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GCSE MATHS

Algebra

Edexcel 1MA1 | Subtopic collection Topic 23

Straight-line graphs

Higher tier

Past paper question booklet

123	2003-2025	Higher
question groups	available papers	tier

Before you begin

1. Show working and use units where appropriate.
2. Use extra paper if you need more space.
3. Print at actual size (100%) for measurement questions.

Name _____ **Date** _____

Whole questions are retained for context; some parts cover other points. Legacy sources are labelled.

6. A straight line has equation $y = \frac{1}{2}x + 1$

The point P lies on the straight line.
P has a y-coordinate of 5.

(a) Find the x-coordinate of P.

.....

(2)

(b) Write down the equation of a different straight line that is parallel to $y = \frac{1}{2}x + 1$

.....

(1)

(c) Rearrange $y = \frac{1}{2}x + 1$ to make x the subject.

Leave blank

.....

(2)

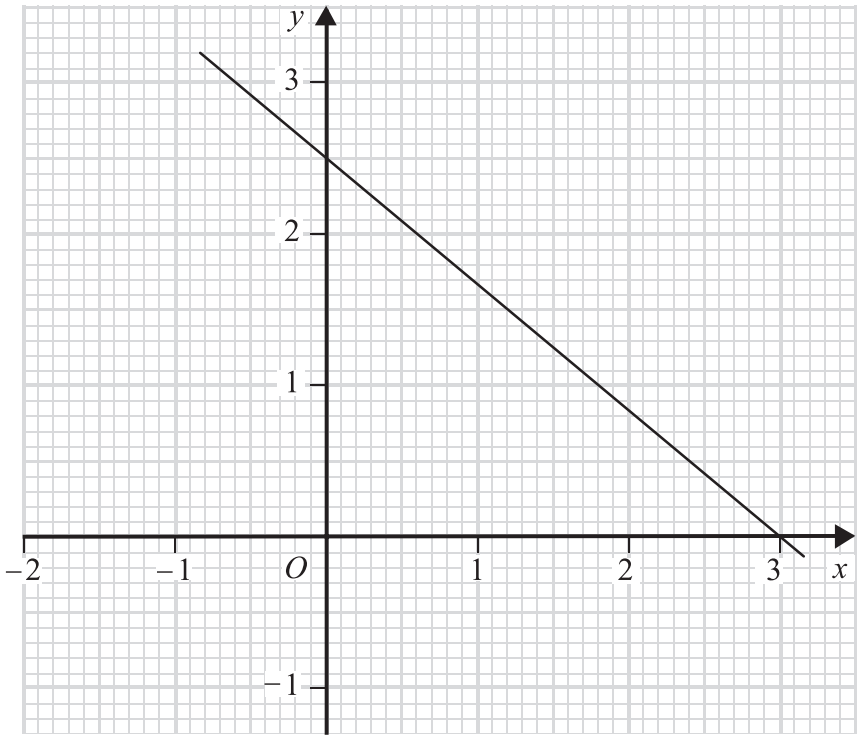
15. A straight line, **L**, passes through the point with coordinates (4, 7) and is perpendicular to the line with equation $y = 2x + 3$.

Find an equation of the straight line **L**.

.....

(3)

10.



The line with equation $6y + 5x = 15$ is drawn on the grid above.

(a) Rearrange the equation $6y + 5x = 15$ to make y the subject.

$y =$ .....

(2)

(b) The point $(-21, k)$ lies on the line.
Find the value of k.

$k =$ .....

(2)

(c) (i) On the grid, shade the region of points whose coordinates satisfy the four inequalities

$$y > 0, \quad x > 0, \quad 2x < 3, \quad 6y + 5x < 15$$

Label this region ***R***.

P is a point in the region ***R***. The coordinates of P are both integers.

(ii) Write down the coordinates of P.

(..... , ...)

(3)

11.

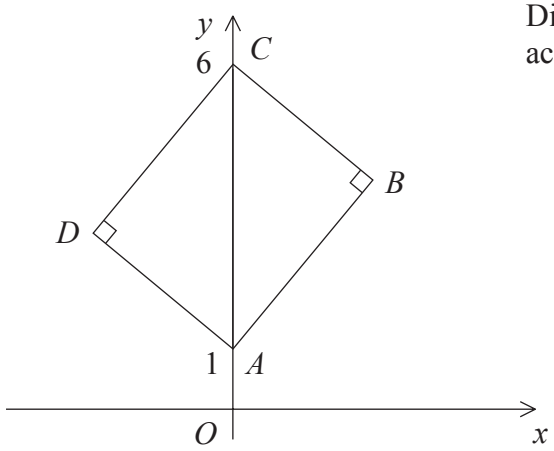


Diagram **NOT** accurately drawn

ABCD is a rectangle.
A is the point (0, 1).
C is the point (0, 6).

The equation of the straight line through *A* and *B* is $y = 2x + 1$

(a) Find the equation of the straight line through *D* and *C*.

.....

(2)

(b) Find the equation of the straight line through *B* and *C*.

.....

(2)

(c) It is always possible to draw a circle which passes through all four vertices of a rectangle.
Explain why.

.....

.....

(1)

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Page Total

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16.

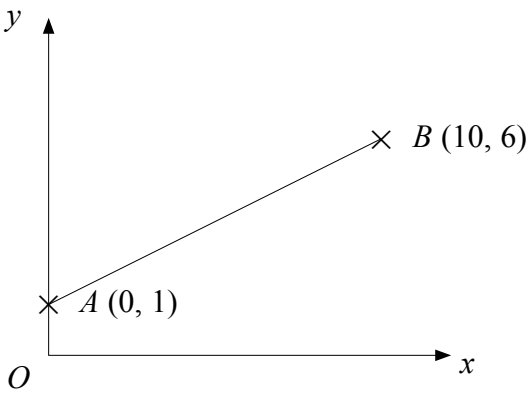


Diagram **NOT** accurately drawn

A is the point (0, 1)
B is the point (10, 6)

The equation of the straight line through A and B is $y = \frac{1}{2}x + 1$

(a) Write down the equation of another straight line that is parallel to $y = \frac{1}{2}x + 1$

.....

(1)

(b) Write down the equation of another straight line that passes through the point (0, 1)

.....

(1)

(c) Find the equation of the line perpendicular to AB passing through B.

.....

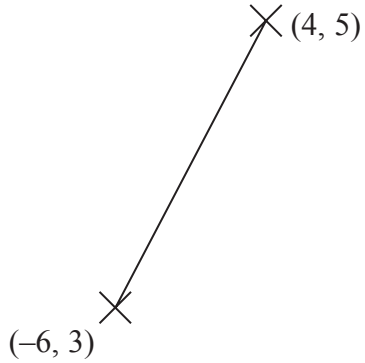
(3)

Q16

(Total 5 marks)

blank

5. Work out the coordinates of the midpoint of the line joining the points (4, 5) and (–6, 3).



(..... , ...)

(Total 2 marks)

Q5

Blank

17. Here are the equations of 5 straight lines.

P	$y = 2x + 5$	**Q**	$y = -2x + 5$
R	$y = x + 5$	**S**	$y = -\frac{1}{2}x + 6$
T	$y = \frac{1}{2}x + 1$		

(a) Write down the letter of the line that is parallel to $y = x + 6$

.....
(1)

(b) Write down the letter of the line that is perpendicular to $y = 2x - 1$

.....
(1)

(c) Find the coordinates of the point where the line $y = 2x + 5$ cuts the

(i) y axis,

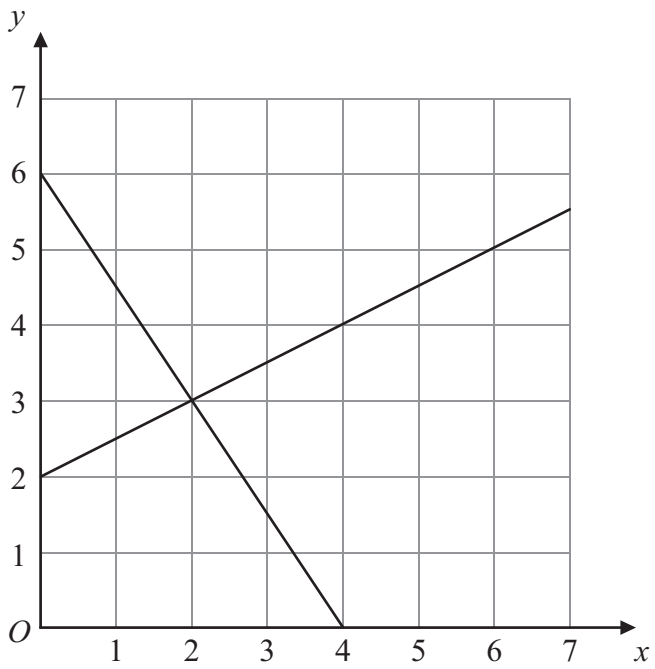
(..... , ...)

(ii) x axis.

(..... , ...)
(2)
(Total 4 marks)

Q17

19.



The diagram shows graphs of $y = \frac{1}{2}x + 2$

and $2y + 3x = 12$

(a) Use the diagram to solve the simultaneous equations

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

$$2y + 3x = 12$$

$x =$ ..... $y =$ .....

(1)

(b) Find an equation of the straight line which is parallel to the line $y = \frac{1}{2}x + 2$ and passes through the point (0, 4).

.....

(2)

(Total 3 marks)

Q19

Blank

23. A straight line passes through (0, –2) and (3, 10).

Find the equation of the straight line.

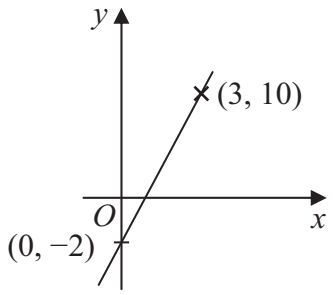


Diagram **NOT** accurately drawn

.....

Q23

(Total 3 marks)

14.

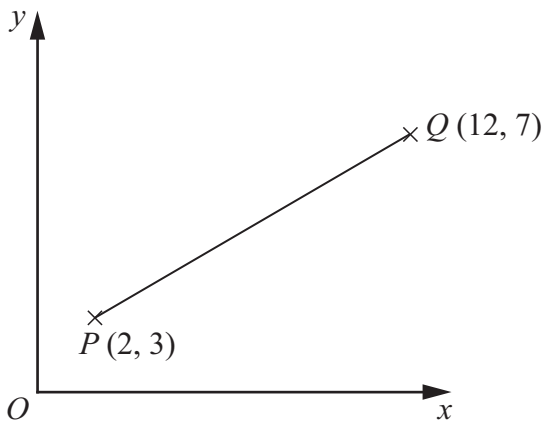


Diagram **NOT** accurately drawn

P is the point with coordinates (2, 3).
Q is the point with coordinates (12, 7).

Work out the coordinates of the midpoint of the line *PQ*.

(....., ...)

Q14

(Total 2 marks)

16. G and H are vertices of a cuboid.

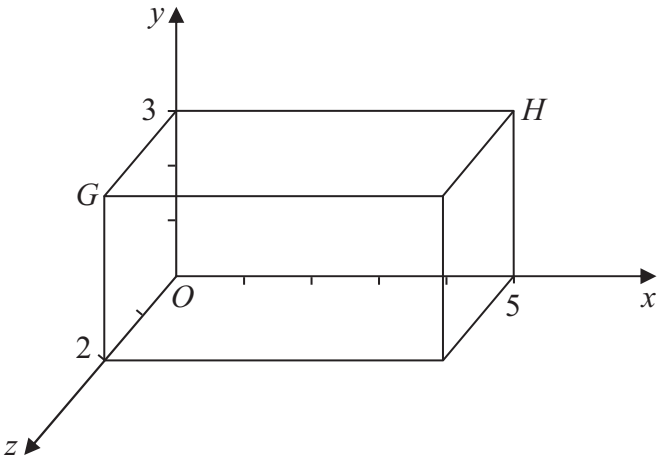


Diagram **NOT** accurately drawn

(a) Write down the coordinates of point G.

(..... , ... , ...)

(1)

(b) Write down the coordinates of point H.

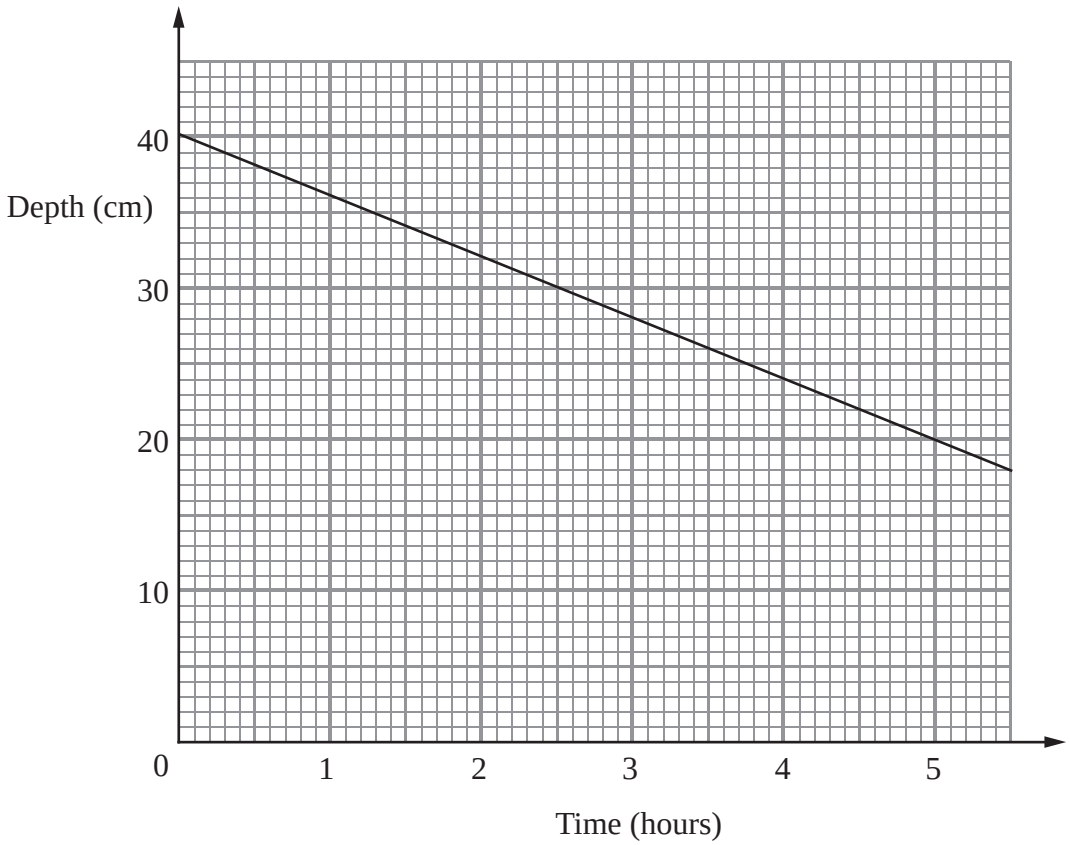
(..... , ... , ...)

(1)

Q16

(Total 2 marks)

8 Water flows out of a cylindrical tank at a constant rate.
The graph shows how the depth of water in the tank varies with time.



(a) Work out the gradient of the straight line.

.....

(2)

(b) Write down a practical interpretation of the value you worked out in part (a).

.....

.....

(1)

(Total for Question 8 is 3 marks)

10 AB is a line segment.
A is the point (2, 5, 6).
The midpoint of the line AB has coordinates (–1, –4, 2).

Find the coordinates of point B.

(..... , ... , ...)

(Total for Question 10 is 2 marks)

13 (a) Write down the equation of a straight line that is parallel to $y = 5x + 6$

.....

(1)

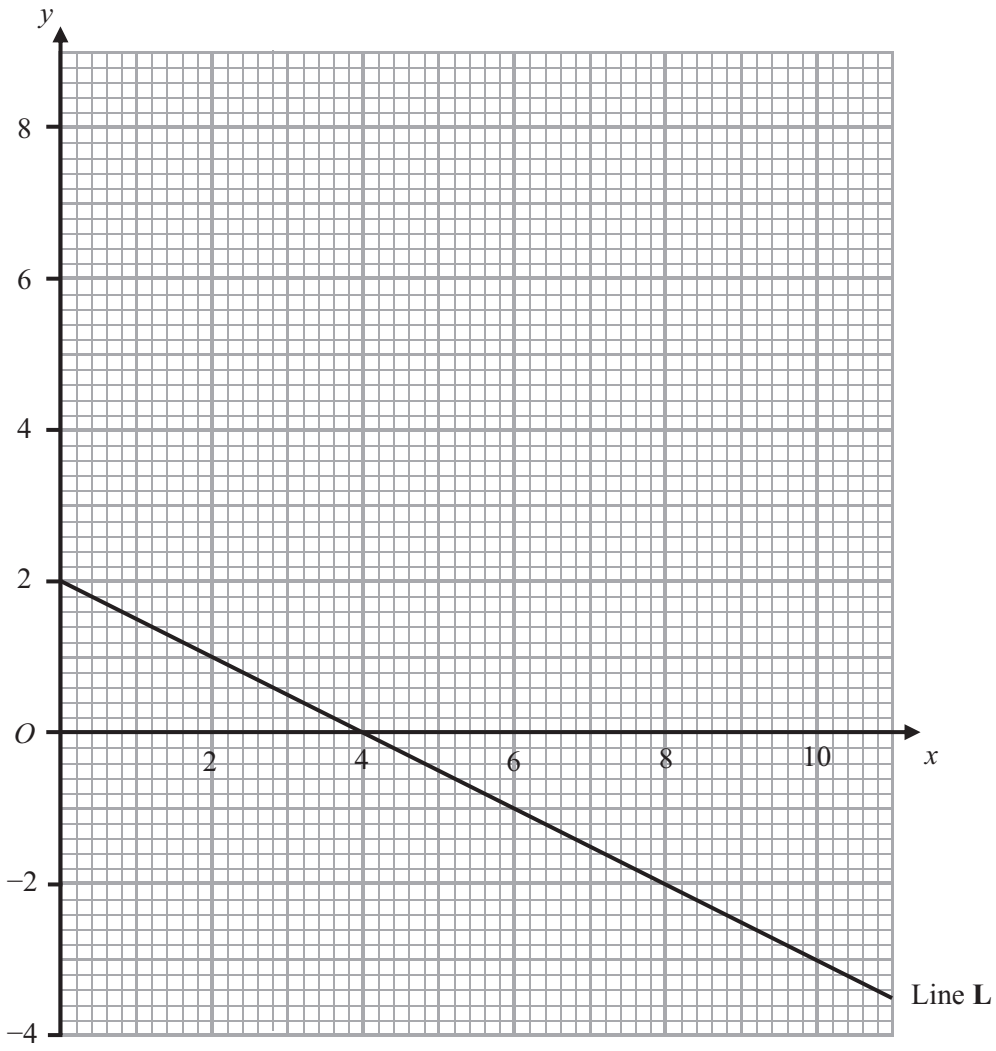
(b) Find an equation of the line that is perpendicular to the line $y = 5x + 6$ and passes through the point (–2, 5).

.....

(3)

(Total for Question 13 is 4 marks)

21.



Line **L** is drawn on the grid.

(a) Work out the gradient of Line **L**.

.....

(2)

Another line, Line **M**, is parallel to Line **L** and passes through the point (6, 2).

(b) Find an equation for Line **M**.

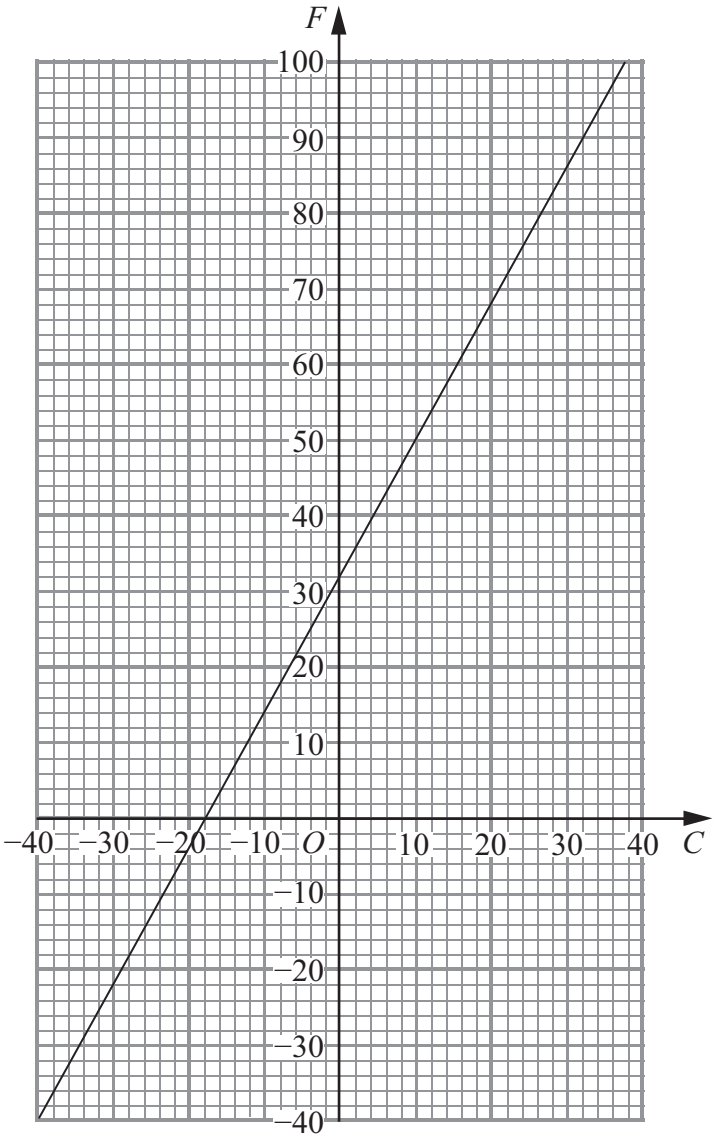
.....

(2)

Q21

(Total 4 marks)

9 This graph can be used to convert between degrees Celsius (C) and degrees Fahrenheit (F).



Find the values of m and k such that

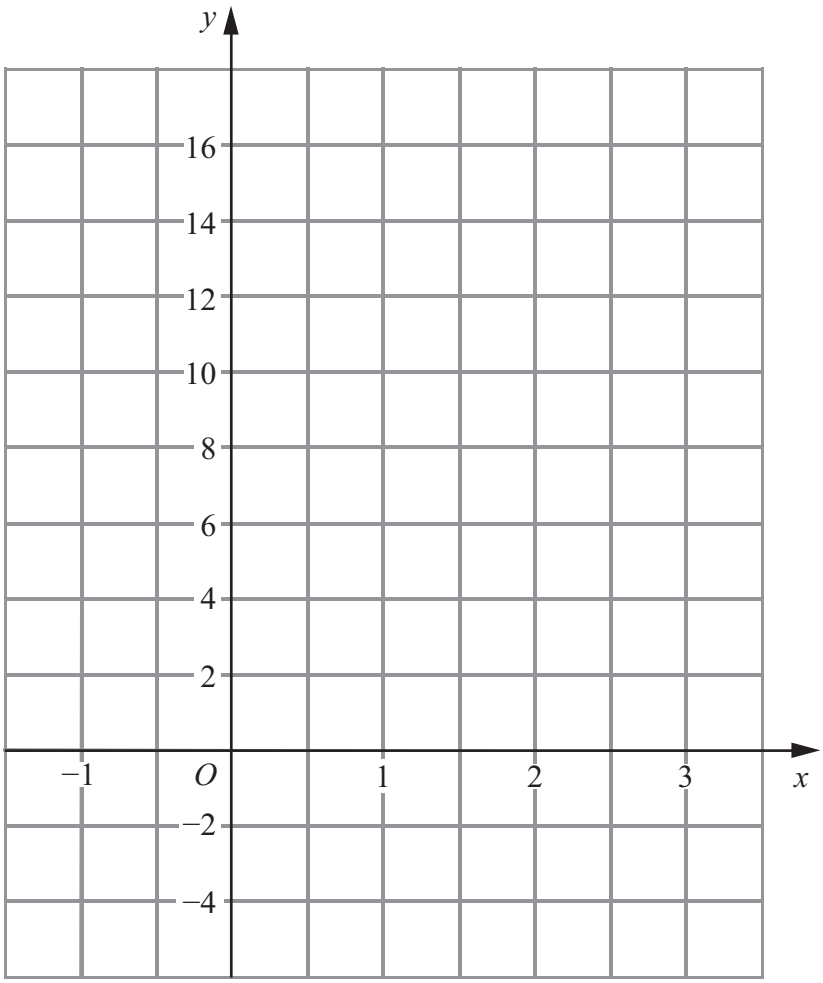
$$F = mC + k$$

$m =$ .....

