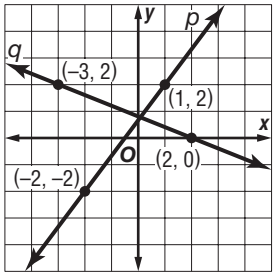
NAME _____ DATE _____ PERIOD _____

3-3 Study Guide and Intervention

Slopes of Lines

Slope of a Line The slope m of a line containing two points with coordinates (x_1, y_1) and (x_2, y_2) is given by the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$, where $x_1 \neq x_2$.

Example **Find the slope of each line.**



For line p, substitute (1, 2) for (x_1, y_1) and (−2, −2) for (x_2, y_2).

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

$$= \frac{-2 - 2}{-2 - 1} \text{ or } \frac{4}{3}$$

For line q, substitute (2, 0) for (x_1, y_1) and (−3, 2) for (x_2, y_2).

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

$$= \frac{2 - 0}{-3 - 2} \text{ or } -\frac{2}{5}$$

Exercises

Determine the slope of the line that contains the given points.

1. $J(0, 0)$, $K(-2, 8)$ **−4**

2. $R(-2, -3)$, $S(3, -5)$ $-\frac{2}{5}$

3. $L(1, -2)$, $N(-6, 3)$ $-\frac{5}{7}$

4. $P(-1, 2)$, $Q(-9, 6)$ $-\frac{1}{2}$

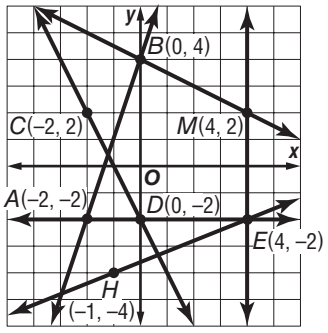
5. $T(1, -2)$, $U(6, -2)$ **0**

6. $V(-2, 10)$, $W(-4, -3)$ $\frac{13}{2}$

Find the slope of each line.

7. $\overleftrightarrow{AB}$ **3**

8. $\overleftrightarrow{CD}$ **−2**



9. $\overleftrightarrow{EM}$ **undefined**

10. $\overleftrightarrow{AE}$ **0**

11. $\overleftrightarrow{EH}$ $\frac{2}{5}$

12. $\overleftrightarrow{BM}$ $-\frac{1}{2}$

Lesson 3-3

NAME _____ DATE _____ PERIOD _____

3-3 Study Guide and Intervention *(continued)*

Slopes of Lines

Parallel and Perpendicular Lines If you examine the slopes of pairs of parallel lines and the slopes of pairs of perpendicular lines, where neither line in each pair is vertical, you will discover the following properties.

Two lines have the same slope if and only if they are parallel.

Two lines are perpendicular if and only if the product of their slopes is -1.

Example **Determine whether $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ are *parallel*, *perpendicular*, or *neither* for $A(-1, -1)$, $B(1, 5)$, $C(1, 2)$, $D(5, 4)$. Graph each line to verify your answer.**

Find the slope of each line.

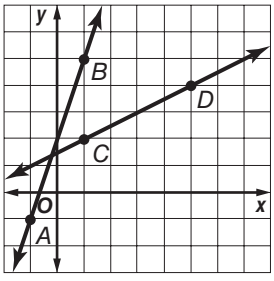
slope of $\overleftrightarrow{AB} = \frac{5-(-1)}{1-(-1)} = \frac{6}{2}$ or 3 slope of $\overleftrightarrow{CD} = \frac{4-2}{5-1} = \frac{2}{4} = \frac{1}{2}$

The two lines do not have the same slope, so they are *not* parallel.
To determine if the lines are perpendicular, find the product of their slopes

$3\left(\frac{1}{2}\right) = \frac{3}{2}$ or 1.5 Product of slope for $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$

Since the product of their slopes is *not* –1, the two lines are *not* perpendicular.
Therefore, there is no relationship between $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$.

When graphed, the two lines intersect but not at a right angle.



Exercises

Determine whether $\overleftrightarrow{MN}$ and $\overleftrightarrow{RS}$ are *parallel*, *perpendicular*, or *neither*. Graph each line to verify your answer.

See students' work

1. $M(0, 3)$, $N(2, 4)$, $R(2, 1)$, $S(8, 4)$
parallel

2. $M(-1, 3)$, $N(0, 5)$, $R(2, 1)$, $S(6, -1)$
perpendicular

3. $M(-1, 3)$, $N(4, 4)$, $R(3, 1)$, $S(-2, 2)$
neither

4. $M(0, -3)$, $N(-2, -7)$, $R(2, 1)$, $S(0, -3)$
parallel

Graph the line that satisfies each condition.

5. slope = 4, passes through (6, 2)

6. passes through $H(8, 5)$, perpendicular to $\overleftrightarrow{AG}$ with $A(-5, 6)$ and $G(-1, -2)$

7. passes through $C(-2, 5)$, parallel to $\overleftrightarrow{LB}$ with $L(2, 1)$ and $B(7, 4)$