

Objective: Determine whether two lines have parallel or perpendicular slopes.

Warm Up:

Complete the "City Grid" Activity

Vocabulary:

Parallel lines: two lines that have the same slope and different y-intercepts (lines that never intersect)

Perpendicular lines: two lines that have opposite reciprocal slopes (lines that intersect at right angles) $\rightarrow \frac{3}{2}$ and $-\frac{2}{3}$

Examples:

1. Determine if the lines are parallel, perpendicular or neither. Justify your answer using mathematical evidence.

a. $y = -4x + 7$
 $y = -4x + 2$

b. $y = \frac{3}{2}x - 6$
 $y = 2x - 6$

c. $2x + y = 8 \Rightarrow y = -2x + 8$
 $y = 2x + 2$

Parallel - same slope (-4), different y-intercepts

Neither - Slopes aren't the same or opposite reciprocals

Neither - Slopes aren't the same and while they are opposite, they aren't reciprocals

2. Write two equations that are perpendicular.

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

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

3. Write two equations that are parallel.

$y = 3x + 8$
 $y = 3x - 6$

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

4. Write the equation of a line that is parallel to the given line and goes through the given point (recall what we know about parallel lines). (Start with point-slope form and transform it to slope-intercept form.)

a. $y = 3x + 2$ $m = 3$
 Point: (0, -3)

same slope!

b. $y = -8x + 4$ $m = -8$
 Point: (2, 4)

Point-slope: $y + 3 = 3(x - 0)$
 $y + 3 = 3x$
 $-3 \quad -3$

Point-slope: $y - 4 = -8(x - 2)$
 $y - 4 = -8x + 16$
 $+4 \quad +4$

Slope-intercept: $y = 3x - 3$

Slope-intercept: $y = -8x + 20$

→ opposite reciprocal slopes

5. Write the equation of a line that is perpendicular to the given line and goes through the given point (recall what we know about perpendicular lines). Start with point-slope form and transform it to slope-intercept form.

a. $y = -x + 3 \rightarrow m = -1$

Point: $(0, -10)$

Slope: $\frac{1}{1}$

Point-slope: $y + 10 = 1(x - 0)$

$$\begin{array}{r} y + 10 = x \\ -10 \quad -10 \end{array}$$

Slope-intercept: $y = x - 10$

b. $y = \frac{3}{2}x - 6 \rightarrow m = \frac{3}{2}$

Point: $(-1, 3)$

Slope: $-\frac{2}{3}$

Point-slope: $y - 3 = -\frac{2}{3}(x + 1)$

$$\begin{array}{r} y - 3 = -\frac{2}{3}x - \frac{2}{3} \\ +3 \quad \quad +3 \end{array}$$

Slope-intercept: $y = -\frac{2}{3}x + \frac{7}{3}$

$m = \frac{y_2 - y_1}{x_2 - x_1}$

6. Write two equations that are parallel to each other and go through the given points.

→ same slope

Line A: $(2, 5)$ and $(3, 7)$

Line B: $(-1, 8)$

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

Line A: $y - 5 = 2(x - 2)$

Line B: $y - 8 = 2(x + 1)$

→ opposite reciprocal slopes

7. Write two equations that are perpendicular to each other and go through the given points.

Line A: $(-3, 10)$ and $(2, 15)$

Line B: $(-1, 8)$

$m = \frac{15-10}{2-(-3)} = \frac{5}{5} = 1$

$m = -1$

Line A: $y - 10 = 1(x + 3)$

Line B: $y - 8 = -1(x + 1)$