

"same slope"



"opposite reciprocals"

# Parallel & Perpendicular Lines



• same slope

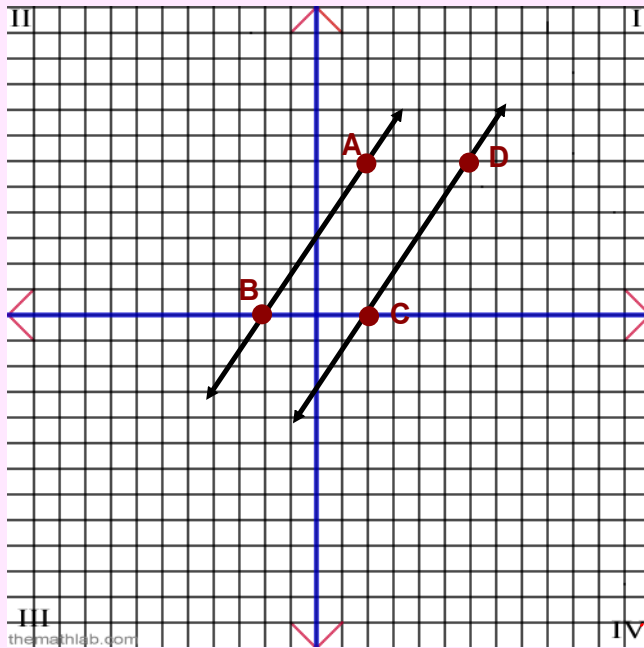
$$m = \frac{4}{3}$$

$$m \parallel = \frac{4}{3}$$

# Parallel Lines

Parallel Lines are two lines that are always the same distance apart, and that never intersect.

# Parallel Lines



Calculate the slope of segments AB & CD

$\begin{matrix} 1st \\ x_1, y_1 \end{matrix}$	$\begin{matrix} 2nd \\ x_2, y_2 \end{matrix}$	$\begin{matrix} 1st \\ x_1, y_1 \end{matrix}$	$\begin{matrix} 2nd \\ x_2, y_2 \end{matrix}$
$(-2, 0)$	$(2, 6)$	$(2, 0)$	$(6, 6)$
$AB = \frac{y_2 - y_1}{x_2 - x_1}$		$CD = \frac{y_2 - y_1}{x_2 - x_1}$	
$AB = \frac{6 - 0}{2 - (-2)}$		$CD = \frac{6 - 0}{6 - 2}$	
$AB = \frac{6}{4}$		$CD = \frac{6}{4}$	
$AB = \frac{3}{2}$		$CD = \frac{3}{2}$	