$k =$ .....

(Total for Question 9 is 3 marks)

5 (a) On the grid, draw the graph of $y = 4x + 2$ from $x = -1$ to $x = 3$



(3)

(b) (i) Write down the equation of a straight line that is parallel to $y = 4x + 2$

.....

(ii) Write down the gradient of a straight line that is perpendicular to $y = 4x + 2$

.....

(2)

(Total for Question 5 is 5 marks)

7 The point A has coordinates $(3, 8)$.
The point B has coordinates $(7, 5)$.
M is the midpoint of the line segment AB.

Find the coordinates of M.

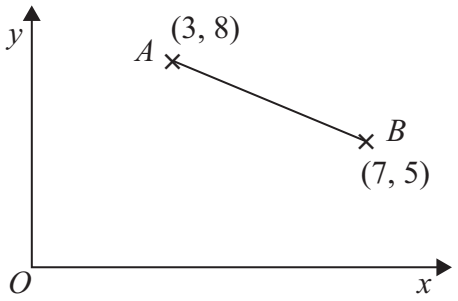


Diagram **NOT** accurately drawn

.....

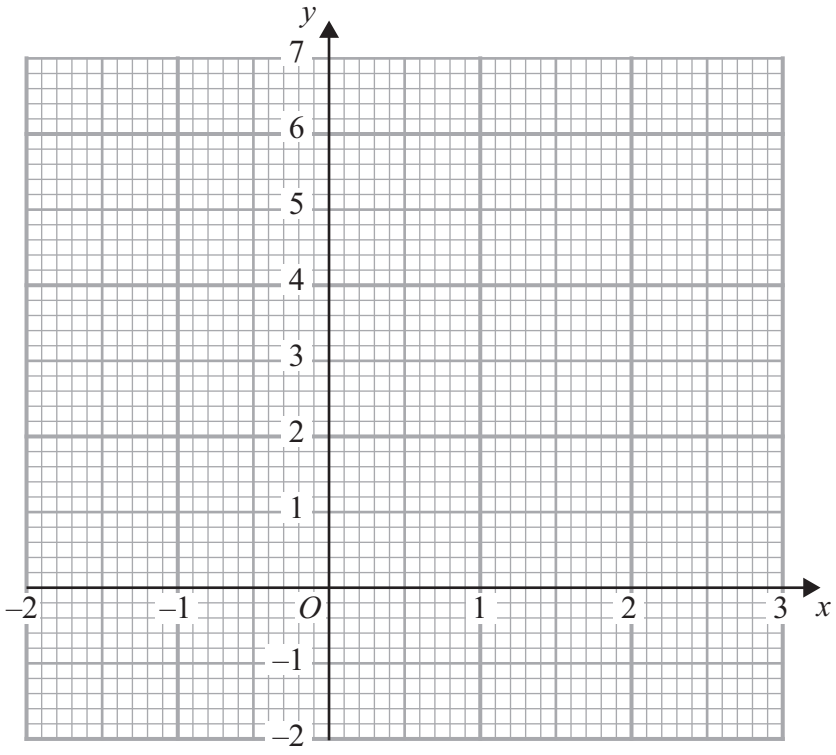
(Total for Question 7 is 2 marks)

13. (a) Complete the table of values for $3x + 2y = 6$

x	-2	-1	0	1	2	3
y		4.5	3			-1.5

(2)

(b) On the grid, draw the graph of $3x + 2y = 6$



(2)

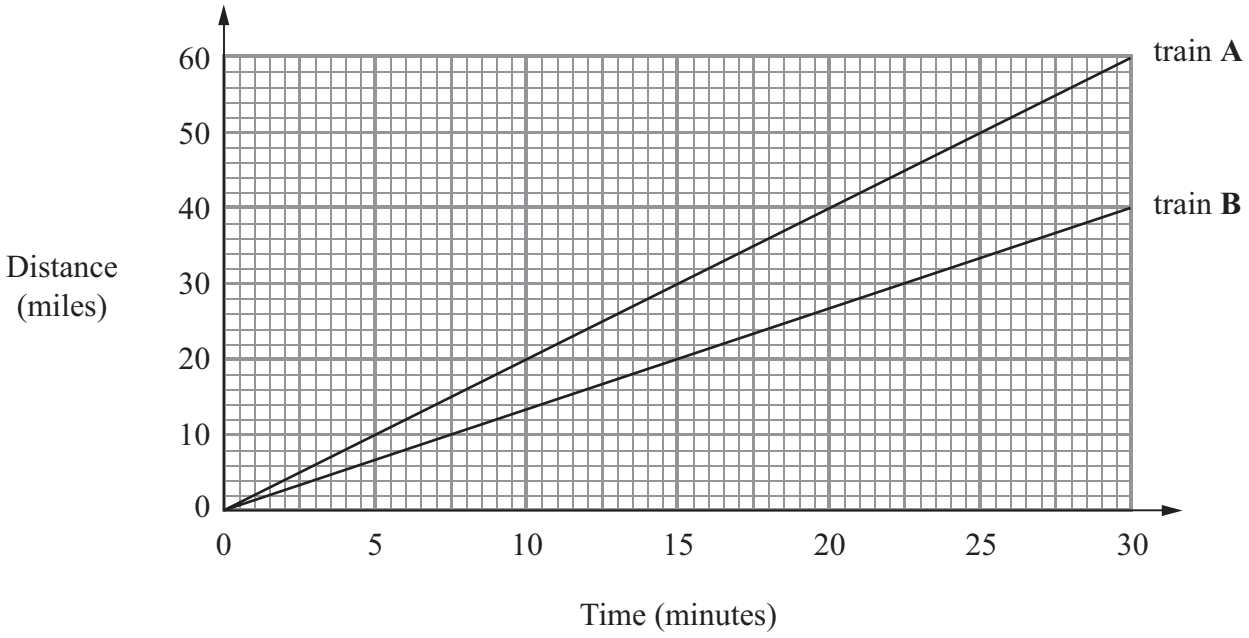
(c) Find the gradient of the graph of $3x + 2y = 6$

.....

(2) **Q13**

(Total 6 marks)

7 The graph shows the distance travelled by two trains.



(a) Work out the gradient of the line for train **A**.

.....

(2)

(b) Which train is travelling at the greater speed?
You must explain your answer.

.....

.....

.....

(1)

(c) After how many minutes has train **A** gone 10 miles further than train **B**?

..... minutes

(1)

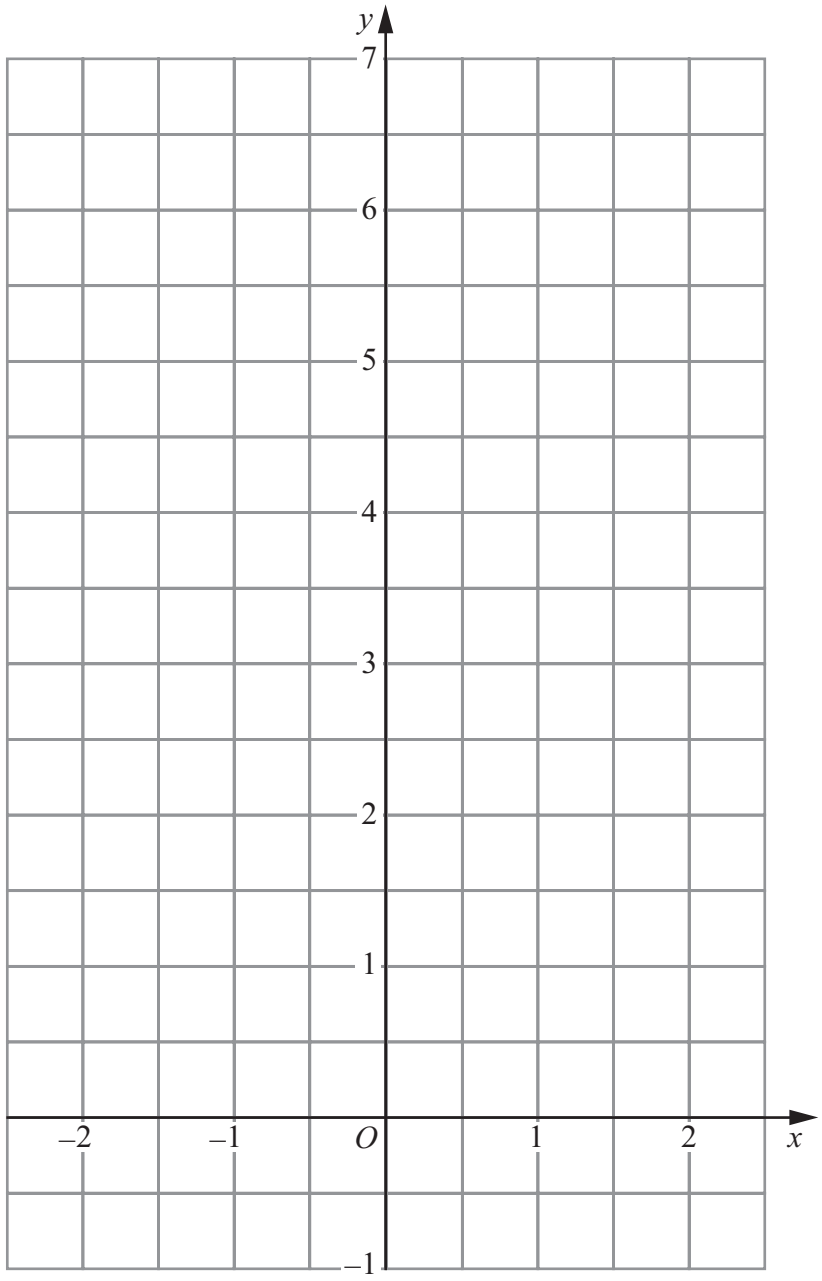
(Total for Question 7 is 4 marks)

8 (a) Complete the table of values for $y = \frac{1}{2}x + 4$

x	–2	–1	0	1	2
y	3		4		

(2)

(b) On the grid, draw the graph of $y = \frac{1}{2}x + 4$



(2)

(c) (i) On the grid, draw the line that is perpendicular to $y = \frac{1}{2}x + 4$ and passes through the point with coordinates (0, 4).

(ii) Find the equation of this line.

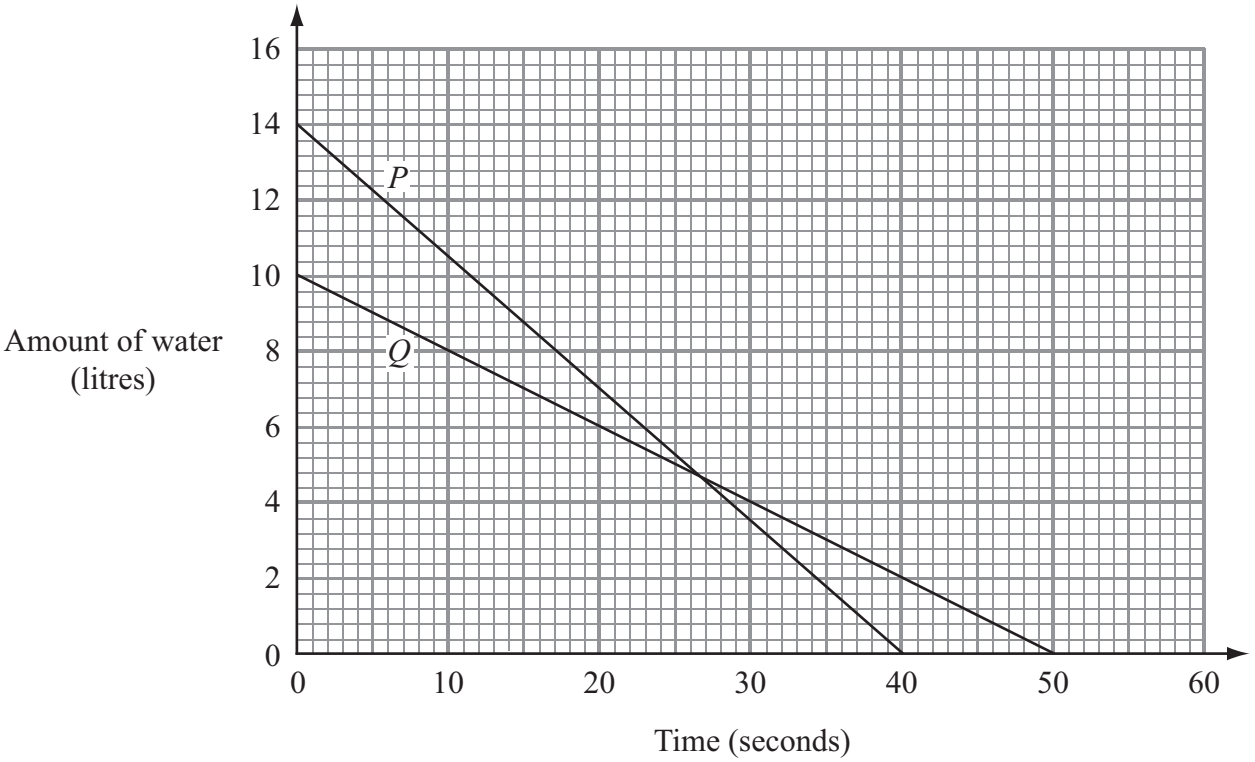
.....

(3)

(Total for Question 8 is 7 marks)

6 Water is leaking out of two containers.
The water started to leak out of the containers at the same time.

The straight line P shows information about the amount of water, in litres, in container P.
The straight line Q shows information about the amount of water, in litres, in container Q.



(a) Work out the gradient of line P.

.....

(2)

One container will become empty first.

(b) (i) Which container?
You must explain your answer.

.....

.....

(ii) How much water is then left in the other container?

..... litres
(2)

(Total for Question 6 is 4 marks)

3 Find the coordinates of the midpoint of the line joining the points (1, 2) and (4, 0).

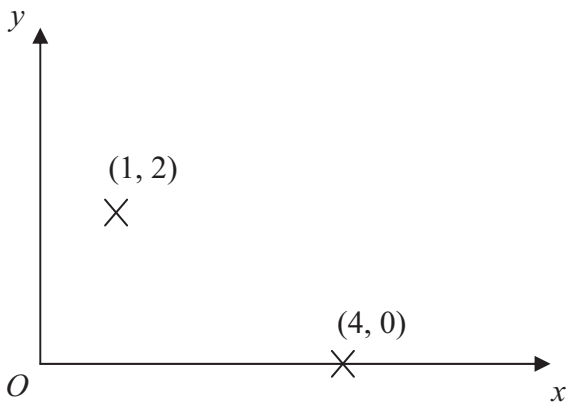


Diagram **NOT** accurately drawn

(..... , ...)

(Total for Question 3 is 2 marks)

15 A straight line, ***L***, is perpendicular to the line with equation $y = 1 - 3x$.
The point with coordinates (6, 3) is on the line ***L***.

Find an equation of the line ***L***.

.....

(Total for Question 15 is 3 marks)

Question 25

***1**

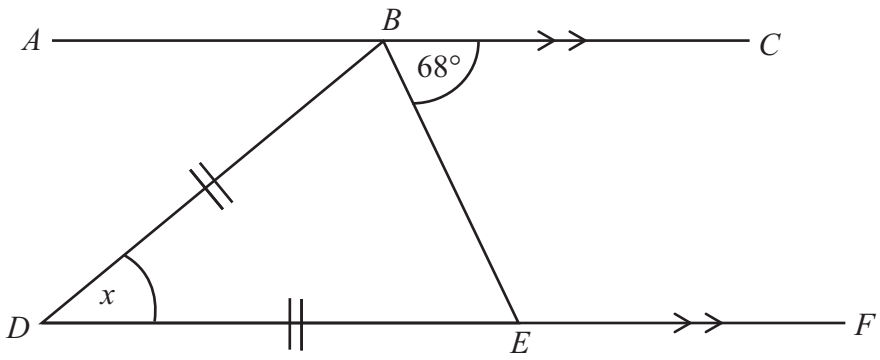


Diagram **NOT** accurately drawn

BDE is an isosceles triangle.
DB = *DE*.
The straight line *ABC* is parallel to the straight line *DEF*.

Work out the size of the angle marked *x*.
You must give reasons for each stage in your working.

(Total for Question 1 is 4 marks)

13 The diagram shows a cuboid drawn on a 3-D coordinate grid.

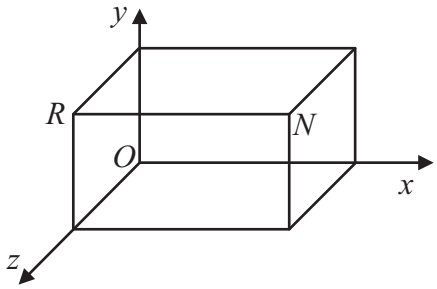


Diagram **NOT** accurately drawn

The vertex N of the cuboid has coordinates (6, 2, 4).

(a) What are the coordinates of the vertex R?

(..... , ... , ...)

(1)

(b) What are the coordinates of the midpoint of the line segment RN?

(..... , ... , ...)

(2)

(Total for Question 13 is 3 marks)

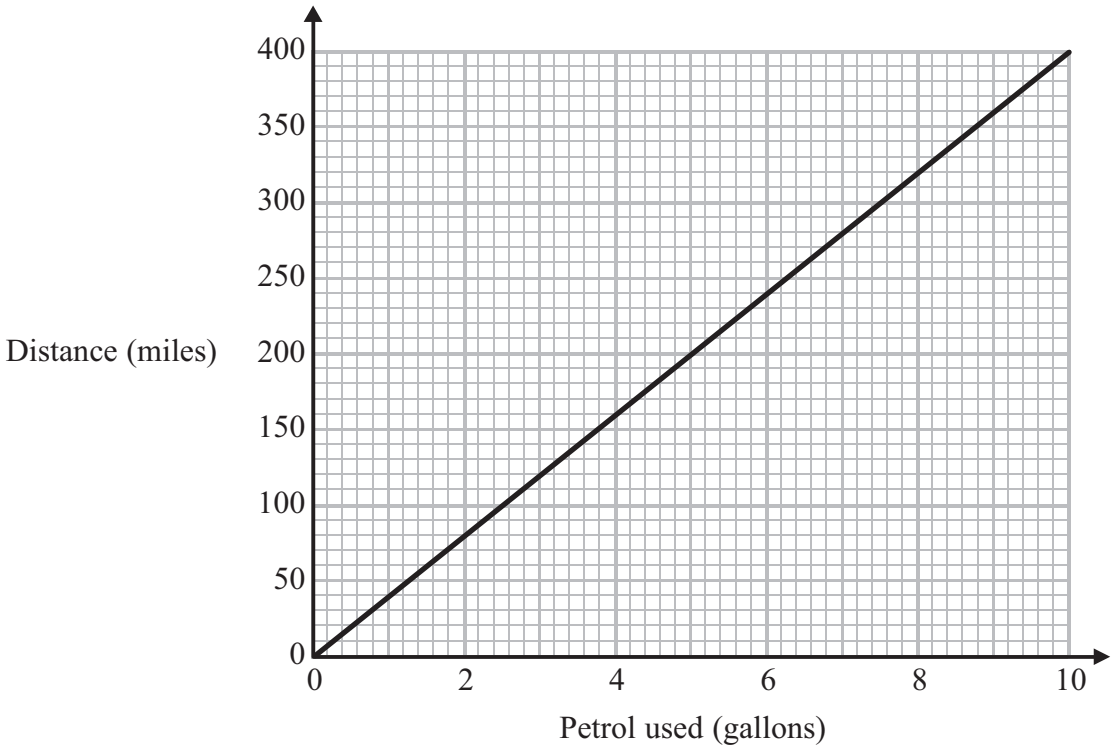
Question 27

17 Find an equation of the straight line that is perpendicular to the straight line $x + 2y = 5$ and that passes through the point (3, 7).

.....

(Total for Question 17 is 4 marks)

8 The graph shows information about the distances travelled by a car for different amounts of petrol used.



(a) Find the gradient of the straight line.

.....

(2)

(b) Write down an interpretation of this gradient.

.....

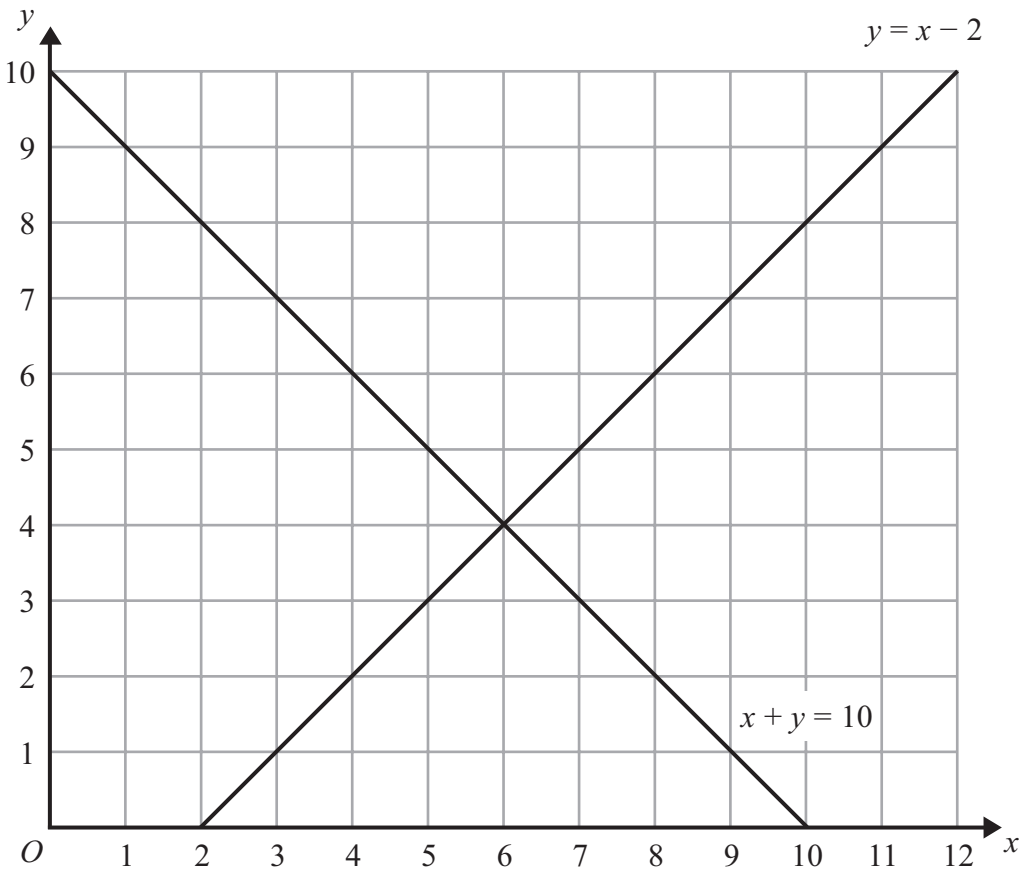
.....

