MTH1W Grade 9 Mathematics

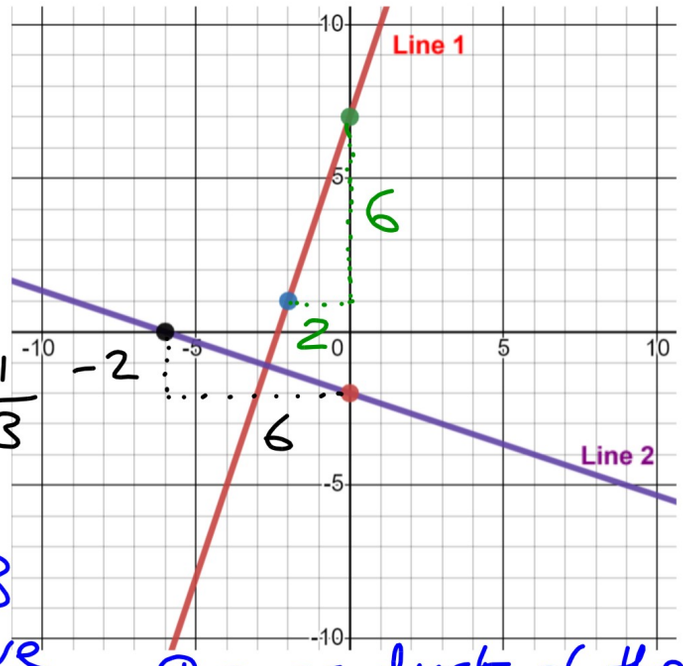
4.7 Rotations of Lines

Goal(s) *- To sketch the graph of a line after it has been rotated 90° or 180° around the origin either clockwise or counterclockwise*

- Write the equation of a line that has been rotated 90° or 180° around the origin either clockwise or counterclockwise

- Explain the meaning of parallel and perpendicular lines

Determine the slope of each line.



Line 1: $m = \frac{6}{2} = 3$

Line 2: $m = \frac{-2}{6} = -\frac{1}{3}$

What do you notice about the slopes?

Both have a 3
One is positive
the other is negative

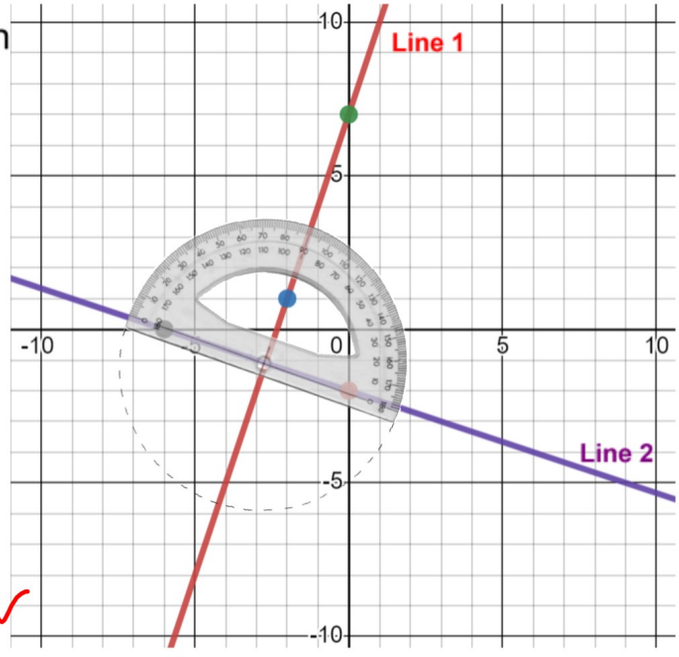
The product of the slopes is -1.

Measure the angle between the lines at the point where they intersect.

