

Algebra 1 4.4

Write the equation of a line parallel to a given line

Write the equation of a line perpendicular to a given line

What do we need to write an equation for a line?

slope

vertical

horizontal

parallel //

perpendicular  $\perp$

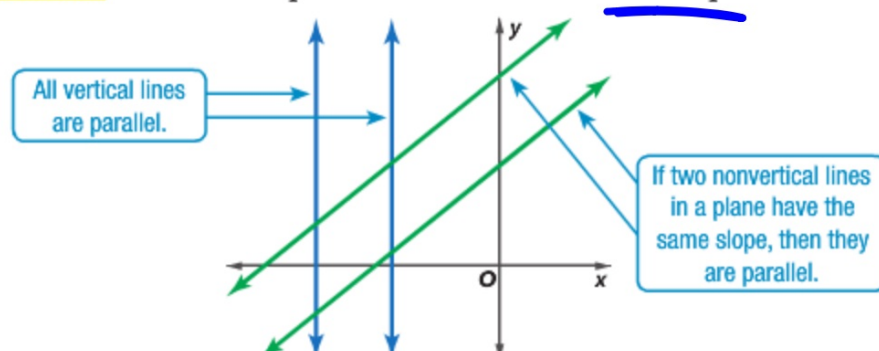
spaghetti lines

$m$   $(x, y)$

$$y = mx + b$$

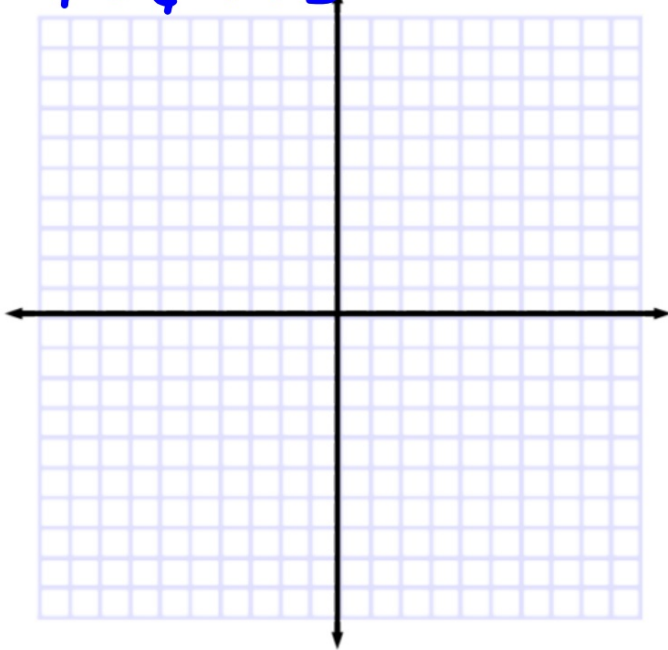
$$y - ? = m(x - ?)$$

**1 Parallel Lines** Lines in the same plane that do not intersect are called **parallel lines**. Nonvertical parallel lines have the same slope.



//  $y = \frac{1}{4}x + 3$  (4,7)

$y = \frac{1}{4}x + 3$   $y = \frac{1}{4}x + 6$   
 $7 = \frac{1}{4} \cdot 4 + 3$



What does it look like when 2 lines are perpendicular?

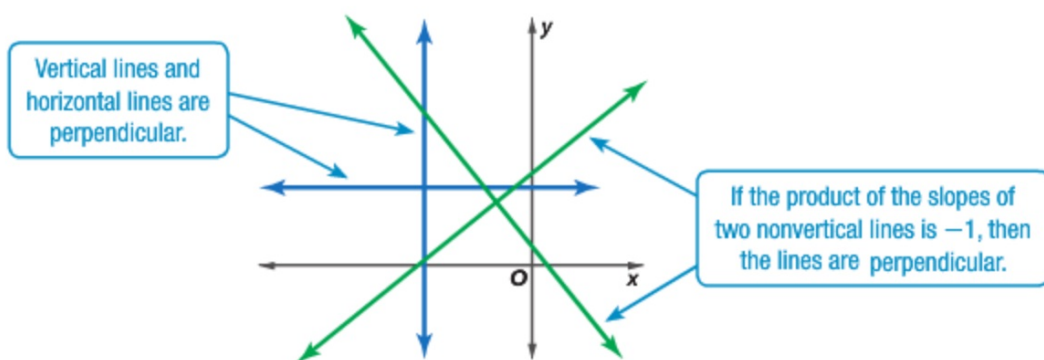


$\begin{matrix} + \\ \text{reg} \end{matrix}$ 
 $\begin{matrix} - \\ \frac{1}{\text{reg}} \end{matrix}$   
 $\begin{matrix} +2 \\ +4 \\ +5 \\ +8 \\ +\frac{1}{3} \end{matrix}$ 
 $\begin{matrix} \frac{1}{2} \\ \frac{1}{4} \\ \frac{1}{5} \\ \frac{1}{8} \\ -3 \end{matrix}$ 
 $\begin{matrix} \frac{1}{4} \\ -4 \end{matrix}$   
 opposite & recip

Desmos exploration

If 2 lines are perpendicular...  
(what?)