.....

(1)

(Total for Question 8 is 3 marks)

17 The lines $y = x - 2$ and $x + y = 10$ are drawn on the grid.



On the grid, mark with a cross (×) each of the points with integer coordinates that are in the region defined by

$$y > x - 2$$
$$x + y < 10$$
$$x > 3$$

(Total for Question 17 is 3 marks)

23

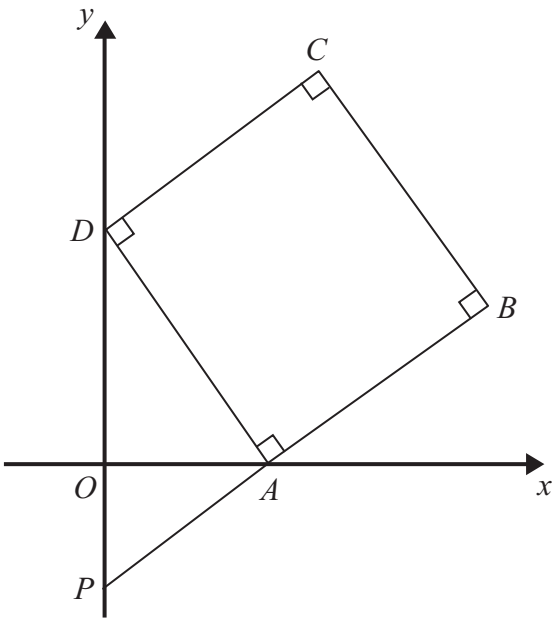


Diagram **NOT** accurately drawn

ABCD is a square.
P and *D* are points on the *y*-axis.
A is a point on the *x*-axis.
PAB is a straight line.

The equation of the line that passes through the points *A* and *D* is $y = -2x + 6$

Find the length of *PD*.

.....

(Total for Question 23 is 4 marks)

12

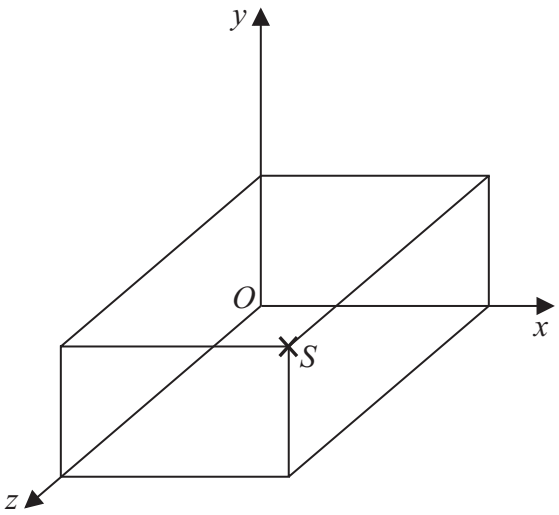


Diagram **NOT** accurately drawn

The diagram shows a cuboid drawn on a 3-D grid.

Three of the vertices of the cuboid are P (3, 2, 0)
Q (3, 0, 0)
R (3, 0, 4)

(a) Label the vertex Q with a cross (×).

(1)

The vertex S is shown on the diagram.

(b) Write down the coordinates of the vertex S.

(..... , ... , ...)

(1)

(Total for Question 12 is 2 marks)

16

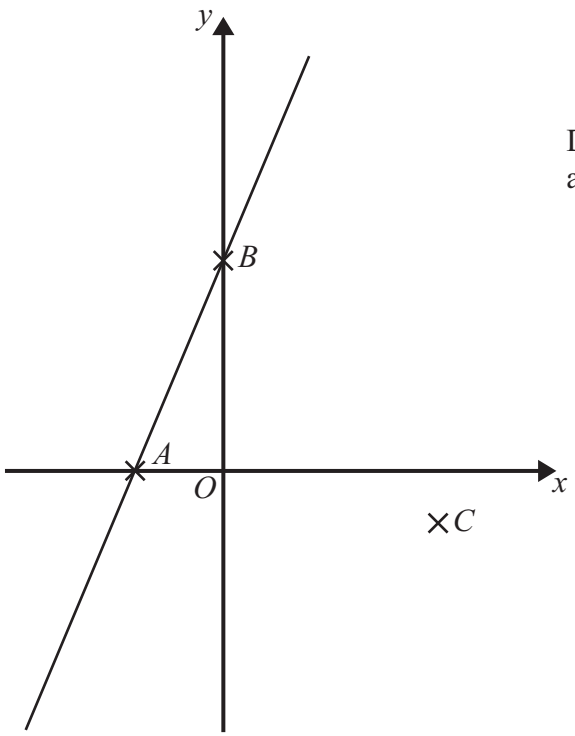


Diagram **NOT** accurately drawn

In the diagram A is the point $(-2, 0)$
B is the point $(0, 4)$
C is the point $(5, -1)$

Find an equation of the line that passes through C and is perpendicular to AB.

.....

(Total for Question 16 is 4 marks)

13

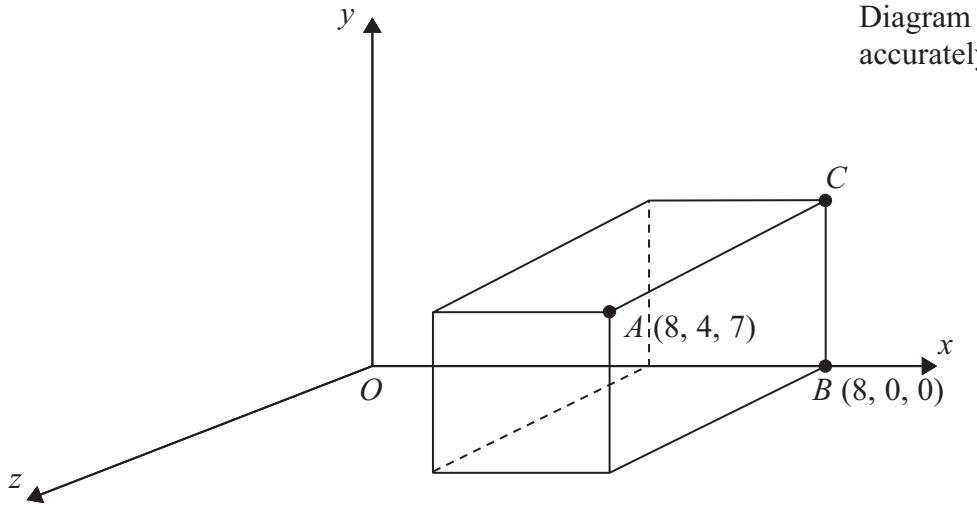


Diagram **NOT** accurately drawn

A, B and C are 3 corners of a cuboid.

(a) Write down the coordinates of C.

(..... , ... , ...)

(1)

M is the midpoint of the line AB.

(b) Find the coordinates of M.

(..... , ... , ...)

(2)

(Total for Question 13 is 3 marks)

15 The straight line **L** has equation $y = 3x - 4$

(a) Write down an equation of the line parallel to **L** which passes through the origin.

.....

(2)

(b) Find an equation of the straight line that passes through (0, 5) and is perpendicular to **L**.

.....

(2)

(Total for Question 15 is 4 marks)

18

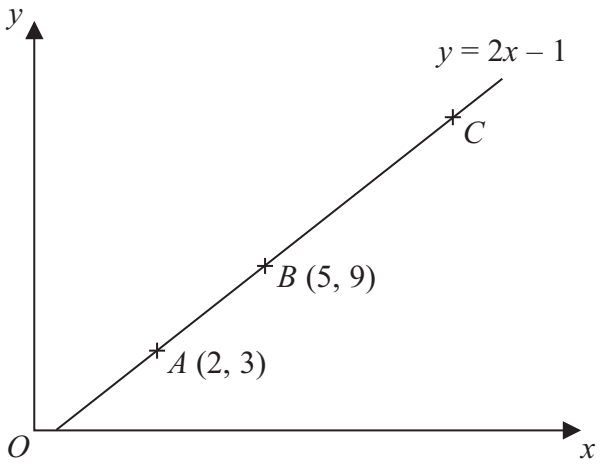


Diagram **NOT** accurately drawn

In the diagram,

the points A, B and C lie on the straight line $y = 2x - 1$

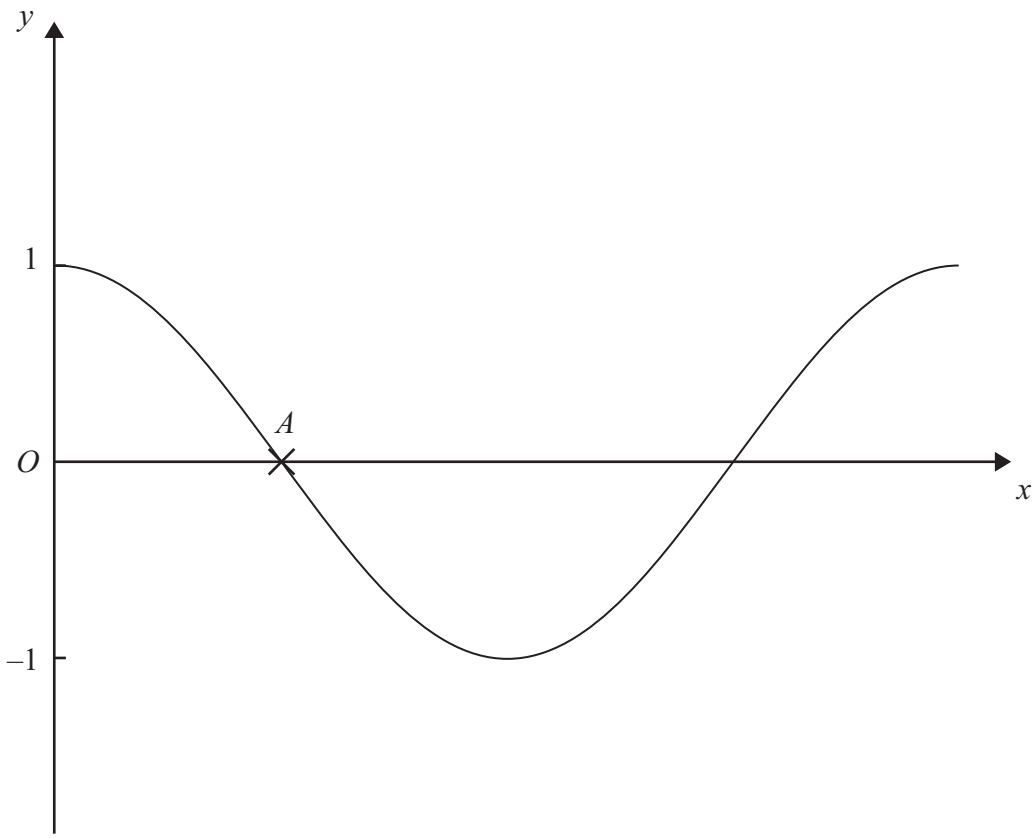
The coordinates of A are (2, 3).
The coordinates of B are (5, 9).

Given that $AC = 3AB$, find the coordinates of C.

(..... , ...)

(Total for Question 18 is 3 marks)

28 The diagram shows a sketch of the graph of $y = \cos x°$



(a) Write down the coordinates of the point A.

(..... , ...)

(1)

(b) On the same diagram, draw a sketch of the graph of $y = 2 \cos x°$

(1)

(Total for Question 28 is 2 marks)

13

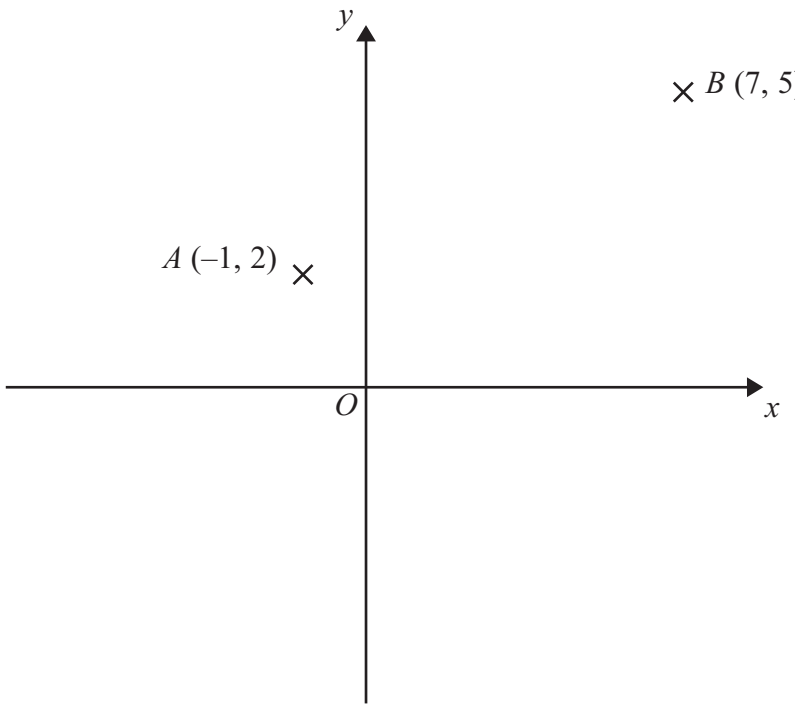


Diagram **NOT** accurately drawn

A is the point $(-1, 2)$
B is the point $(7, 5)$

(a) Find the coordinates of the midpoint of AB.

(..... , ...)
(2)

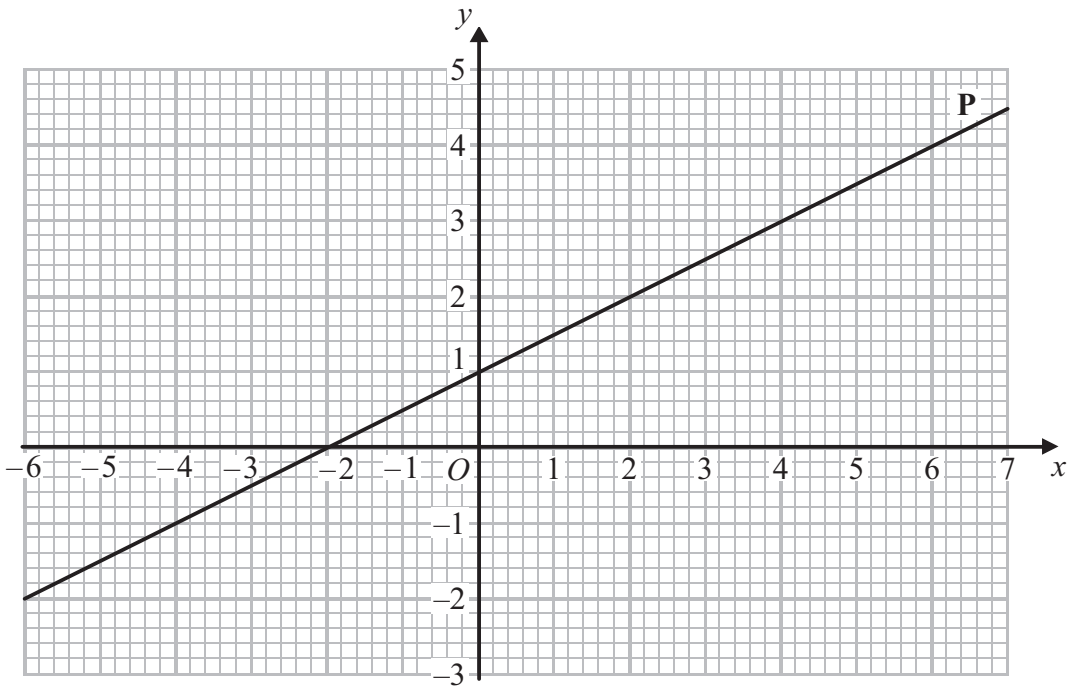
P is the point $(-4, 4)$
Q is the point $(1, -5)$

(b) Find the gradient of PQ.

.....
(2)

(Total for Question 13 is 4 marks)

7 The straight line **P** has been drawn on a grid.



Find the gradient of the line **P**.

.....

(Total for Question 7 is 2 marks)

14 The diagram shows a cuboid on a 3-D grid.

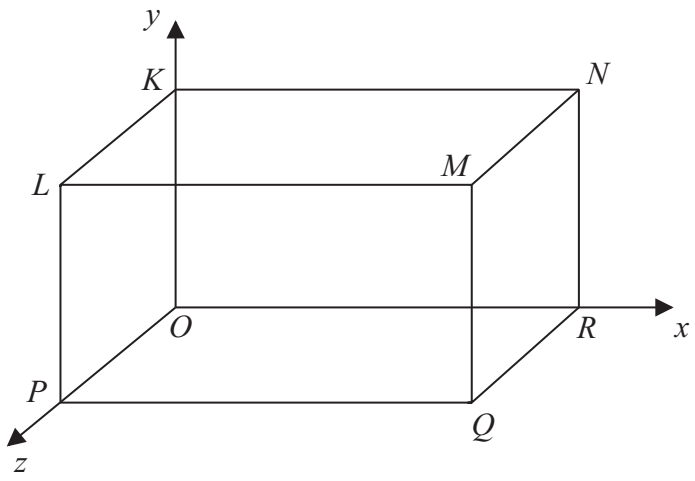


Diagram **NOT** accurately drawn

The coordinates of the vertex M are (5, 3, 2).

Work out the coordinates of the midpoint of LN.

(..... , ... , ...)

(Total for Question 14 is 2 marks)

16 (a) Write down an equation of a straight line that is parallel to the straight line $y = 3x - 5$

.....

(1)

A straight line, L, is perpendicular to the straight line $y = 3x - 5$ and passes through the point (6, 5)

(b) Find an equation of L.

.....

(3)

(Total for Question 16 is 4 marks)

17 AB is a line segment.

A is the point with coordinates (3, 6, 7).
The midpoint of AB has coordinates (–2, 2, 5).

Find the coordinates of B.

.....

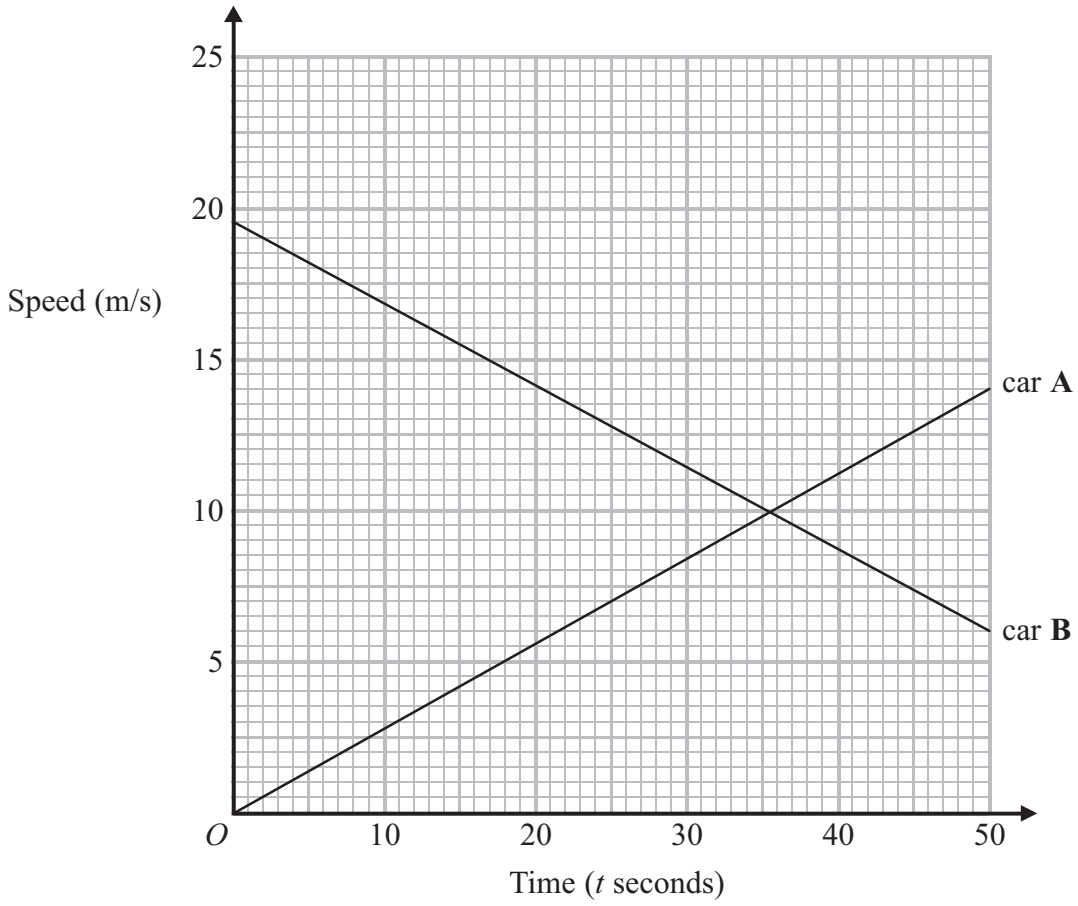
(Total for Question 17 is 2 marks)

***25** **A** and **B** are straight lines.
Line **A** has equation $2y = 3x + 8$
Line **B** goes through the points $(-1, 2)$ and $(2, 8)$

Do lines **A** and **B** intersect?
You must show all your working.

(Total for Question 25 is 3 marks)

12 The graph shows information about the speeds of two cars.



(a) Work out the gradient of the line for car A.

.....

(2)

(b) After how many seconds is the speed of car A equal to the speed of car B?

..... seconds

(1)

(Total for Question 12 is 3 marks)

15 **L** is a straight line.
The gradient of **L** is 4
L passes through the point (0, 2).

(a) Write down an equation of the straight line **L**.

.....

(2)

$\mathbf{L}_1$ is a straight line parallel to **L**.
$\mathbf{L}_1$ passes through the point with coordinates (2, –6)

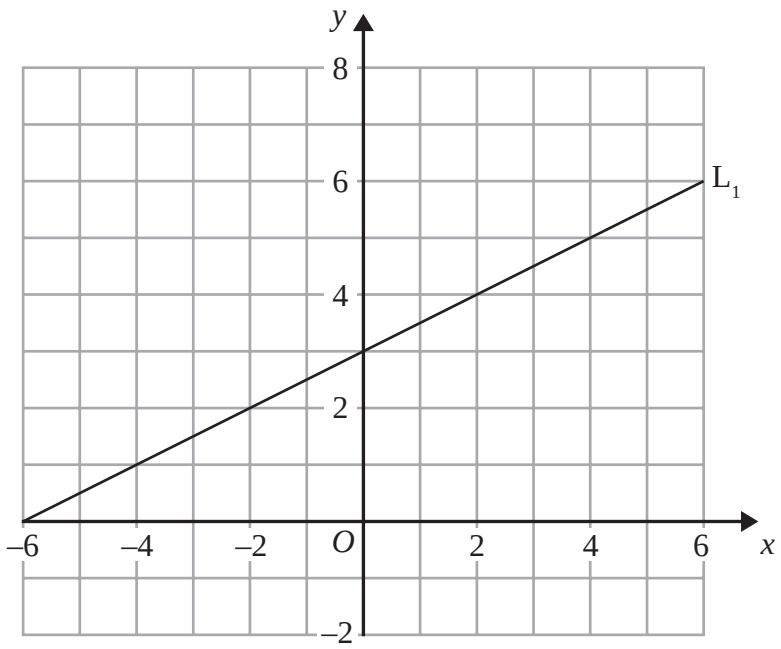
(b) Find an equation of $\mathbf{L}_1$.

.....

