

Name:

Exam Style Questions

Perpendicular Lines



Corbettmaths

Equipment needed: Calculator, pen

Guidance

1. Read each question carefully before you begin answering it.
2. Check your answers seem right.
3. Always show your workings

Video Tutorial

www.corbettmaths.com/contents

Video 197



Answers and Video Solutions



1. Write down the equation of a line perpendicular to $y = 2x + 3$

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

e.g.

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

2. Write down the equation of the line that is perpendicular to $y = \frac{1}{2}x + 3$ and passes through $(0, -1)$

$$\text{gradient} = -2$$

$$\underline{y = -2x - 1} \quad (2)$$

3. A straight line passes through the point $(0, 8)$ and is perpendicular to $y = -4x - 3$

$$\text{gradient} = \frac{1}{4}$$

$$\underline{y = \frac{1}{4}x + 8} \quad (2)$$

4. Write down the equation of the line that is perpendicular to $3x - y = 1$ and passes through $(0, 9)$

$$3x = 1 + y$$

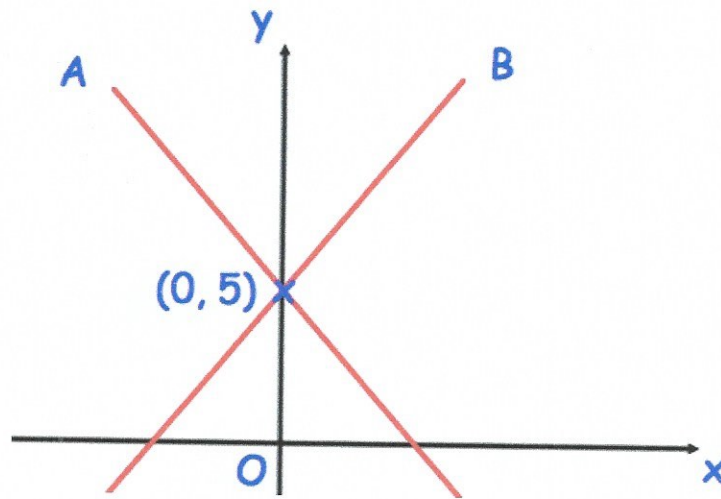
$$3x - 1 = y$$

$$y = 3x - 1$$

$$\text{gradient} = -\frac{1}{3}$$

$$\underline{y = -\frac{1}{3}x + 9} \quad (2)$$

5.



The lines A and B are perpendicular.

Both lines pass through the point (0, 5)

The gradient of line A is $-\frac{3}{4}$

Write down the equation of line B

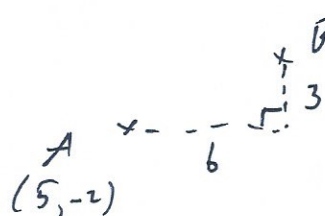
gradient, m , = $\frac{4}{3}$

$$y = \frac{4}{3}x + 5$$

(2)

6. The point A is (5, -2) and the point B is (11, 1).

Find the equation of the line perpendicular to AB passing through the origin.

$A (5, -2)$ $B (11, 1)$

 gradient of AB = $\frac{3}{6} = \frac{1}{2}$
 $y = -2x$

$$y = -2x$$

(3)

7. The equations of five lines are given below.

Line A $y = 4x + 5$

Line B $y = \frac{1}{4}x - 5$

Line C $y = 6 - x$

Line D $y - 4x = 1$ $y = 4x + 1$

Line E $y + 4x = 6$ $y = -4x + 6$

(a) Which line goes through the point $(20, 0)$?

$$0 = \frac{1}{4}(20) - 5$$

$$0 = 5 - 5 \quad \checkmark$$

..... B

(1)

(b) Which two lines cross the y-axis at the same point?

$$(0, 6)$$

..... C and E

(2)

(c) Which two lines are parallel?

