Coordinate Geometry
Difficulty: Easy

Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Co-ordinate Geometry
Sub-Topic	Coordinate Geometry
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 1

Time allowed: **45 minutes**

Score: **/35**

Percentage: **/100**

Grade Boundaries:

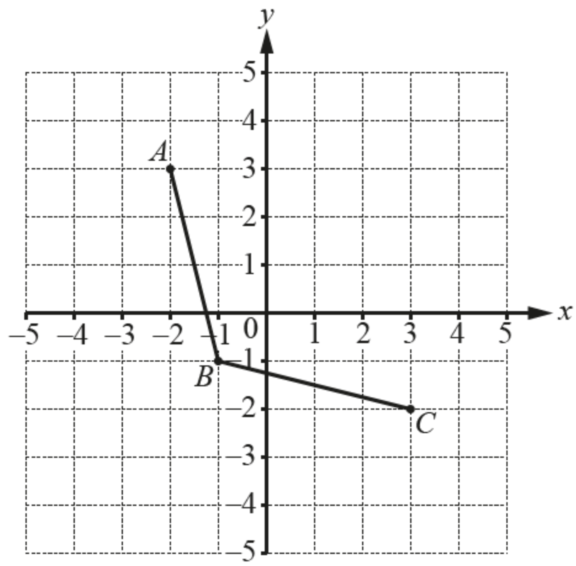
Assembled by A.S

CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

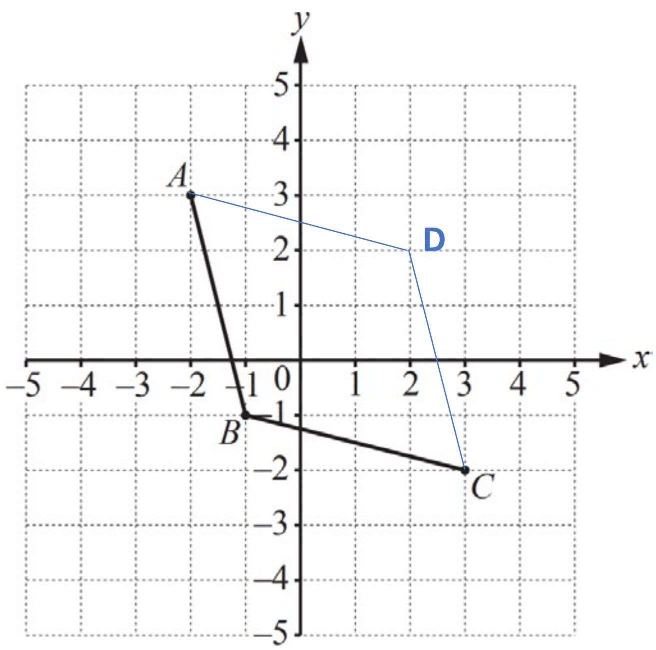


The diagram shows two sides of a rhombus *ABCD*.

(a) Write down the co-ordinates of *A*. [1]

$(-2, 3)$

(b) Complete the rhombus *ABCD* on the grid. [1]



$y = mx + c$

Find the value of y when $m = -2$, $x = -7$ and $c = -3$. [2]

Sub in each of our values to get

y=-2-7+-3

Multiplying two minus numbers makes a positive, and adding a minus turns into a subtraction:

y=2×7-3

y=14-3

y=11

The point A has co-ordinates (– 4, 6) and the point B has co-ordinates (7,–2).

Calculate the length of the line AB. [3]

The change in *x* coordinate between points A and B (subtract the coordinates):

$$\Delta x = (-4) - (7) = -11$$

The change in *y* coordinate between points A and B (subtract the coordinates):

$$\Delta y = (6) - (-2) = 8$$

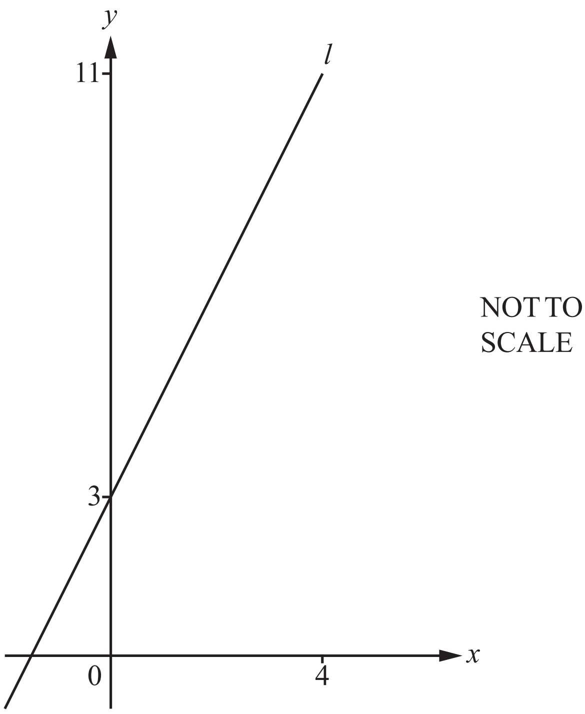
The length is given as:

$$length = \sqrt{(\Delta x)^2 + (\Delta y)^2}$$

Use the previous results to get the length of AB.

$$length = \sqrt{(-11)^2 + (8)^2}$$

$$length = \mathbf{13.6}$$



The diagram shows the straight line, l, which passes through the points (0, 3) and (4, 11).

(a) Find the equation of line l in the form $y = mx + c$. [3]

The general equation of the line is $y = mx + c$. The number m is the gradient

The gradient is found as the change of y-coordinate over the change of x-coordinate

between two points on the line. We have two points (0,3) and (4,11).

$$\text{Gradient } m = \frac{dy}{dx} = \frac{11-3}{4-0} = \frac{8}{4} = 2.$$

To calculate the value of contact c, we simply use one of the points and the equation $y = 2x + c$.

Use point (0,3):

$$3 = 2 \times 0 + c$$

$$c = 3$$

The equation of the line: $\boldsymbol{y = 2x + 3}$

(b) Line p is perpendicular to line l.

Write down the gradient of line p. [1]

The gradient of a perpendicular line *l* is found as negative reciprocal of the original gradient:

$$n = -\frac{1}{m}$$

Therefore the gradient of line n is:

$$n = -\frac{\mathbf{1}}{\mathbf{2}}$$

Find the equation of the line passing through the points with co-ordinates (5, 9) and (–3, 13). [3]

Gradient found as

$$\boldsymbol{m = \frac{y_2 - y_1}{x_2 - x_1}}$$

$$= \frac{13 - 9}{-3 - 5}$$

$$= -\frac{4}{8}$$

$$= -\frac{1}{2}$$

Now use straight-line equation

$$y - y_1 = m(x - x_1)$$

$$\rightarrow y - 13 = -\frac{1}{2}(x + 3)$$

$$\rightarrow \boldsymbol{y = -\frac{1}{2}x + \frac{23}{2}}$$

$A(5, 23)$ and $B(-2, 2)$ are two points.

(a) Find the co-ordinates of the midpoint of the line AB. [2]

A(5, 23) and B(-2, 2) are two points.

Using the midpoint formula,

$$Midpoint = \left(\frac{5+(-2)}{2}, \frac{23+2}{2}\right)$$

$$= \mathbf{(1.5, 12.5)}$$

(b) Find the equation of the line AB. [3]

To find the equation of a straight line, first find the gradient:

$$Gradient = \frac{2-23}{-2-5}$$

$$m = 3$$

Thus, substitute m=3 into the equation: y = mx + c

$$y = 3x + c$$

Substitute a point on the graph, take A(5, 23) in this instance, B can be used too:

$$23 = 3(5) + c$$

$$c = 23 - 15$$

$$= 8$$

Therefore,

$$\boldsymbol{y = 3x + 8}$$

(c) Show that the point (3, 17) lies on the line *AB*. [1]

If (3, 17) lies on line AB, then it will fulfil the equation of the line:

$$y = 3x + 8$$

Sub (3, 17) into the equation above:

$$17 = 3(3) + 8$$

$$= 9 + 8$$

$$= 17$$

Therefore, since LHS = RHS, the **point does lie on the line.**

Find the equation of the line passing through the points (0, –1) and (3, 5). [3]

We are given two points, $(0, -1)$ and $(3, 5)$ and asked to find the equation of a line passing through them. To do this we begin with the generic equation of a straight line,

$$y = mx + c$$

We can calculate m, the gradient, using the equation

$$m = \frac{change\ in\ y}{change\ in\ x} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

Plugging in the values from our points ensuring that order is consistent,

$$m = \frac{5 - (-1)}{3 - 0} = \frac{6}{3} = 2$$

This gives us the equation

$$y = 2x + c$$

To find c we can just plug in either point and rearrange. Choosing $(0, -1)$, we get:

$$-1 = 2(0) + c$$

$$-1 = c$$

Hence our equation becomes

$$\boldsymbol{y = 2x - 1}$$

(a) The two lines $y = 2x + 8$ and $y = 2x - 12$ intersect the x-axis at P and Q. [2]

Work out the distance PQ.