(3)

(Total for Question 15 is 5 marks)

19 The diagram shows a straight line, L_1, drawn on a grid.



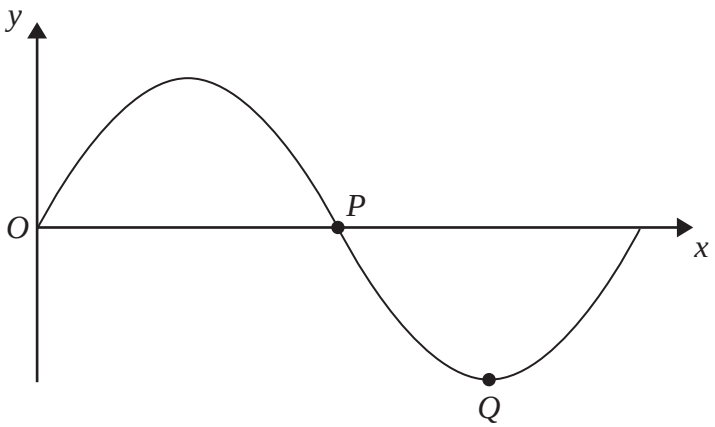
A straight line, L_2, is parallel to the straight line L_1 and passes through the point (0, –5).

Find an equation of the straight line L_2.

.....

(Total for Question 19 is 3 marks)

26 The diagram shows part of a sketch of the curve $y = \sin x°$.



(a) Write down the coordinates of the point P.

(..... , ...)

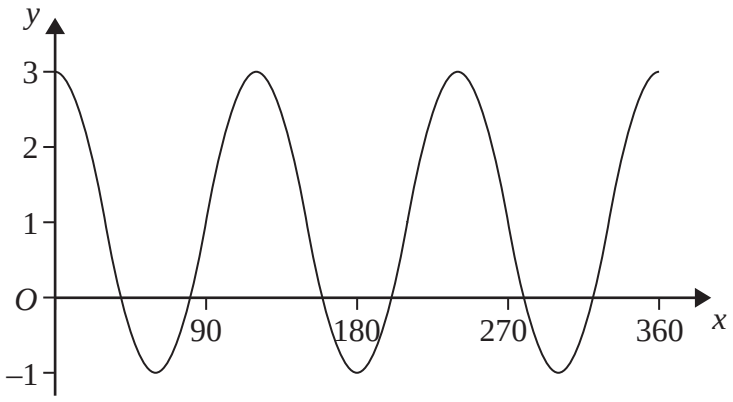
(1)

(b) Write down the coordinates of the point Q.

(..... , ...)

(1)

Here is a sketch of the curve $y = a\cos bx° + c, \quad 0 \leqslant x \leqslant 360$



(c) Find the values of a, b and c.

a = ...

b = ...

c = ...

(3)

(Total for Question 26 is 5 marks)

1 The point A has coordinates (2, 3).
The point B has coordinates (6, 8).

M is the midpoint of the line AB.

Find the coordinates of M.

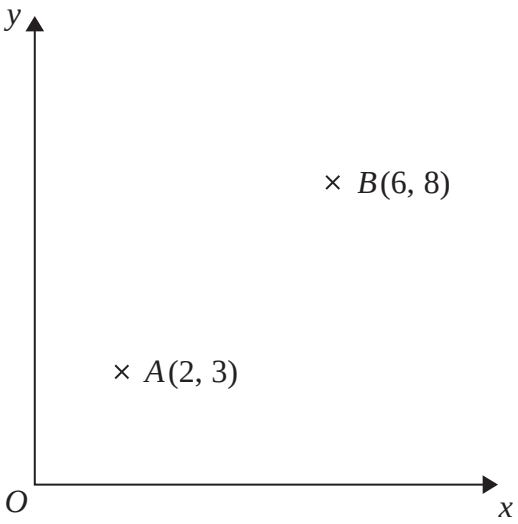


Diagram **NOT** accurately drawn

.....

(Total for Question 1 is 2 marks)

19 Here is a cuboid drawn on a 3-D grid.

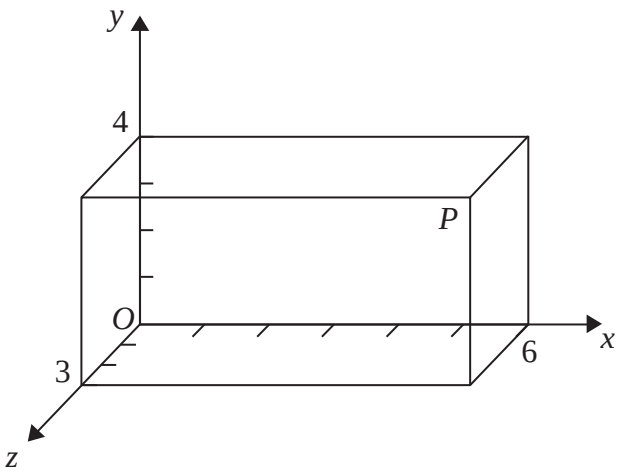


Diagram **NOT** accurately drawn

P is a vertex of the cuboid.

T divides the line *OP* in the ratio 1 : 2

Find the coordinates of *T*.

(..... , ... , ...)

(Total for Question 19 is 2 marks)

17 The straight line **L** has equation $y = 2x - 5$

Find an equation of the straight line perpendicular to **L** which passes through (–2, 3).

.....

(Total for Question 17 is 3 marks)

11

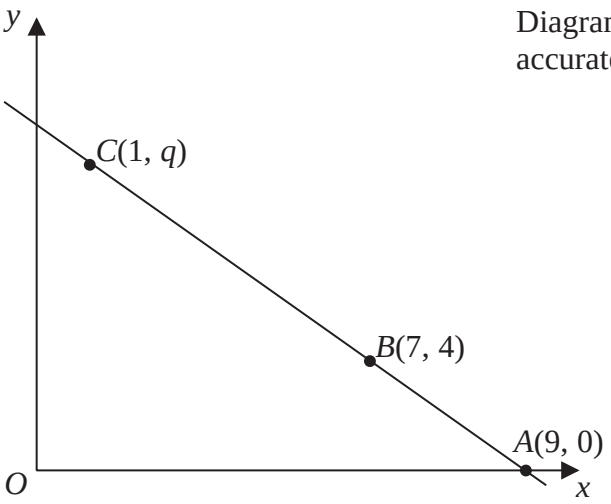


Diagram **NOT** accurately drawn

The points A, B and C lie on a straight line.

The coordinates of A are (9, 0).
The coordinates of B are (7, 4).
The coordinates of C are (1, q).

Work out the value of q.

.....

(Total for Question 11 is 3 marks)

***24** A is the point with coordinates (1, 3)
B is the point with coordinates (4, –1)
The straight line L goes through both A and B.

Is the line with equation $2y = 3x - 4$ perpendicular to line L?
You must show how you got your answer.

(Total for Question 24 is 4 marks)

9 *AB* is a line segment.

A is the point (3, 6, 7)
The midpoint of the line *AB* has coordinates (0, –3, 3)

Find the coordinates of point *B*.

(..... , ... , ...)

(Total for Question 9 is 2 marks)

12

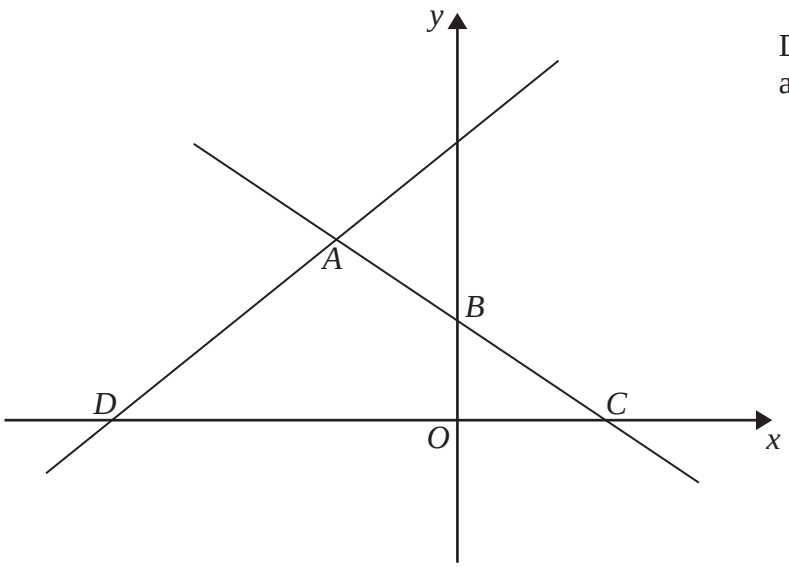


Diagram **NOT** accurately drawn

In the diagram, *ABC* is the line with equation $y = -\frac{1}{2}x + 5$

AB = *BC*
D is the point with coordinates (–13, 0)

Find an equation of the line through *A* and *D*.

.....

(Total for Question 12 is 5 marks)

15 A and B are two points.

Point A has coordinates $(-2, 4)$.
Point B has coordinates $(8, 9)$.

C is the midpoint of the line segment AB.

(a) Find the coordinates of C.

(..... , ...)
(2)

D is the point with coordinates $(100, 56)$.

*(b) Does point D lie on the straight line that passes through A and B?
You must show how you work out your answer.

(3)

(Total for Question 15 is 5 marks)

12 The points A, B and C lie in order on a straight line.

The coordinates of A are $(2, 5)$
The coordinates of B are $(4, p)$
The coordinates of C are $(q, 17)$

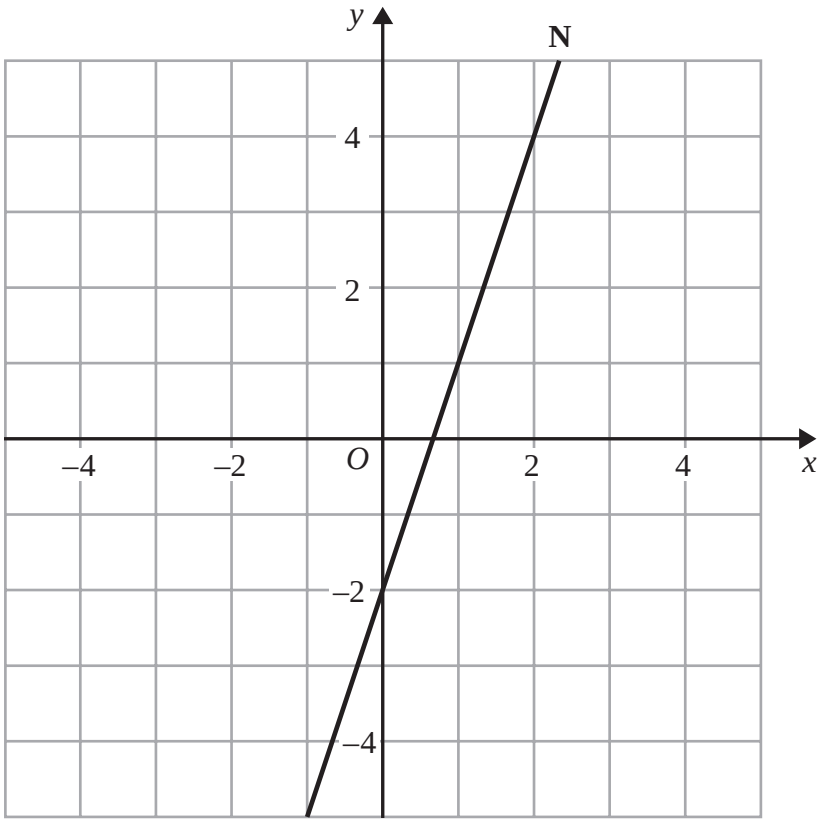
Given that $AC = 4AB$, find the values of p and q.

$p =$ .....

$q =$ .....

(Total for Question 12 is 3 marks)

17 The line **N** is drawn below.



Find an equation of the line perpendicular to line **N** that passes through the point (0, 1).

.....

(Total for Question 17 is 3 marks)

12

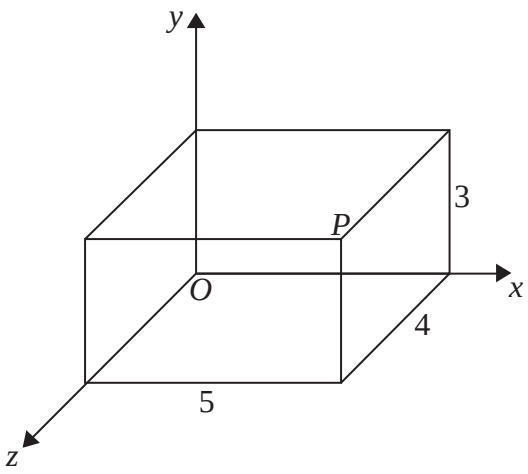


Diagram **NOT** accurately drawn

The diagram shows a cuboid drawn on a 3-D coordinate grid.
P is a vertex of the cuboid.

(a) Write down the coordinates of *P*.

(..... , ... , ...)

(1)

The point *C* on the cuboid has coordinates (0, 3, 2).

(b) On the diagram, mark with a cross (×) the point *C*.
Label the point *C*.

(1)

(Total for Question 12 is 2 marks)

16 The points $A(6, 1)$ and $B(-2, 5)$ are on the line with equation $y = -\frac{1}{2}x + 4$

M is the midpoint of AB.

Find an equation of the line through M that is perpendicular to $y = -\frac{1}{2}x + 4$

.....

(Total for Question 16 is 4 marks)

17 $\mathbf{L}_1$ and $\mathbf{L}_2$ are parallel lines.

The equation of $\mathbf{L}_1$ is $y = 3x + 2$
$\mathbf{L}_2$ passes through the point (3, 4).

Find an equation for $\mathbf{L}_2$.

.....

(Total for Question 17 is 3 marks)

12 The diagram shows a cube drawn on a 3-D grid.

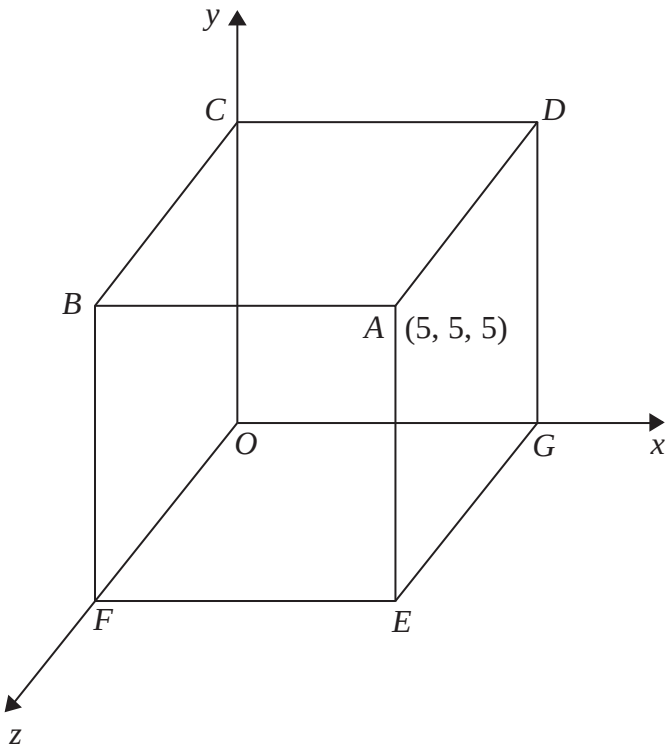


Diagram **NOT** accurately drawn

The coordinates of vertex A are (5, 5, 5).

(a) Write down the coordinates of vertex B.

(..... , ... , ...)

(1)

(b) Work out the coordinates of the midpoint of AC.

(..... , ... , ...)

(1)

(Total for Question 12 is 2 marks)

15

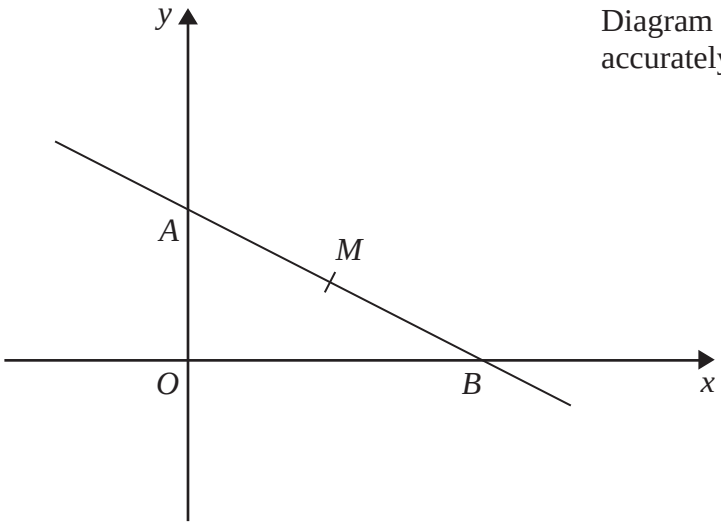


Diagram **NOT** accurately drawn

In the diagram A is the point (0, 4)
B is the point (6, 0)

M is the midpoint of AB.

Find an equation of the line that passes through M and is perpendicular to AB.

.....

(Total for Question 15 is 4 marks)

10

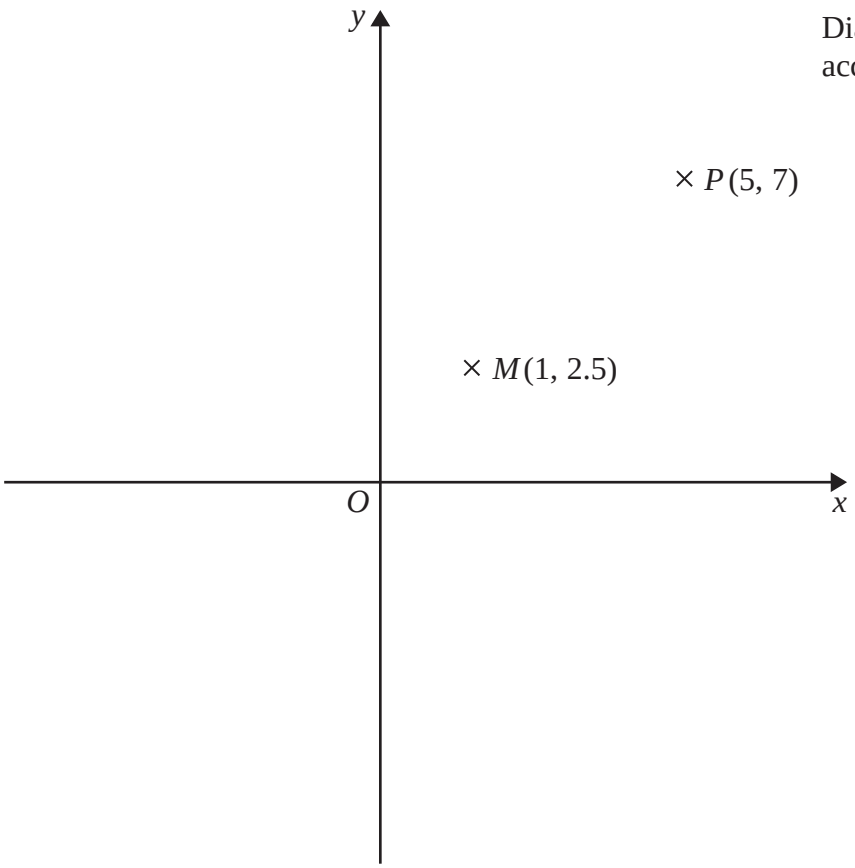


Diagram **NOT** accurately drawn

Point P has coordinates (5, 7).
Point M has coordinates (1, 2.5).

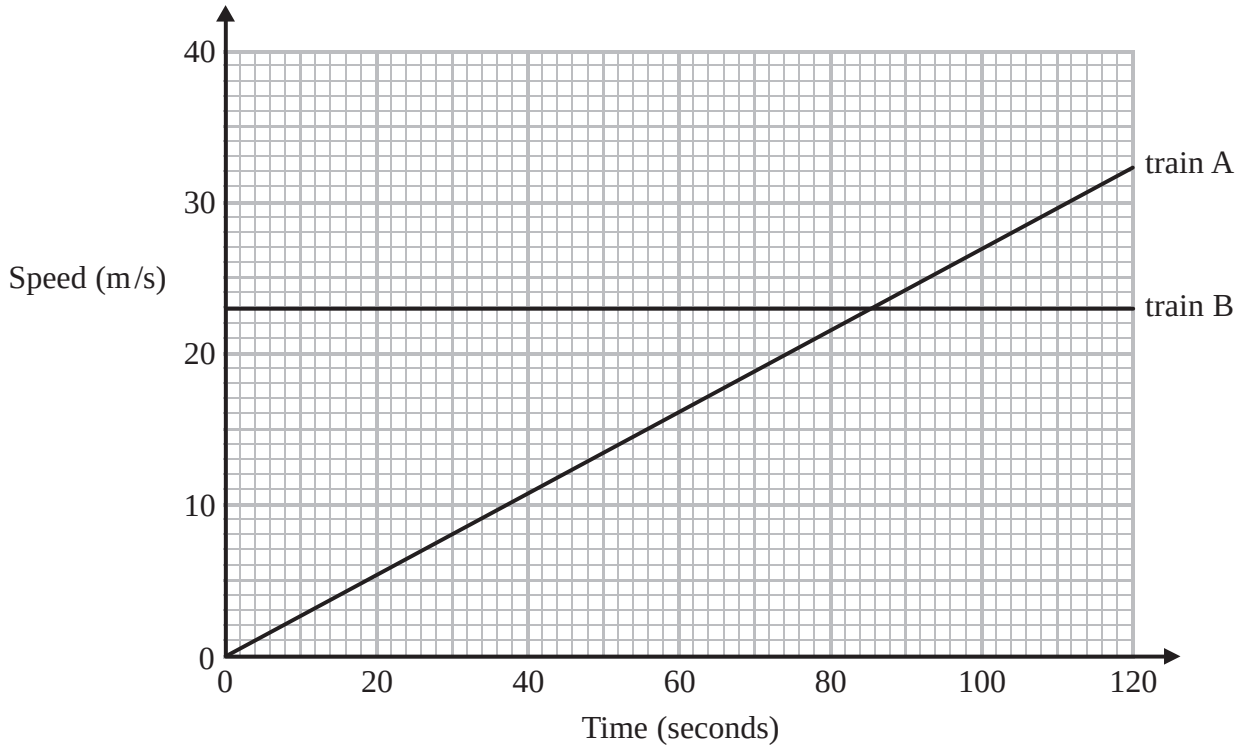
Point M is the midpoint of the line PQ.

Find the coordinates of point Q.

(..... , ...)

(Total for Question 10 is 2 marks)

12 The graph shows information about the speeds of two trains.



(a) Work out the gradient of the line for train A.

.....

(2)

*(b) Describe how the speed of train A and the speed of train B are changing in relation to time.

.....

.....

.....

(1)

(Total for Question 12 is 3 marks)

9

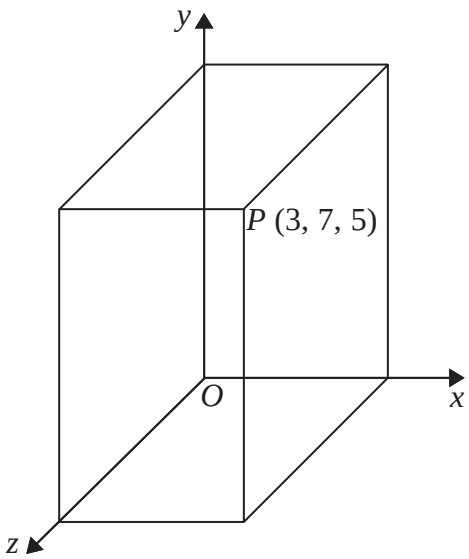


Diagram **NOT** accurately drawn

The diagram shows a cuboid drawn on a 3-D coordinate grid.
All measurements are in cm.