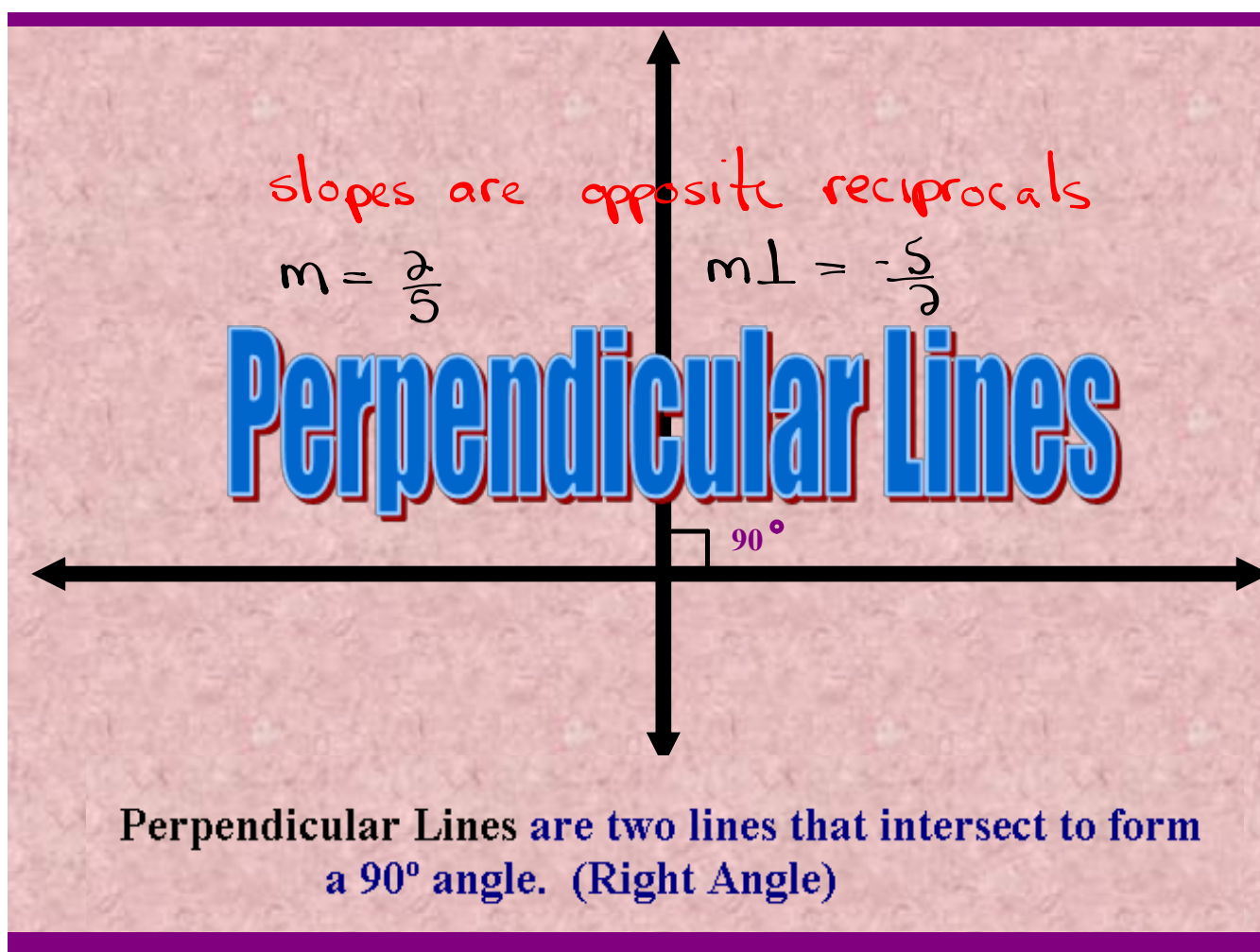
**What Do You Notice?**

they have the same slope (Parallel)

## Parallel Slopes are Equal

**Slope of AB = Slope of CD, therefore**

**$\overleftrightarrow{AB}$  is parallel to  $\overleftrightarrow{CD}$**



slopes are opposite reciprocals

$$m = \frac{2}{5}$$
$$m_{\perp} = -\frac{5}{2}$$

# Perpendicular Lines

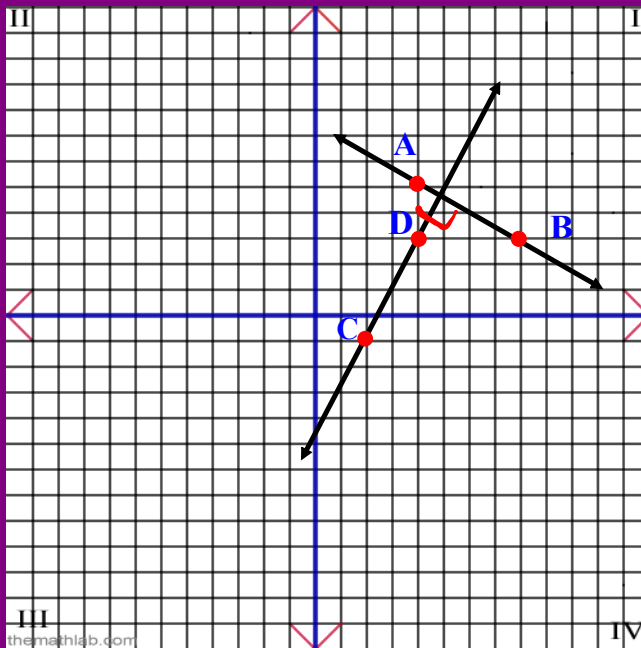
90°

**Perpendicular Lines are two lines that intersect to form a 90° angle. (Right Angle)**

1  
2  
3  
4  
5  
6  
7  
8  
9  
0  
=

# Perpendicular Lines

Calculate the slope of AB & DC



AB 1<sup>st</sup> (4, 5) 2<sup>nd</sup> (8, 3)