..... A and D

(2)

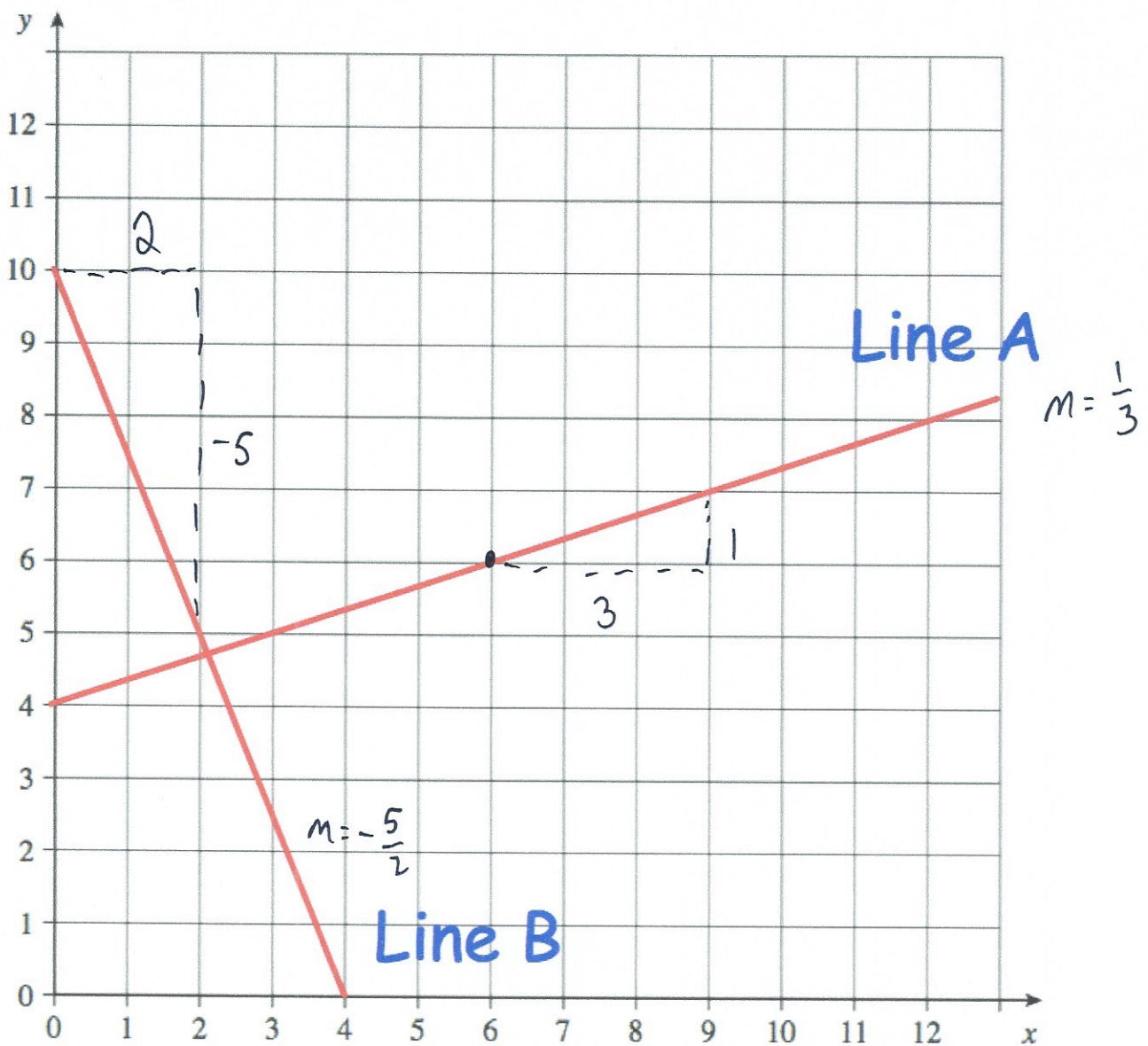
(d) Which two lines are perpendicular?

$$\frac{1}{4}x - 4 = -1 \quad \checkmark$$

..... B and E

(2)

8. On the grid below, the lines A and B are drawn.



Are the lines A and B perpendicular?

Explain your answer.

