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

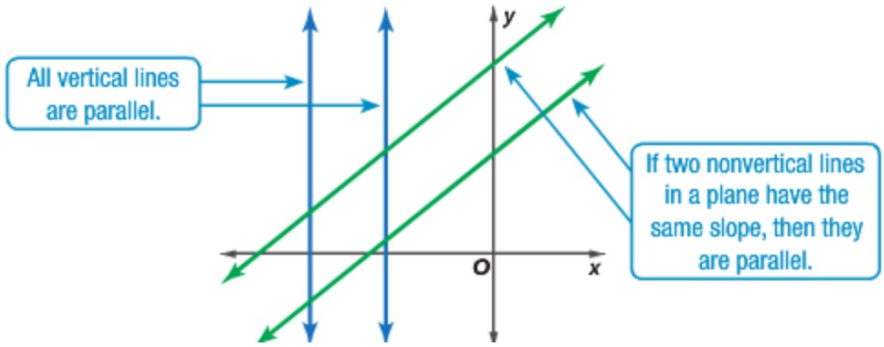
horizontal

// parallel same slope

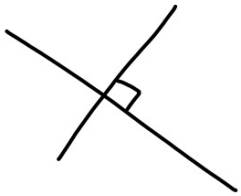
⊥ perpendicular (meets at 90° angle) Slope

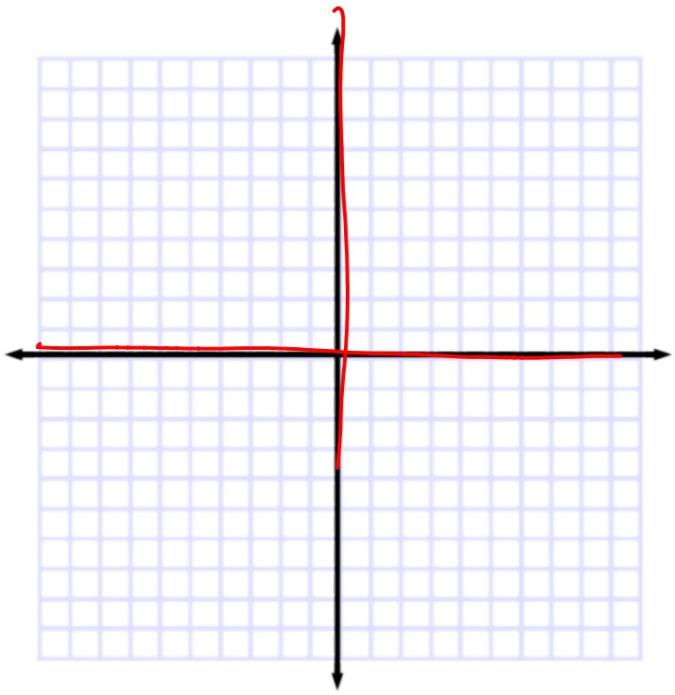
spaghetti lines

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



What does it look like when 2 lines are perpendicular?





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

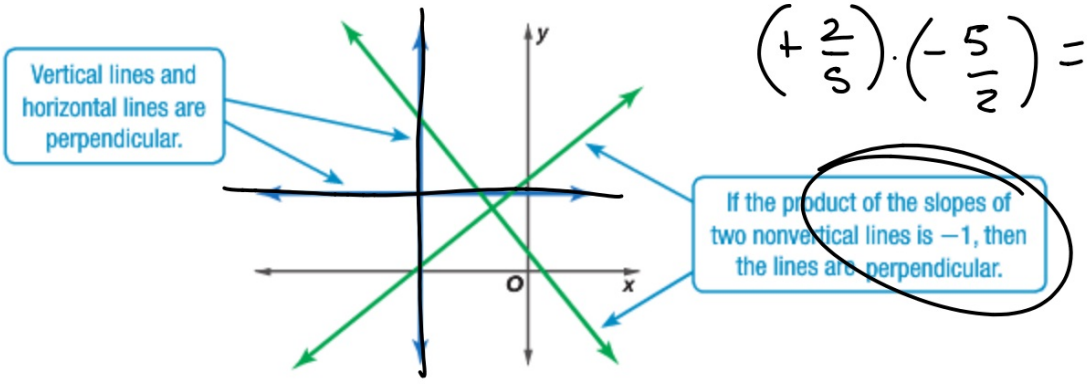
meet at 90° bec.

$\perp$ Slopes are opposite + reciprocals

Desmos

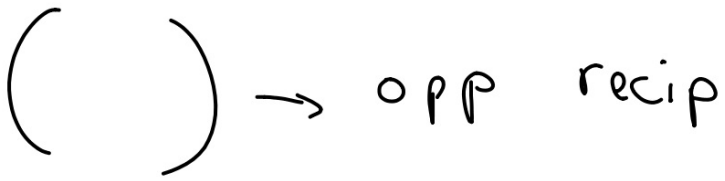
2 Perpendicular Lines

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 $-\frac{1}{4}$.