90°

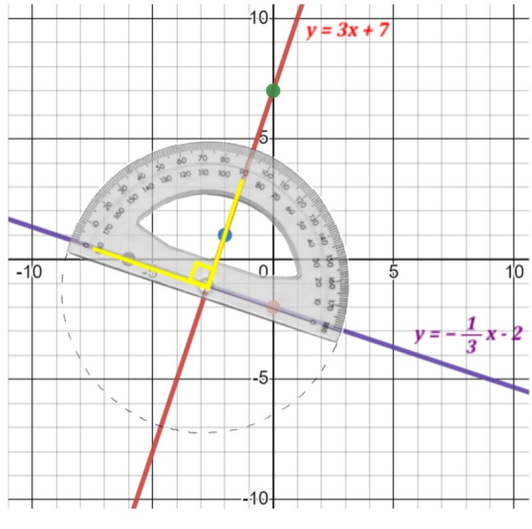
What type of lines are these?

They are perpendicular



Perpendicular lines intersect at ***90°*** (a right angle). The **slopes** of perpendicular lines are ***negative reciprocals*** (two numbers whose product is ***-1***).

A perpendicular line can be created by rotating a line 90° about a point.



Identify pairs of **perpendicular** lines. State the slopes of each pair.

$y = \frac{1}{2}x - 8$

$y = \frac{4}{5}x$

$y = -3x + 10$

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

$y = -2x - 12$

$y = -7x + 6$

$y = -\frac{5}{4}x + 1$

$y = 3x + 7$

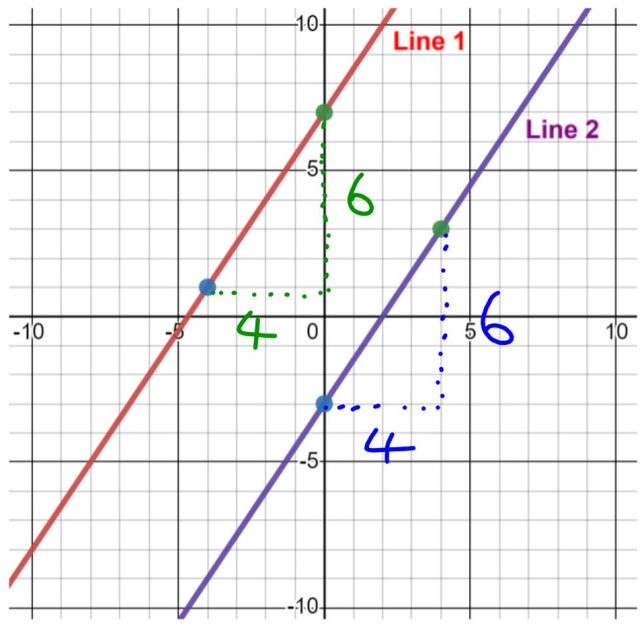
$\frac{1}{2} \rightarrow -2$

$3 \rightarrow -\frac{1}{3}$

$\frac{4}{5} \rightarrow -\frac{5}{4}$

The slopes are the negative reciprocals of each other.

Determine the slope of each line.



Line 1: $m = \frac{6}{4} = \frac{3}{2}$

Line 2: $m = \frac{6}{4} = \frac{3}{2}$

What do you notice about the slopes?