**2 Perpendicular Lines** Lines that intersect at right angles are called **perpendicular lines**. The slopes of nonvertical perpendicular lines are opposite reciprocals. That is, if the slope of a line is 4, the slope of the line perpendicular to it is  $-\frac{1}{4}$ .



Partners:

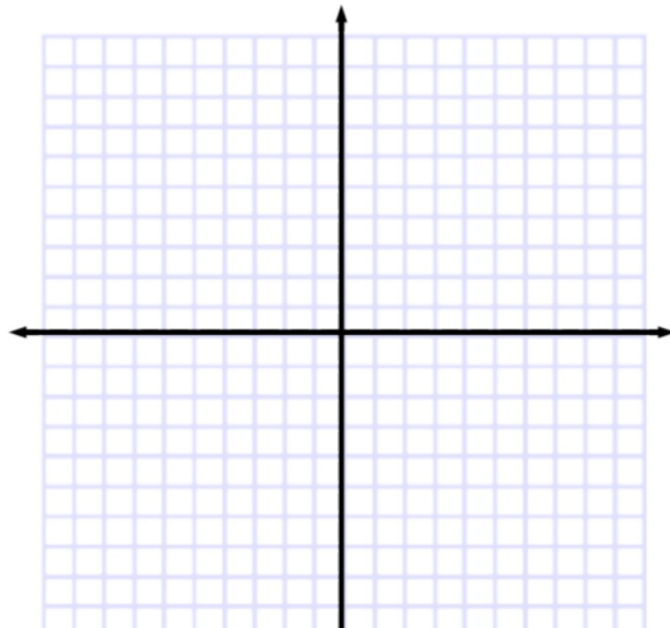
One person write a slope.

Other person writes the perpendicular to the slope.

Eyeball is not enough...

**Guided**Practice

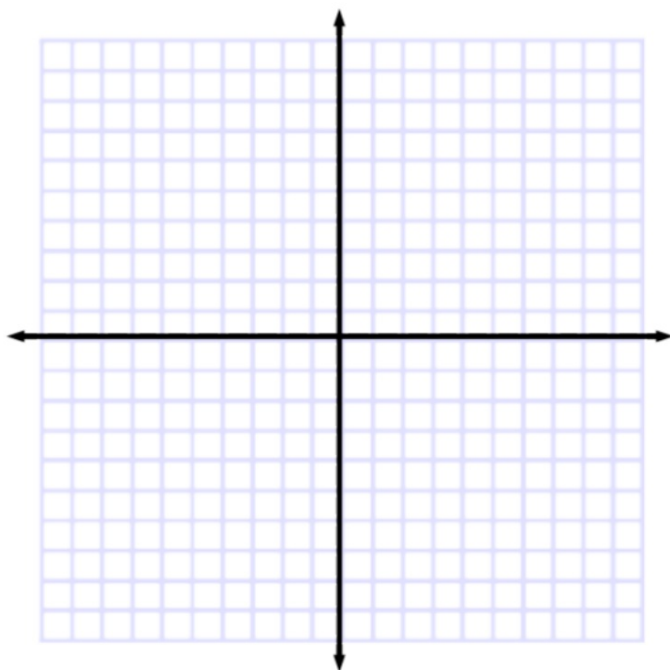
2. **CONSTRUCTION** On the plans for a treehouse, a beam represented by  $\overline{QR}$  has endpoints  $Q(-6, 2)$  and  $R(-1, 8)$ . A connecting beam represented by  $\overline{ST}$  has endpoints  $S(-3, 6)$  and  $T(-8, 5)$ . Are the beams perpendicular? Explain.



**Example 3** Parallel or Perpendicular Lines

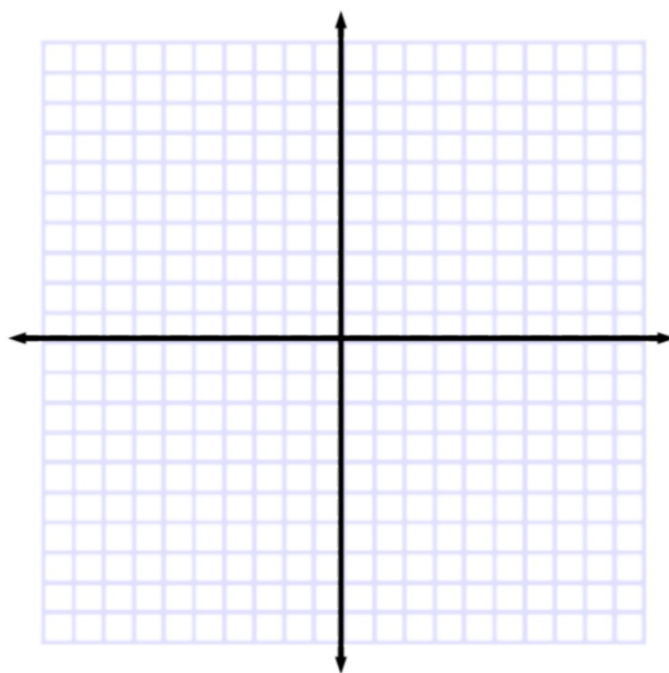
Determine whether the graphs of  $y = 5$ ,  $x = 3$ , and  $y = -2x + 1$  are *parallel* or *perpendicular*. Explain.

