

Name: _____

Level 2 Further Maths

Parallel Lines
Perpendicular Lines



Corbettmaths

Ensure you have: Pencil or pen

Guidance

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

Revision for this topic

www.corbettmaths.com/more/further-maths/



1. Write down the equation of the line that is parallel to $4x - 2y = 7$ and passes through $(9, -3)$

$$x \quad y \quad 4x = 2y + 7$$

~~$$4x = 2y + 7$$~~

$$2y + 7 = 4x$$

$$2y = 4x - 7$$

$$y = 2x - \frac{7}{2}$$

$$y = 2x + c$$

$$-3 = 18 + c$$

$$c = -21$$

$$\text{..... } y = 2x - 21 \quad (3)$$

2. A straight line L_1 passes through the points $(-6, 1)$ and $(-2, -1)$.
A straight line L_2 passes through the point $(5, 7)$ and is parallel to L_1 .

$$x_1 \quad y_1 \quad x_2 \quad y_2$$

$$x \quad y$$

Find the equation of the line L_2

$$L_1 \quad m = \frac{-1 - 1}{-2 - -6}$$

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

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

$$L_2 \quad y = -\frac{1}{2}x + c$$

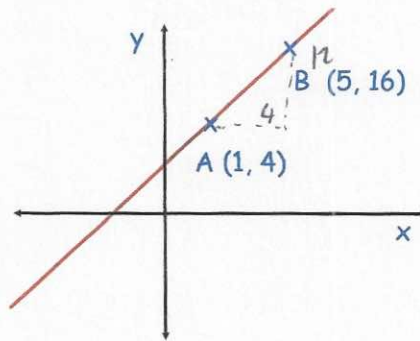
$$7 = -\frac{5}{2} + c$$

$$9.5 = c$$

$$y = -\frac{1}{2}x + 9\frac{1}{2}$$

$$\text{..... } y = -\frac{1}{2}x + 9\frac{1}{2} \quad (4)$$

3. A straight line passes through the point A(1, 4) and B(5, 16)



Find the equation of the line parallel to AB that passes through $(-8, 2)$

$$\frac{AB}{m} = \frac{12}{4} = 3$$

$$y = 3x + c$$

$$2 = -24 + c$$

$$c = 26$$

$$y = 3x + 26$$

(4)

4. The line L passes through the points $(-5, 3)$ and $(1, -2)$.
The line N passes through the points $(-22, 1)$ and $(-4, -14)$.

Bryan says that the lines L and N are parallel.
Is Bryan correct? Explain your answer.

$$\frac{L}{m} = \frac{-2 - 3}{1 - -5} = \frac{-5}{6}$$

$$\frac{N}{m} = \frac{-14 - 1}{-4 - -22} = \frac{-15}{18} = -\frac{5}{6}$$

yes, both lines have the same gradients.

(4)

5. Line L_1 is parallel to $5x - 7y = 31$ and passes through the point $(4, 16)$

Find the coordinates of the point where L_1 intersects the x -axis. $y=0$

$$-7y = -5x + 31$$

$$7y = 5x - 31$$

$$y = \frac{5}{7}x - \frac{31}{7}$$

$$y = \frac{5}{7}x + c$$

$$16 = \frac{20}{7} + c$$

$$c = \frac{92}{7}$$

$$y = \frac{5}{7}x + \frac{92}{7}$$

$$0 = \frac{5}{7}x + \frac{92}{7}$$

$$\frac{5}{7}x = -\frac{92}{7}$$

$$x = -\frac{92}{5}$$

$$(-18.4, 0)$$

(5)

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

$$m = \frac{1}{3}$$

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

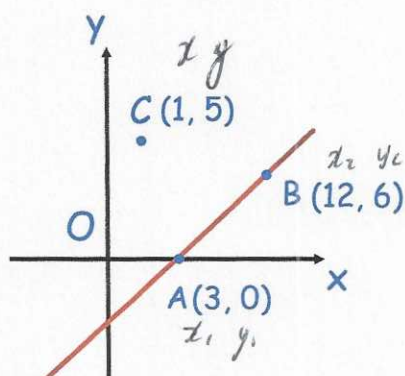
$$-3 = 3 + c$$

$$c = -6$$

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

(3)