$\left(+\frac{2}{5}\right)\cdot\left(-\frac{5}{2}\right) = -1$

Partners:
One person write a slope.
Other person writes the perpendicular to the slope.



Eyeball is not enough...

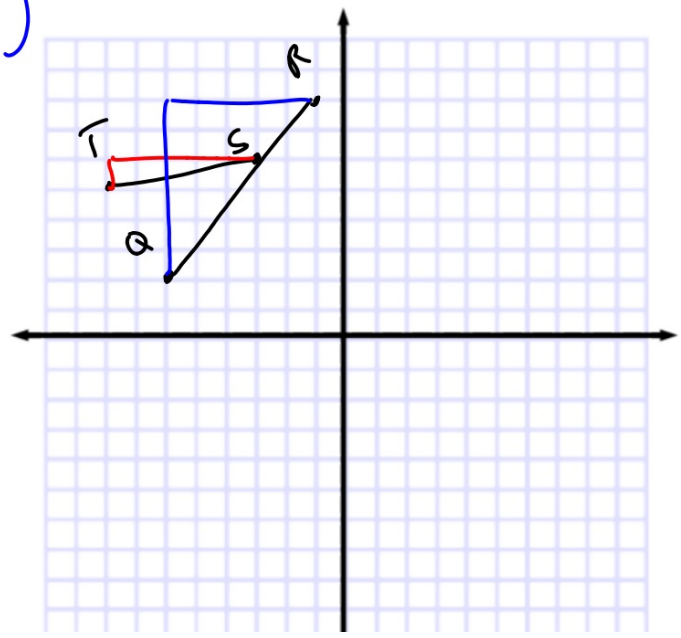
GuidedPractice

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.

Slope $\overline{QR} = \frac{6}{5}$

Slope $\overline{ST} = \frac{1}{5}$

} Slopes are not opp + recip



⊥ bec slopes opp & recip

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

Example 3 Parallel or Perpendicular Lines

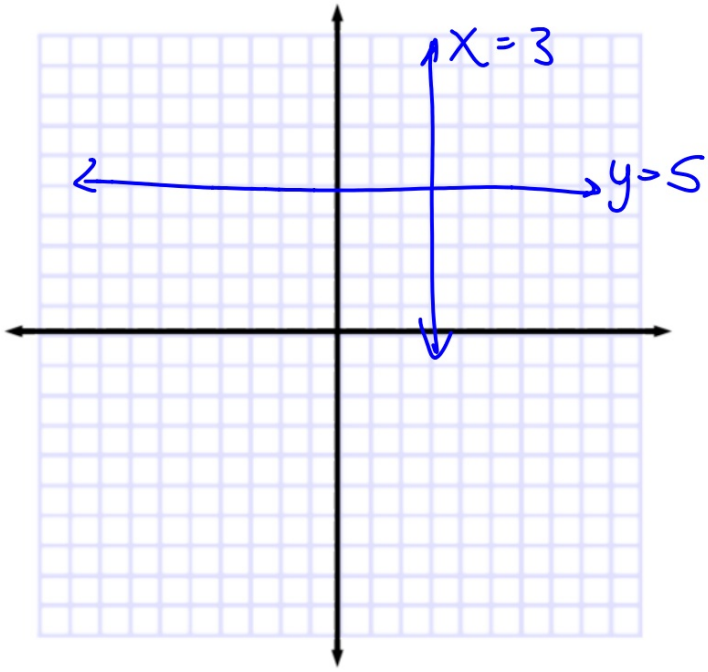
Determine whether the graphs of $y = 5$, $x = 3$, and $y = -2x + 1$ are *parallel* or *perpendicular*. Explain.