$y = 2x + 8$ intersects the x-axis for

$$2x + 8 = 0$$

$$\rightarrow x = -4$$

$y = 2x - 12$ intersects the x-axis for

$$2x - 12 = 0$$

$$\rightarrow x = 6$$

The distance PQ is then

$$6 - -4$$

$$= \mathbf{10}$$

(b) Write down the equation of the line with gradient -4 passing through (0, 5). [2]

Straight-line equation is

$$y = mx + c$$

Where m is the gradient and c is the y-intercept. Hence

$$\boldsymbol{y = -4x + 5}$$

(c) Find the equation of the line parallel to the line in **part (b)** passing through $(5, 4)$. [3]

Parallel means that it has the same gradient, so -4. Now we use the equation

$$y - y_1 = m(x - x_1)$$

And our known point (5, 4) to get

$$y - 4 = -4(x - 5)$$

$$\rightarrow y - 4 = -4x + 20$$

$$\rightarrow \boldsymbol{y = -4x + 24}$$

(a) Find the co-ordinates of the midpoint of the line joining $A(-8, 3)$ and $B(-2, -3)$. [2]

Midpoint is found as

$$M = \left(\frac{x_A + x_B}{2}, \frac{y_A + y_B}{2}\right)$$

$$= \left(\frac{-8-2}{2}, \frac{-3+3}{2}\right)$$

$$= (\mathbf{-5}, \mathbf{0})$$

(b) The line $y = 4x + c$ passes through $(2, 6)$.

Find the value of c. [1]

$$6 = 4(2) + c$$

$$\rightarrow 6 = 8 + c$$

$$\rightarrow \boldsymbol{c = -2}$$

(c) The lines $5x = 4y + 10$ and $2y = kx - 4$ are parallel.

Find the value of k. [2]

Parallel means they will have the same gradient.

Rearrange both equations into the form

$$y = mx + c$$

Where we know that m is the gradient of the line.

$$5x = 4y + 10$$

$$\rightarrow 4y = 5x - 10$$

$$\rightarrow y = \frac{5}{4}x - \frac{10}{4}$$

Hence the gradient of both lines is

$$m = \frac{5}{4}$$

For the other line

$$2y = kx - 4$$

$$\rightarrow y = \frac{k}{2}x - 2$$

Hence

$$\frac{k}{2} = \frac{5}{4}$$

$$\rightarrow \boldsymbol{k = \frac{5}{2}}$$

Coordinate Geometry
Difficulty: Easy

Model Answers 2

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Co-ordinate Geometry
Sub-Topic	Coordinate Geometry
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 2

Time allowed: **46 minutes**

Score: **/36**

Percentage: **/100**

Grade Boundaries:

CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

CIE IGCSE Maths (0980)

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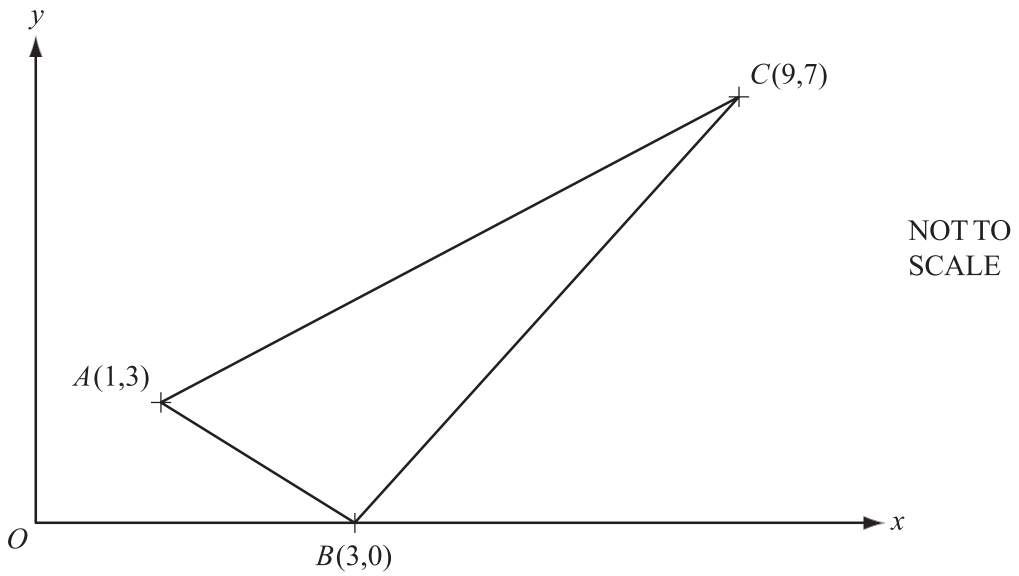


The co-ordinates of A, B and C are shown on the diagram, which is not to scale.

(a) Find the length of the line AB. [3]

The length of the line AB, given the coordinates of the 2 points, A and B,

can be worked out using the formula:

AB = $\sqrt{(xB - xA)^2 + (yB - yA)^2}$

In our case, xA = 1, yA = 3, xB = 3, yB = 0:

AB = $\sqrt{(3-1)^2 + (0-3)^2}$

AB = $\sqrt{2^2 + (-3)^2}$

AB = $\sqrt{13}$ = 3.61

(b) Find the equation of the line AC. [3]

The equation of a line is presented in the form:

$$y = mx + n$$

where m is the gradient

n is the y-intercept

and x and y are the coordinates of a point on the line.

To work out the equation of the line we need to know the gradient of the line AC, m.

The formula for the gradient of a line knowing 2 points on the line is:

$m = \frac{yC - yA}{xC - xA}$

$m = \frac{7-3}{9-1}$

$m = ½$

A(1, 3) is a point on the line AC.

We substitute x = 1, y = 3 and m = 2 in: y = mx + n to work

out the value of n.

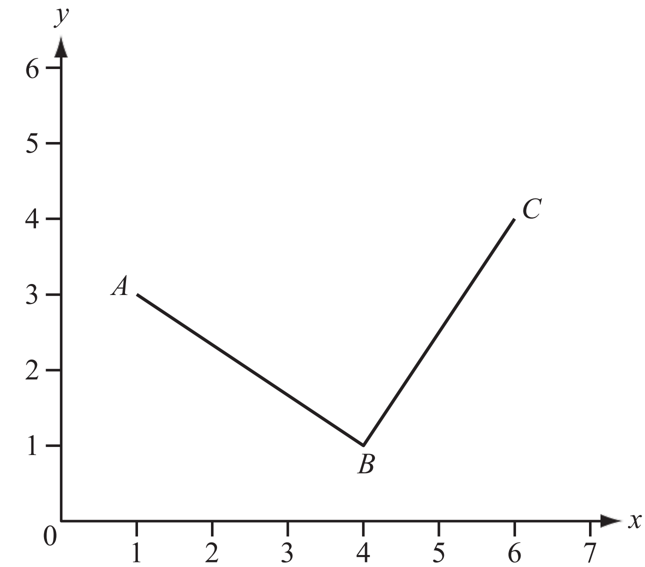
$y = mx + n$

$3 = ½ \times 1 + n$

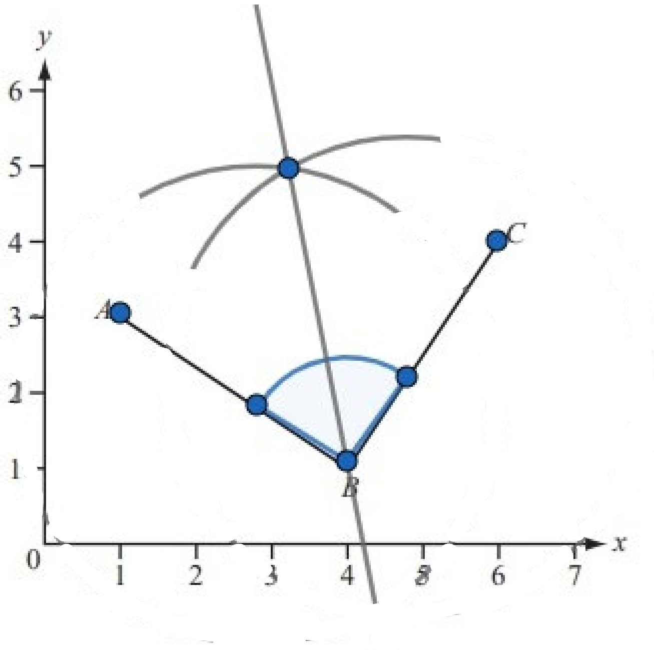
$n = 2½$

Therefore, for any point on the line AC, the equation of the line is:

$y = ½x + 2½$



$A(1, 3)$, $B(4, 1)$ and $C(6, 4)$ are shown on the diagram.



(a) Work out the equation of the line BC. [3]

The equation of a line is presented in the form:

$$y = mx + n$$

where m is the gradient

n is the y-intercept

and x and y are the coordinates of a point on the line.

We need to work out the gradient of the line, m, by using the formula:

$$m = \frac{yC - yB}{xC - xB}$$

$$m = \frac{4-1}{6-4}$$

$$m = \frac{3}{2}$$

We know that B(4, 1) is a point on the line BC.

In the equation y = mx + n, we substitute the following values: $m = \frac{3}{2}$, x = 4

and y = 1.

1 = 4 x $\frac{3}{2}$ + n

n = 1 - 6

n = -5

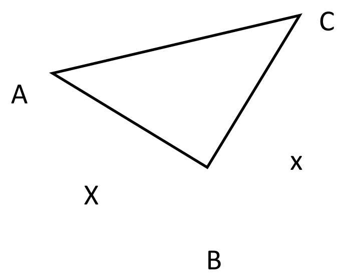
The equation of the line for any point on the line is:

y = 1$\frac{1}{2}$x − 5

(b) *ABC* forms a right-angled isosceles triangle of area 6.5 cm^2.

