

## 6.10: Applying Algebra to Geometric Situations

1. Write down the slope perpendicular to the given slope.

(a)  $m = -\frac{4}{3}$   $m_{\perp} = +\frac{3}{4}$

(c)  $m = 0.5$   $m_{\perp} = -2$

(b)  $m = 3$   $m_{\perp} = -\frac{1}{3}$

(d)  $m = -\frac{2}{3}$   $m_{\perp} = +\frac{3}{2}$

2. The line  $l$  has the equation  $y = \frac{2}{3}x + 1$ . To each line below, circle whether  $l$  is parallel, perpendicular, or neither.  $m = \frac{2}{3}$ 

(a) parallel perpendicular neither  $y = -\frac{2}{3}x - 1$ 

(b) parallel perpendicular neither  $y = \frac{3}{2}x + 4$ 

(c) parallel perpendicular neither  $2x - 3y = -7$   
 $-3y = -2x - 7$   
 $y = \frac{2}{3}x + \frac{7}{3}$ 

(d) parallel perpendicular neither  $3x + 2y = 5$   
 $2y = -3x + 5$   
 $y = -\frac{3}{2}x + \frac{5}{2}$ 

In the following problems, use the point-slope formula:  $y - y_A = m(x - x_A)$ 

3. What is the equation of a line through the point  $A(3, -2)$  and parallel to the line  $y = 3x - 1$ ?

$m = 3$

$y - (-2) = 3(x - 3)$

4. What is an equation of the perpendicular bisector of  $\overline{QR}$  with  $Q(2, 0)$  and  $R(6, 2)$ ?

mid point

slope

$m = \frac{2-0}{6-2} = \frac{1}{2}$

$M = \left( \frac{2+6}{2}, \frac{0+2}{2} \right)$   
 $= (4, 1)$

$m_{\perp} = -2$

 $\perp$  line  
Bisector

$y - 1 = -2(x - 4)$

5. Graph and label the two equations. Mark their intersection as an ordered pair.

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

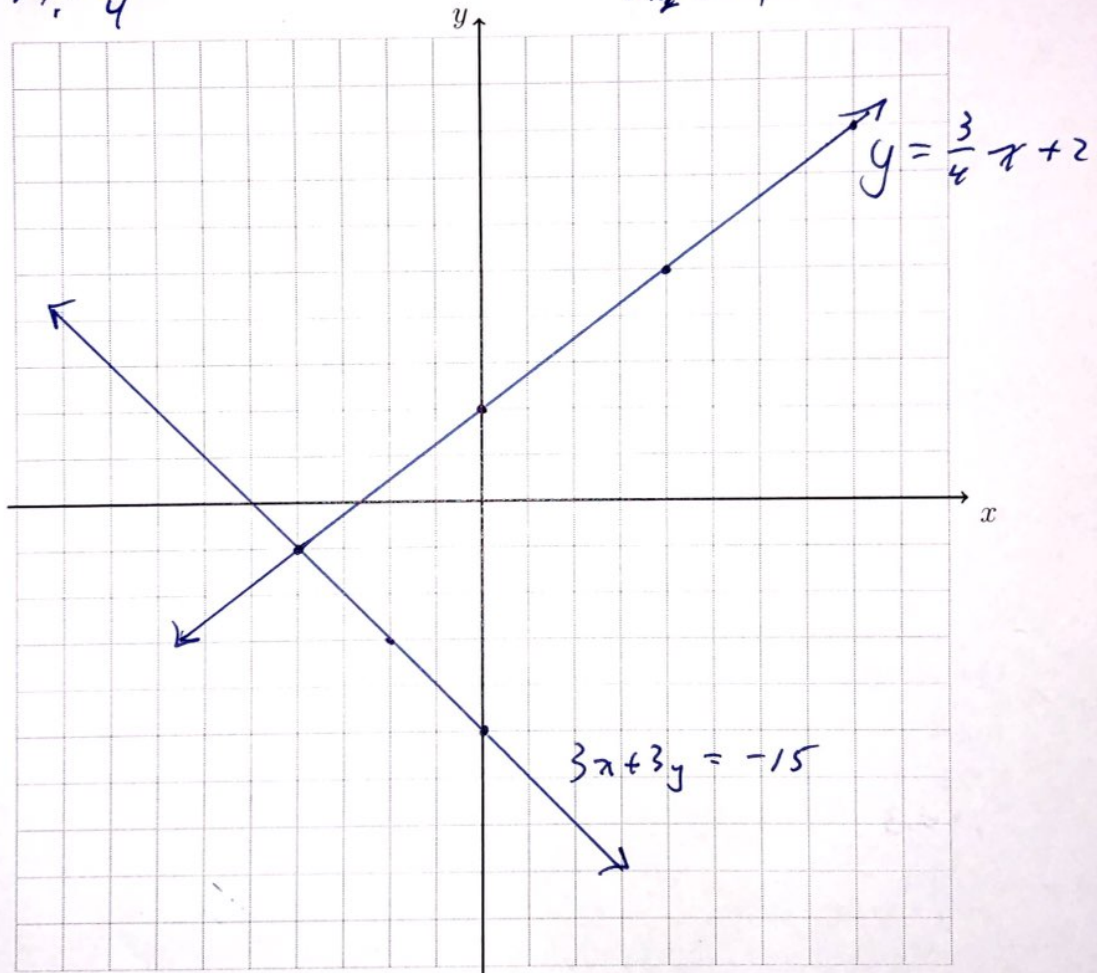
$$3x + 3y = -15$$

$$3y = -3x - 15$$

$$y = -1x - 5$$

$$m_2 = -1$$

$$m_1 = \frac{3}{4}$$



Are the lines parallel, perpendicular, or neither? Justify your answer, stating the values of the lines' slopes.

