

## 6.5 Parallel and Perpendicular Lines

Parallel lines are lines in the same plane that never intersect.

Perpendicular lines are lines that intersect to form right angles.

Page 1

Parallel lines have the same slope. They must rise and run exactly the same way in order to never intersect on the plane.

To determine whether two lines are parallel, you must determine if they have the same slope.

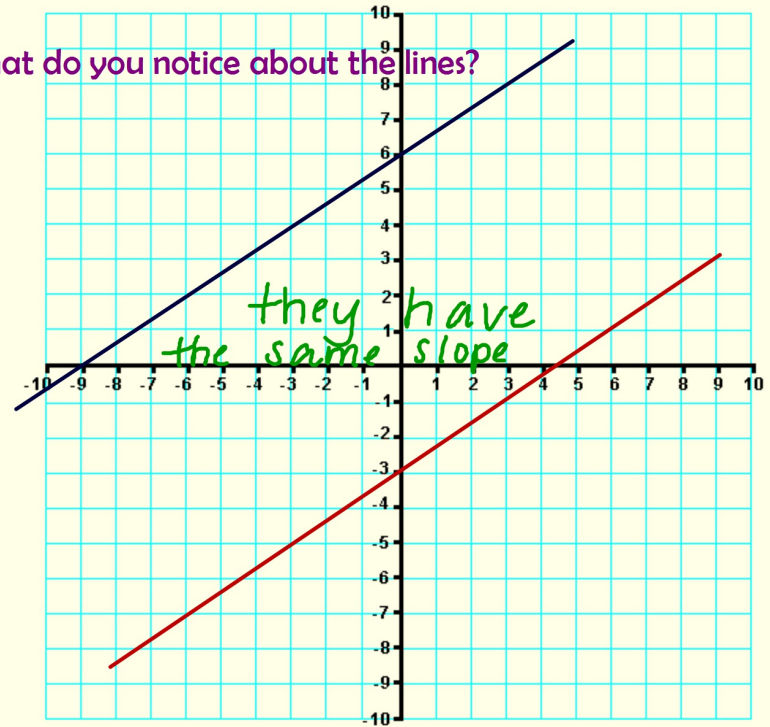
Take  $-6x + 8y = -24$  and  $y = \frac{3}{4}x - 7$ . Are the slopes the same?

$$\begin{aligned} &+6x \quad +bx \\ \frac{8y}{8} &= \frac{6x-24}{8} \\ y &= \frac{6}{8}x - 3 \\ y &= \frac{3}{4}x - 3 \end{aligned}$$

slopes =  
lines //

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What do you notice about the lines?



Page 2

We can also write equations for lines that are parallel.

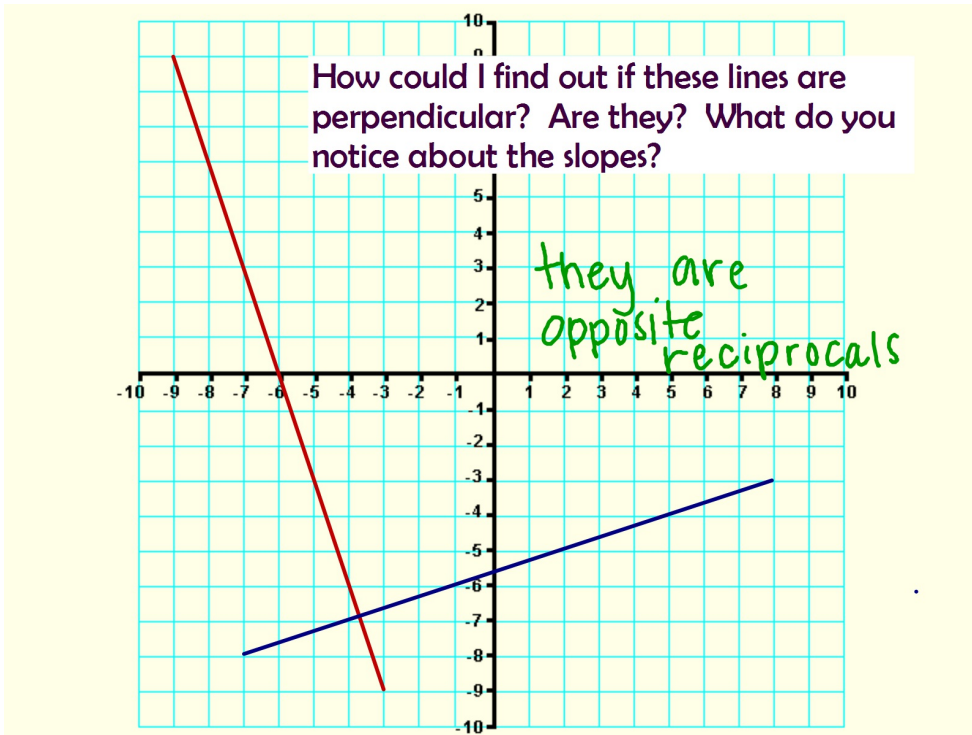
Write the equation for the line that contains  $(2, -6)$  and is parallel to  $y = 3x + 9$

