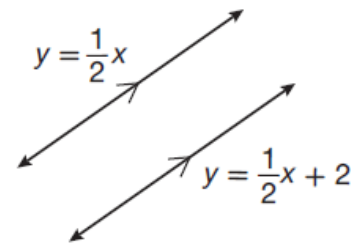


## Geometry Lesson 37

Objective: TSW write equations of parallel and perpendicular lines.

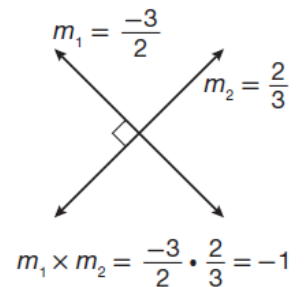
The coordinate plane provides a connection between algebra and geometry. Postulates 17 and 18 establish a simple way to find lines that are parallel or perpendicular on the coordinate plane.

*Postulate 17: Parallel Lines Postulate - If two lines are parallel, then they have the same slope. All vertical lines are parallel to each other.*



Perpendicular lines can also be found by looking at the \_\_\_\_\_.

*Postulate 18: Perpendicular Lines Postulate - If two nonvertical lines are perpendicular, then the product of their slopes is -1. Vertical and horizontal lines are perpendicular to each other.*



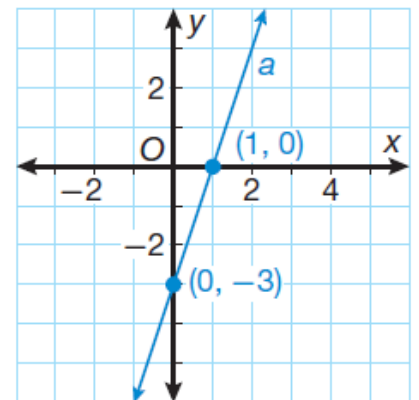
\_\_\_\_\_ Reciprocal - The reciprocal of that number with the sign reversed.

Whenever two lines have slopes that are opposite reciprocals of each other, they are \_\_\_\_\_ lines.

Example 1 Finding the Slopes of Parallel and Perpendicular Lines

a. Find the slope of line  $a$ .

SOLUTION



b. Find the slope of a line parallel to line  $a$ .

SOLUTION

c. Find the slope of a line perpendicular to line  $a$ .

SOLUTION

Example 2 Identifying Parallel and Perpendicular Lines

a. Are the lines  $y = 2x + 4$  and  $y = -3 + 2x$  parallel, perpendicular, or neither?

SOLUTION

b. Are the lines  $y = \frac{2}{3}x - 1$  and  $y = \frac{3}{2}x$  parallel, perpendicular, or neither?

SOLUTION

The point-slope formula for a line \_\_\_\_\_ . Sometimes it is helpful to find a line passing through a given point that is parallel or perpendicular to another line. The point-slope formula can be used to solve problems like this, once you have discovered the slope of the parallel or perpendicular line.

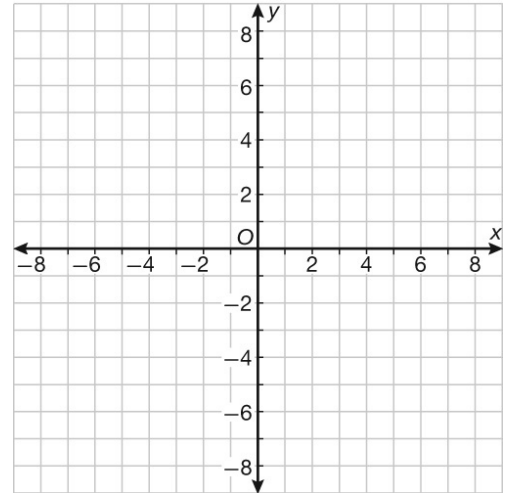
Example 3 Graphing a Line Parallel to a Given Line

a. Find a line that is parallel to  $y = x + 2$  and passes through point  $(3, 8)$ .