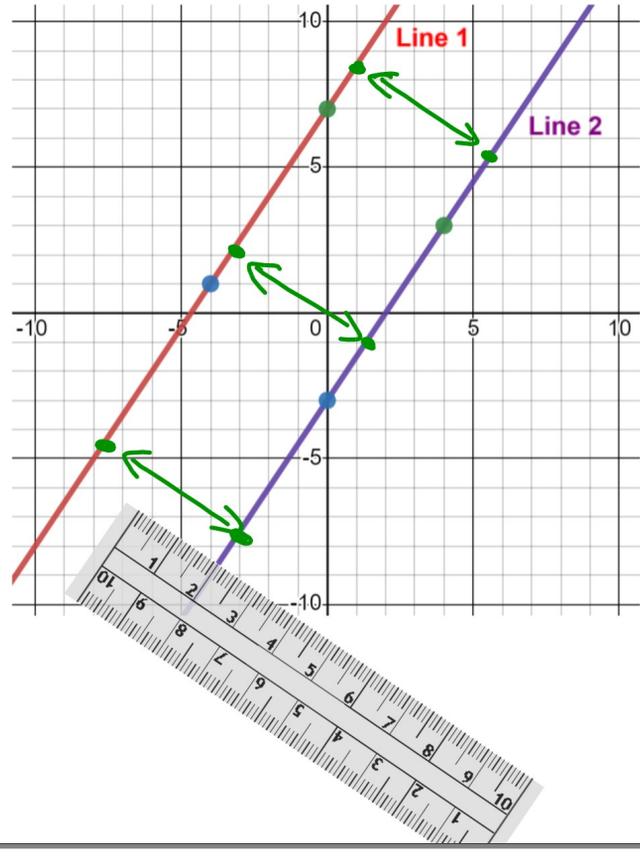
They are the same

Use a ruler and measure the horizontal distance between the lines at 3 different points. Be as accurate as you can!

3.5 cm

What does this tell you about the lines?

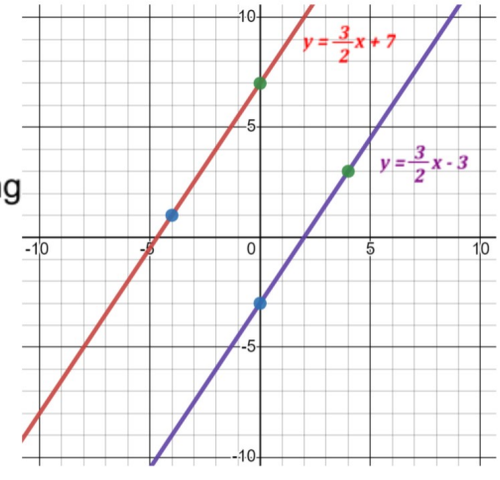
The lines are parallel



Parallel lines are two or more lines that run in the same direction and never intersect.

Parallel lines have the ***same slope*** and ***different y-intercepts***.

A parallel line can be created by rotating a line 180° around a point.



Identify pairs of **parallel** lines. State the slopes of each pair.

$y = -3x + 10$ $y = -\frac{1}{3}x - 2$ $y = -2x - 12$

$y = \frac{4}{5}x$ $y = -2x + 6$ $y = \frac{1}{2}x - 8$

$y = -3x + 7$ $y = \frac{4}{5}x + 1$

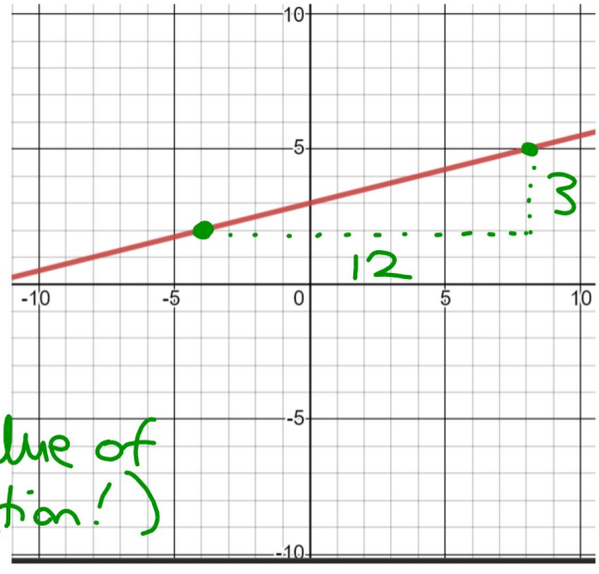
$-3 \rightarrow -3$ $-2 \rightarrow -2$

$\frac{4}{5} \rightarrow \frac{4}{5}$

The slopes are equal to each other for parallel lines

The line $y = \frac{1}{4}x + 3$ is shown in the graph.

State the slope of the line.