Calculate the length of *AB*. [2]

As triangle ABC is isosceles, then AB = BC = x cm

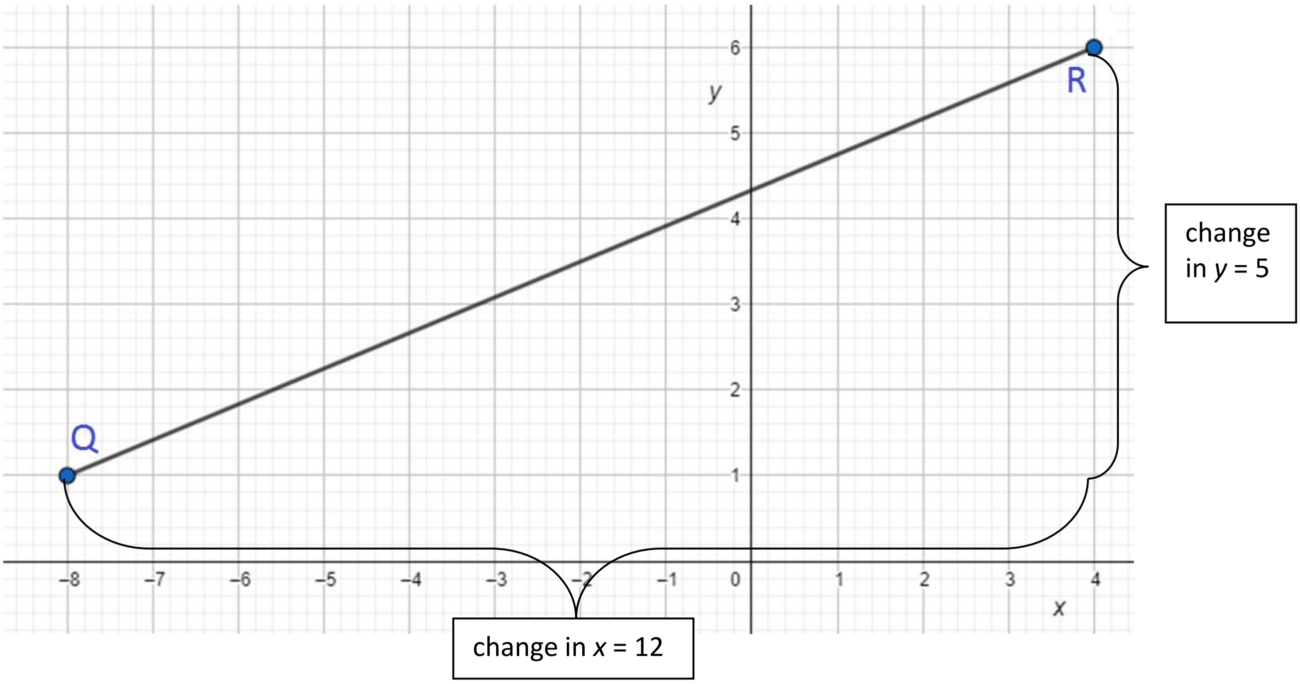


Triangle ABC is also right angled, therefore:

Area = $\frac{1}{2} \times x^2 = 6.5$

$\boldsymbol{x = \sqrt{2 \times 6.5} = \sqrt{13} = 3.61cm}$

Find the length of the straight line from Q (−8, 1) to R (4 , 6). [3]



The change in x coordinate between points Q and Ris found by subtracting the x coordinates:

$$Change\ in\ x = \Delta x = (4) - (-8) = 12$$

The change in y coordinate between points Q and R is found by subtracting the ycoordinates:

$$Change\ in\ y = \Delta y = (6) - (1) = 5$$

Using Pythagoras' Theorem, the length is given as:

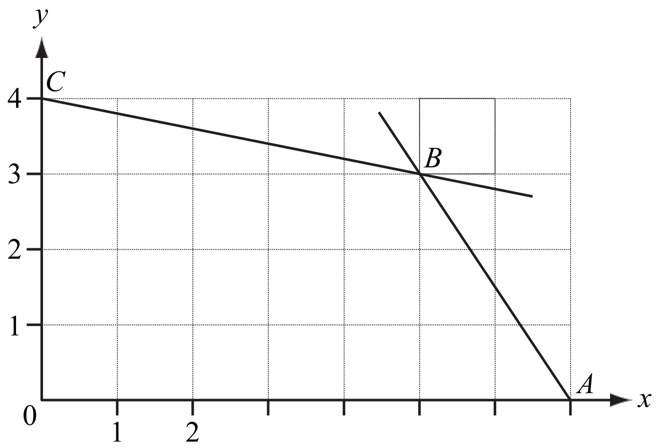
$$length^2 = (\Delta x)^2 + (\Delta y)^2$$

$$length = \sqrt{(\Delta x)^2 + (\Delta y)^2}$$

Use the previous results to get the length of QR.

$$length = \sqrt{(12)^2 + (5)^2} = \sqrt{169} = 13$$

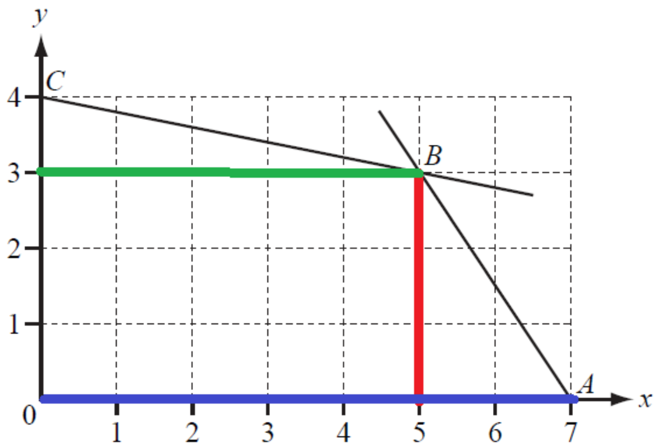
$$\boldsymbol{length = 13}$$



The lines AB and CB intersect at B.

(a) Find the co-ordinates of the midpoint of AB. [1]

From the graph, the coordinate of A is (7,0) and the coordinate of B is (5,3).



To find the coordinate of midpoint of AB, add the coordinated of these points together and half them.

$$\frac{1}{2}\left((7,0) + (5,3)\right) = \frac{1}{2}(12,3)$$

$$\boldsymbol{midpoint\ coordinates = (6\ , 1.5)}$$

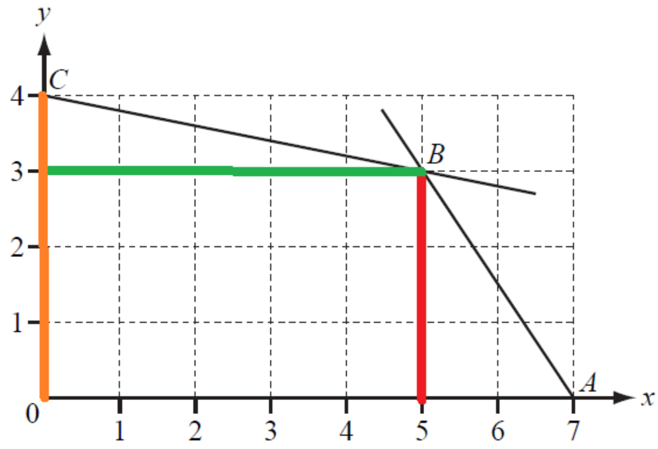
(b) Find the equation of the line CB. [3]

The general equation of a line is:

$$y = mx + c$$

where m is the gradient and c is a constant.

To find an equation of a line, we need the coordinates of two points on the line. We already have B.



Point C has coordinates (0,4).

First, subtract the two coordinates to find the coordinate difference between the two points.

$$coordinate\ difference = (0,4) - (5,3) = (-5,1)$$

The gradient of a line is the ratio of *y* coordinate difference (second number) to *x* coordinate difference (first number).

$$gradient\ m = \frac{1}{-5}$$

Substitute to the equation for a line:

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

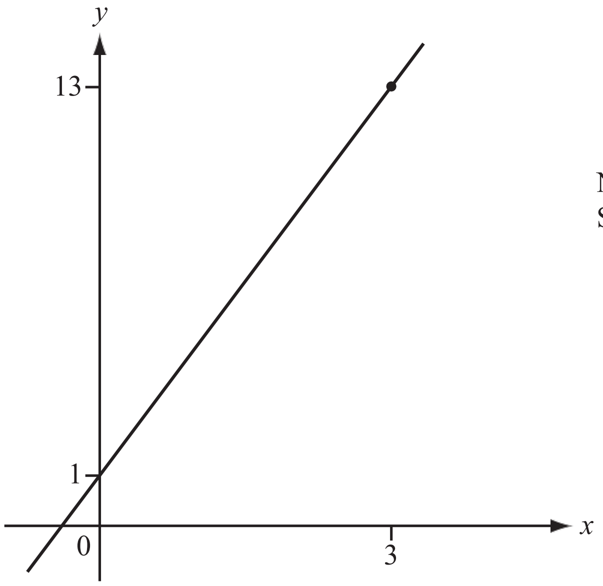
Plug in the coordinates for C to find the constant *c*.

$$4 = -\frac{1}{5} \times 0 + c$$

$$c = 4$$

Hence we have the equation of the line CB:

$$\boldsymbol{y = -\frac{1}{5}x + 4}$$



NOT TO SCALE

The diagram shows the straight line which passes through the points (0, 1) and (3, 13).

