NAME _____ DATE _____

8–3 Slope of a Line

Objective: To find the slope of a line.

Vocabulary

Slope If (x_1, y_1) and (x_2, y_2) are *any* two different points on a line,

$$\text{Slope} = \frac{\text{rise}}{\text{run}} = \frac{\text{difference between } y\text{-coordinates}}{\text{difference between } x\text{-coordinates}} = \frac{y_2 - y_1}{x_2 - x_1}.$$

Positive slope The slope of a line that rises from left to right is positive.

Negative slope The slope of a line that falls from left to right is negative.

Zero slope A horizontal line has slope 0.

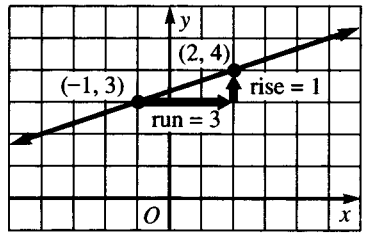
No slope A vertical line has no slope.

Collinear points Points that lie on the same line.

Example 1 Find the slope of the line through $(-1, 3)$ and $(2, 4)$.

Solution Let $(x_1, y_1) = (-1, 3)$ and $(x_2, y_2) = (2, 4)$.

$$\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - 3}{2 - (-1)} = \frac{1}{3}$$



Example 2 Find the slope of the line through $(1, -3)$ and $(4, -3)$.

Solution $\text{Slope} = \frac{-3 - (-3)}{4 - 1} = \frac{0}{3} = 0$ The line has slope 0.

Example 3 Find the slope of the line through $(2, -1)$ and $(2, 5)$.

Solution $\text{Slope} = \frac{5 - (-1)}{2 - 2} = \frac{6}{0}$ (undefined) The line has *no* slope.

Find the slope of the line through the given points.

1. $(5, -6), (2, -4)$
2. $(-3, 6), (-5, 4)$
3. $(0, 1), (2, -2)$
4. $(1, 2), (4, 6)$
5. $(2, 1), (8, -2)$
6. $(-1, 5), (0, 0)$
7. $(4, 3), (2, 7)$
8. $(5, 2), (-1, 2)$
9. $(-3, -4), (1, 2)$
10. $(-5, 2), (7, -6)$
11. $(1, 4), (-3, 0)$
12. $(4, 4), (-4, 6)$
13. $(8, -1), (6, 0)$
14. $(3, -1), (-2, 4)$
15. $(7, 4), (7, -4)$

NAME _____ DATE _____

8–3 Slope of a Line *(continued)*

Example 4 Find the slope of the line with the equation $2x + 3y = 6$.

Solution 1. First find any two points on the line.

If $x = 0$: $2(0) + 3y = 6$, $3y = 6$, $y = 2$. One point: (0,2)

If $y = 0$: $2x + 3(0) = 6$, $2x = 6$, $x = 3$. Another point: (3,0)

2. Now use the slope formula. Slope $= \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - 2}{3 - 0} = -\frac{2}{3}$

Find the slope of each line. If the line has no slope, say so.

16. $y = 2x - 1$ **17.** $y = 3x + 2$ **18.** $y = 4 - 2x$ **19.** $y = 6 - 3x$

20. $6x + 2y = 3$ **21.** $2x - 5y = 10$ **22.** $3x + 6y = 12$ **23.** $x - 2y = 4$

24. $y = 5$ **25.** $y + 2 = 0$ **26.** $x = 1$ **27.** $2x - 3 = 0$

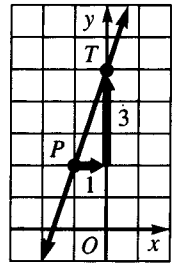
Example 5 Draw a line through the point $P(-1, 2)$ with a slope of 3.

Solution 1. Plot point P.

2. Write the slope as $\frac{3}{1}$. Rise $= 3$. Run $= 1$.

3. From P, measure 1 unit to the right and 3 units up to locate a second point, T.

4. Draw the line through P and T.



Through the given point, draw a line with the given slope.

28. $A(2, 1)$; slope 2 **29.** $B(-2, 3)$; slope -3 **30.** $C(1, -4)$; slope 4

31. $D(-3, -2)$; slope $\frac{2}{3}$ **32.** $E(-4, 1)$: slope $-\frac{1}{2}$ **33.** $F(3, 0)$; slope $-\frac{3}{4}$

34. $G(-2, -1)$; slope $\frac{2}{5}$ **35.** $H(-5, 2)$; slope -2 **36.** $I(2, -3)$; slope -1

Mixed Review Exercises

Solve.

1. $\frac{x + 2}{2} + \frac{x}{4} = 0$ **2.** $-3 = \frac{9b}{4}$ **3.** $\frac{2 + z}{3z} = \frac{4}{z}$ **4.** $-3(y + 2) = 9$

Evaluate if $x = -2$, $y = 1$, $a = 3$, and $b = -4$.

5. $\frac{a + 2b}{2a - b}$ **6.** $3(x + 3y)$ **7.** $\frac{1}{2}(3x + 4y)$ **8.** $(2a - 3b) + 5$