SOLUTION

b. Graph the parallel lines from part a.

SOLUTION



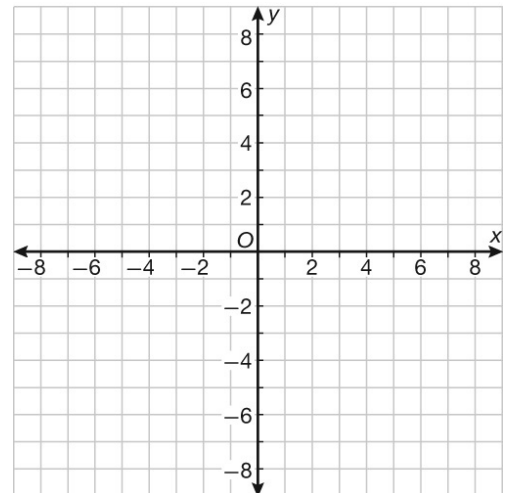
Example 4 Graphing a Line Perpendicular to a Given Line

a. Find a line that is perpendicular to  $y = \frac{2}{3}x$  and passes through the point  $(2, 4)$ .

SOLUTION

b. Graph the perpendicular lines from part a.

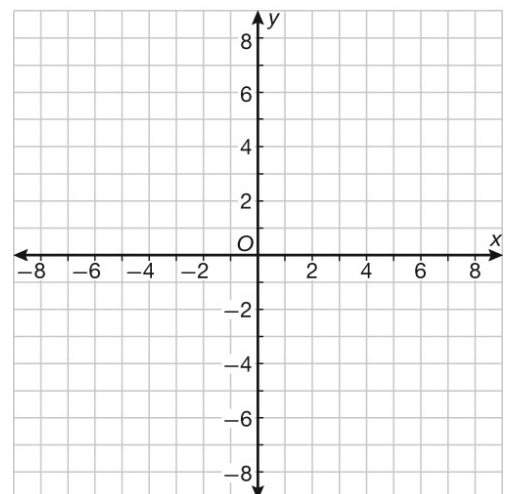
SOLUTION



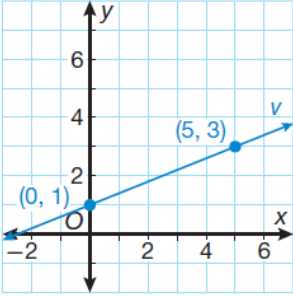
Example 5 Application: Swimming

In a race, one swimmer is swimming at a rate of 21 meters per second. Another swimmer gets a 5-meter head start, and also swims at 21 meters per second. What is the equation that will model the distance,  $y$ , that each swimmer has gone after  $x$  seconds? Will the first swimmer ever catch up to the second?

SOLUTION

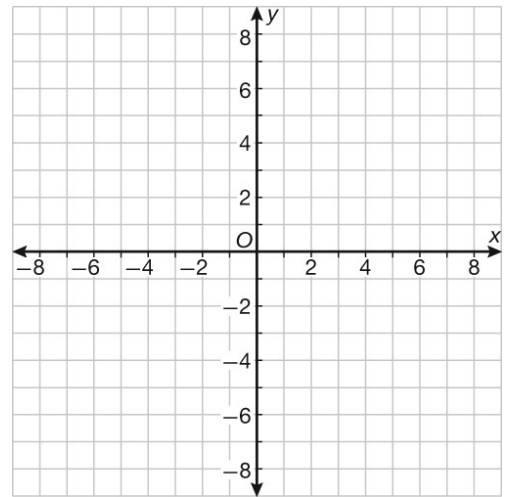


You Try!!



a. Find the slopes of lines that are parallel and perpendicular to line  $v$ .

d. Find and graph a line that is parallel to  $y = -2x + 7$  and passes through the origin.



e. Find and graph a line that is perpendicular to  $y = -\frac{4}{3}x + 3$  and passes through the point  $(2, 3)$ .

