Equations for a Line

- Slope-Intercept Form $y = mx + b$
- Standard Form $Ax + By = C$
- Point-Slope Form $y - y_1 = m(x - x_1)$
- Horizontal Lines $y = \#$
- Vertical Lines $x = \#$

Sec 6-5: Parallel and Perpendicular Lines

Two lines are Parallel if they:
- Have the same slope
- Different y-intercepts

Two lines are Perpendicular if they:
- Have opposite reciprocal slopes
- y-intercepts don't matter

Find the opposite reciprocal of each number:

	Opposite Reciprocal
-9	$\frac{1}{9}$
$\frac{1}{7}$	$-\frac{7}{1}$

	Opposite Reciprocal
-3.5	$\frac{10}{35} = \frac{2}{7}$
	$-\frac{35}{10}$
0.73	$-\frac{100}{73}$
	$\frac{73}{100}$

$3\frac{1}{2} = \frac{7}{2}$

How do you tell if numbers are opposite reciprocals?

Is each pair of numbers opposite reciprocals?

-2 and 0.5 → $\frac{1}{2}$ Yes

$\frac{5}{3}$ and -0.6 $= -\frac{6}{10} = -\frac{3}{5}$ Yes

1.6 and -0.625

$\frac{16}{10} = \frac{8}{5}$ $-\frac{625}{1000} = -\frac{5}{8}$ Yes

The product of any number and its reciprocal is **1**

$\frac{5}{2} \cdot \frac{2}{5} = 1$

The product of OPPOSITE RECIPROCALS is **-1**

$\frac{5}{2} \cdot \frac{-2}{5} = -1$

Is each pair of lines parallel?

1. $y = -2x + 4$ $m = -2$

   $y = -2 + 4x$ $m = 4$

   Slopes aren't the same NO

2. $y = 3x - 7$ $m = 3$

   $y = 3$ $m = 0$

   Slopes aren't the same NO

3. $y = -\frac{1}{2}x + 7$ $m = -\frac{1}{2}$, $b = 7$

   $4x + 8y = 24$ $m = -\frac{1}{2}$, $b = 3$

   $\frac{8y}{8} = \frac{24 - 4x}{8}$

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

   Yes: Slopes are equal and y-int are different

4. $y = 6x - 1$ $m = 6$

   $6x - 2y = 8$ $m = 3$

   NO

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

   Slopes aren't the same

Is each pair of lines perpendicular?

1. $y = 3x - 8$

   $y = -3x + 5$

   NO slopes aren't opposite reciprocals

2. $y = 4x + 20$

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

   NO slopes aren't opposite reciprocals

3. $y = 2x - 5$

   NO $6x - 3y = 15$

   $y = \frac{15 - 6x}{-3} = -5 + 2x$

   these are the same line

4. $y = 9$ HORIZ

   $x = 9$ VERT

   YES

Tell if each pair of lines are parallel, perpendicular, or neither.

1. $y = 1.5x + 8$ $m = 1.5 = \frac{3}{2}$

   $y = -\frac{2}{3}x + 6$ $m = -\frac{2}{3}$

   ⊥

   Slopes are Opposite Reciprocals so the lines are Perpendicular

2. $y = 6x - 7$ $m = 6$ $b = -7$

   $24x - 4y = 28$ $m = 6$ $b = -7$

   $y = \frac{28 - 24x}{-4}$

   $= -7 + 6x$

   these are the same line so the can't be parallel or perpendicular

   Neither

Tell if each pair of lines are parallel, perpendicular, or neither.

3.

$y = x + 3$ $\quad m = 1 = \frac{1}{1}$

$y = -x - 5$ $\quad m = -1 = \frac{-1}{1}$

⊥

Slopes are Opposite Reciprocals so the lines are Perpendicular

4.

$y = -8x + 3$ $\quad m = -8$, $b = 3$

$16x + 2y = 11$ $\quad m = -8$, $b = 11/2$

$-16x \quad -16x$

$\frac{2y}{2} = \frac{11 - 16x}{2}$

$y = \frac{11}{2} - 8x$

Same Slope but different y-intercept:

Lines area Parallel ||

Use this equation: $y = 4x - 9$ $\quad m = 4$

Write the equation of a line that is parallel to this line and passes through the point (5,1) $\quad m = 4$

$y - 1 = 4(x - 5)$

Write the equation of a line that is perpendicular to this line and passes through the point (-8, 7) $\quad m = -1/4$

$y - 7 = -1/4(x + 8)$

Use this equation: $6x + 3y = 12$

$-6x \quad -6x$

$\frac{3y}{3} = \frac{12 - 6x}{3}$ $\quad y = 4 - 2x$ $\quad m = -2$

Write the equation of a line that is parallel to this line and passes through the point (-7,4) $\quad m = -2$

$y - 4 = -2(x + 7)$

Write the equation of a line that is perpendicular to this line and passes through the point (4, 10) $\quad m = 1/2$

$y - 10 = 1/2(x - 4)$

Use this equation: $y = -6$ $\quad \rightarrow$ Horiz

Write the equation of a line that is parallel to this line and passes through the point (13, -8) $\quad$ Horiz

$y = -8$

Write the equation of a line that is perpendicular to this line and passes through the point (-2, -7) $\quad$ Vertical

$x = -2$