P is a vertex of the cuboid.
The coordinates of *P* are (3, 7, 5).

Work out the surface area of the cuboid.

..... cm^2

(Total for Question 9 is 3 marks)

15

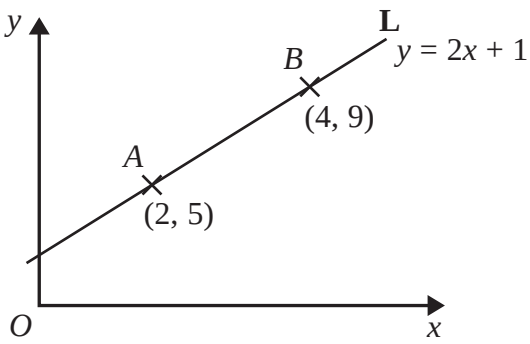


Diagram **NOT** accurately drawn

The point A has coordinates (2, 5).
The point B has coordinates (4, 9).

The line **L** passes through the points A and B.
The equation of line **L** is $y = 2x + 1$

M is the midpoint of the line segment AB.

Find an equation of the line that is perpendicular to line **L** and passes through M.

.....

(Total for Question 15 is 4 marks)

15 AB is a line segment.

The midpoint of the line segment AB has coordinates (3, 5)
Point A has coordinates (9, 2)

(a) Work out the coordinates of point B.

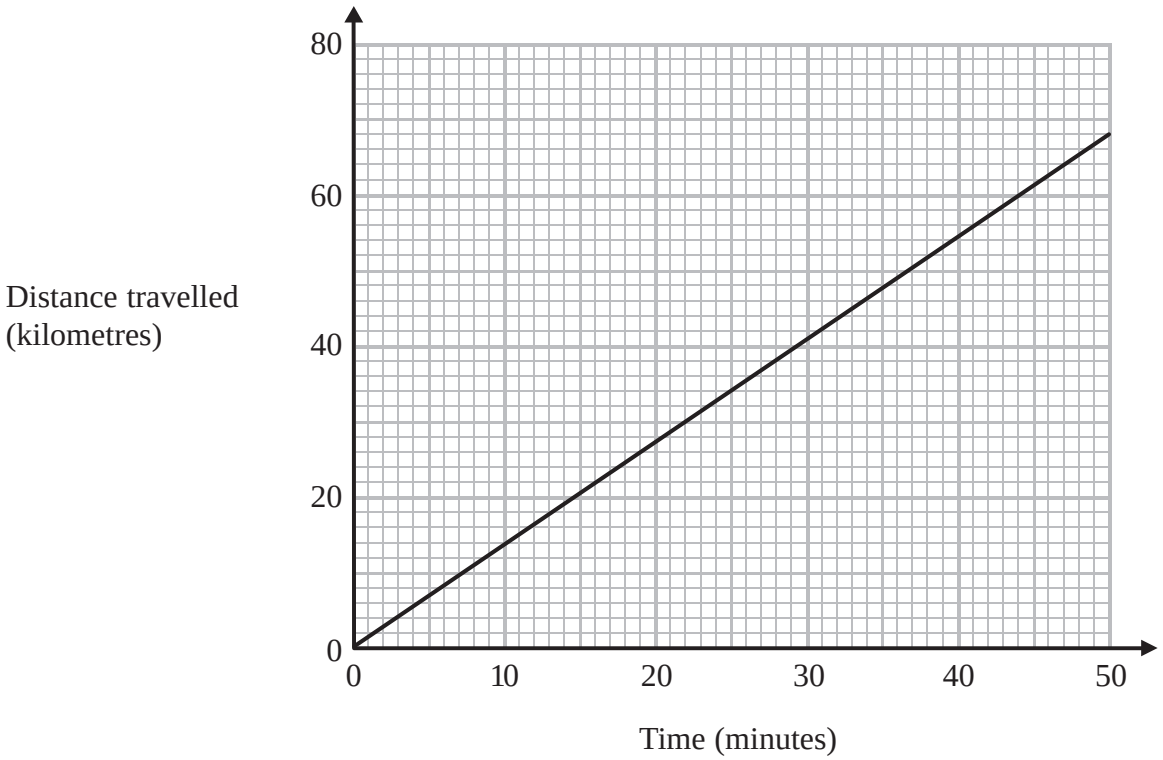
(..... , ...)
(2)

(b) Work out an equation of the straight line that passes through (9, 2) and (3, 5)

.....
(3)

(Total for Question 15 is 5 marks)

9 The graph shows information about the distances travelled by a lorry.



The graph is a straight line.

(a) Work out the gradient of the straight line.

.....

(2)

(b) Write down a practical interpretation of the value you calculated in part (a).

.....

.....

(1)

(Total for Question 9 is 3 marks)

13 The diagram shows a cube on a 3-D grid.

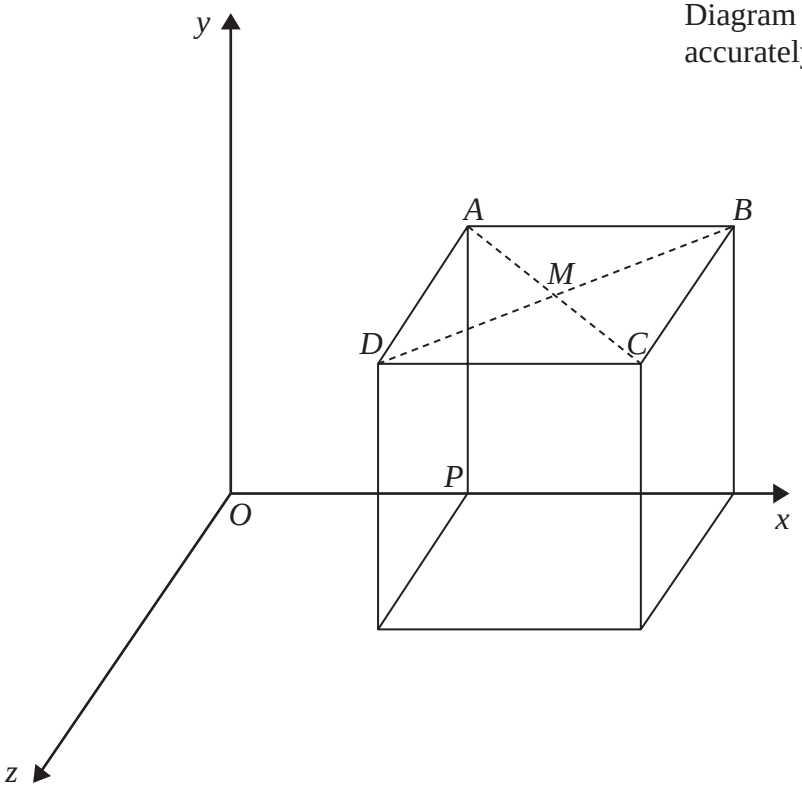


Diagram **NOT** accurately drawn

The coordinates of vertex P are (3, 0, 0).
The coordinates of vertex B are (5, 2, 0).

Another vertex of the cube has coordinates (3, 0, 2).

(a) Write down the coordinates of vertex C.

(..... , ... , ...)

(1)

M is the point where the diagonals of the top face of the cube intersect.

(b) Work out the coordinates of M.

(..... , ... , ...)

(2)

(Total for Question 13 is 3 marks)

17

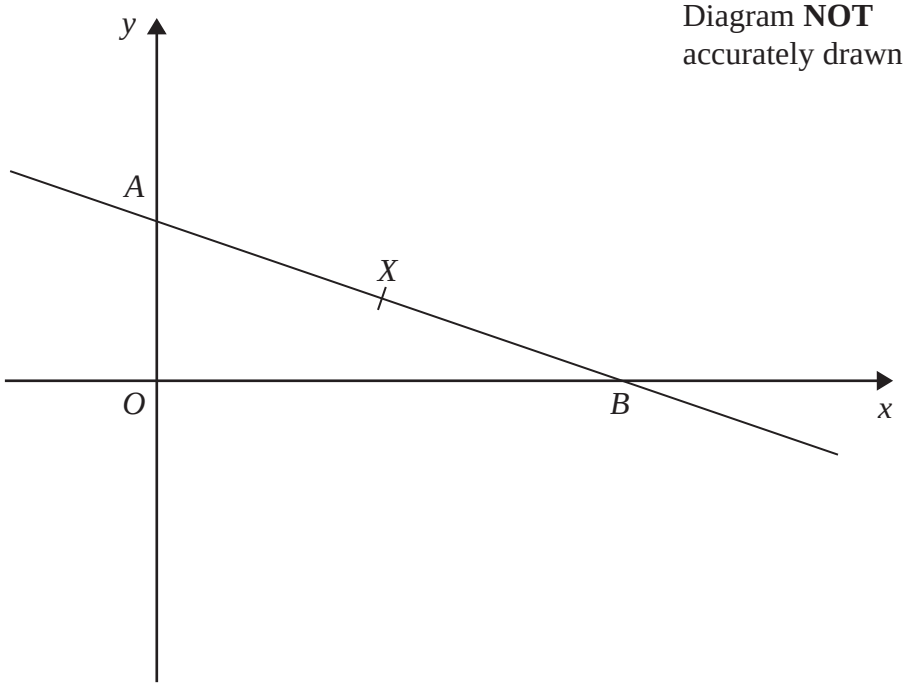


Diagram **NOT** accurately drawn

In the diagram A is the point (0, 2)
B is the point (6, 0)
X is the point (3, 1)

Find an equation of the line through X that is perpendicular to AB.

.....

(Total for Question 17 is 4 marks)

11 Q, R and S are points on a grid.

Q is the point with coordinates (106, 103)
R is the point with coordinates (106, 105)
S is the point with coordinates (104, 105.5)

P and A are two other points on the grid such that

R is the midpoint of PQ
S is the midpoint of PA

Work out the coordinates of the point A.

(..... , ...)

(Total for Question 11 is 3 marks)

24 The straight line **L** has equation $4x + y = 7$

Find an equation of the straight line perpendicular to **L** that passes through (–8, 3).

.....

(Total for Question 24 is 4 marks)

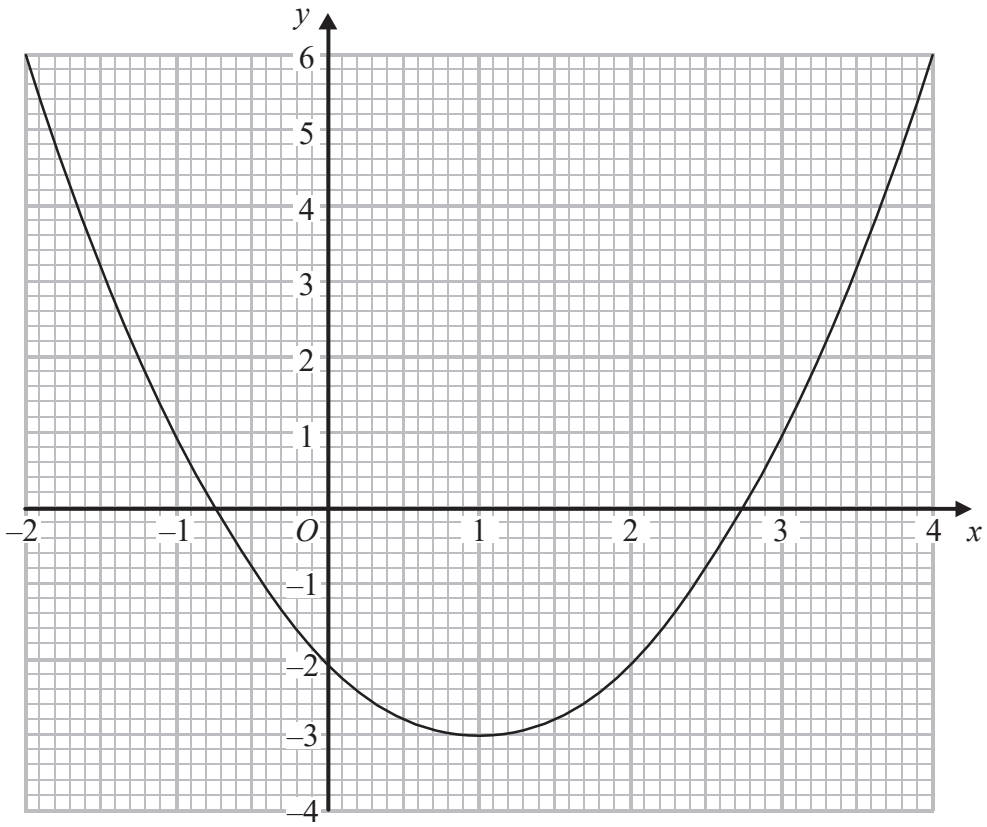
Question 72

6 The equation of the line L_1 is $y = 3x - 2$
The equation of the line L_2 is $3y - 9x + 5 = 0$

Show that these two lines are parallel.

(Total for Question 6 is 2 marks)

11 The graph of $y = f(x)$ is drawn on the grid.



(a) Write down the coordinates of the turning point of the graph.

(..... , ...)

(1)

(b) Write down estimates for the roots of $f(x) = 0$

.....

(1)

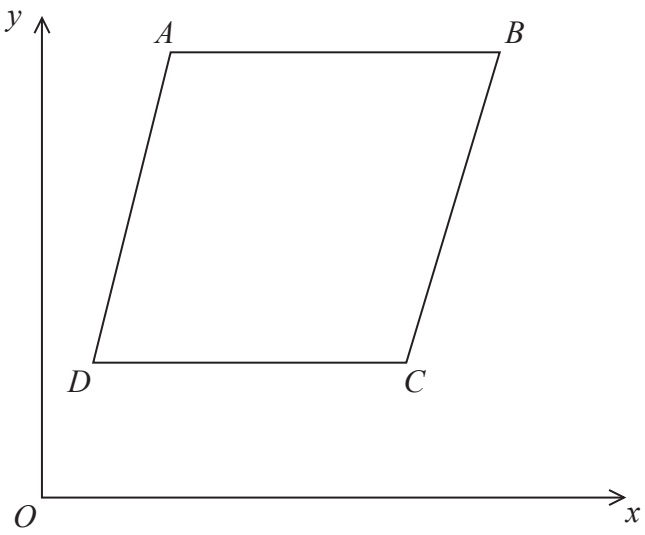
(c) Use the graph to find an estimate for $f(1.5)$

.....

(1)

(Total for Question 11 is 3 marks)

18



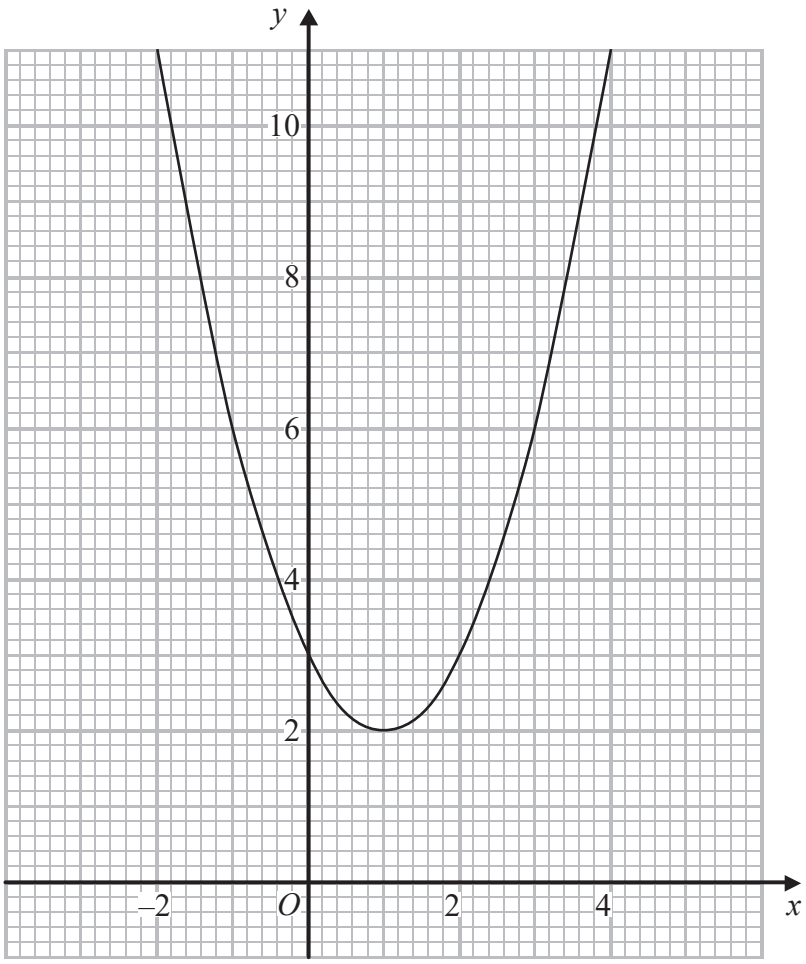
$ABCD$ is a rhombus.
The coordinates of A are $(5, 11)$
The equation of the diagonal DB is $y = \frac{1}{2}x + 6$

Find an equation of the diagonal AC.

.....

(Total for Question 18 is 4 marks)

20 The diagram shows part of the graph of $y = x^2 - 2x + 3$



(a) By drawing a suitable straight line, use your graph to find estimates for the solutions of $x^2 - 3x - 1 = 0$

.....

(2)

P is the point on the graph of $y = x^2 - 2x + 3$ where $x = 2$

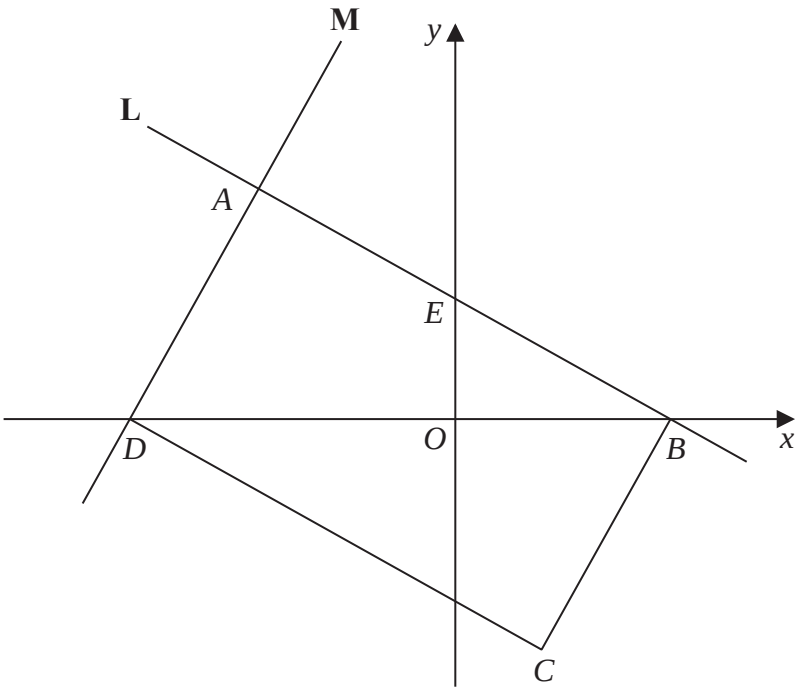
(b) Calculate an estimate for the gradient of the graph at the point P.

.....

(3)

(Total for Question 20 is 5 marks)

19



ABCD is a rectangle.

A, *E* and *B* are points on the straight line **L** with equation $x + 2y = 12$
A and *D* are points on the straight line **M**.

$AE = EB$

Find an equation for **M**.

.....

(Total for Question 19 is 4 marks)

19 A triangle has vertices P, Q and R.

The coordinates of P are $(-3, -6)$
The coordinates of Q are $(1, 4)$
The coordinates of R are $(5, -2)$

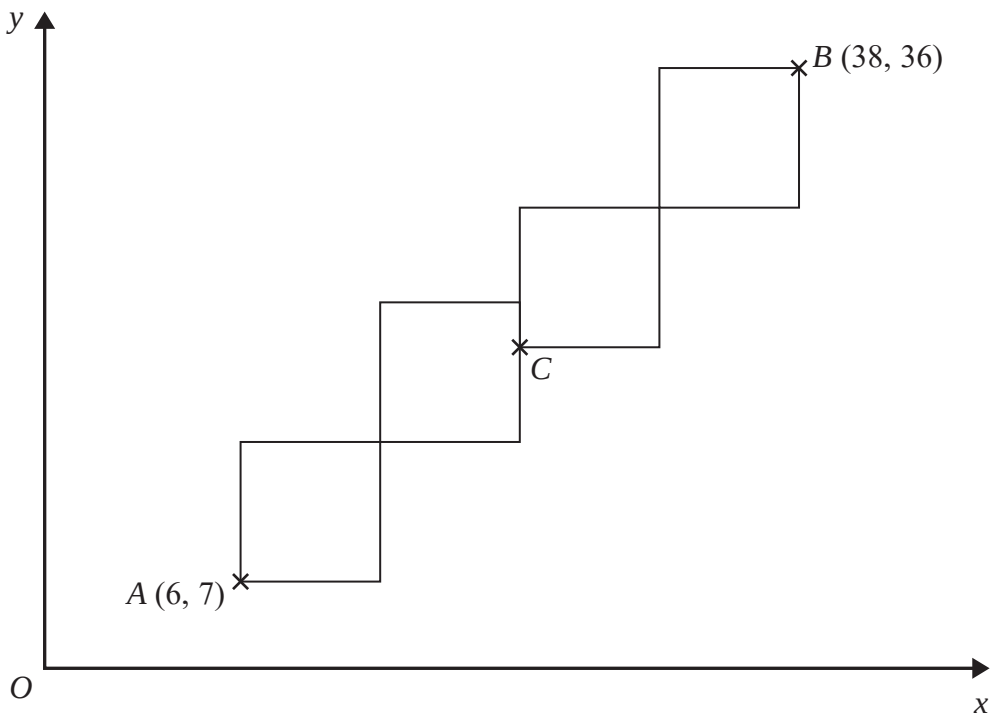
M is the midpoint of PQ.
N is the midpoint of QR.

Prove that MN is parallel to PR.
You must show each stage of your working.

(Total for Question 19 is 4 marks)

6 A pattern is made from four identical squares.

The sides of the squares are parallel to the axes.



Point A has coordinates (6, 7)
Point B has coordinates (38, 36)
Point C is marked on the diagram.

Work out the coordinates of C.

(..... , ...)

(Total for Question 6 is 5 marks)

19 The point P has coordinates $(3, 4)$
The point Q has coordinates (a, b)

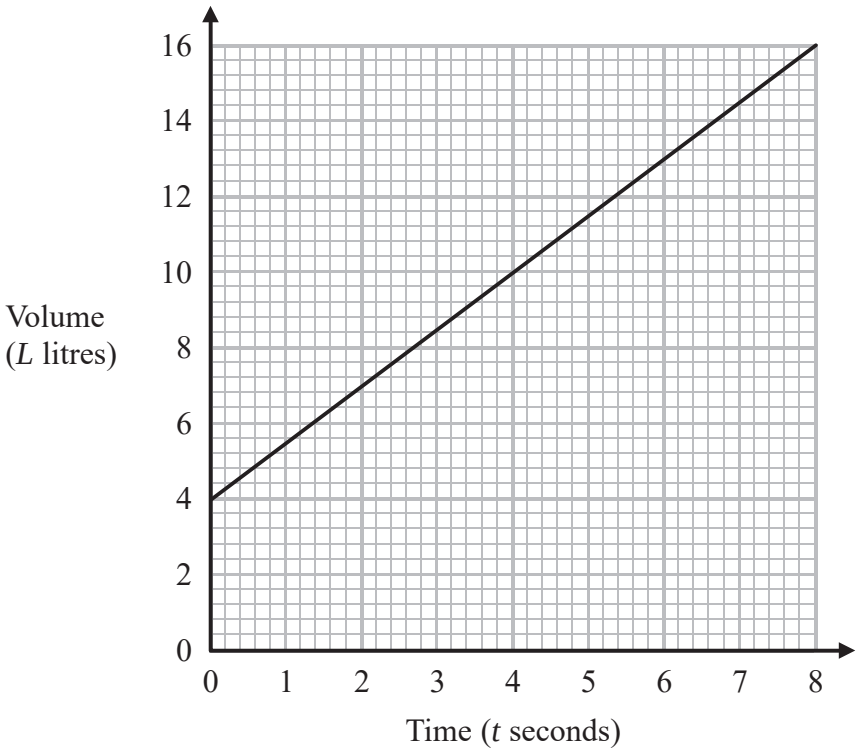
A line perpendicular to PQ is given by the equation $3x + 2y = 7$

Find an expression for b in terms of a.