No, the gradient of B would need to be -3 .

or

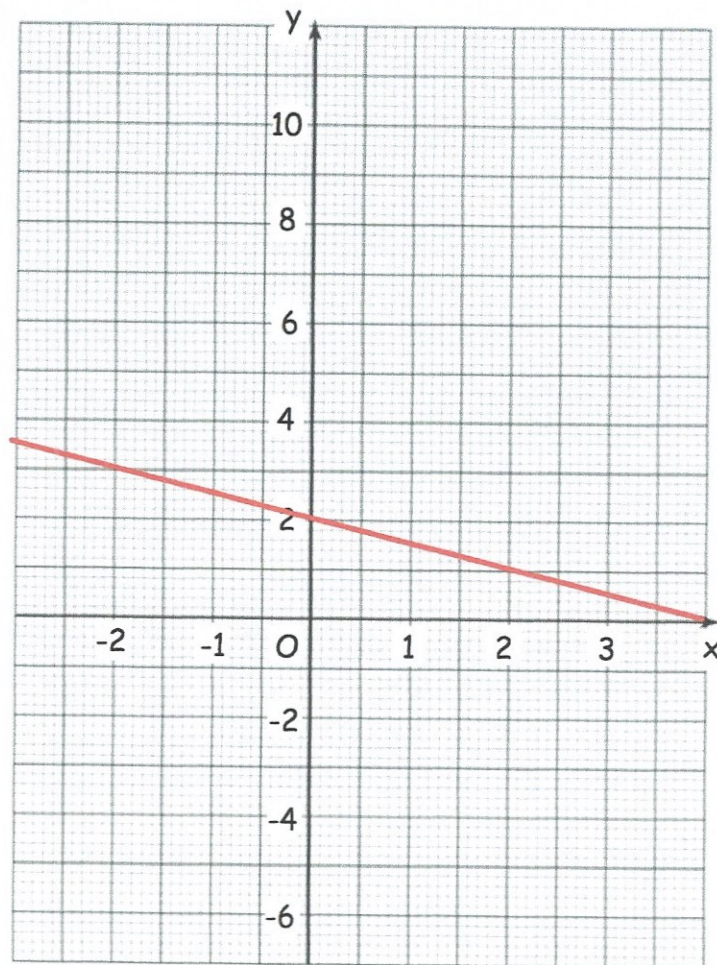
if perpendicular $m_1 \times m_2 = -1$

$$\frac{1}{3} \times -\frac{5}{2} \neq -1$$

No

(3)

9.



The straight line L has equation $y = -\frac{1}{2}x + 2$

(a) Write down the equation of a line parallel to L

$$\dots \underline{y = -\frac{1}{2}x + 8} \dots \quad (1)$$

(b) Find an equation of the line that goes through the point $(1, 6)$ and is perpendicular to L

gradient = 2

$$y = 2x + c$$

$$6 = 2 + c$$

$$c = 4$$

$$\dots \underline{y = 2x + 4} \dots \quad (3)$$

10. The straight line K has equation $y = 2x - 5$

The straight line J is perpendicular to line K and passes through the point $(-4, 8)$.

x y
Find the equation of line J

$$\text{gradient of } J = -\frac{1}{2}$$

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

$$8 = 2 + c$$

$$c = 6$$

$$\underline{y = -\frac{1}{2}x + 6}$$

(3)

11. A straight line, L, is perpendicular to the line with equation $y = 2x + 3$
L passes through the point $(10, 3)$

x y
Find an equation for the straight line L.

$$\text{gradient of perpendicular line} = -\frac{1}{2}$$

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

$$3 = -5 + c$$

$$c = 8$$

$$\underline{y = -\frac{1}{2}x + 8}$$

(3)

12. Line A has equation $y = 3x + 2$

Line B is perpendicular to Line A and passes through the point $(6, 5)$

Find the equation of Line B.

$$\text{gradient of } B = -\frac{1}{3}$$

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

$$5 = -2 + c$$

$$c = 7$$

$$\underline{y = -\frac{1}{3}x + 7}$$

(3)

13. The line L passes through the points $(-4, 0)$ and $(2, -2)$
 The line M passes through the points $(3, 8)$ and $(2, 2)$

Are the lines L and M perpendicular?
 Show your workings

$$\begin{array}{ll} \text{gradient of L} & \text{gradient of M} \\ \frac{-2}{6} = -\frac{1}{3} & \frac{6}{1} = 6 \end{array}$$

$$m_L \times m_M = -1 \text{ if perpendicular}$$

$$-\frac{1}{3} \times 6 \neq -1$$

No

.....
(4)