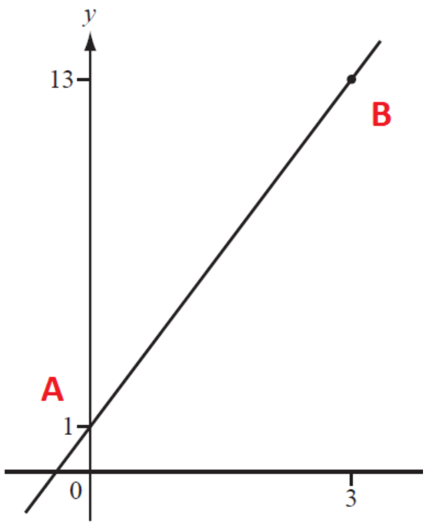
Find the equation of the straight line. [3]

The general equation of a line is:

$$y = mx + c$$

where m is the gradient and c is a constant.

To find an equation of a line, we need the coordinates of two points on the line.



Point A has coordinates (0,1).

Point B has coordinates (3,13).

First, subtract the two coordinates to find the coordinate difference between the two points.

$$coordinate\ difference = (3,13) - (0,1) = (3,12)$$

The gradient of a line is the ratio of *y* coordinate difference (second number) to *x* coordinate difference (first number).

$$gradient\ m = \frac{12}{3}$$

$$m = 4$$

Substitute to the equation for a line:

$$y = 4x + c$$

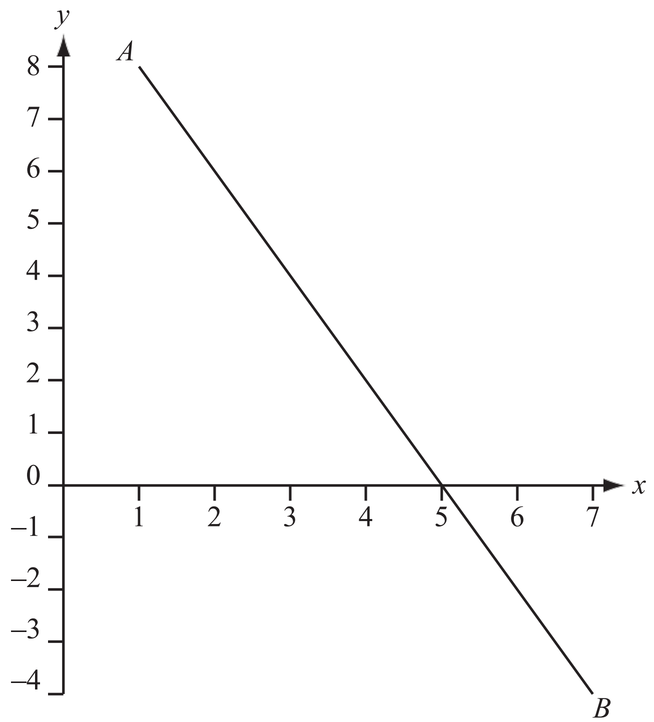
Plug in the coordinates for A to find the constant *c*.

$$1 = 4 \times 0 + c$$

$$c = 1$$

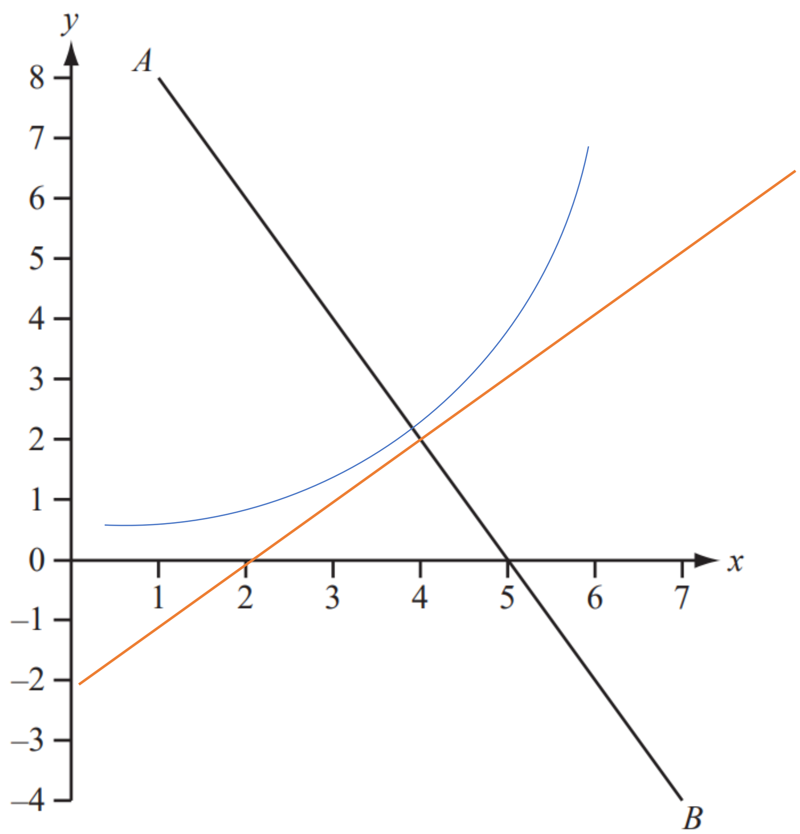
Hence we have the equation of the line:

$$\boldsymbol{y = 4x + 1}$$



(a) **Using a straight edge and compasses only**, construct the perpendicular bisector of AB on the diagram above. [2]

Construction lines in blue, answer in orange (perpendicular bisector of AB).



(b) Write down the co-ordinates of the midpoint of the line segment joining $A(1, 8)$ to $B(7, -4)$. [1]

Midpoint is found as

$$M = \left(\frac{x_A + x_B}{2}, \frac{y_A + y_B}{2}\right)$$

$$= \left(\frac{1+7}{2}, \frac{8-4}{2}\right)$$

$$= (\mathbf{4}, \mathbf{2})$$

(c) Find the equation of the line AB. [3]

The gradient of AB can be found using

$$m = \frac{y_B - y_A}{x_B - x_A}$$

$$= \frac{-4-8}{7-1}$$

$$= -\frac{12}{6}$$

$$= -2$$

Using the straight-line equation, we then have

$$y - y_1 = m(x - x_1)$$

$$\rightarrow y - 8 = -2(x - 1)$$

$$\rightarrow y = -2x + 2 + 8$$

$$\rightarrow \boldsymbol{y = -2x + 10}$$

(a) The line $y = 2x + 7$ meets the y-axis at A.

Write down the co-ordinates of A. [1]

Straight-line equation is

$$\boldsymbol{y = mx + c}$$

Where m is the gradient and c is the y-intercept.

Hence A is

$$\boldsymbol{A = (0, 7)}$$

(b) A line parallel to $y = 2x + 7$ passes through $B(0, 3)$.

(i) Find the equation of this line. [2]

Parallel, so it has the same gradient, 2.

Now use the straight-line equation

$$y - y_1 = m(x - x_1)$$

$$\rightarrow y - 3 = 2(x - 0)$$

$$\rightarrow y - 3 = 2x$$

$$\rightarrow \boldsymbol{y = 2x + 3}$$

(ii) C is the point on the line $y = 2x + 1$ where $x = 2$.

Find the co-ordinates of the midpoint of BC. [3]

Find the y-coordinate of C

$$y_c = 2x_c + 1$$

$$= 2(2) + 1$$

$$= 5$$

Need to find the midpoint of (0, 3) and (2, 5).

Use the formula

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$= \left(\frac{0 + 2}{2}, \frac{(3 + 5)}{2}\right)$$

$$= (\mathbf{1}, \mathbf{4})$$

Find the equation of the straight line which passes through the points (0, 8) and (3, 2). [3]

The gradient is found using

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{2-8}{3-0}$$

$$= -\frac{6}{3}$$

$$= -2$$

Now we use the straight-line equation

$$y - y_1 = m(x - x_1)$$

$$\rightarrow y - 8 = -2(x - 0)$$

$$\rightarrow \boldsymbol{y = -2x + 8}$$

Coordinate Geometry
Difficulty: Easy

Model Answers 3

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Co-ordinate Geometry
Sub-Topic	Coordinate Geometry
Paper	Paper 2
Difficulty	Easy
Booklet	Model Answers 3

Time allowed: **40 minutes**

Score: **/31**

Percentage: **/100**

Grade Boundaries:

CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

The points (2, 5), (3, 3) and (k, 1) all lie in a straight line.

(a) Find the value of k. [1]

The gradient found using these points must be the same.