.....

(Total for Question 19 is 5 marks)

12 The graph shows the volume of liquid (L litres) in a container at time t seconds.



(a) Find the gradient of the graph.

.....

(2)

(b) Explain what this gradient represents.

.....

.....

(1)

The graph intersects the volume axis at $L = 4$

(c) Explain what this intercept represents.

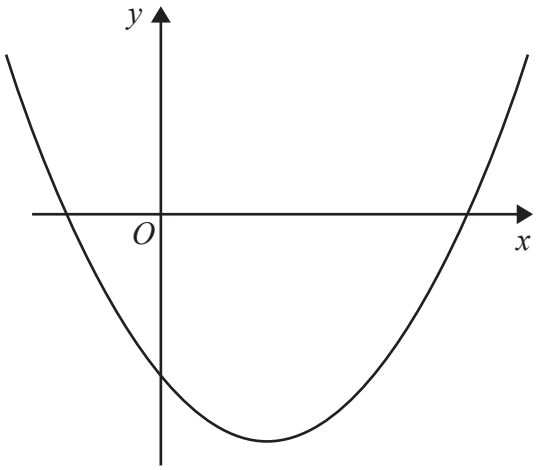
.....

.....

(1)

(Total for Question 12 is 4 marks)

17 Here is a sketch of a curve.



The equation of the curve is $y = x^2 + ax + b$ where a and b are integers.

The points $(0, -5)$ and $(5, 0)$ lie on the curve.

Find the coordinates of the turning point of the curve.

(..... , ...)

(Total for Question 17 is 4 marks)

Question 82

6 A is the point with coordinates (5, 9)
B is the point with coordinates (d, 15)

The gradient of the line AB is 3

Work out the value of d.

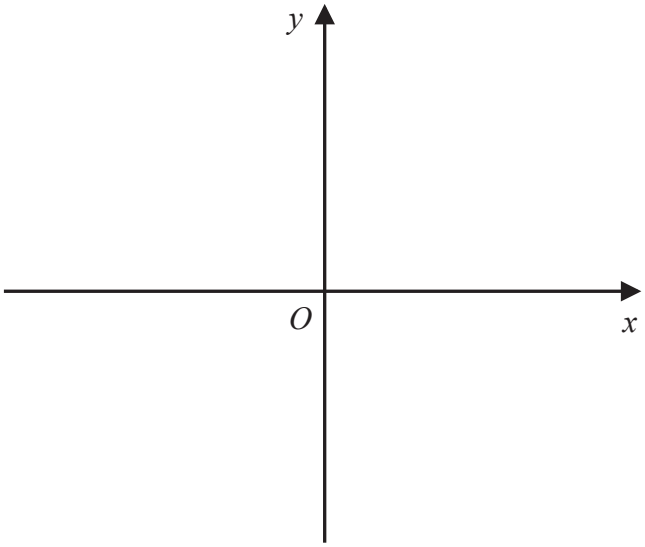
.....

(Total for Question 6 is 3 marks)

Question 83

November 2018 | 1MA1/2H | Original Q14

14 On the grid, sketch the curve with equation $y = 2^x$
Give the coordinates of any points of intersection with the axes.



(Total for Question 14 is 2 marks)

18 The straight line $\mathbf{L}_1$ passes through the points with coordinates (4, 6) and (12, 2)
The straight line $\mathbf{L}_2$ passes through the origin and has gradient -3

The lines $\mathbf{L}_1$ and $\mathbf{L}_2$ intersect at point P.

Find the coordinates of P.

(..... , ...)

(Total for Question 18 is 4 marks)

19 Given that $x^2 - 6x + 1 = (x - a)^2 - b$ for all values of x,

(i) find the value of a and the value of b.

$a =$ .....

$b =$ .....

(2)

(ii) Hence write down the coordinates of the turning point on the graph of $y = x^2 - 6x + 1$

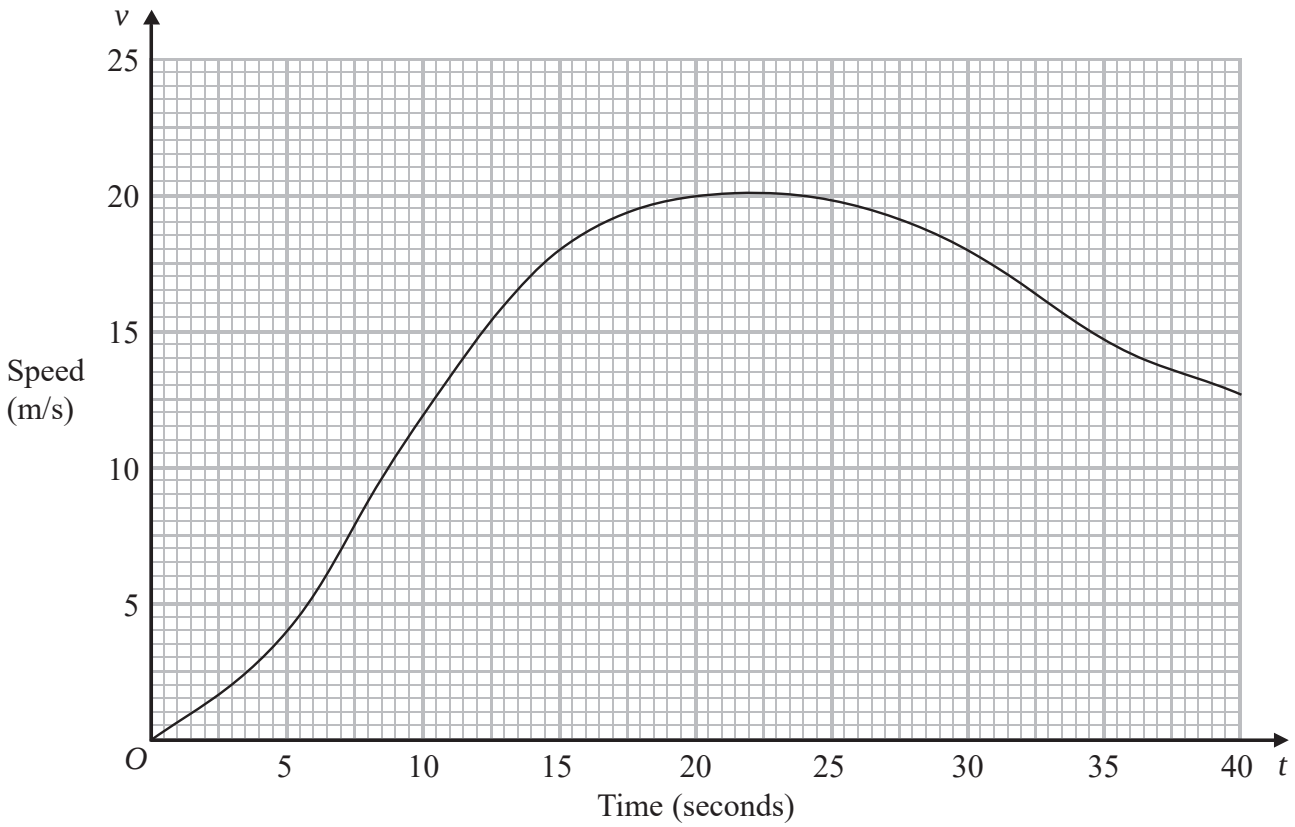
(..... , ...)

(1)

(Total for Question 19 is 3 marks)

14 A car moves from rest.

The graph gives information about the speed, v metres per second, of the car t seconds after it starts to move.



(a) (i) Calculate an estimate of the gradient of the graph at $t = 15$

.....

(3)

(ii) Describe what your answer to part (i) represents.

.....

(1)

(b) Work out an estimate for the distance the car travels in the first 20 seconds of its journey.
Use 4 strips of equal width.

.....m

(3)

(Total for Question 14 is 7 marks)

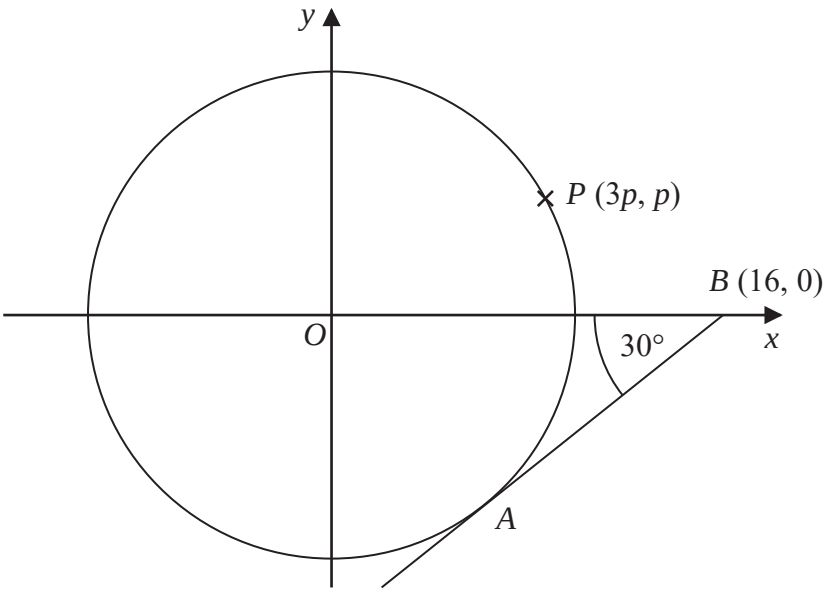
16 The straight line **L** has the equation $3y = 4x + 7$
The point A has coordinates $(3, -5)$

Find an equation of the straight line that is perpendicular to **L** and passes through A.

.....

(Total for Question 16 is 3 marks)

22 The diagram shows a circle, centre O.



AB is the tangent to the circle at the point A.
Angle $OBA = 30°$

Point B has coordinates $(16, 0)$
Point P has coordinates $(3p, p)$

Find the value of p.
Give your answer correct to 1 decimal place.
You must show all your working.

$p =$ .....

(Total for Question 22 is 4 marks)

21 Sketch the graph of

$$y = 2x^2 - 8x - 5$$

showing the coordinates of the turning point and the exact coordinates of any intercepts with the coordinate axes.

(Total for Question 21 is 5 marks)

25 The straight line **L** has equation $3x + 2y = 17$

The point A has coordinates (0, 2)
The straight line **M** is perpendicular to **L** and passes through A.

Line **L** crosses the y-axis at the point B.
Lines **L** and **M** intersect at the point C.

Work out the area of triangle ABC.
You must show all your working.

.....

(Total for Question 25 is 5 marks)

Question 91

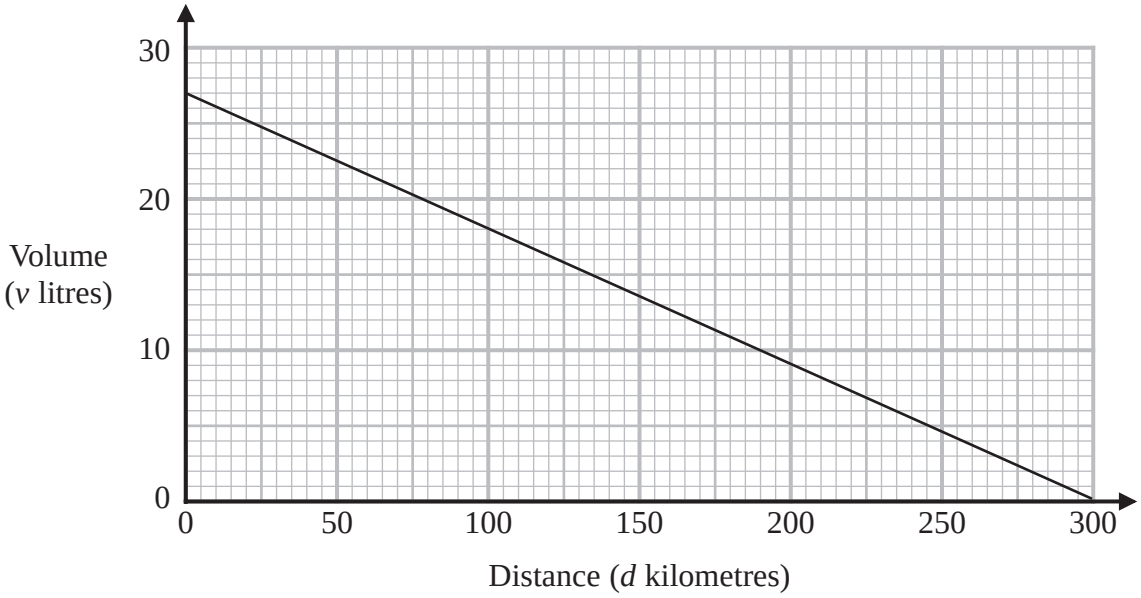
15 The straight line L_1 has equation $y = 3x - 4$
The straight line L_2 is perpendicular to L_1 and passes through the point (9, 5)

Find an equation of line L_2

.....

(Total for Question 15 is 3 marks)

12 The graph gives information about the volume, v litres, of petrol in the tank of Jim's car after it has travelled a distance of d kilometres.



(a) Find the gradient of the graph.

.....

(2)

(b) Interpret what the gradient of the graph represents.

.....

.....

.....

(1)

(Total for Question 12 is 3 marks)

Question 93

17 Write down the coordinates of the turning point on the graph of $y = (x + 12)^2 - 7$

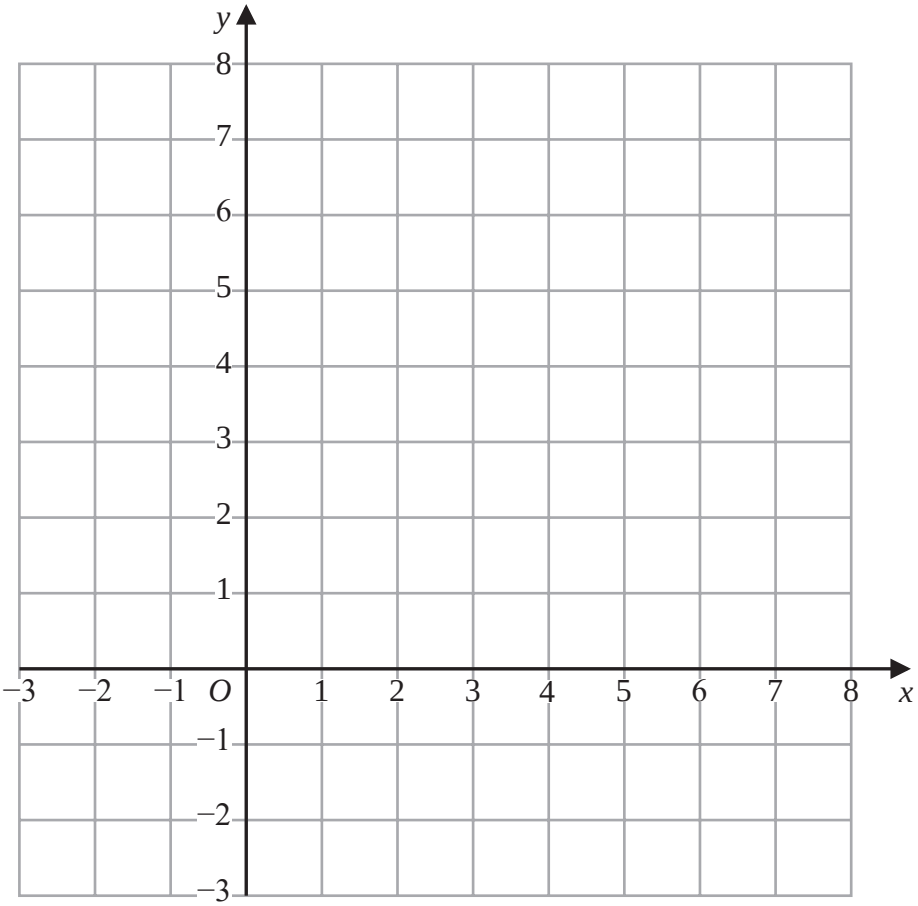
(..... , ...)

(Total for Question 17 is 1 mark)

13 (a) On the grid show, by shading, the region that satisfies all these inequalities.

$x \geqslant 0$ $x \leqslant 2$ $y \leqslant x + 3$ $2x + 3y \geqslant 6$

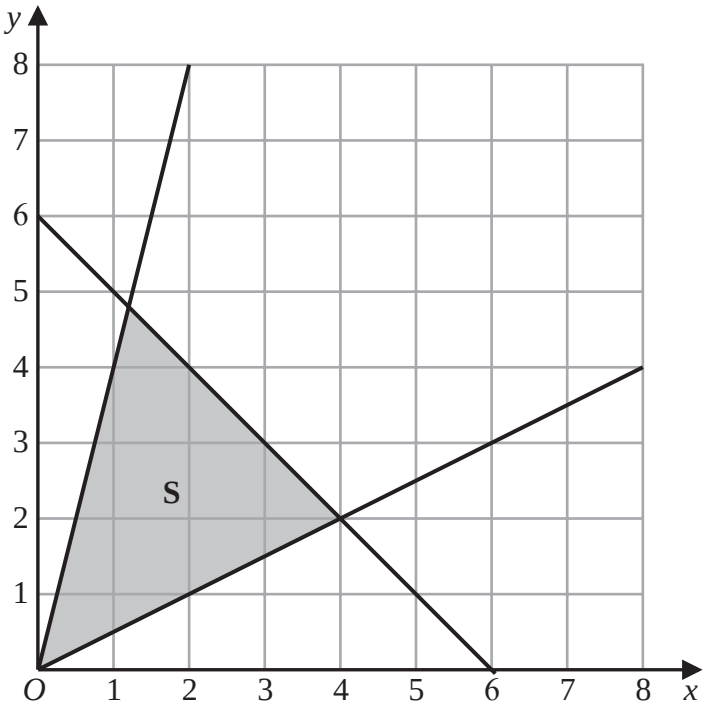
Label the region **R**.



(4)

(b) The diagram below shows the region **S** that satisfies the inequalities

$$y \leqslant 4x \qquad y \geqslant \frac{1}{2}x \qquad x + y \leqslant 6$$



Geoffrey says that the point with coordinates (2, 4) does not satisfy all the inequalities because it does not lie in the shaded region.

Is Geoffrey correct?
You must give a reason for your answer.

.....

.....

.....

(1)

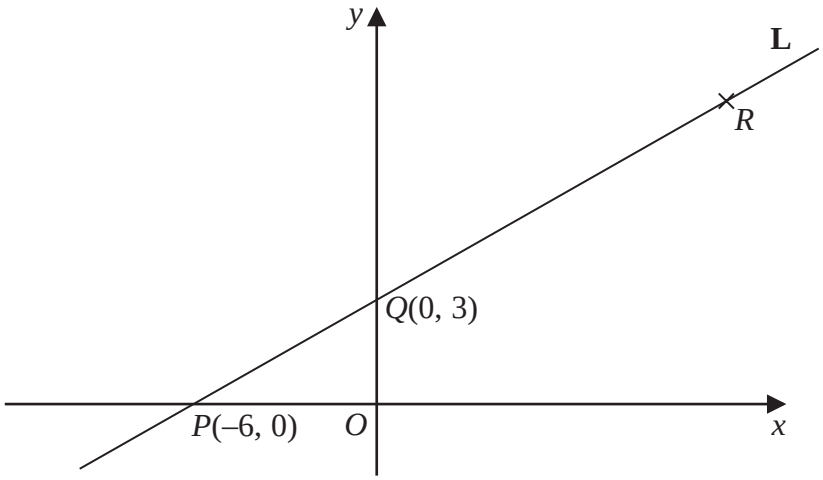
(Total for Question 13 is 5 marks)

22 Find the coordinates of the turning point on the curve with equation $y = 9 + 18x - 3x^2$
You must show all your working.

(..... , ...)

(Total for Question 22 is 4 marks)

11 Here is a sketch of the line **L**.



The points $P(-6, 0)$ and $Q(0, 3)$ are points on the line **L**.

The point R is such that PQR is a straight line and $PQ : QR = 2 : 3$

(a) Find the coordinates of R.

(..... , ...)

(2)

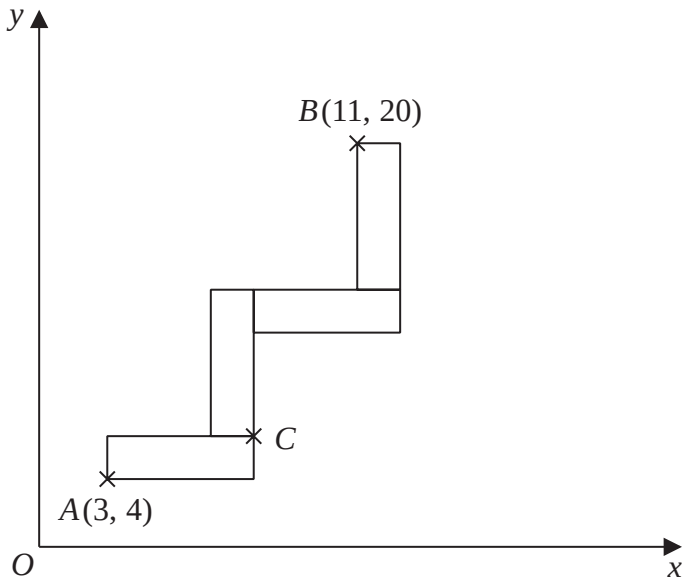
(b) Find an equation of the line that is perpendicular to **L** and passes through Q.

.....

(3)

(Total for Question 11 is 5 marks)

13 A pattern is made from four identical rectangles.
The sides of the rectangles are parallel to the axes.



Point A has coordinates (3, 4)
Point B has coordinates (11, 20)
Point C is marked on the diagram.

Work out the coordinates of C.
You must show all your working.

(..... , ...)

(Total for Question 13 is 5 marks)

Question 98

5 The points L, M and N are such that LMN is a straight line.

The coordinates of L are $(-3, 1)$

The coordinates of M are $(4, 9)$

Given that $LM : MN = 2 : 3$,

find the coordinates of N.

(..... , ...)

