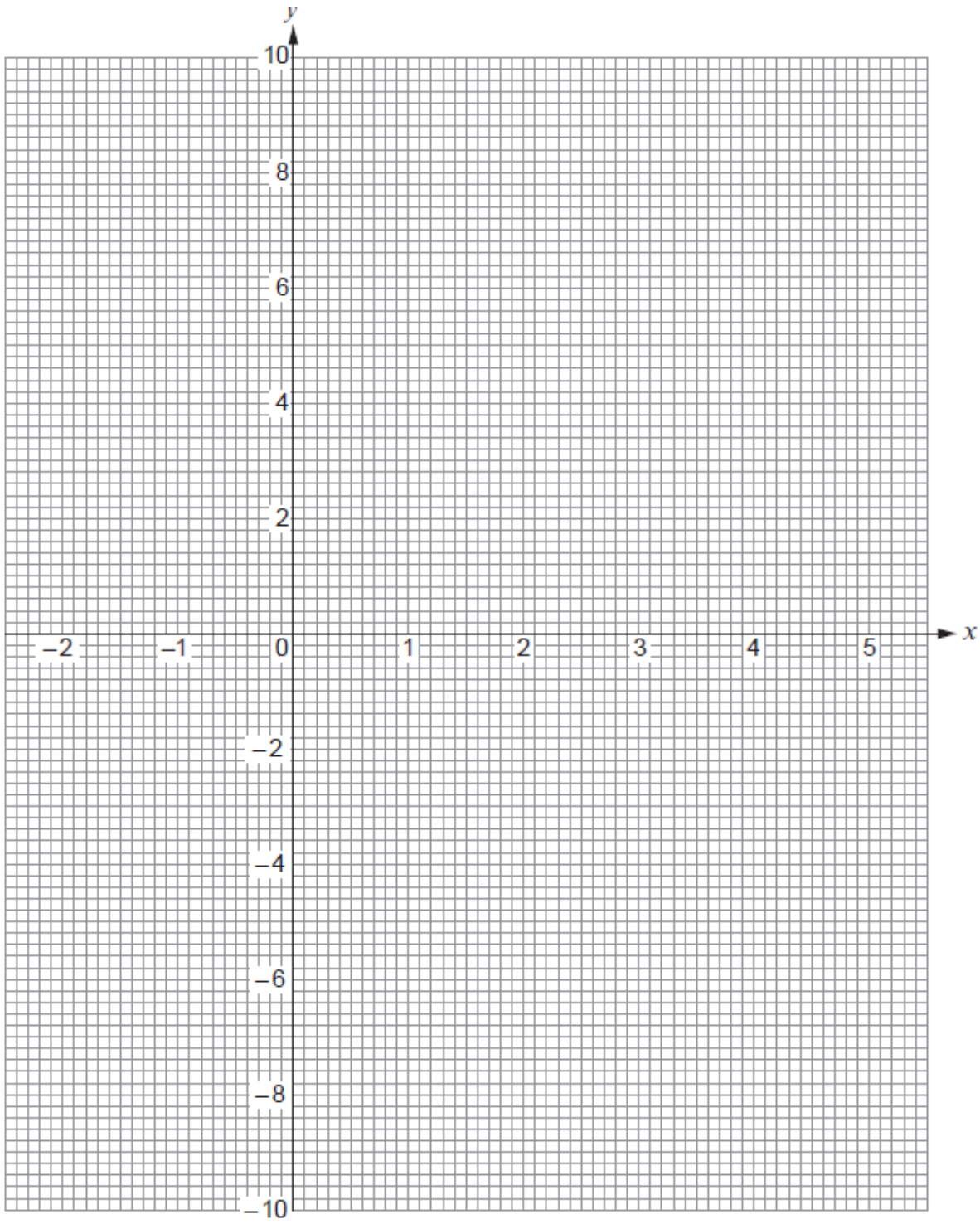
(b) On the graph paper opposite, draw the graph of $y = x^2 - 4x - 3$ for values of x from –2 to 5. [2]

(c) Draw the line $y = 1$ on the graph paper.
Write down the values of x where the line $y = 1$ cuts the curve $y = x^2 - 4x - 3$. [2]

Values of x are ..... and .....


y
10
8
6
4
2
−2
−4
−6
−8
−10
x
−2
−1
0
1
2
3
4
5

ABCD is a quadrilateral.