$$AB = \frac{3-5}{8-4}$$

$$AB = \frac{-2}{4} = \left(-\frac{1}{2}\right)$$

CD 1<sup>st</sup> (2, -1) 2<sup>nd</sup> (4, 3)

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

$$CD = \frac{4}{2} = \left(\frac{2}{1}\right)$$

What Do You Notice?

the slopes are opposite reciprocals (Perpendicular)

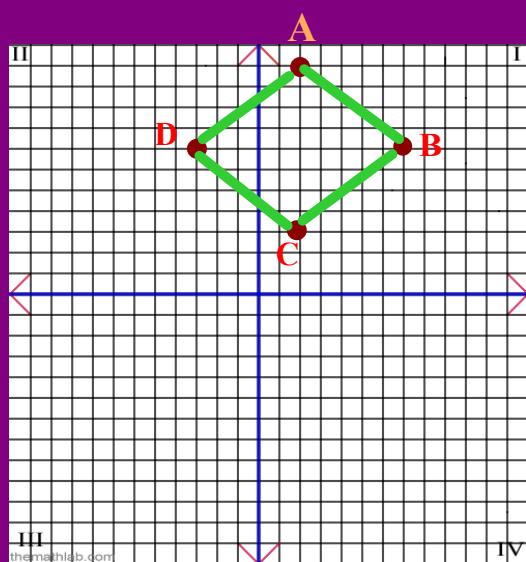
Therefore if the slopes of two lines are

**OPPOSITE RECIPROCAL**

we can say the lines are perpendicular

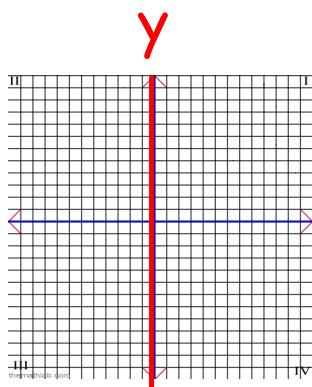
**Therefore AB is perpendicular to DC**

Determine whether or not the following figure is a rectangle.





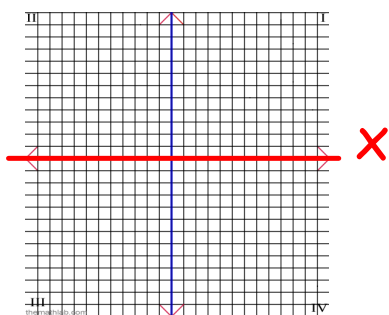
What is the slope of the y-axis?



Vertical line

$$\text{slope} = m = \frac{\perp}{0} \text{ undefined}$$

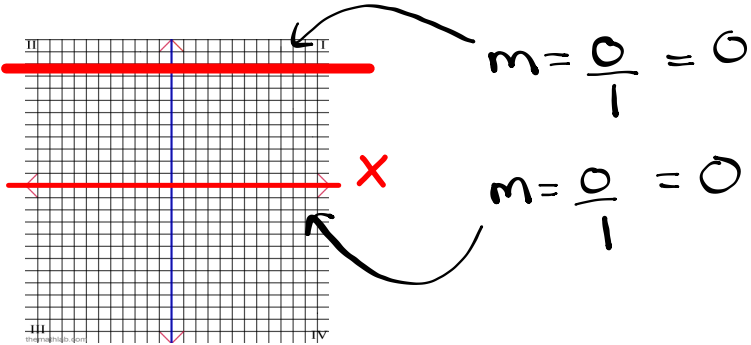
What is the slope of the x-axis?