7. A straight line passes through the point A(1, 4) and B(5, 16)



$$m = \frac{6-0}{12-3} = \frac{6}{9} = \frac{2}{3}$$

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

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

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

$$6\frac{1}{2} = c$$

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

(4)

8. The line Q passes through the points $(-10, -2)$ and $(-8, -8)$
The line R passes through the points $(1, 2)$ and $(10, a)$

The lines Q and R are perpendicular.

Find a.

$$\frac{-8 - (-2)}{-8 - (-10)} = -3$$

$$a - 2 = 3$$

$$a = 5$$

$$R \quad m = \frac{1}{3}$$

$$\frac{a-2}{10-1} = \frac{1}{3}$$

$$\frac{a-2}{9} = \frac{1}{3}$$

5

(4)

9. Point A has coordinates $(9, 7)$
 Point B has coordinates $(13, -27)$

midpoint of AB $\begin{matrix} x & y \\ (11, & -10) \end{matrix}$

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

AB $m = \frac{-27-7}{13-9}$
 $= -\frac{17}{2}$

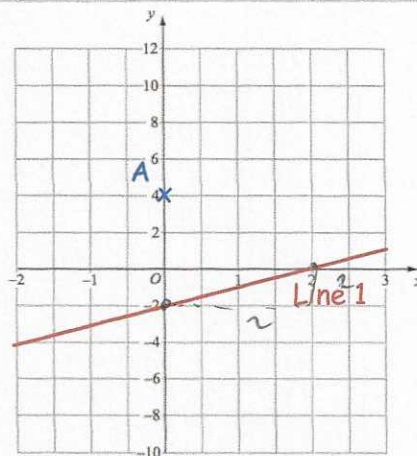
$-10 = \frac{22}{17} + c$
 $c = -\frac{192}{17}$

$y = \frac{2}{17}x + c$

$y = \frac{2}{17}x - \frac{192}{17}$

 (4)

10.



Calculate the shortest distance between Line 1 and the point A.

L_1 $m = \frac{2}{2} = 1$

$-x + 4 = x - 2$
 $6 = 2x$
 $x = 3$

L_2 $m = -1$

A $\begin{matrix} x & y \\ (0, & 4) \end{matrix}$ P $\begin{matrix} x & y \\ (3, & 1) \end{matrix}$

$y = -x + c$

AP $\sqrt{(1-4)^2 + (3-0)^2}$

$\begin{matrix} x & y \\ (0, & 4) \end{matrix}$

$4 = c$

$= \sqrt{18}$

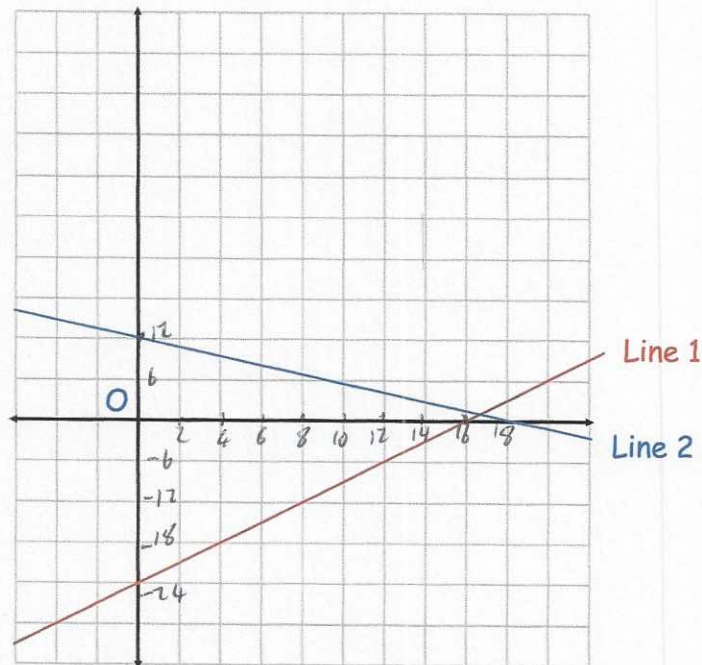
$3\sqrt{2}$

 (6)