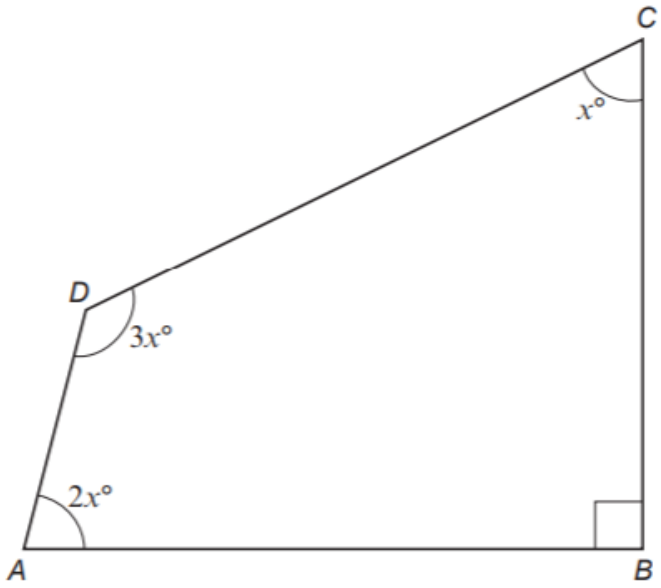


Diagram not drawn to scale

(a) Calculate the value of x. [4]

A rectangle has a length of $(x + 5)$ cm and a width of $(2x - 3)$ cm.
Its perimeter is 46 cm.

Calculate the value of x. [4]

Show that the triangle below is **not** a right-angled triangle. [5]

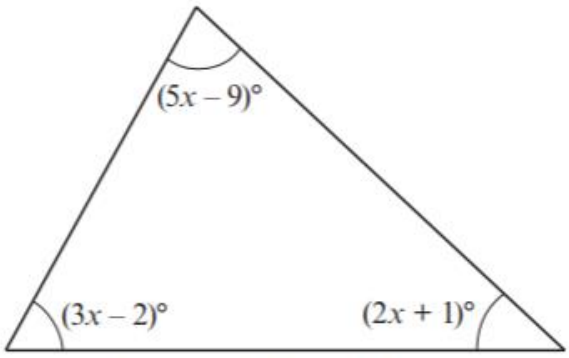


Diagram not drawn to scale

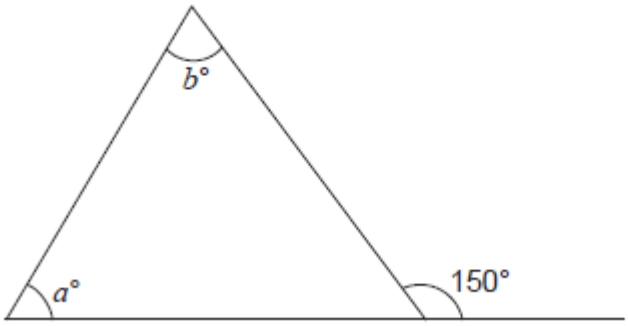


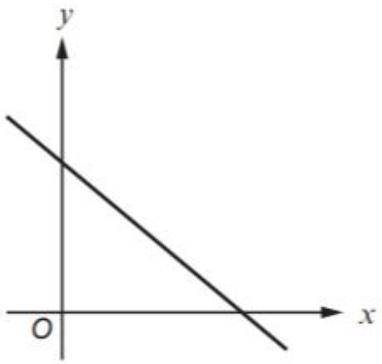
Diagram not drawn to scale

Which of the following equations is correct for the diagram shown above?
Circle your answer. [1]

$a + b = 30$ $a + b = 210$ $b - a = 150$

$a - b = 150$ $a + b = 150$

(a)



Which **one** of the following equations could represent the line shown in the graph above?
Circle your answer. [1]

$y = -x - 2$ $y = -x + 2$ $y = x + 2$ $y = x - 2$ $y = -x.$

(b) Which **one** of the following points lies on the line $2y = 3x + 4$?
Circle your answer. [1]

(2, –5) (5, 2) (–2, 5) (2, 5) (–2, –5)

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19. *(a)* Circle the equation of a straight line that is parallel to the line $3y = 2x + 6$. [1]

$3y = 2x + 7$ $2y = 3x + 6$ $3y = -2x + 6$ $-3y = 2x + 6$ $2y = -3x + 6$

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(b) Circle the equation of a straight line that is perpendicular to the line $y = 5x - 3$. [1]

$y = \frac{x}{5} + 3$ $y = 5x + 3$ $y = 5x + \frac{1}{3}$ $y = -5x + 3$ $y = \frac{-x}{5} + 3$

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. *(a)* Which one of the following equations represents a straight line that is parallel to the line $2y = 5x - 4$?
Circle your answer. [1]

$y = 2{\cdot}5x + 3$ $y = 5x - 2$ $y = 0{\cdot}4x - 4$ $y = -0{\cdot}4x - 2$ $2y = -5x + 4$

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(b) Which one of the following equations represents a straight line that intersects the line $y = 7x - 5$ on the y-axis?
Circle your answer. [1]