$$m_1 \neq m_2$$

$$(m_1)(m_2) \neq -1$$

Neither



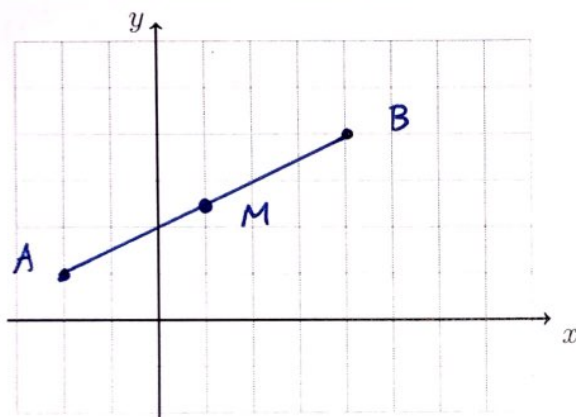
Name: Solomon

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6. Given  $J(-2, 7)$  and  $K(1, 4)$ , find the length of  $\overline{JK}$ . Leave the result in simplified radical form (not a decimal).

$$\begin{aligned} l &= \sqrt{(1 - (-2))^2 + (7 - 4)^2} \\ &= \sqrt{3^2 + 3^2} \\ &= \sqrt{18} = \sqrt{9} \sqrt{2} = 3\sqrt{2} \end{aligned}$$

7. On the graph below, draw  $\overline{AB}$ , with  $A(-2, 1)$  and  $B(4, 4)$ , labeling the end points.



- (a) Determine and state the coordinates of the midpoint  $M$  of  $\overline{AB}$ . Mark  $M$  and label it on the graph.

$$M = \left( \frac{-2 + 4}{2}, \frac{1 + 4}{2} \right) = \left( 1, \frac{5}{2} \right)$$

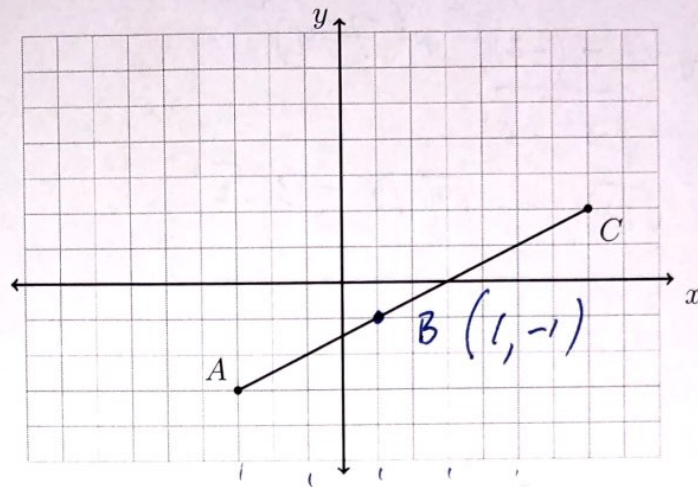
- (b) Find the slope of  $\overline{AB}$ .

$$m = \frac{4 - 1}{4 - (-2)} = \frac{3}{6} = \frac{1}{2}$$

- (c) Find the length of  $\overline{AB}$ . Leave the result as a simplified radical.

$$\begin{aligned} AB &= \sqrt{(4 - (-2))^2 + (4 - 1)^2} \\ &= \sqrt{6^2 + 3^2} \\ &= \sqrt{45} = \sqrt{9} \sqrt{5} = 3\sqrt{5} \end{aligned}$$

8. In the diagram below,  $\overline{AC}$  has endpoints with coordinates  $A(-3, -3)$  and  $C(7, 2)$ .



If  $B$  is a point on  $\overline{AC}$  and  $AB:BC = 2:3$ , what are the coordinates of  $B$ ?

9.  $A(2, 4)$  is one endpoint of  $\overline{AB}$ . The segment's midpoint is  $M(7, 3)$ . Find the other endpoint,  $B$ .

$$\overline{T}_{+5, -1}$$

$$\overline{T}_{+5, -1} \\ M \rightarrow B(12, 2)$$

10. A translation maps  $A(-1, 12) \rightarrow A'(5, 6)$ . What is the image of  $B(10, -1)$  under the same translation?

$$\overline{T}_{+6, -6}$$

$$B'(16, -7)$$