We use the equation for the gradient of a straight-line

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\rightarrow m = \frac{3-5}{3-2}$$

$$= -\frac{2}{1}$$

$$= -2$$

Now use the unknown point

$$-2 = \frac{1-3}{k-3}$$

$$\rightarrow -2 = -\frac{2}{k-3}$$

Divide through by -2

$$1 = \frac{1}{k-3}$$

Multiply through by the denominator

$$k - 3 = 1$$

Add 3 to both sides

$$\boldsymbol{k = 4}$$

(b) Find the equation of the line. [3]

Equation of a straight-line is

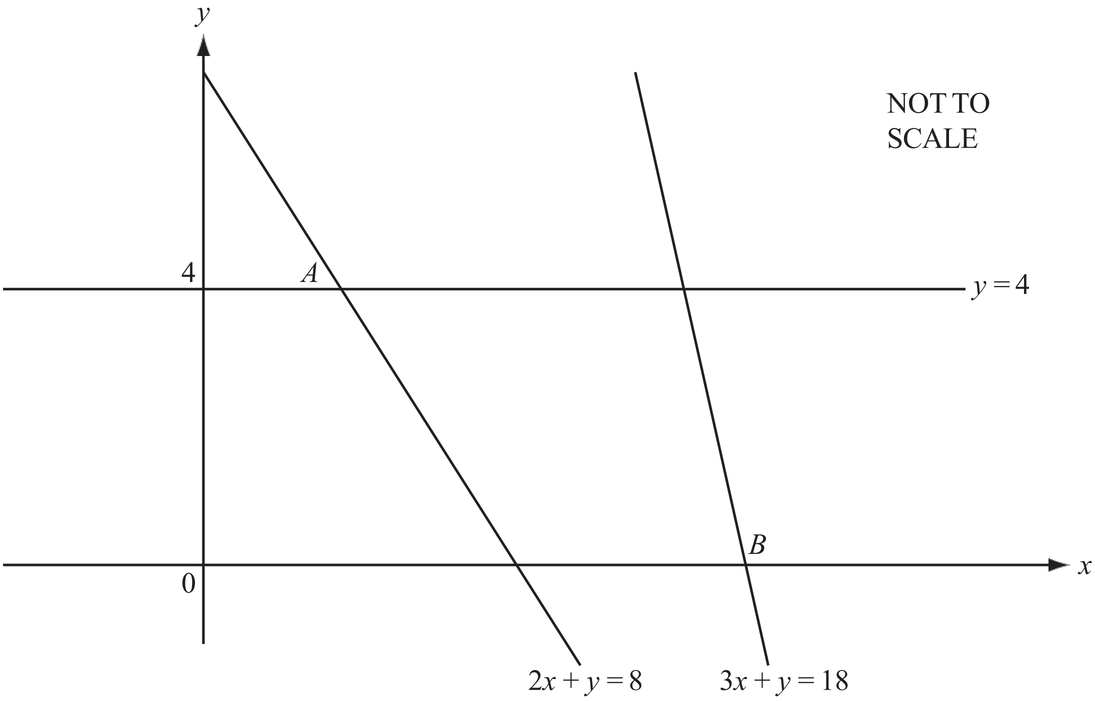
$$y - y_1 = m(x - x_1)$$

Using known points, we have

$$y - 5 = -2(x - 2)$$

$$\rightarrow y - 5 = -2x + 4$$

$$\rightarrow \boldsymbol{y = -2x + 9}$$



(a) The line $y = 4$ meets the line $2x + y = 8$ at the point A.
Find the co-ordinates of A. [1]

$$2x + 4 = 8$$

$$\rightarrow 2x = 4$$

$$\rightarrow x = 2$$

$$\boldsymbol{A = (2, 4)}$$

(b) The line $3x + y = 18$ meets the x axis at the point B.
Find the co-ordinates of B. [1]

$$3x + 0 = 18$$

$$\rightarrow x = 6$$

$$\boldsymbol{B = (6, 0)}$$

(c) (i) Find the co-ordinates of the mid-point M of the line joining A to B. [1]

Midpoint is calculated as

$$M = \left(\frac{x_A + x_B}{2}, \frac{y_A + y_B}{2}\right)$$

$$= \left(\frac{2+6}{2}, \frac{4+0}{2}\right)$$

$$= (\mathbf{4}, \mathbf{2})$$

(ii) Find the equation of the line through M parallel to $3x + y = 18$. [2]

Rearranging the line, we get

$$y = -3x + 18$$

So, its gradient is -3.

A parallel line has the same gradient, and using the

straight-line equation we have

$$y - y_1 = m(x - x_1)$$

$$\rightarrow y - 2 = -3(x - 4)$$

$$\rightarrow y = -3x + 12 + 2$$

$$\rightarrow \boldsymbol{y = -3x + 14}$$

Find the length of the line joining the points $A(-4, 8)$ and $B(-1, 4)$. [2]

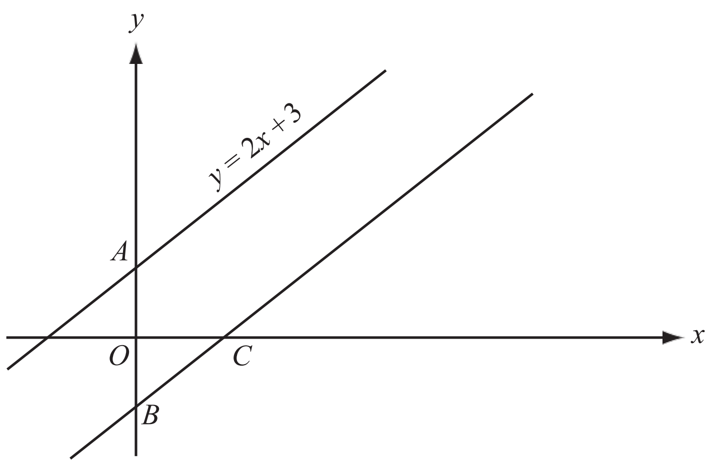
The length of a line joining two points $A(x_1, y_1)\ and\ B(x_2, y_2)$ is found using Pythagoras Theorem. The equation in this case is:

$$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Using this we get:

$$Distance = \sqrt{(-1 - \ -4)^2 + (4 - 8)^2} = \sqrt{9 + 16} = \sqrt{25} = 5$$

So the answer is: 5



NOT TO SCALE

The distance AB is 7 units.

(a) Write down the equation of the line through B which is parallel to $y = 2x + 3$. [2]

The y-coordinate of A is the y-intercept of the straight line $y = 2x + 3$, which is 3.

B is 7 below A

$$3 - 7$$

$$= -4$$

$$\rightarrow B = (0, -4)$$

The line is parallel (has the same gradient) and cuts through B, giving us

$$\boldsymbol{y = 2x - 4}$$

(b) Find the co-ordinates of the point C where this line crosses the x axis. [1]

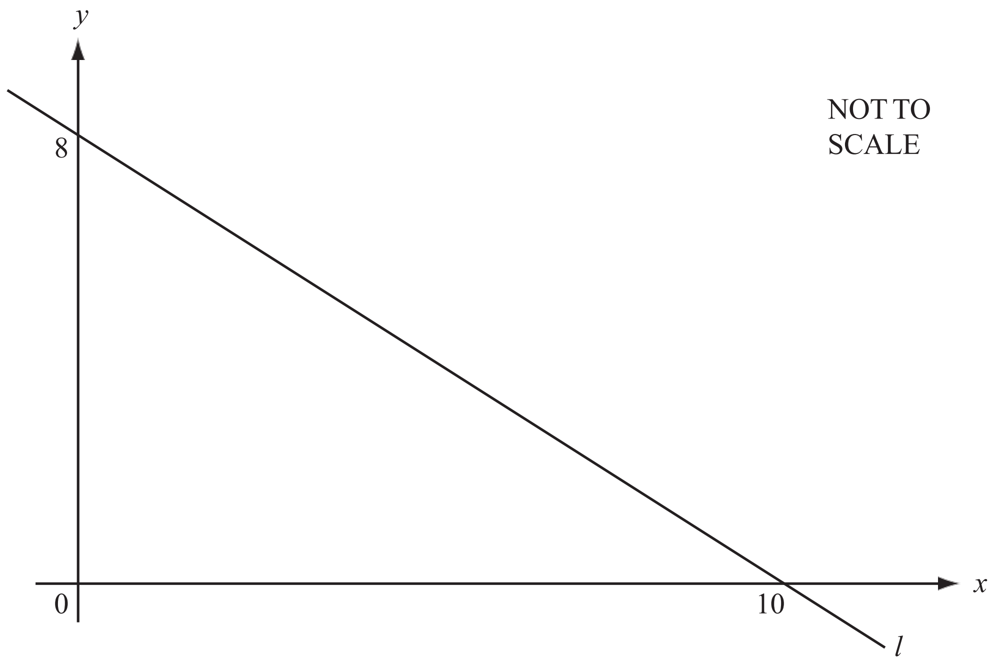
Need to solve

$$0 = 2x - 4$$

$$\rightarrow 2x = 4$$

$$\rightarrow x = 2$$

$$\rightarrow \boldsymbol{C = (2, 0)}$$



The line l passes through the points (10, 0) and (0, 8) as shown in the diagram.

(a) Find the gradient of the line as a fraction in its simplest form. [1]

Gradient is found as

$$\boldsymbol{m = \frac{y_2 - y_1}{x_2 - x_1}}$$

Hence

$$m = \frac{0-8}{10-0}$$

$$= -\boldsymbol{\frac{4}{5}}$$

(b) **Write down** the equation of the line parallel to l which passes through the origin. [1]

Parallel so it has the same gradient.

Passes through the origin so y intercept is zero

$$\rightarrow \boldsymbol{y = -\frac{4}{5}x}$$

(c) Find the equation of the line parallel to l which passes through the point $(3,\ 1)$. [2]

Use the straight-line equation

$$\boldsymbol{y - y_1 = m(x - x_1)}$$

$$\rightarrow y - 1 = -\frac{4}{5}(x - 3)$$

$$\rightarrow 5y - 5 = -4x + 12$$

$$\rightarrow \boldsymbol{4x + 5y - 17 = 0 \ or \ y = \frac{-4}{5}x + 3.4}$$

The equation of a straight line can be written in the form $3x + 2y - 8 = 0$.

(a) Rearrange this equation to make y the subject. [2]

$3x + 2y - 8 = 0$

$2y = 8 - 3x$

$y = \frac{8-3x}{2}$

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

The equation of a line takes up the form: $y = mx + n$

Where m is the gradient and n is the y-intercept.