What do we need to know so that we can answer the question?



3. Determine whether the graphs of  $6x - 2y = -2$ ,  $y = 3x - 4$ , and  $y = 4$  are *parallel* or *perpendicular*. Explain.

What do we need to know?



opp recip.

**Example 4** Perpendicular Line Through a Given Point

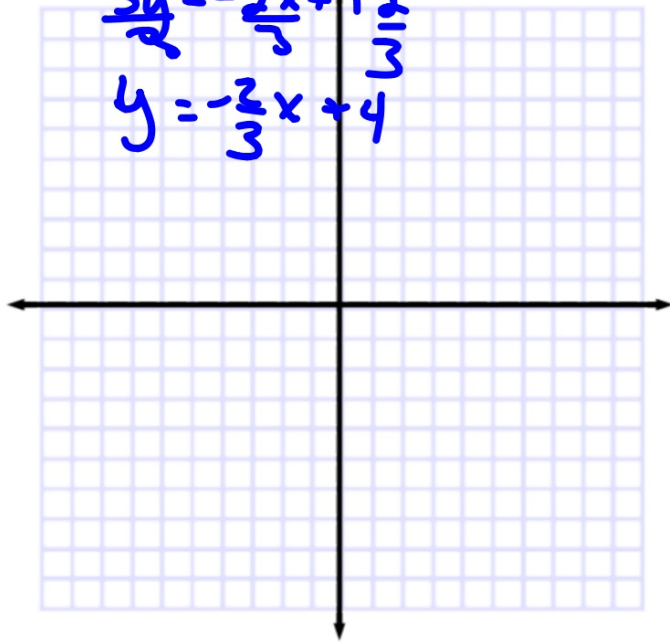
Write an equation in slope-intercept form for the line that passes through  $(-4, 6)$  and is perpendicular to the graph of  $2x + 3y = 12$ .

What do we need to know?

$(-4, 6)$      $m = + \frac{3}{2}$

$y = mx + b$

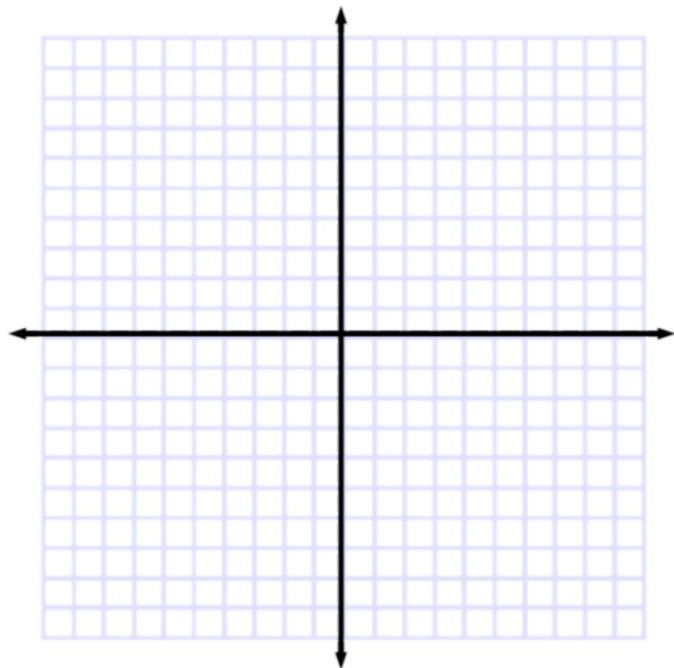
$$\begin{array}{r} -2x \quad -2x \\ 3y = -2x + 12 \\ \hline y = -\frac{2}{3}x + 4 \end{array}$$



What do we need to know?

**Guided**Practice

4. Write an equation in slope-intercept form for the line that passes through  $(4,7)$  and is perpendicular to the graph of  $y = \frac{2}{3}x - 1$ .
- 



Write an equation in slope-intercept form for the line that passes through the given point and is perpendicular to the graph of the equation.

7.  $(-2, 3), y = -\frac{1}{2}x - 4$

8.  $(-1, 4), y = 3x + 5$

What do we need to know?