(Total for Question 5 is 4 marks)

Question 99

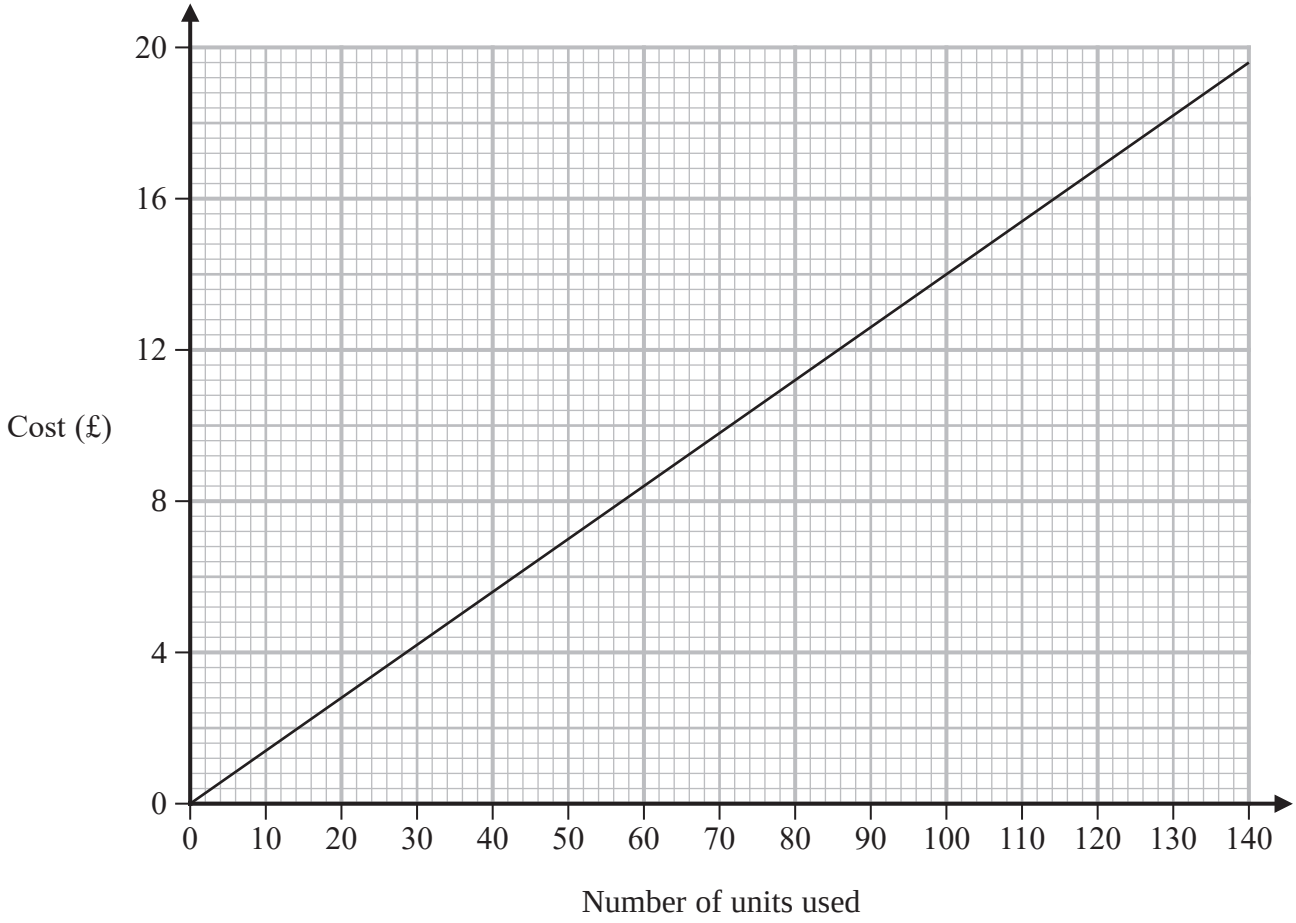
12 The equation of the line $\mathbf{L}_1$ is $y = 2x + 3$
The equation of the line $\mathbf{L}_2$ is $5y - 10x + 4 = 0$

Show that these two lines are parallel.

(Total for Question 12 is 2 marks)

8 An electricity company charges the same fixed amount for each unit of electricity used.

David uses this graph to work out the total cost of the electricity he has used.



(a) Work out the gradient of the straight line.

.....

(2)

(b) What does the gradient of this line represent?

.....

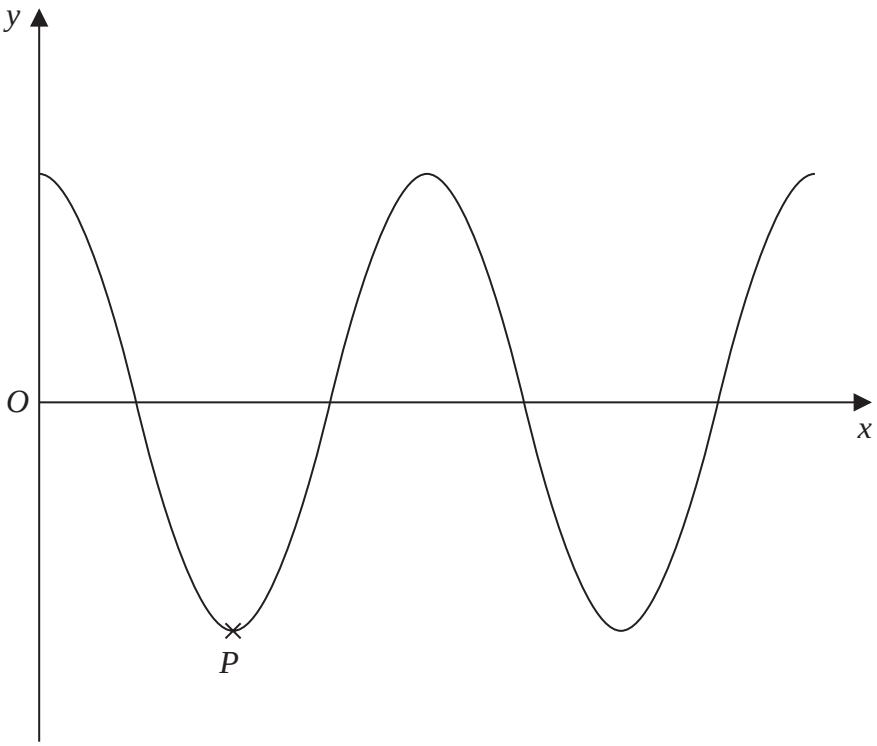
.....

.....

(1)

(Total for Question 8 is 3 marks)

21



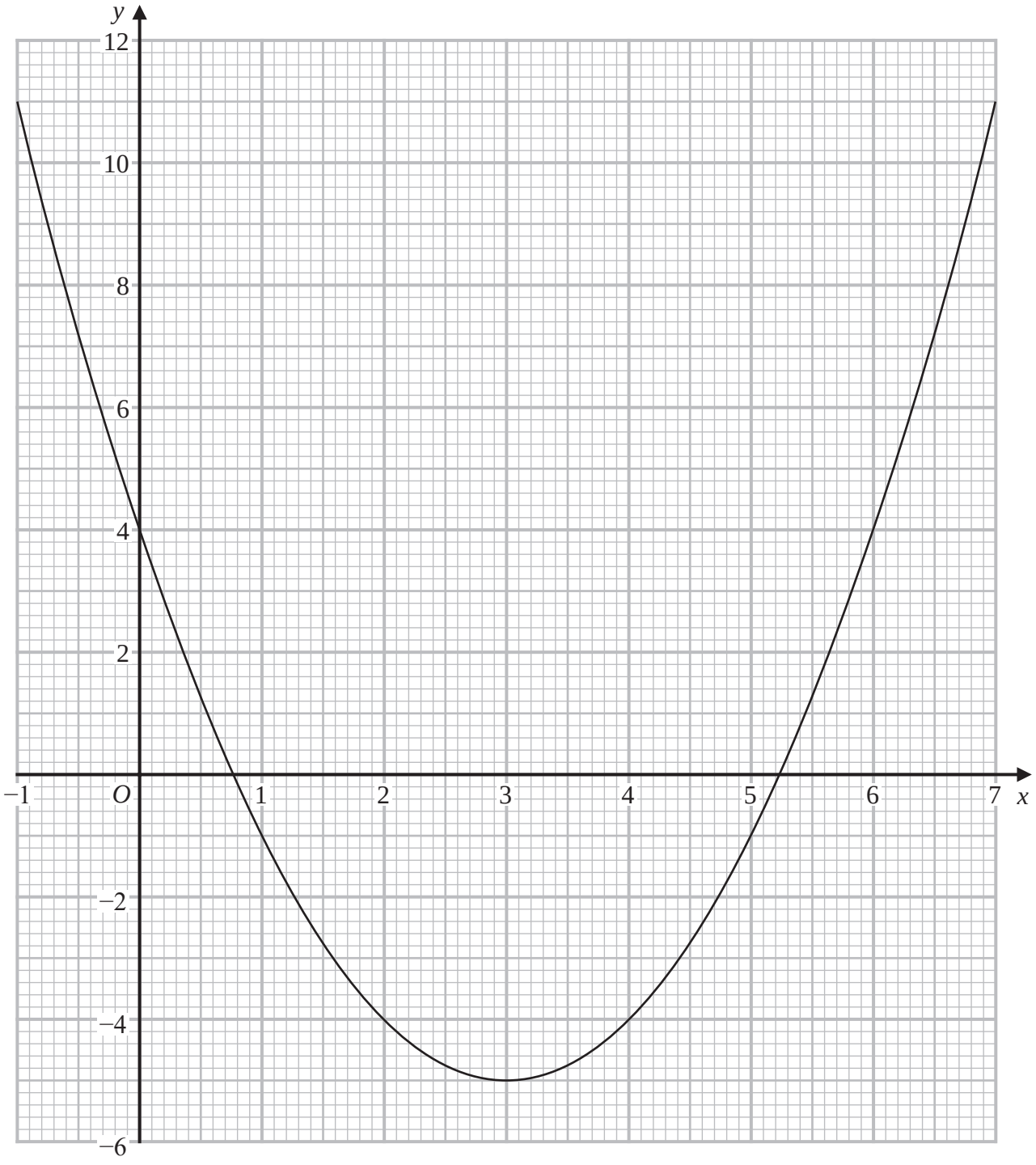
The diagram shows a sketch of part of the curve with equation $y = \cos x°$
P is a minimum point on the curve.

Write down the coordinates of P.

(..... , ...)

(Total for Question 21 is 2 marks)

7 Here is the graph of $y = x^2 - 6x + 4$



(a) Write down the y intercept of the graph of $y = x^2 - 6x + 4$

.....

(1)

(b) Write down the coordinates of the turning point of the graph of $y = x^2 - 6x + 4$

(..... , ...)

(1)

(c) Use the graph to find estimates for the roots of $x^2 - 6x + 4 = 0$

.....

(2)

(Total for Question 7 is 4 marks)

Question 103

9 Here are the equations of two straight lines.

$$y = \frac{1}{2}x - 6 \qquad 6y = 3x + 7$$

Oscar says that these lines are parallel.

Is Oscar correct?
You must give a reason for your answer.

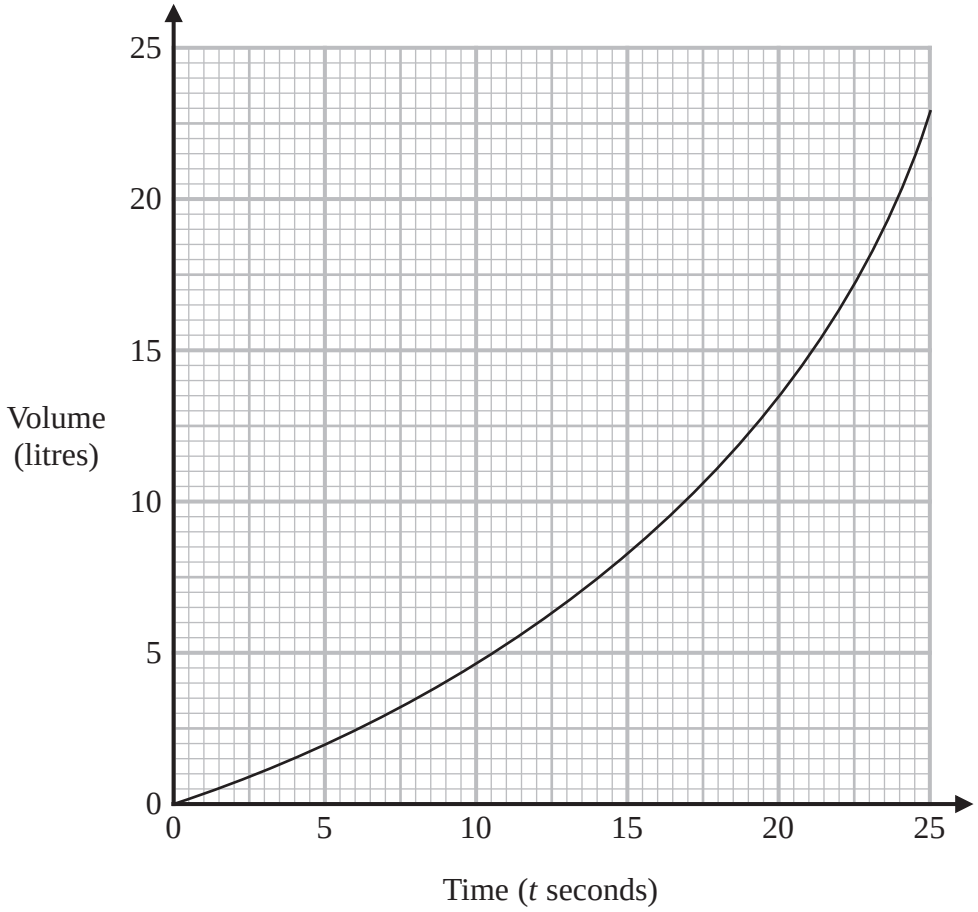
.....

.....

.....

(Total for Question 9 is 2 marks)

21 The graph below gives the volume, in litres, of water in a container t seconds after the water starts to fill the container.



(a) Calculate an estimate for the gradient of the graph when $t = 17.5$
You must show how you get your answer.

.....

(3)

(b) Describe fully what the gradient in part (a) represents.

.....

.....

.....

(1)

(Total for Question 21 is 4 marks)

Question 105

15 The equation of line $\mathbf{L_1}$ is $y = 2x - 5$
The equation of line $\mathbf{L_2}$ is $6y + kx - 12 = 0$

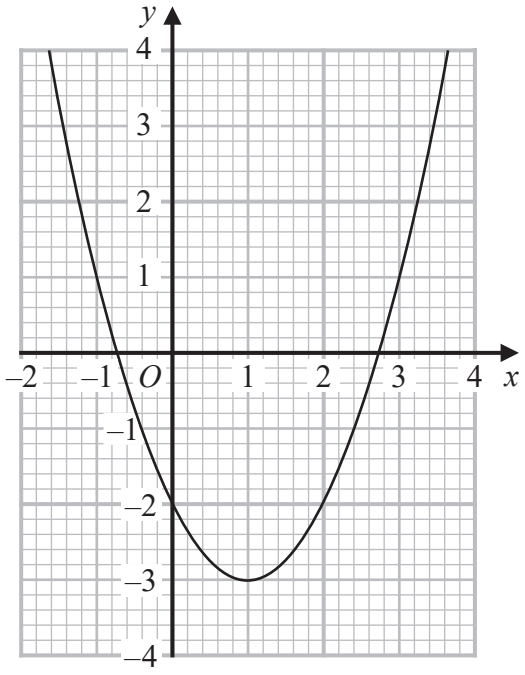
$\mathbf{L_1}$ is perpendicular to $\mathbf{L_2}$

Find the value of k.
You must show all your working.

$k =$ .....

(Total for Question 15 is 3 marks)

7 Here is the graph of $y = x^2 - 2x - 2$



(a) Write down the coordinates of the turning point on the graph of $y = x^2 - 2x - 2$

(..... , ...)

(1)

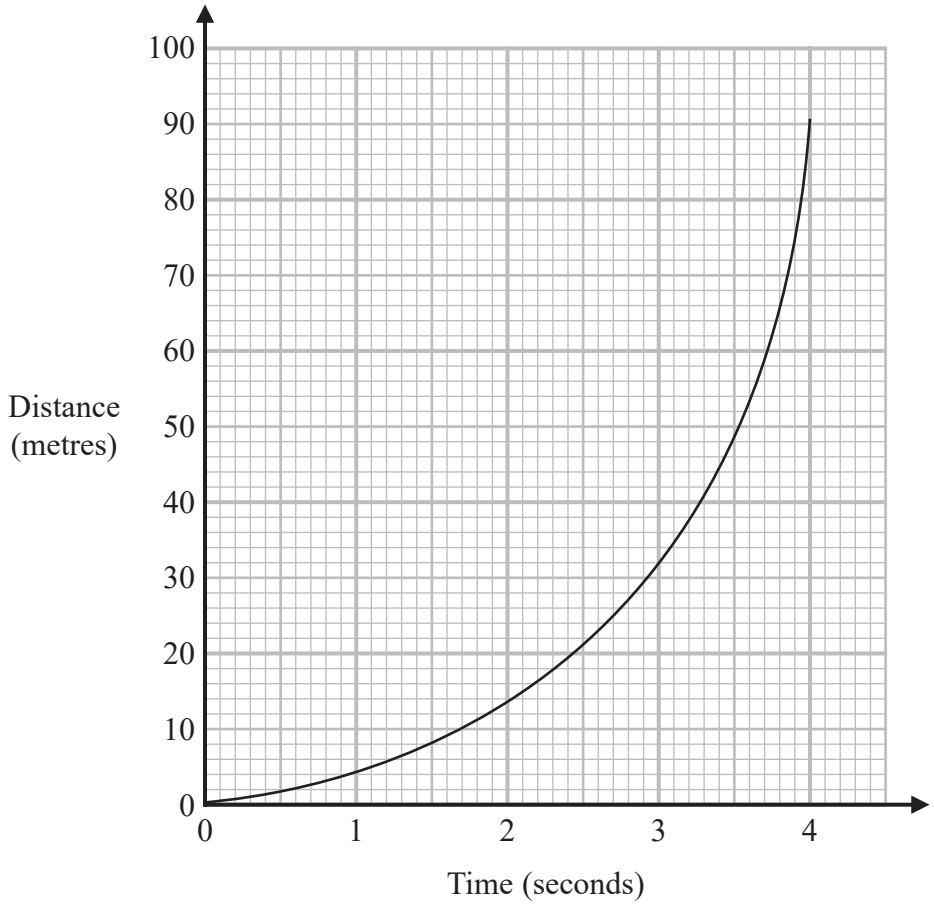
(b) Write down an estimate for one of the roots of $x^2 - 2x - 2 = 0$

.....

(1)

(Total for Question 7 is 2 marks)

17 Here is a distance-time graph.



(a) Find an estimate of the gradient of the graph at time 2.5 seconds.
You must show how you get your answer.

.....

(3)

(b) What does the gradient of the graph represent?

.....

.....

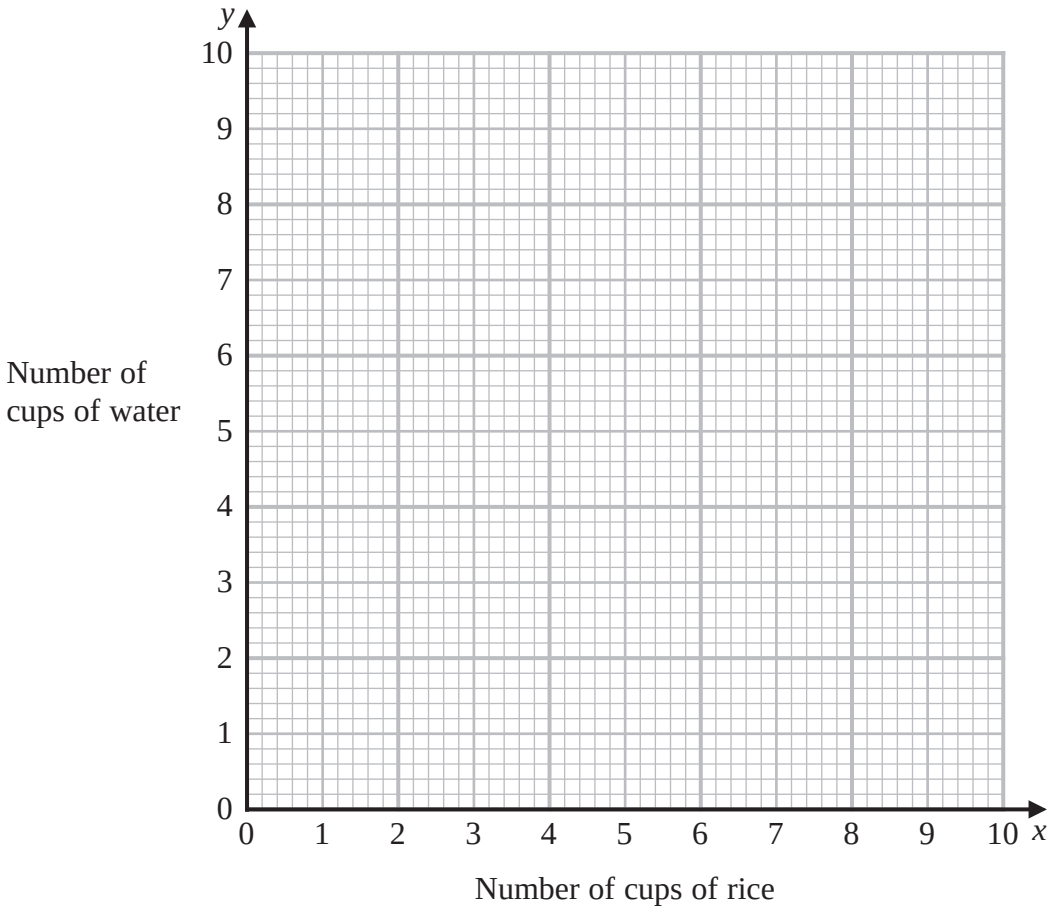
(1)

(Total for Question 17 is 4 marks)

9 To cook rice

the number of cups of rice (x) : the number of cups of water (y) = 4 : 5

(a) Use this information to draw a graph to show the relationship between the number of cups of rice and the number of cups of water needed to cook rice.



(2)

(b) (i) Find the gradient of the line drawn in part (a).

.....

(1)

(ii) Explain what this gradient represents.

.....

.....

.....

(1)

(Total for Question 9 is 4 marks)

12 The straight line **L** has equation $2y = 3x - 7$

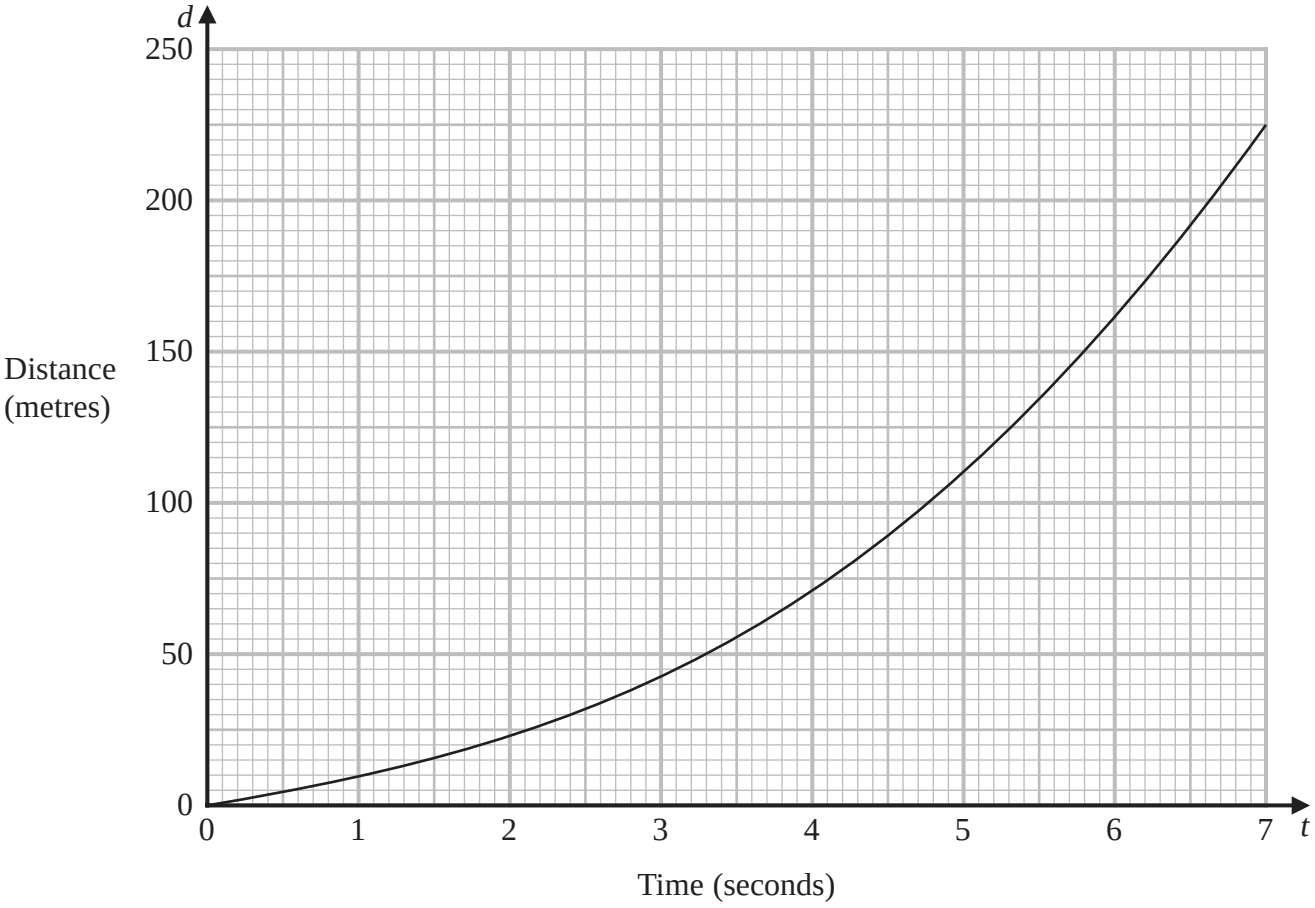
Find an equation of the straight line perpendicular to **L** that passes through (6, –5)

.....