In our case, the equation of the line from a) is:

$y = 4 - \frac{3x}{2}$

The gradient is: **m = -3/2**

(c) Write down the co-ordinates of the point where the line crosses the y axis. [1]

The point where the line crosses the y axis has the x coordinate x = 0.

We substitute x in the equation to work out y.

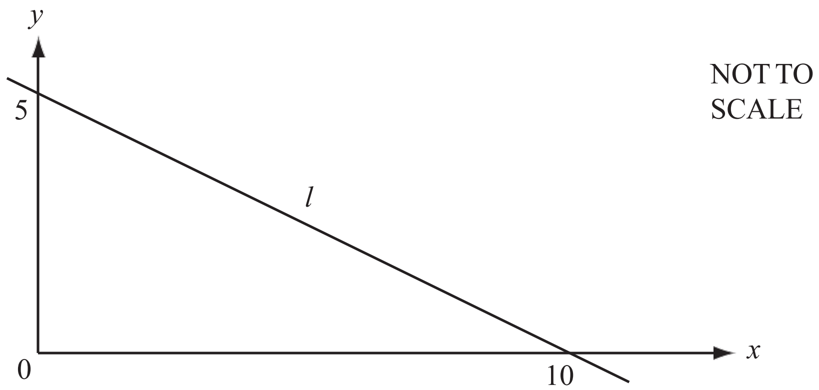
$y = \frac{8-3x}{2}$

$8 - 3 \times 0 = 2y$

$2y = 8$

$y = 4$

Coordinate: **(0, 4)**



(a) Calculate the gradient of the line l. [2]

The gradient of line is the change in y over the change in x.

In our case, the gradient of line l is:

Gradient = $\frac{-5}{10}$

Gradient = $\mathbf{\frac{-1}{2}}$

(b) Write down the equation of the line l. [2]

We know that the equation of a line has the form:

$y = mx + n$

where m is the gradient and n is the y intercept.

In our case, we know from point a) that the gradient is $m = \frac{-1}{2}$

and the y intercept is $n = 5$.

The equation of the line is $\mathbf{y = \frac{-1}{2}x + 5}$**.**

The straight line graph of $y = 3x - 6$ cuts the x-axis at A and the y-axis at B.

(a) Find the coordinates of A and the coordinates of B. [2]

Point A is the intersection of the graph with the x-axis, therefore, y = 0.

0 = 3x – 6

x = 2

A = (2,0)

Point B is the intersection of the graph with the y-axis, therefore, x = 0.

y = 3 x 0 – 6

y = - 6

B = (0,-6)

(b) Calculate the length of AB. [2]

A (2, 0), B (0, -6)

AB = $\sqrt{(x_A - x_B)^2 + (y_A - y_B)^2}$

AB = $\sqrt{(0-2)^2 + ((-6) - 0)^2}$

AB = $\sqrt{4 + 36}$

AB = $\sqrt{40}$ = 6.32

(c) M is the mid-point of AB.
Find the coordinates of M. [1]

M is the midpoint of AB.

xM = $\frac{x_A+x_B}{2} = \frac{2+0}{2}$ = 1

yM = $\frac{y_A+y_b}{2} = \frac{0+(-6)}{2}$ = -3

M(1, -3)

Coordinate Geometry
Difficulty: Hard

Model Answers 1

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Co-ordinate Geometry
Sub-Topic	Coordinate Geometry
Paper	Paper 2
Difficulty	Hard
Booklet	Model Answers 1

Time allowed: **32 minutes**

Score: **/25**

Percentage: **/100**

Grade Boundaries:

CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

A line has gradient 5.
M and N are two points on this line.
M is the point $(x, 8)$ and N is the point $(k, 23)$.

Find an expression for x in terms of k. [3]

The equation for a gradient is

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Plugging in our known values

$$\rightarrow 5 = \frac{23 - 8}{k - x}$$

Multiply through by $(k - x)$

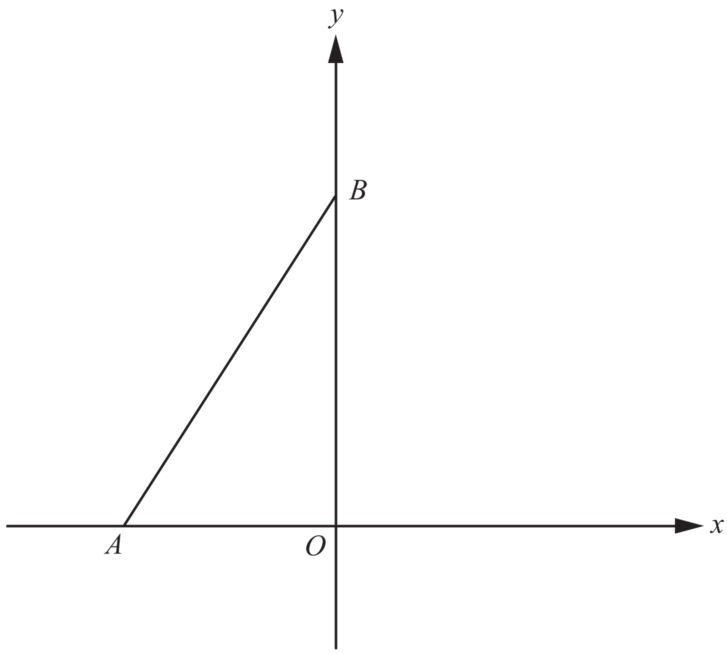
$$5k - 5x = 15$$

Divide through by 5

$$k - x = 3$$

Add x and subtract 3 from both sides

$$\boldsymbol{x = k - 3}$$



NOT TO SCALE

A is the point $(-2,\ 0)$ and B is the point $(0, 4)$.

(a) Find the equation of the straight line joining A and B. [3]

Gradient is

$$m = \frac{y_B - y_A}{x_B - x_A}$$

$$= \frac{4 - 0}{0 - -2}$$

$$= \frac{4}{2}$$

$$= 2$$

Now using the straight-line equation

$$y - y_1 = m(x - x_1)$$

with point A, we get

$$y - 0 = 2(x + 2)$$

$$\rightarrow \boldsymbol{y = 2x + 4}$$

(b) Find the equation of the perpendicular bisector of AB. [4]

Midpoint is

$$M = \left(\frac{x_A + x_B}{2}, \frac{y_A + y_B}{2}\right)$$

$$= \left(\frac{-2+0}{2}, \frac{0+4}{2}\right)$$

$$= (-1, 2)$$

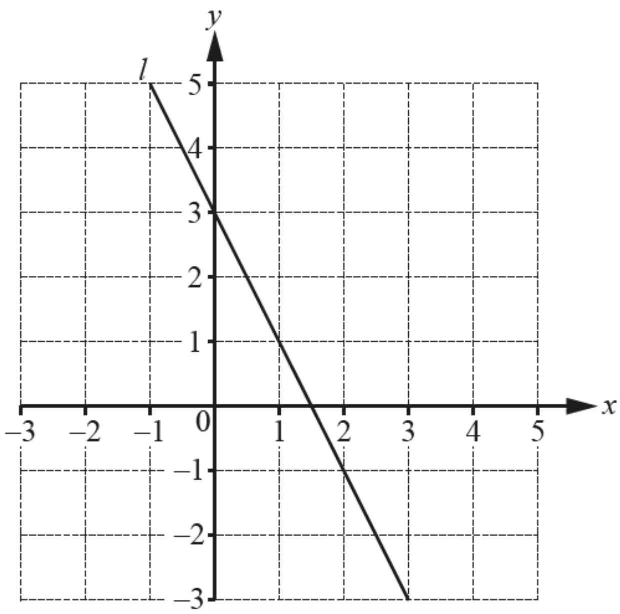
The perpendicular bisector will have gradient $-\frac{1}{2}$ and will

go through the midpoint.

Again, using the straight-line equation, we get

$$y - 2 = -\frac{1}{2}(x + 1)$$

$$\rightarrow \boldsymbol{y = -\frac{1}{2}x + \frac{3}{2}}$$



(a) Find the equation of the line l.
Give your answer in the form $y = mx + c$. [3]

The gradient of the line is:

$$m = \frac{\Delta y}{\Delta x}$$

$$m = -\frac{8}{4}$$

$$m = -2$$

The equation of the line is found by plugging in a point. For this we can use (3,0):

$$y = mx + c$$

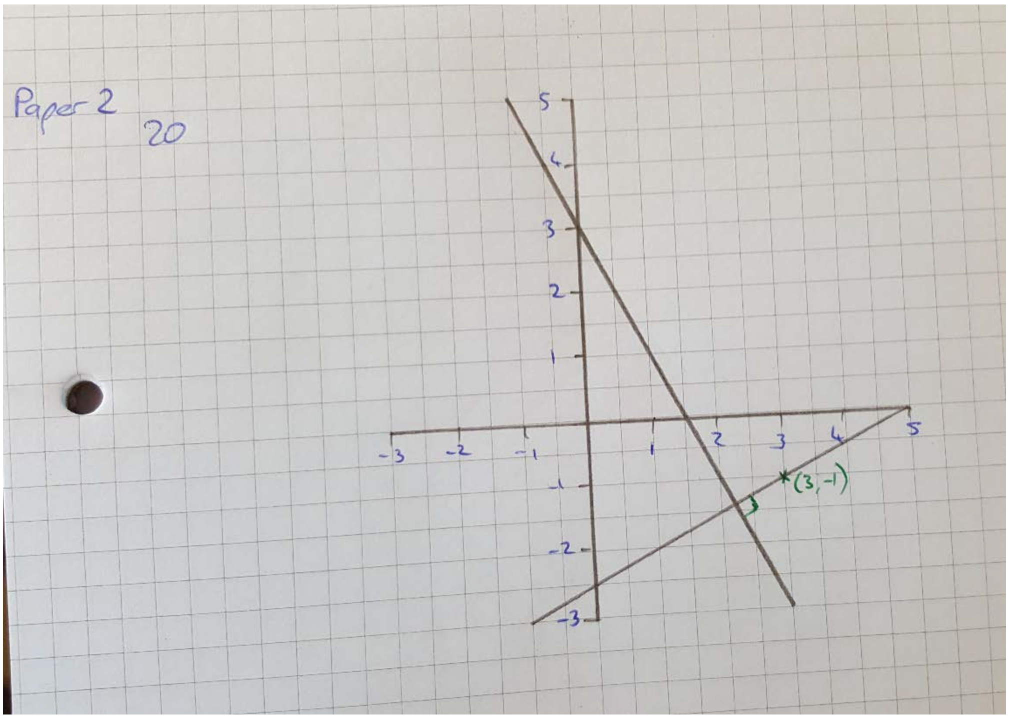
$$3 = -2(0) + c$$

$$c = 3$$

$$c = 3$$

So the equation for the line is:

$$\boldsymbol{y = -2x + 3}$$



(b) A line perpendicular to the line l passes through the point $(3, -1)$.