14. The straight line L_1 has equation $y = 4x - 6$

The straight line L_2 is perpendicular to L_1 and passes through the point $(-10, 1)$

Find the equation of the line L_2

$$\text{gradient of } L_2 = -\frac{1}{4}$$

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

$$1 = 2.5 + c$$

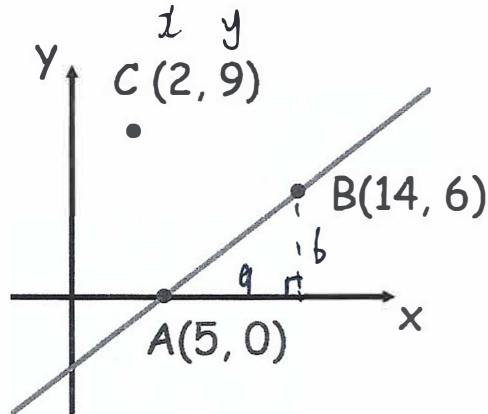
$$c = -1.5$$

$$y = -\frac{1}{4}x - \frac{3}{2}$$

$$\text{or } y = -0.25x - 1.5$$

.....
(3)

15. A straight line passes through the point A(5, 0) and B(14, 6)



Find the equation of the line perpendicular to AB that passes through C (2, 9)

$$\text{gradient of } AB = \frac{b}{a} = \frac{2}{3}$$

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

$$9 = -\frac{3}{2}(2) + c$$

$$9 = -3 + c$$

$$c = 12$$

$$\dots y = -\frac{3}{2}x + 12 \dots$$

(4)

16. Point A has coordinates (9, 4)
Point B has coordinates (13, -16)

$$\text{m.d point } \left(\frac{x}{2}, \frac{y}{2} \right) = (11, -6)$$

Find the equation of the line perpendicular to AB that passes through the midpoint of AB

$$(9, 4) \quad x - 4$$

$$\begin{array}{c} \vdots -20 \\ \vdots \\ x \\ B(13, -16) \end{array}$$

$$\text{gradient } \frac{-20}{4} = -5$$

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

$$-6 = 2.2 + c$$

$$c = -8.2$$

$$y = 0.2x - 8.2$$

$$\text{or } \dots y = \frac{1}{5}x - 8\frac{1}{5} \dots$$

(4)

17. A straight line, L, is perpendicular to the line with equation $5x - 2y + 4 = 0$
 L passes through the point $(5, -3)$
 $x \quad y$

Find an equation for the straight line L.

$$5x + 4 = 2y$$

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

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

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

$$-3 = -\frac{2}{5}(5) + c$$

$$-3 = -2 + c$$

$$c = -1$$

$$\underline{y = -\frac{2}{5}x - 1} \quad (4)$$

18. Line A has equation $y = -\frac{2}{3}x$
 $x \quad y$

Line B is perpendicular to Line A and passes through the point $(4, 15)$

Find the coordinates of the point where Line B intersects the x-axis.