$y = 7x + 5$ $y = 5 - 7x$ $y = 3x + 5$ $y = 0$ $y = 3x - 5$

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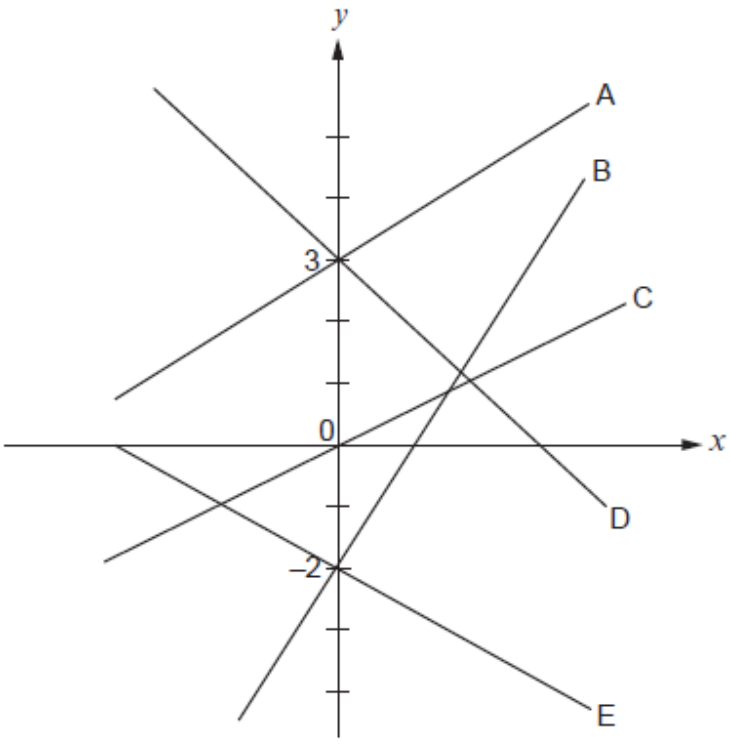
(c)



Which one of the five straight lines shown above could represent the equation $y = -2x + 3$?
Circle your answer. [1]

Line A Line B Line C Line D Line E

(a) Factorise $x^2 - 2x - 24$, and hence solve $x^2 - 2x - 24 = 0$. [3]

Factorise $x^2 + 4x - 21$. Hence, solve $x^2 + 4x - 21 = 0$. [3]

Solve the equation $\frac{2x-3}{5}+\frac{4x+5}{2}=\frac{11}{2}$. [4]

Solve the equation $\frac{4x-3}{2}+\frac{7x+1}{6}=\frac{29}{2}$. [4]

A solution of the equation

$$x^3 - 3x = 37$$

lies between 3 and 4.

Use the method of trial and improvement to find this solution correct to 1 decimal place.
You must show all your working. [4]

A solution of the equation

$$2x^3 + x - 10 = 0$$

lies between 1 and 2.

Use the method of trial and improvement to find this solution correct to 1 decimal place.
You must show all your working. [4]

A solution of the equation

$$x^3 - 5x - 350 = 0$$

lies between 7·2 and 7·3.

Use the method of trial and improvement to find this solution correct to 2 decimal places.
You must show all your working. [4]

A solution to the equation

$$2x^3 - 3x - 17 = 0$$

lies between 2 and 3.

Use the method of trial and improvement to find this solution correct to 1 decimal place.
You must show all your working. [4]

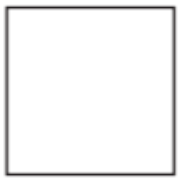
A solution to the equation

$$x^3 - 2x - 45 = 0$$

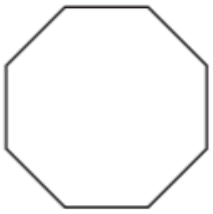
lies between 3 and 4.

Use the method of trial and improvement to find this solution correct to 1 decimal place.
You must show all your working. [4]

Each side of a square is of length $(2x + 3y)$ cm.
The perimeter of the square is 62 cm.



Each side of a regular octagon is of length $(x + 2y)$ cm.
The perimeter of the octagon is 72 cm.



Use an algebraic method to find the value of x and the value of y. [5]

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Solve the following simultaneous equations using an algebraic (not graphical) method. [4]

$$3x + 4y = 7$$
$$2x - 3y = 16$$

Solve the following simultaneous equations using an algebraic (not graphical) method.

$$5x + 3y = 11$$
$$2x - 7y = 29$$

You must show all your working. [4]

The Morgan family and the Smith family are on holiday in Aberystwyth.
There are 7 adults and 2 children in the Morgan family.
There are 4 adults and 3 children in the Smith family.

Both families visit a Craft Centre.
The entry price to the Craft Centre is £x for adults and £y for children.

The total cost for the Morgan family is £41.50.
The total cost for the Smith family is £29.75.

Form two equations in terms of x and y.

Solve your equations, using an algebraic method, to find the entry price for adults and the entry price for children. [5]

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Solve the following simultaneous equations using an algebraic (not graphical) method.

$$3x - 2y = 14$$
$$7x + 3y = 25$$

You **must** show all your working. [4]

Rashid owned n sheep.
Eifion had exactly 4 times as many sheep as Rashid.

Rashid buys 17 extra sheep.
Eifion sells 8 of his sheep.

Eifion still has more sheep than Rashid.

Form an inequality, in terms of n.
Solve the inequality to find the **least** value of n.
You must show all your working. [5]

William has n marbles.
Lois had 4 times as many marbles as William, but she has now lost 23 of them.

Lois still has more marbles than William.

Write down an inequality in terms of n to show the above information.
Use your inequality to find the least number of marbles that William may have. [4]