Find the equation of this line. [3]

We can find the gradient of a perpendicular line:

$$m_{perp} = -\frac{1}{m}$$

$$m_{perp} = -\frac{1}{-2}$$

$$m_{perp} = \frac{1}{2}$$

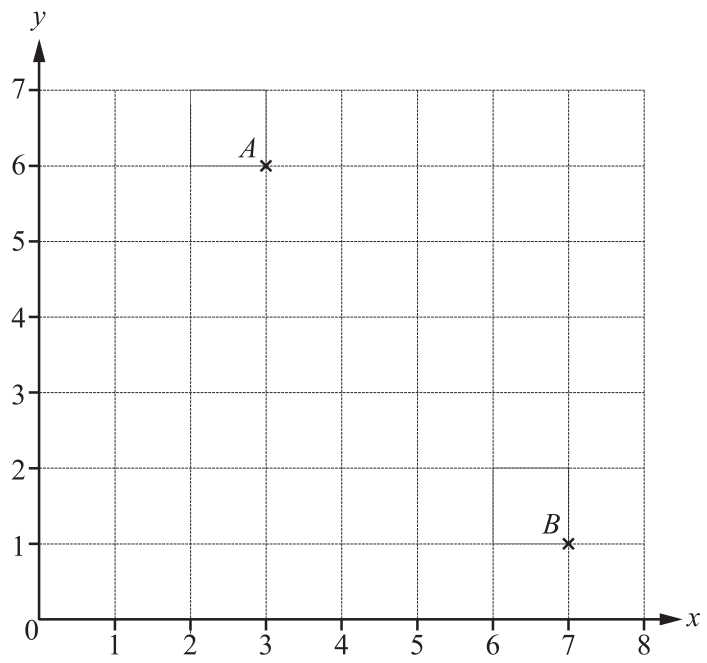
We can find the equation of the line using the general equation:

$$y - y_1 = m(x - x_1)$$

$$y - (-1) = \frac{1}{2}(x - 3)$$

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

$$\boldsymbol{y = \frac{1}{2}x - \frac{5}{2}}$$



Point A has co-ordinates (3, 6).

(a) Write down the co-ordinates of point B. [1]

Coordinates are given in the form (x, y) so: $\boldsymbol{B(7,1)}$

(b) Find the gradient of the line AB. [2]

Gradient of the line connecting (x_1, y_1) and $(x_2, y_2) = \dfrac{y_2 - y_1}{x_2 - x_1}$

Gradient of AB $= \dfrac{1-6}{7-3} = -\dfrac{\mathbf{5}}{\mathbf{4}}$

(c) Find the equation of the line that

- is perpendicular to the line AB

and

- passes through the point $(0, 2)$. [3]

Two gradients m_1 and m_1 are perpendicular if $m_1 \times m_2 = -1$

So the gradient wanted is $\frac{4}{5}$ since $\frac{4}{5} \times \left(-\frac{5}{4}\right) = -1$

Equation of a line is $y = mx + c$ so:

$$y = \frac{4}{5}x + c$$

$(0, 2)$ is the y-intercept so $c = 2$

$$\boldsymbol{y = \frac{4}{5}x + 2}$$

A is the point (8, 3) and B is the point (12, 1).

Find the equation of the line, perpendicular to the line AB, which passes through the point (0, 0). [3]

Gradient of the line connecting (x_1, y_1) and (x_2, y_2) $= \dfrac{y_2 - y_1}{x_2 - x_1}$

Gradient of AB $= \dfrac{1-3}{12-8} = \dfrac{-2}{4} = -\dfrac{1}{2}$

Two gradients m_1 and m_1 are perpendicular if $m_1 \times m_2 = -1$

So the gradient wanted is 2 since $2 \times \left(-\dfrac{1}{2}\right) = -1$

Equation of a line is $y = mx + c$ so:

$$y = 2x + c$$

$(0, 0)$ is the origin so $c = 0$

$$\boldsymbol{y = 2x}$$

Coordinate Geometry
Difficulty: Hard

Model Answers 2

Level	IGCSE
Subject	Maths (0580/0980)
Exam Board	CIE
Topic	Co-ordinate Geometry
Sub-Topic	Coordinate Geometry
Paper	Paper 2
Difficulty	Hard
Booklet	Model Answers 2

Time allowed: **35 minutes**

Score: **/27**

Percentage: **/100**

Grade Boundaries:

CIE IGCSE Maths (0580)

A*	A	B	C	D	E
>88%	76%	63%	51%	40%	30%

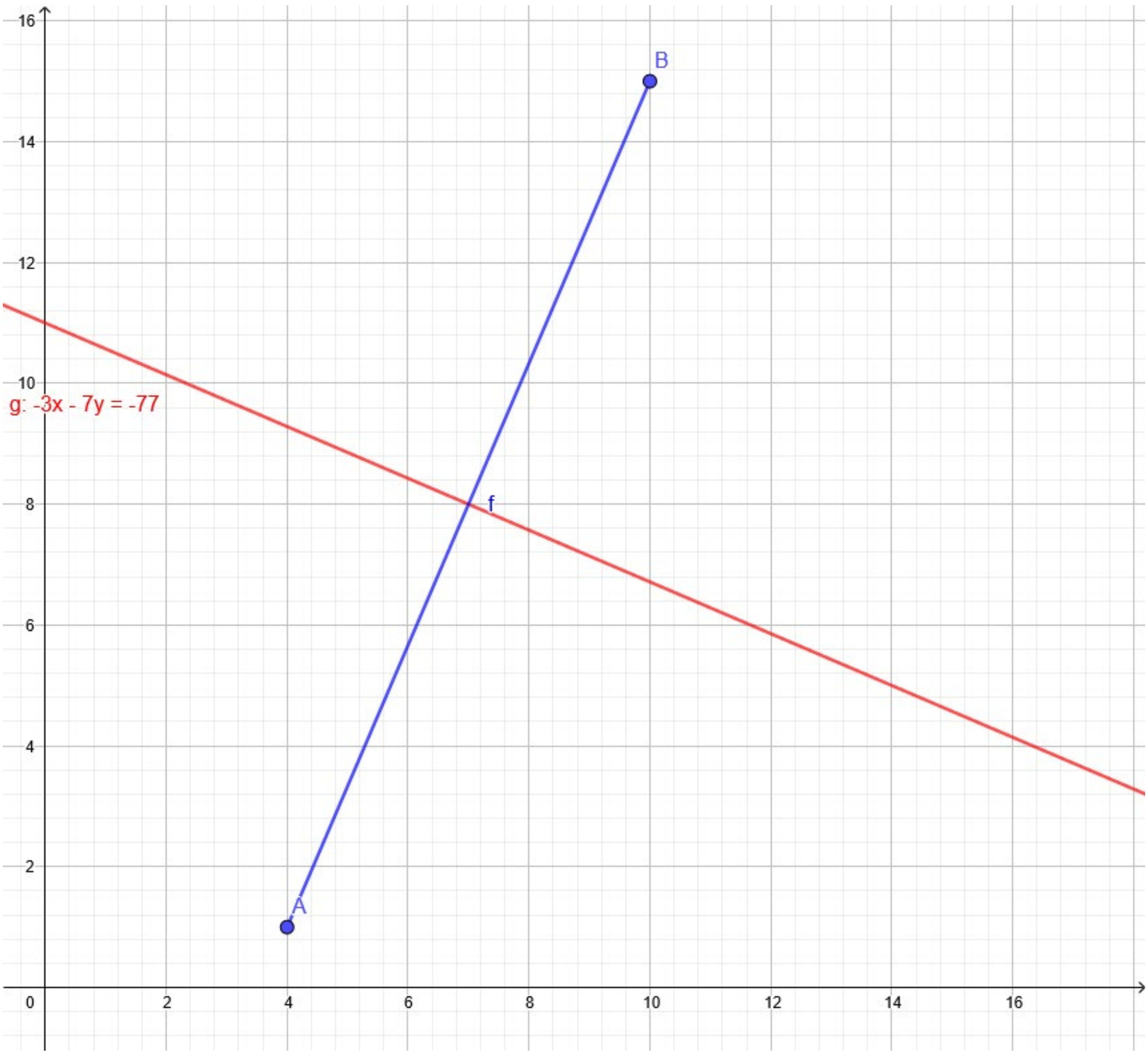
CIE IGCSE Maths (0980)

9	8	7	6	5	4	3
>94%	85%	77%	67%	57%	47%	35%

A is the point (4, 1) and B is the point (10, 15).