$$\begin{aligned} y + 6 &= 3(x - 2) \\ y + 6 &= 3x - 6 \\ -6 & \quad -6 \\ y &= 3x - 12 \end{aligned}$$

Write the equation for the line that contains  $(-2, 3)$  and is parallel to  $y = \frac{5}{2}x - 4$

$$\begin{aligned} y - 3 &= \frac{5}{2}(x + 2) \\ y - 3 &= \frac{5}{2}x + 5 \\ +3 & \quad +3 \\ y &= \frac{5}{2}x + 8 \end{aligned}$$

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Write the equation for the line that contains (1, 8) and is perpendicular to  $y = \frac{3}{4}x + 1$

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

$$y - 8 = -\frac{4}{3}(x - 1)$$

$$y - 8 = -\frac{4}{3}x + \frac{4}{3}$$

$$+ 8 \qquad + 8$$

$$y = -\frac{4}{3}x + 9\frac{1}{3}$$

Write the equation for the line that contains (6, 2) and is perpendicular to  $y = -2x + 7$

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

$$y - 2 = \frac{1}{2}(x - 6)$$

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

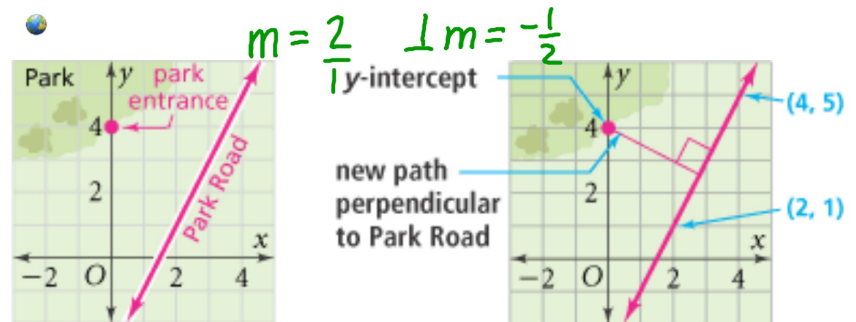
$$+ 2 \qquad + 2$$

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

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To find an equation for a perpendicular line, you have to have the opposite reciprocal of the slope of the other line. Opposite means change the sign + to - or - to + and reciprocal means flip the fraction, just to review some vocabulary.

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a path perpendicular to Park Road that goes through (0, 4) and can be used as the entrance to the park.

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

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$\overline{AB}$  and  $\overline{CD}$  lie in the standard coordinate plane. The coordinates of the points are  $A(4, 4)$ ,  $B(-5, -5)$ ,  $C(2, 3)$ , and  $D(-5, -4)$ . What is the relationship between these segments?

- A.  $\overline{AB}$  and  $\overline{CD}$  are parallel.  $m = m$   
 B.  $\overline{AB}$  and  $\overline{CD}$  are perpendicular.  $m = -\frac{1}{m}$   
 C.  $\overline{AB}$  and  $\overline{CD}$  intersect but are not perpendicular.  
 D.  $\overline{AB}$  and  $\overline{CD}$  do not intersect but are not parallel.

$$\frac{-5-4}{-5-4} = \frac{-9}{-9} = 1$$

$$\frac{-4-3}{-5-2} = \frac{-7}{-7} = 1$$

homework  
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