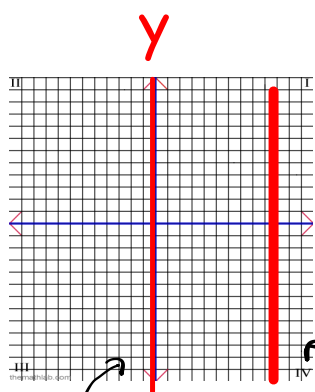
Horizontal line

$$\text{slope} = m = \frac{0}{1} = 0$$

*same slope*  
What is the slope parallel to the x-axis?



What is the slope parallel to the y-axis?



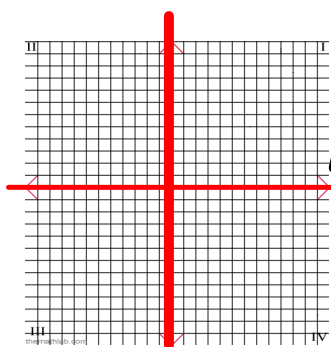
$m = \frac{0}{1}$

$m = \frac{0}{1}$

$m = \text{undefined}$

$m = \text{undefined}$

What is the slope perpendicular to the x-axis?

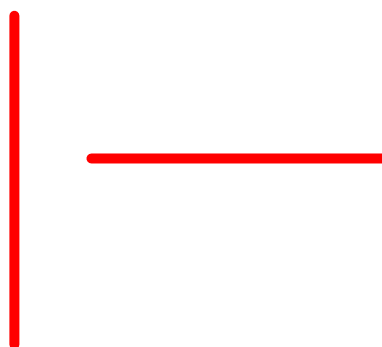
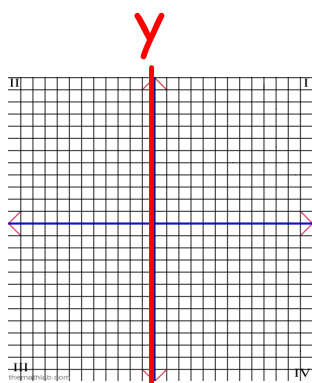


$$m = \frac{0}{1} = 0$$

$$m = \frac{-1}{0} = \text{undefined}$$



What is the slope perpendicular to the y-axis?



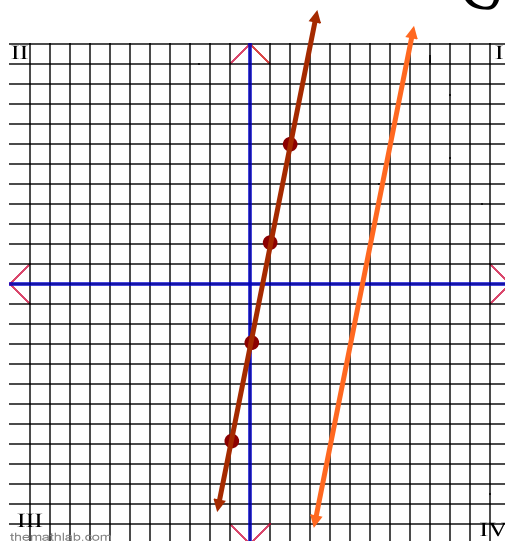
Same slope  $y = \underline{m}x + \underline{b}$

State the slope parallel to  $y = \underline{5}x - \underline{3}$ .

•  $y = mx + b$

where  $m = \text{slope}$   
 $b = \text{y-int}$

$m = 5$   
 $|m| = 5$



opposite reciprocals

$$y = mx + b$$

State the slope perpendicular to  $y = \frac{4}{5}x - 3$

$$m = \frac{4}{5}$$

$$m_{\perp} = -\frac{5}{4}$$



same slope

State the slope parallel to  $y = -8x + 7$

$$m = -8$$

$$m_{||} = -8$$

opposite reciprocals  
State the slope perpendicular to  $y = -\frac{2}{3}x - 4$

$$m = -\frac{2}{3}$$

$$m_{\perp} = \frac{3}{2}$$

State the slope perpendicular to  $y = -2x + 8$

$$m = -2$$

$$m_{\perp} = \frac{1}{2}$$