(Total for Question 12 is 3 marks)

15 An object falls from rest.

Here is the distance-time graph for the distance (d metres) fallen by the object t seconds after it starts to fall.



Work out an estimate for the gradient of the graph at $t = 3$
You must show how you get your answer.

.....

(Total for Question 15 is 3 marks)

12 A is the point with coordinates (7, 13)
B is the point with coordinates (−3, 21)
C is the point with coordinates (15, 23)

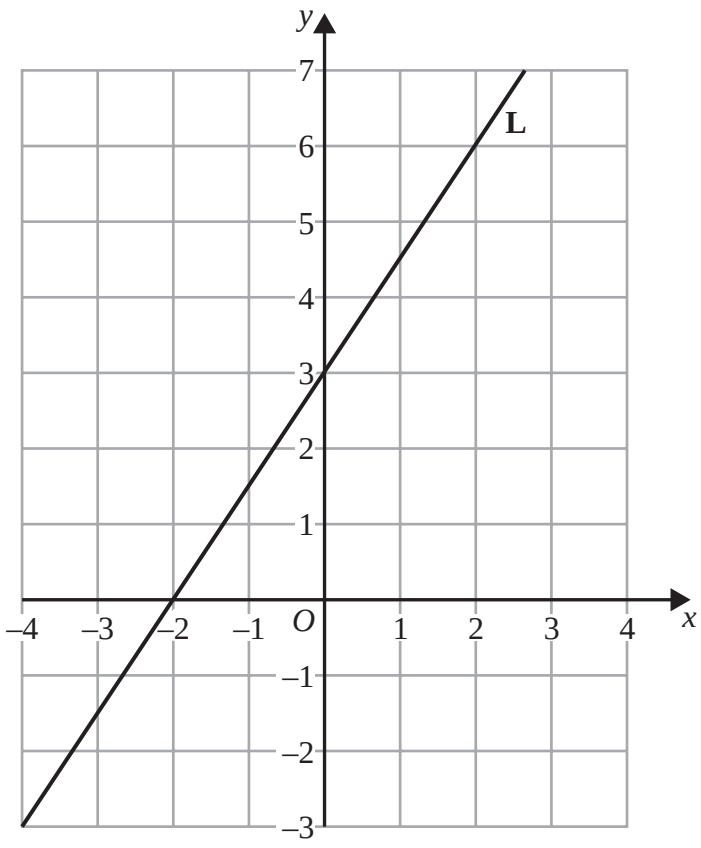
M is the midpoint of AB.
N is the midpoint of BC.

Work out the distance between M and N.
Give your answer correct to 1 decimal place.

.....

(Total for Question 12 is 3 marks)

6 Here is a straight line **L** drawn on a grid.



(a) Find an equation for **L**.

.....

(3)

M is a different straight line with equation $y = 5x$

(b) Write down the equation of a straight line parallel to **M**.

.....

(1)

(Total for Question 6 is 4 marks)

23 **C** is a circle with centre (0, 0)
L is a straight line.

The circle **C** and the line **L** intersect at the points P and Q.
The coordinates of P are (5, 10)
The x coordinate of Q is –2

L has a positive gradient and crosses the y-axis at the point $(0, k)$

Find the value of k.

$k =$ .....

(Total for Question 23 is 5 marks)

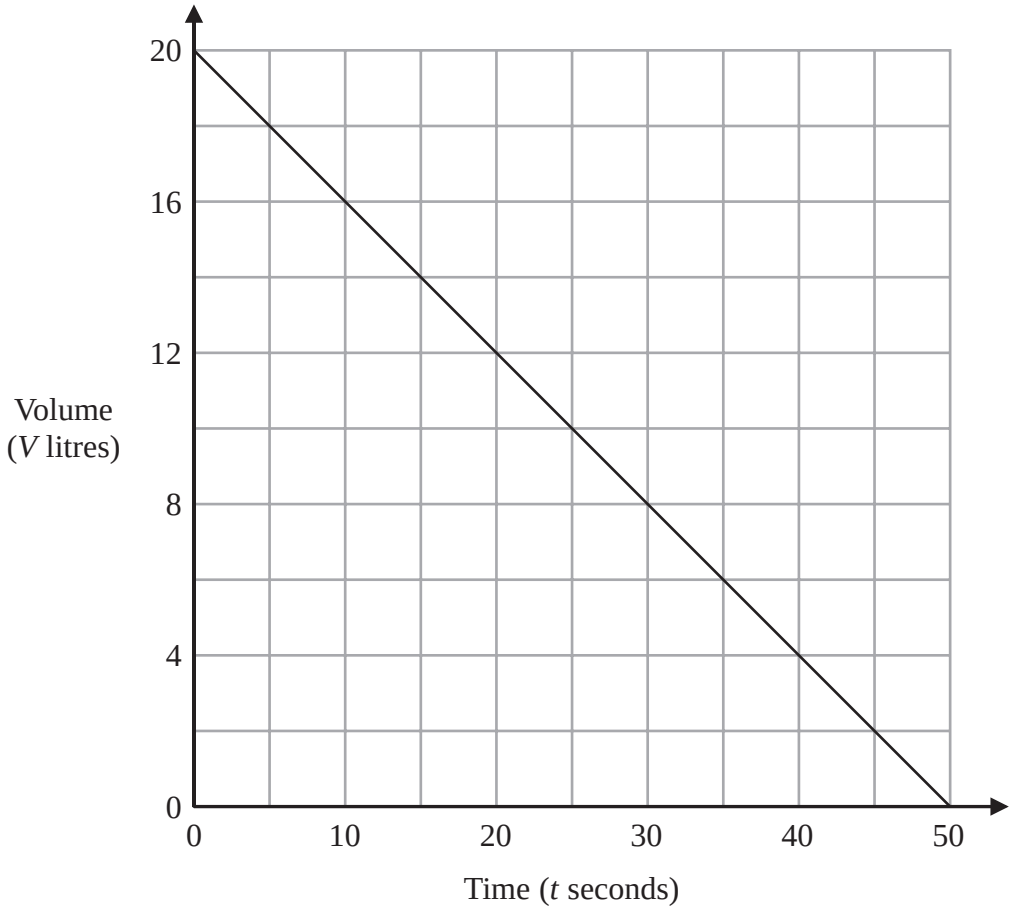
20 The curve **C** has equation $y = 2x^2 - 12x + 7$

Find the coordinates of the turning point on **C**.

(..... , ...)

(Total for Question 20 is 3 marks)

7 The graph shows the volume of water, V litres, in a tank at time t seconds.



What does the gradient of this graph represent?

.....

.....

.....

(Total for Question 7 is 1 mark)

21 The point P has coordinates $(-4, 5)$
The point Q has coordinates $(6, -6)$

The point R has coordinates $(k, k + 3)$

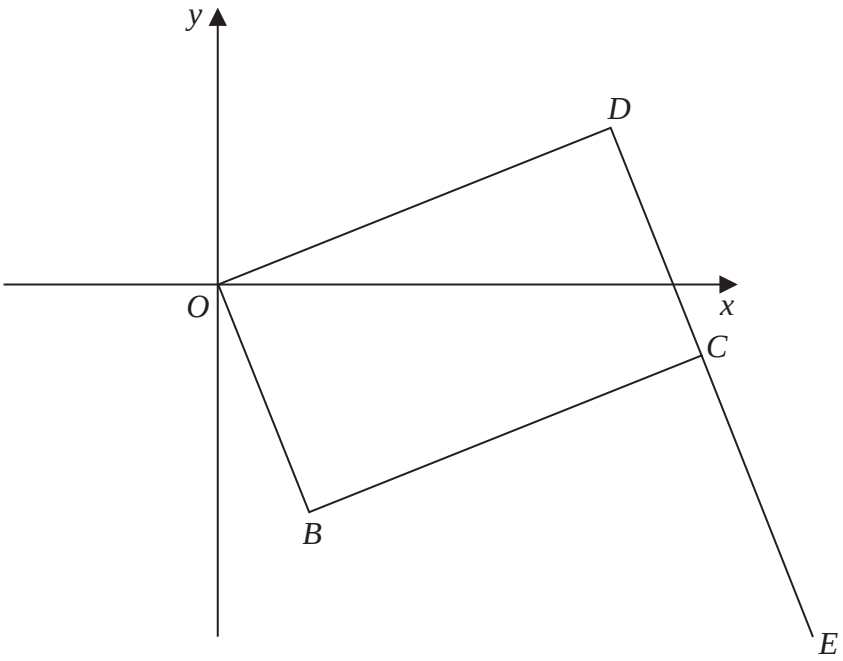
Given that angle PRQ is a right angle,

find the possible values of k.
You must show all your working.

.....

(Total for Question 21 is 5 marks)

16 *OBCD* is a rectangle.
DCE is a straight line.



B has coordinates (2, −4)
E has coordinates (12, −6.5)

Work out the coordinates of *D*.
You must show all your working.

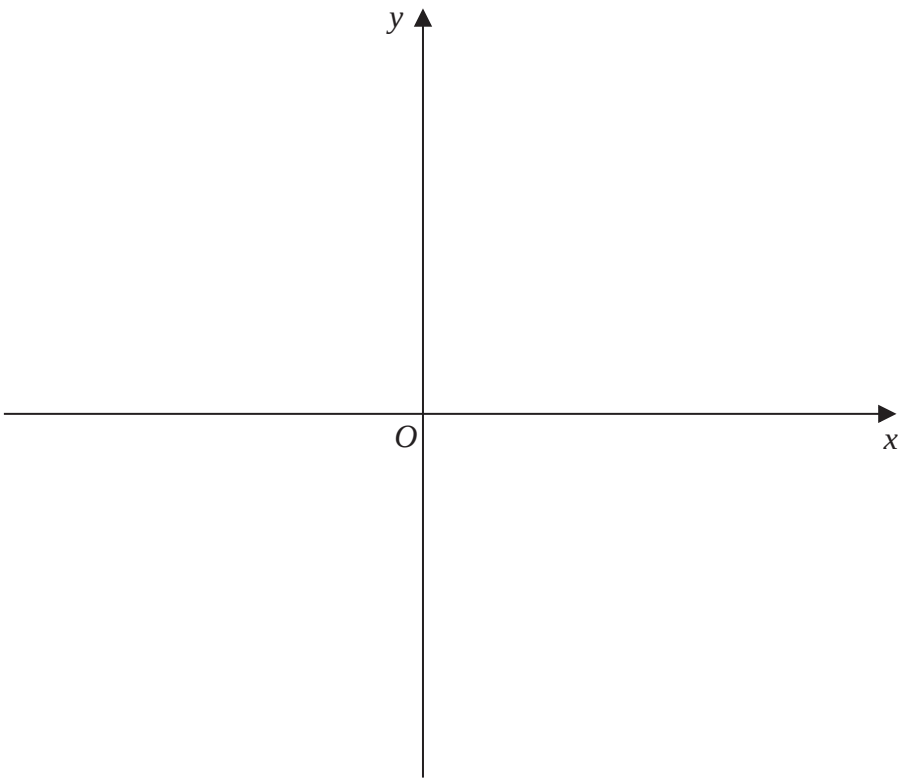
(..... , ...)

(Total for Question 16 is 5 marks)

23 Sketch the graph of

$$y = x^2 - 6px - 7 \quad \text{where} \quad p > 0$$

showing the coordinates of the turning point, in terms of p, and the coordinates of the intercept with the y-axis.
You must show all your working.



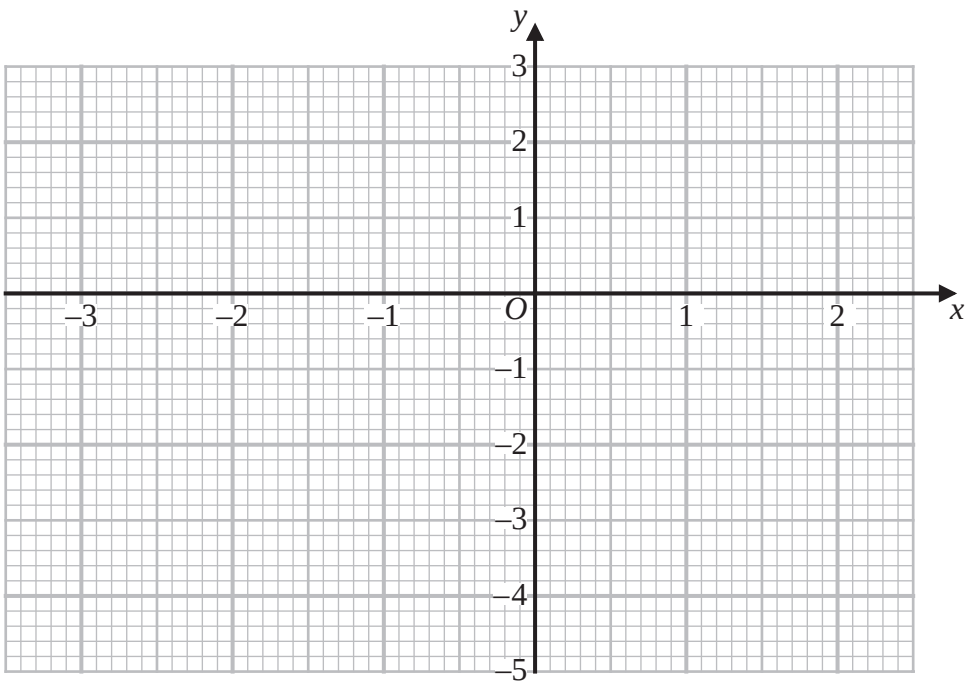
(Total for Question 23 is 5 marks)

3 (a) Complete the table of values for $y = x^2 + x - 4$

x	–3	–2	–1	0	1	2
y	2		–4			

(2)

(b) On the grid, draw the graph of $y = x^2 + x - 4$ for values of x from –3 to 2



(2)

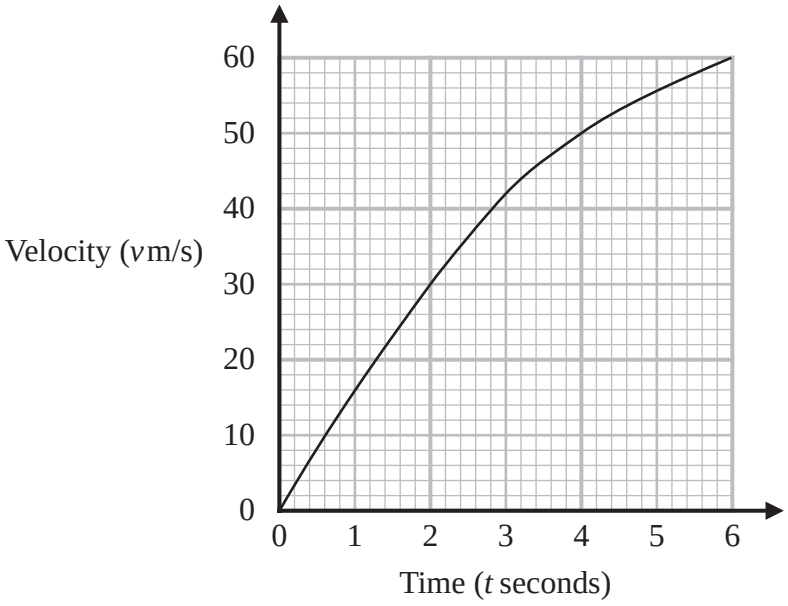
(c) Write down the coordinates of the turning point of the graph of $y = x^2 + x - 4$

(..... , ...)

(1)

(Total for Question 3 is 5 marks)

12 The graph shows the velocity, v m/s, of a particle t seconds after it starts to move.



(a) (i) Work out an estimate of the gradient of the graph at $t = 3$
You must show how you get your answer.

.....

(3)

(ii) What does this gradient represent?

.....

.....

(1)

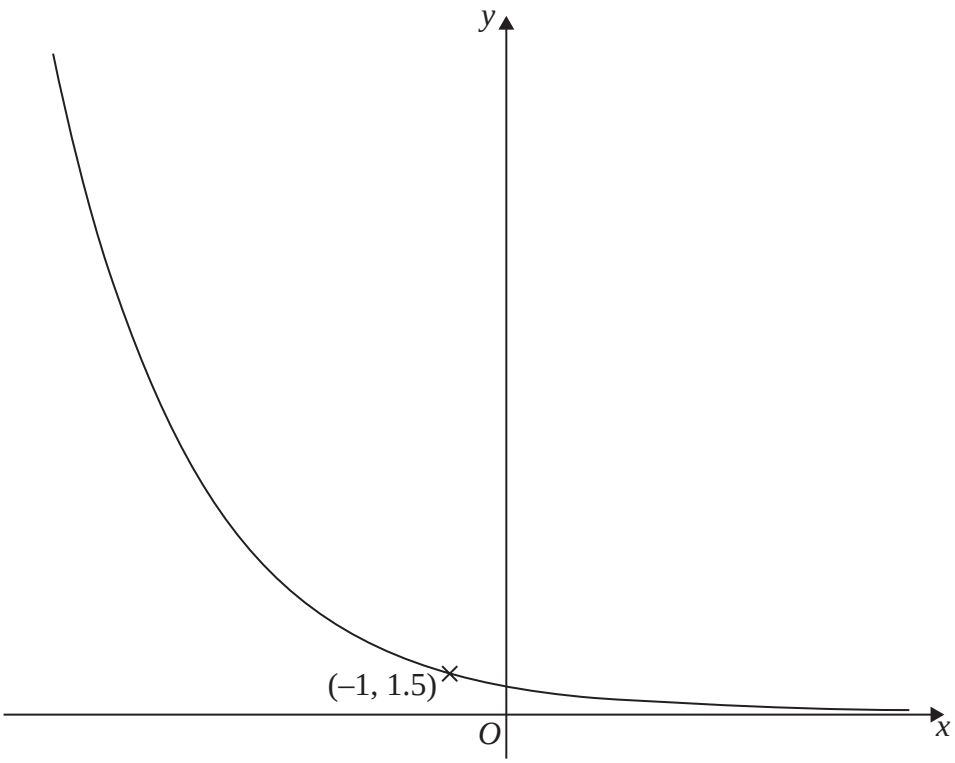
(b) Work out an estimate for the distance the particle travelled in the first 6 seconds.
Use 3 strips of equal width.

..... m

(3)

(Total for Question 12 is 7 marks)

17 Here is a sketch of part of the graph of $y = k^x$ where k is a positive constant.



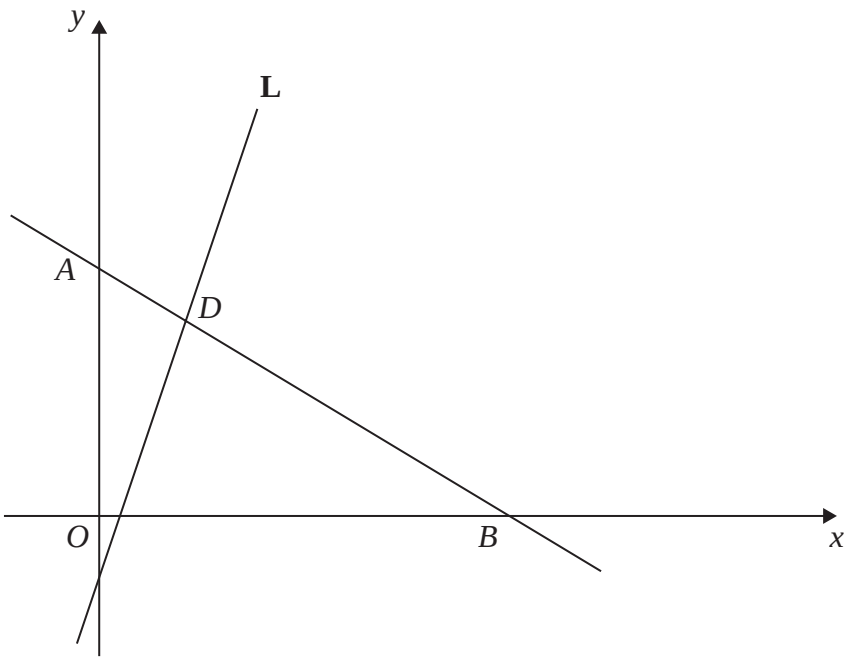
The graph passes through the point with coordinates (–1, 1.5)

Find the value of k.

$k =$ .....

(Total for Question 17 is 2 marks)

20



In the diagram
A is the point (0, 8)
B is the point (16, 0)

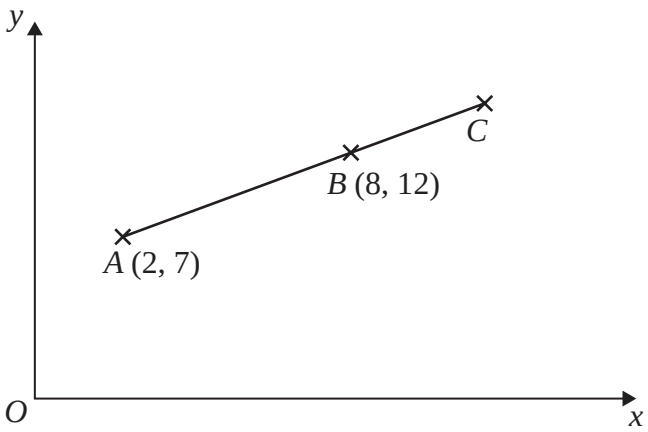
The point *D* divides the line segment *AB* in the ratio 1 : 3
The line **L** passes through *D*.
The gradient of **L** is $\sqrt{3}$

L passes through the point with coordinates (–2, f)

Show that $f < -4$

(Total for Question 20 is 5 marks)

7 ABC is a straight line.



Point A has coordinates (2, 7)
Point B has coordinates (8, 12)

$BC = \frac{1}{2} AB$

Find the coordinates of point C.

(..... , ...)

(Total for Question 7 is 3 marks)