$$\text{Line B gradient} = \frac{3}{2}$$

$$y = \frac{3}{2}x + c$$

$$15 = \frac{3}{2}(4) + c$$

$$15 = 6 + c$$

$$c = 9$$

$$y = \frac{3}{2}x + 9$$

$$0 = \frac{3}{2}x + 9$$

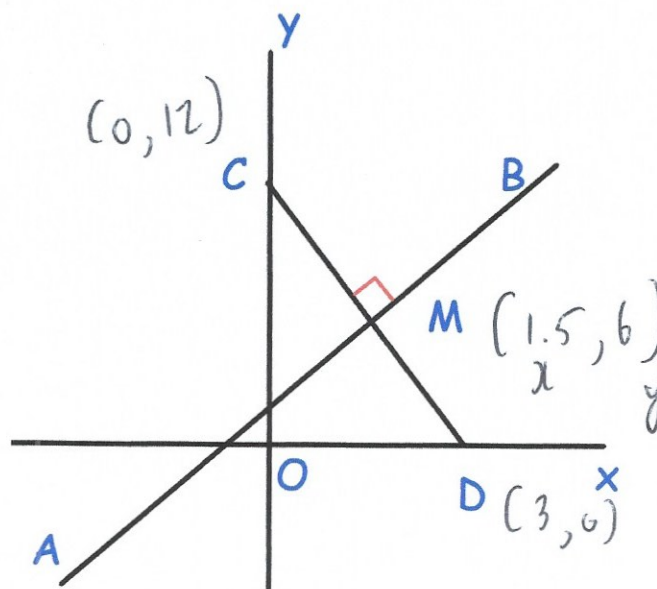
$$-9 = \frac{3}{2}x$$

$$-18 = 3x$$

$$x = -6$$

$$\underline{(-6, 0)} \quad (4)$$

19. Shown below are the straight lines AB and CD



M is the midpoint of CD

AB is perpendicular to CD and passes through M.

C is the point (0, 12)

D is the point (3, 0)

Find the equation of the line AB.

$$\text{gradient of } CD = -4$$

$$\text{gradient of } AB = \frac{1}{4}$$

$$y = \frac{1}{4}x + c$$

$$6 = \frac{1}{4}\left(\frac{3}{2}\right) + c$$

$$6 = \frac{3}{8} + c$$

$$c = \frac{45}{8}$$

$$y = \frac{1}{4}x + \frac{45}{8}$$

(6)

20. The point A has coordinates (3, 11)
 The point B has coordinates (-9, 7)
 The point C has coordinates (-7, 1)

Luna says that angle ABC is a right angle.

Show that Luna is correct.

If ABC is a right angle, AB & BC will be perpendicular.

$$\text{gradient of AB} : \frac{4}{12} = \frac{1}{3}$$

$$\text{gradient of BC} : \frac{-6}{2} = -3$$

$$\frac{1}{3} \times -3 = -1 \quad \therefore \text{perpendicular, so Luna is right.}$$

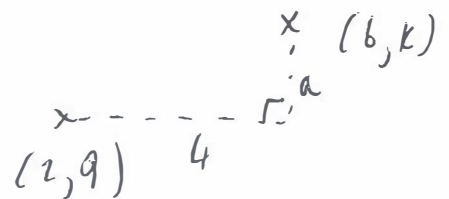
(3)

21. A, B and C have coordinates (2, 9), (10, -7) and (6, k) respectively.
 AB is perpendicular to AC

Find k

$$\text{gradient of AB} : \frac{-16}{8} = -2$$

$$\therefore \text{gradient of AC} = \frac{1}{2}$$



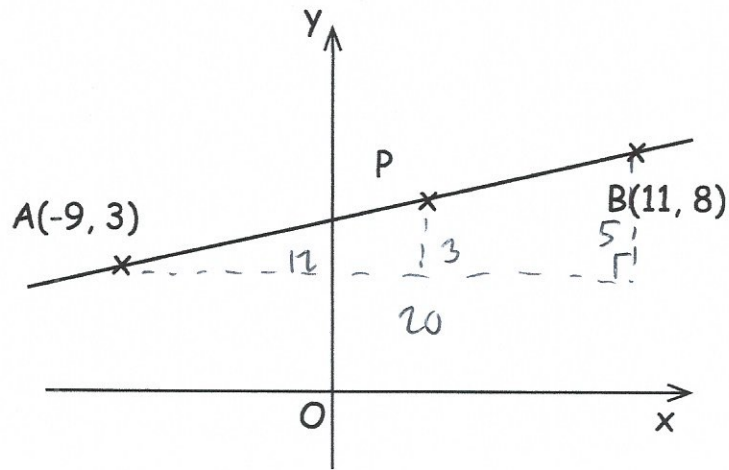
$$\frac{a}{4} = \frac{1}{2}$$

$$a = 2$$

$$k = 11$$

(3)

22.



A straight line, L, passes through the points A(-9, 3) and B(11, 8).