Find the equation of the perpendicular bisector of the line AB. [6]

This looks like this:



The perpendicular bisector cuts through the middle of AB. Firstly, we find the gradient of AB as

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{15 - 1}{10 - 4}$$

$$m = \frac{14}{6}$$

$$m = \frac{7}{3}$$

The perpendicular gradient is then

$$m_n = -\frac{3}{7}$$

The midpoint of AB is

$$M = \left(\frac{10 + 4}{2}, \frac{15 + 1}{2}\right)$$

$$= (7, 8)$$

Using the straight-line equation

$$y - y_1 = m(x - x_1)$$

We get

$$y - 8 = -\frac{3}{7}(x - 7)$$

$$\rightarrow y = -\frac{3}{7}x + 3 + 8$$

$$\boldsymbol{y = -\frac{3}{7}x + 11}$$

Find the equation of the line that

- is perpendicular to the line $y = 3x - 1$

and

- passes through the point (7, 4). [3]

The gradient of line *y=3x-1* is *m*=3 (it is the factor multiplying variable *x*).

The gradient of a perpendicular line *n* is found as negative reciprocal of the original gradient:

$$n = -\frac{1}{m}$$

Therefore the gradient of the new line is:

$$n = -\frac{1}{3}$$

The general equation for a line is $y = -\frac{1}{3}x + p$ where *p* is a constant. This constant is decided by the point through which the equation passes.

We want the new line to pass through point (7,4), therefore the equation must be satisfied:

$$4 = -\frac{1}{3} \times 7 + p$$

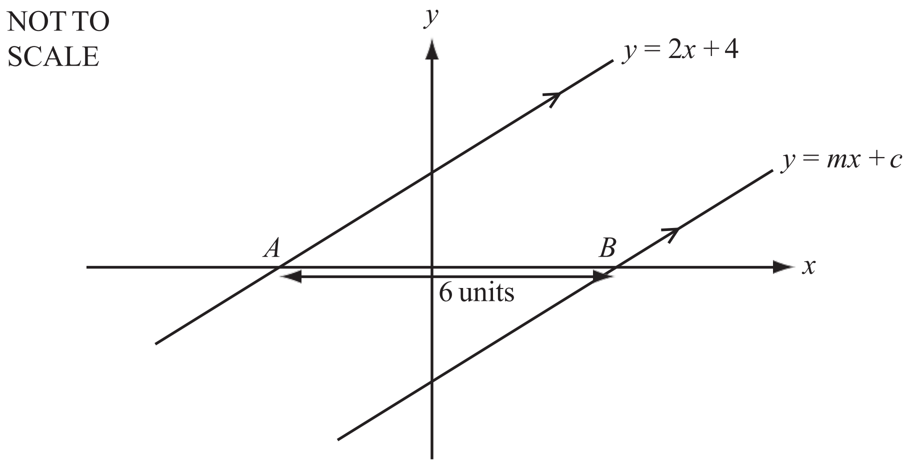
$$4 = -\frac{7}{3} + p$$

Add 7/3 to both sides of the equation.

$$4 + \frac{7}{3} = p$$

$$\frac{19}{3} = p$$

Therefore the equation of the new line is $\boldsymbol{y = -\frac{1}{3}x + \frac{19}{3}}$.



The line $y = mx + c$ is parallel to the line $y = 2x + 4$.
The distance AB is 6 units.

Find the value of m and the value of c. [4]

As the lines are parallel we know their gradients must be the same, hence

$$m = 2$$

To calculate the value of c, we can use the fact that AB is 6 units.

We can find the coordinates of A by using the equation given and setting $y = 0$. This gives

$2x + 4 = 0$, *and hence* $x = -2$.

so point A has coordinates $(-2,0)$, and hence point B has coordinates $(4,0)$ using the fact they are 6 units apart

subbing this value of B into our eqation when $y = 0$ we get $0 = 8 + c$ and hence $c = -8$

So the answers are:

M=2, C=-8

Find the co-ordinates of the mid-point of the line joining the points $A(2, -5)$ and $B(6, 9)$. [2]

We represent with the mid-point of the segment AB with

$M(x_M, y_M)$.

$X_M = \frac{xA+xB}{2}$

$y_M = \frac{yA+yB}{2}$

In our case:

$X_M = \frac{2+6}{2} = 4$

$y_M = \frac{-5+9}{2} = 2$

M(4, 2)

A straight line passes through two points with co-ordinates (6, 8) and (0, 5).
Work out the equation of the line. [3]

Gradient is give by the formula:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{5-8}{0-6}$$

$$= -\frac{3}{-6} = \frac{1}{2}$$

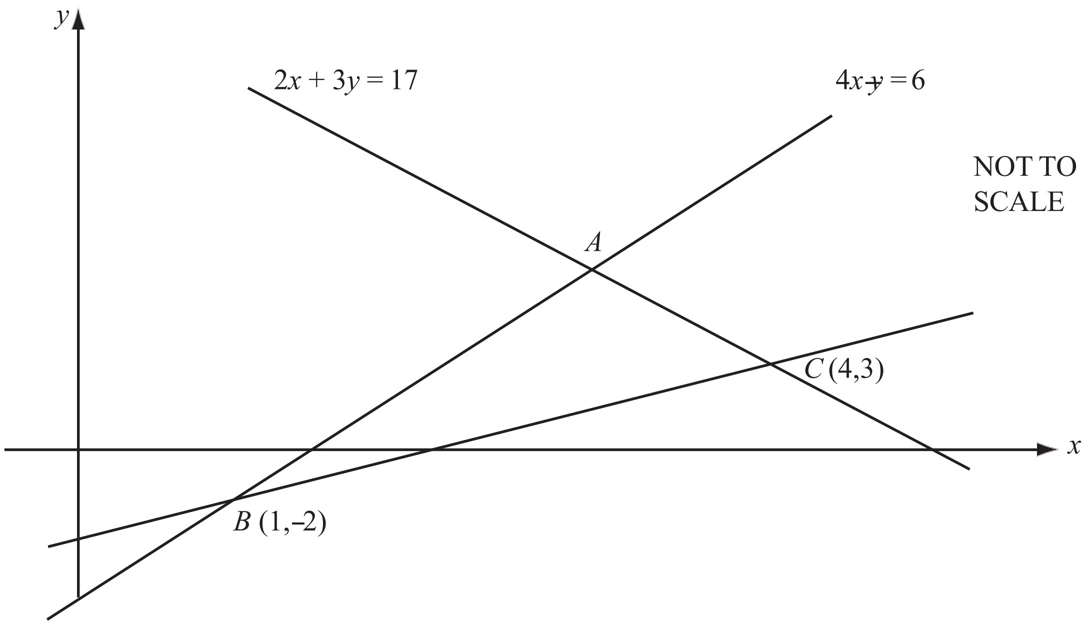
Hence, using the formula:

$$y - y_1 = m(x - x_1)$$

we have

$$y - 5 = \frac{1}{2}(x - 0)$$

$$\rightarrow y = \frac{1}{2}x + 5$$



In the diagram, the line AC has equation $2x + 3y = 17$ and the line AB has equation $4x - y = 6$.
The lines BC and AB intersect at $B(1, -2)$.
The lines AC and BC intersect at $C(4, 3)$.

(a) Use algebra to find the coordinates of the point A. [3]

Point A is at the intersection of 2 lines. The coordinates of point A would be the x and y coordinates which satisfy the equations of both lines.

$2x + 3y = 17$

$4x - y = 6$

$y = 4x - 6$

We substitute this value in the first equation.

$2x + 3(4x - 6) = 17$

$2x + 12x - 18 = 17$

$14x = 35$

$\mathbf{x = 2.5}$

$\mathbf{y = 4 \times 2.5 - 6 = 4}$

(b) Find the equation of the line BC. [3]

We can use the following formula to work out the equation of a line:

$y - y_1 = m(x - x_1)$

We use the coordinates of point B as x_1 and y_1.

$y - (-2) = m(x - 1)$

$m = \frac{\text{change in y}}{\text{change in x}}$

$m = \frac{3-(-2)}{4-1}$

$m = \frac{5}{3}$

$y + 2 = \frac{5}{3}(x - 1)$

We rewrite this as $y = mx + n$.

$y + 2 = \frac{5}{3}x - \frac{5}{3}$

$\mathbf{y = \frac{5}{3}x - \frac{11}{3}}$

The points $A(6,2)$ and $B(8,5)$ lie on a straight line.

(a) Work out the gradient of this line. [1]

We need to use the following formula

$$\text{gradient} = \frac{yB - yA}{xB - xA}$$

In our case, the gradient is:

Gradient = $\frac{5-2}{8-6}$

Gradient = $\frac{3}{2}$

(b) Work out the equation of the line, giving your answer in the form $y = mx + c$. [2]

y = mx + c

where m is the gradient and c is the y-intercept

From a), we know that m = $\frac{3}{2}$.

We know that A(6, 2) is a point on the line, therefore, x = 6 and y = 2.

$2 = \frac{3}{2} \times 6 + c$

$2 = 9 + c$

$c = -7$

The equation of the line is $y = \frac{3}{2}x - 7$.