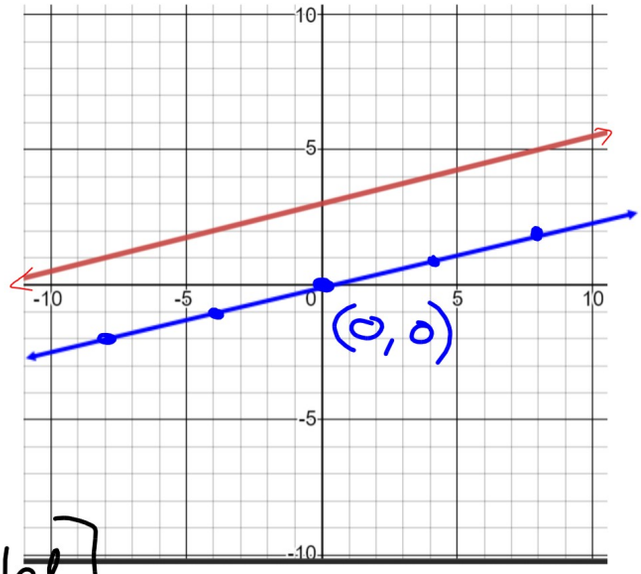
$m = \frac{3}{12}$

$= \frac{1}{4}$

(matches the value of "m" in the equation!)

The line $y = \frac{1}{4}x + 3$ is shown in the graph.

Sketch the graph of a **parallel** line that with a y-intercept ***(0, 0)***. State the slope of this line.

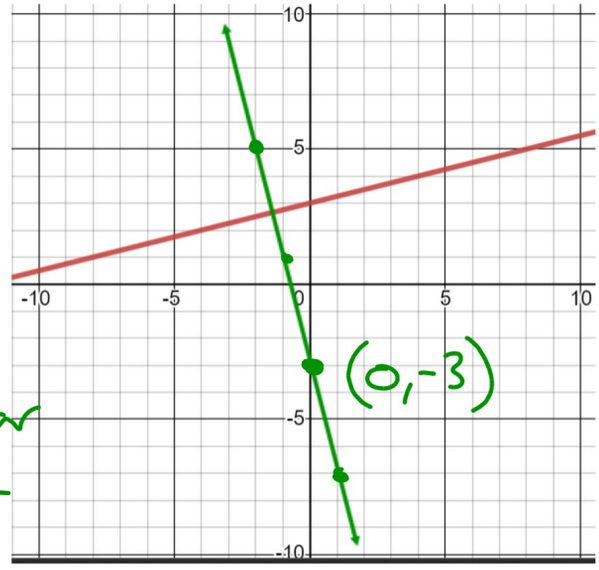


The slope is also $\frac{1}{4}$

[It has to be if it's parallel]

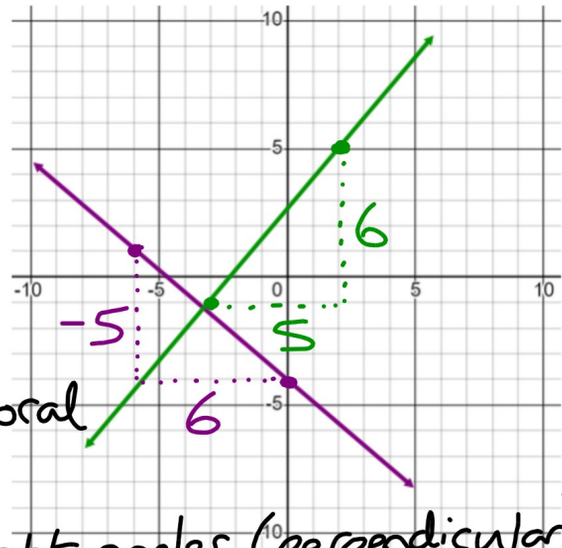
The line $y = \frac{1}{4}x + 3$ is shown in the graph.

Sketch the graph of a **perpendicular** line that passes through the point ***(0, -3)***. State the slope of this line.



New slope that is perpendicular to $\frac{1}{4} \rightarrow -4$

Two streets have houses at each end. On the first street, one house is located at ***(2, 5)*** and the other at ***(-3, -1)***. On the second street, one house is located at ***(-6, 1)*** and the other at ***(0, -4)***. Determine if these two streets intersect and form a right angle. Provide algebraic evidence to support your answer!



slope $= \frac{6}{5}$

slope $= \frac{-5}{6}$

These slopes are the negative reciprocal of each other

$\Rightarrow$ they are at right angles (perpendicular)