perp. bec. horiz + vert automatically ⊥

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

$m = -2$

neither



$y = mx + B$

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? 1st 2 are // bec slopes =

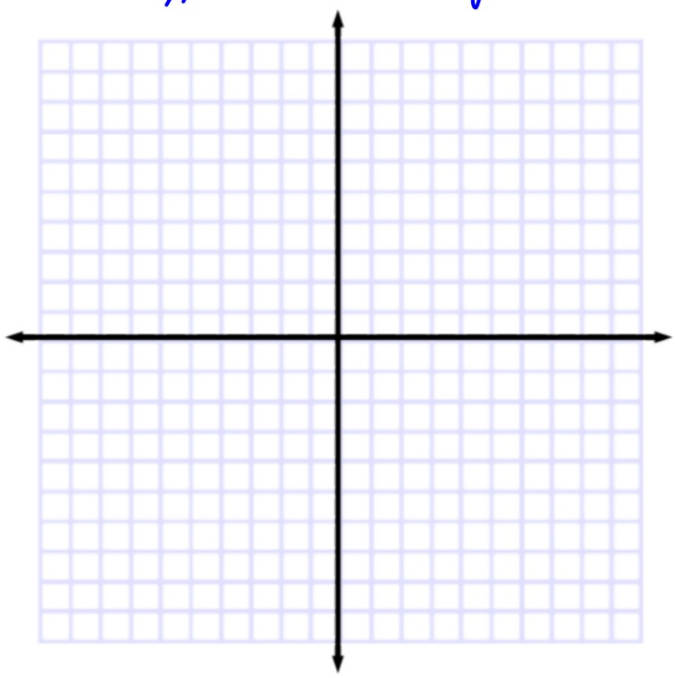
$6x - 2y = -2$

$-6x \quad -6x$

$-2y = -6x - 2$

$\frac{-2y}{-2} = \frac{-6x}{-2} - \frac{2}{-2}$

$y = 3x + 1$



$y = mx + B$ $y = -\frac{2}{3}x + 4$ $m = -\frac{2}{3}$

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 $2x + 3y = 12$.

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

What do we need to know?

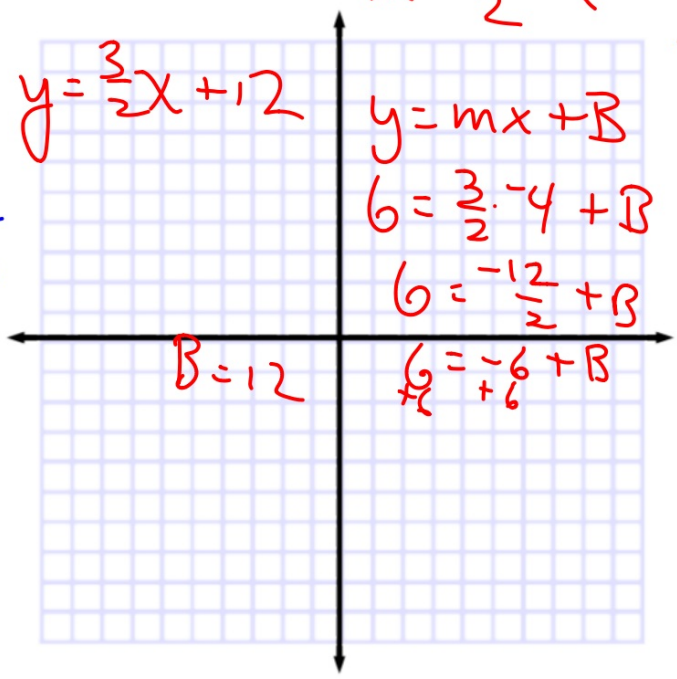
$2x + 3y = 12$
$-2x \quad -2x$

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

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

$B = 12$

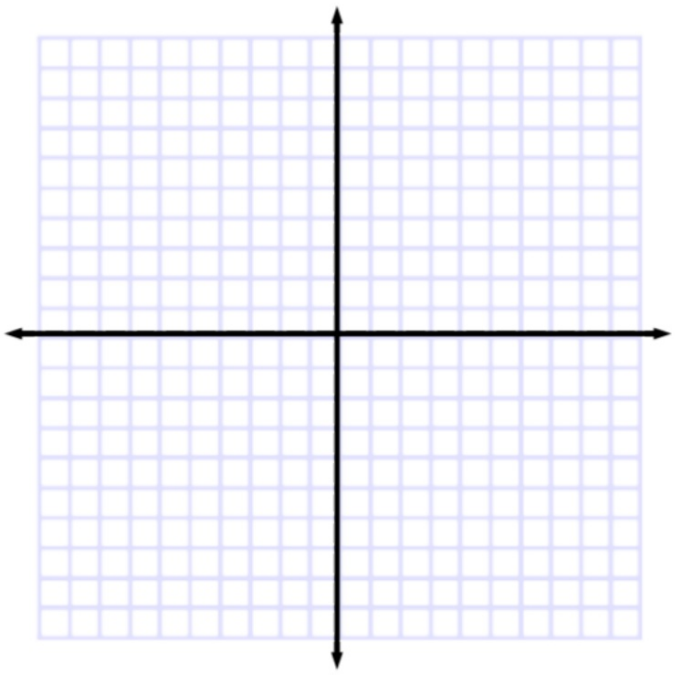
$y = mx + B$
$6 = \frac{3}{2} \cdot -4 + B$
$6 = \frac{-12}{2} + B$
$6 = -6 + B$
$+6 \quad +6$



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?