$y = -x + 4$

$= 3\sqrt{2}$

11. Two straight lines are shown below.



Line 1 has equation $y = \frac{3}{2}x - 24$

Are Line 1 and Line 2 perpendicular?

L_1

$$0 = 1.5x - 24$$

$$24 = 1.5x$$

$$x = 16$$

$$m_1 = \frac{3}{2}$$

L_2

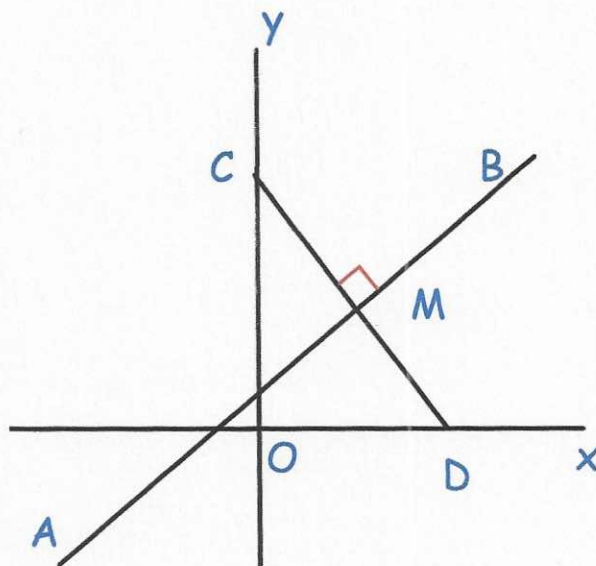
$$m_2 = \frac{0 - 12}{18 - 0} = -\frac{2}{3}$$

$$m_1 \times m_2 = \frac{3}{2} \times -\frac{2}{3} = -\frac{6}{6} = -1$$

Yes, L_1 & L_2 are perpendicular.

(6)

12. 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 (6, 0)

$$M(3, 6)$$

Find the coordinates of the point where AB crosses the y-axis.

$$CD / m = -2$$

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

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

$$4.5 = c$$

$$y = \frac{1}{2}x + 4\frac{1}{2}$$

(6)

13. The line L_1 passes through the points $A(-4, 2)$ and $B(11, 7)$

The line L_2 is parallel to L_1 and passes through the point $C(5, 0)$

The line L_3 is perpendicular to L_2 and passes through the point $D(-3, 8)$

The lines L_2 and L_3 intersect at the point E .

Find the area of triangle OCE

$$L_1 / m = \frac{7-2}{11-(-4)} = \frac{5}{15} = \frac{1}{3}$$

$$L_2 / m = \frac{1}{3}$$

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

$$0 = \frac{5}{3} + c$$

$$c = -\frac{5}{3}$$

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

$$E / \frac{1}{3}x - \frac{5}{3} = -3x - 1$$

$$3 \cdot \frac{1}{3}x = \frac{2}{3}$$

$$x = \frac{1}{5}$$

$$y = -3 \cdot \frac{1}{5} - 1$$

$$y = -\frac{8}{5}$$

$$\left(\frac{1}{5}, -\frac{8}{5}\right)$$

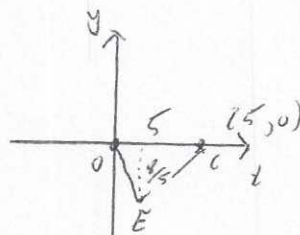
$$L_3 / m = -3$$

$$y = -3x + c$$

$$8 = 9 + c$$

$$c = -1$$

$$y = -3x - 1$$



$$A = \frac{1}{2} \times 5 \times \frac{8}{5} = 4$$