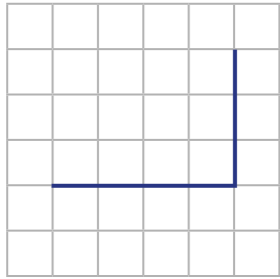
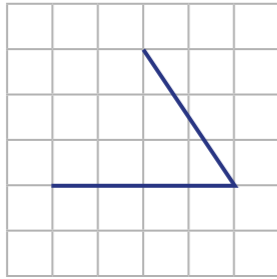


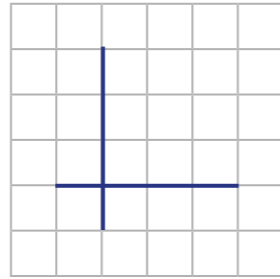
# Explore perpendicular lines

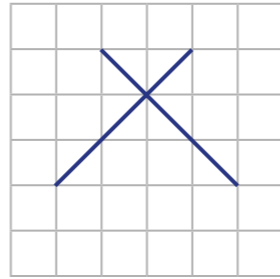
H

1 a) Tick the pairs of perpendicular lines.









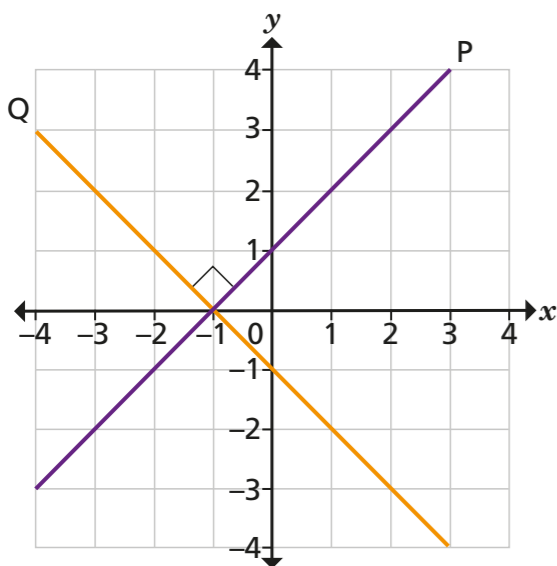

b) What does it mean for a pair of lines to be perpendicular?

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2 Two lines, P and Q, are drawn on the graph.



a) Are the lines perpendicular? \_\_\_\_\_

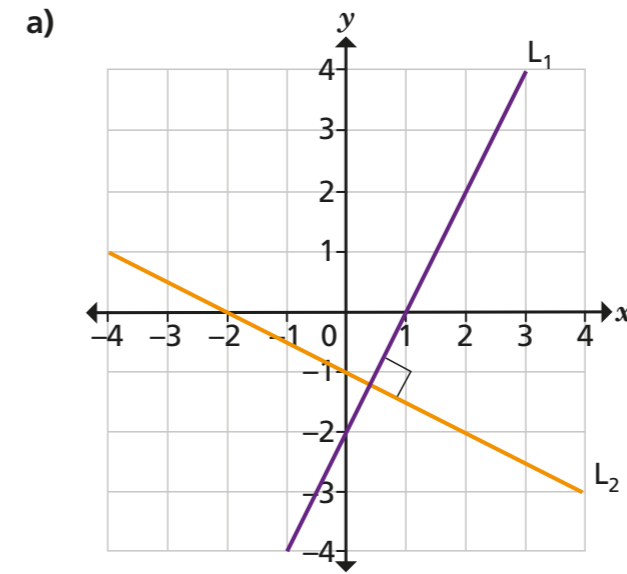
How do you know?

b) What is the gradient of P?

c) What is the gradient of Q?

d) What is the product of the gradients of lines P and Q?

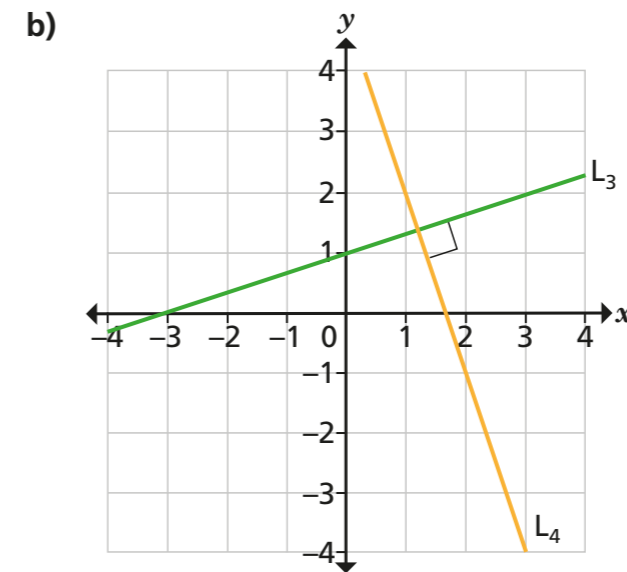
3 Each coordinate grid shows a pair of perpendicular lines. Find the product of the gradients of the pairs.