The point P lies on line L, such that $AP : PB = 3 : 2$

$$3+2=5$$

$$20 \div 5 = 4$$

$$4 \times 3 = 12$$

Find the equation of the line perpendicular to L that passes through P.

$$5 \div 5 = 1$$

$$1 \times 3 = 3$$

$$P \begin{matrix} x & y \\ (3, & 6) \end{matrix}$$

gradient of AB $\frac{5}{20} = \frac{1}{4}$

$$y = -4x + c$$

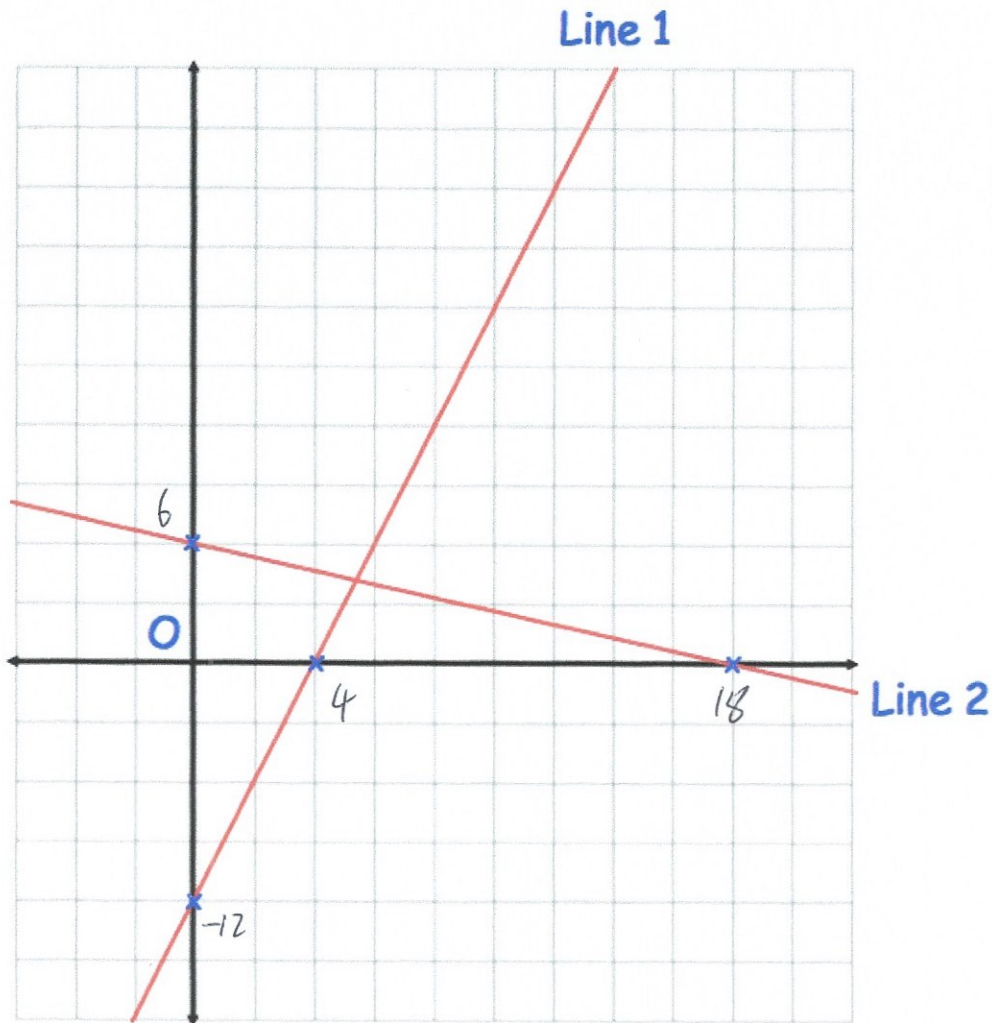
$$6 = -12 + c$$

$$c = 18$$

$$\underline{y = -4x + 18}$$

(5)

23. Shown are two straight lines drawn on the grid.



Line 1 has equation $y = 3x - 12$

$$0 = 3x - 12$$

(a) Find the equation of Line 2

$$x = 4$$

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

(4)

(b) Are the two lines perpendicular?
Explain your answer.

yes $m_{L1} \times m_{L2} = -1$ if perpendicular.

$$3 \times -\frac{1}{3} = -1 \quad \checkmark$$

(1)