gradient of  $L_1$  ( $m_1$ ) =

gradient of  $L_2$  ( $m_2$ ) =

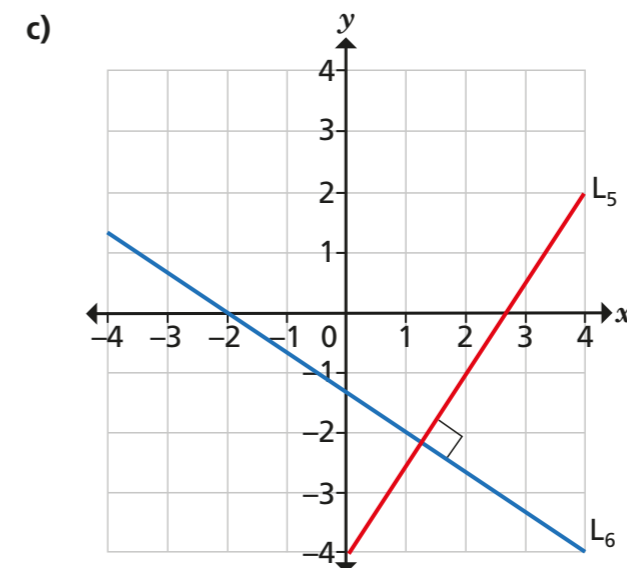
$m_1 \times m_2 =$



gradient of  $L_3$  ( $m_3$ ) =

gradient of  $L_4$  ( $m_4$ ) =

$m_3 \times m_4 =$



gradient of  $L_5$  ( $m_5$ ) =

gradient of  $L_6$  ( $m_6$ ) =

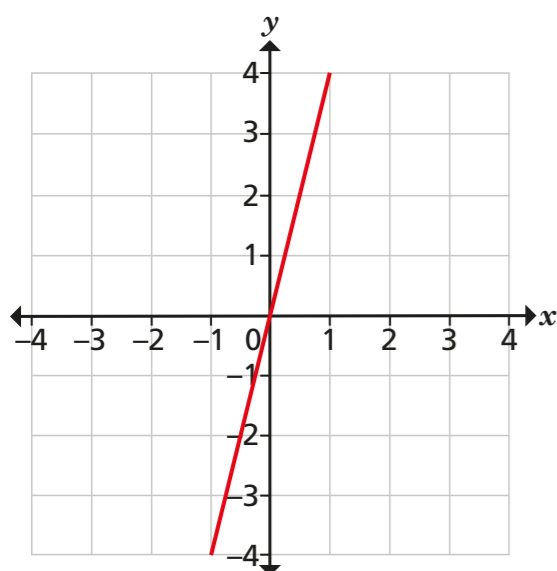
$m_5 \times m_6 =$

What do you notice?

4 Complete the calculations.

- a)  $\square \times 6 = -1$       e)  $\frac{2}{3} \times \square = -1$       i)  $\square \times 0.25 = -1$   
 b)  $3 \times \square = -1$       f)  $-1 = \frac{5}{7} \times \square$       j)  $\square \times -0.625 = -1$   
 c)  $-2 \times \square = -1$       g)  $-1 = -9 \times \square$       k)  $-a \times \square = -1$   
 d)  $-\frac{1}{7} \times \square = -1$       h)  $-0.5 \times \square = -1$       l)  $\frac{3b}{5} \times \square = -1$

5 The graph of  $y = 4x$  is shown on the grid.



- a) What is the gradient of this line?  $\square$   
 b) What is the gradient of a line perpendicular to this one?  $\square$   
 c) On the grid, draw the line that is perpendicular to  $y = 4x$  and that passes through the origin. Label this line M.  
 What is the equation of line M?  
 \_\_\_\_\_

d) On the same grid, draw the line that is perpendicular to  $y = 4x$  and passes through the point  $(0, -2)$ . Label this line N.  
 What is the equation of line N? \_\_\_\_\_

e) Are lines M and N perpendicular? \_\_\_\_\_  
 Explain your answer.  
 \_\_\_\_\_  
 \_\_\_\_\_

6 Tommy says, "When two lines are perpendicular, one will always have a positive gradient and the other will always have a negative gradient."

Do you agree with Tommy? \_\_\_\_\_

Explain your answer.

7 Write the negative reciprocal of each number.

- a)  $\frac{5}{3}$   $\square$       c)  $\frac{4}{7}$   $\square$       e)  $-\frac{1}{14}$   $\square$   
 b)  $-\frac{2}{5}$   $\square$       d) 13  $\square$       f) -0.8  $\square$

8 Write the equation of a line that is perpendicular to  $y = 14x + 1$

\_\_\_\_\_

Compare your answer with a partner's. How many different answers are there?

9 Write the equation of a line that is perpendicular to  $y = 8 - 3x$  and that passes through the point  $(0, 15)$ .

\_\_\_\_\_

Compare your answer with a partner's. How many different answers are there?

10 Two straight lines are given by these equations.

$L_1 \quad y - 6x = 15$

$L_2 \quad 6y = 3 - x$

Show that lines  $L_1$  and  $L_2$  are perpendicular.