

8.4 The Slope of a Line

Goal: Find and interpret slopes of lines.

Vocabulary

Slope:

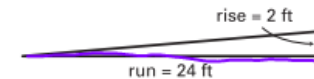
Rise:

Run:

Example 1 Finding Slope

A building's access ramp has a rise of 2 feet and a run of 24 feet. Find its slope.

$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{2}{24} = \frac{1}{12}$$



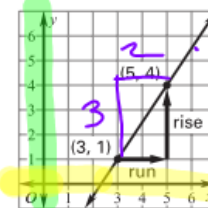
Answer: The access ramp has a slope of $\frac{1}{12}$.

Slope of a Line

Given two points on a nonvertical line, you can find the slope m of the line using this formula.

$$m = \frac{\text{rise}}{\text{run}} = \frac{\text{difference of } y\text{-coordinates}}{\text{difference of } x\text{-coordinates}}$$

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



$$\begin{matrix} (5, 4) & (3, 1) \\ x_2 & x_1 \\ y_2 & y_1 \end{matrix}$$

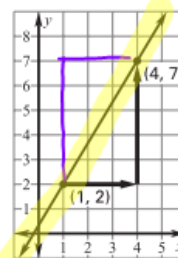
slope: $\frac{y_2 - y_1}{x_2 - x_1}$

Example 2 Finding Positive and Negative Slope

Find the slope of the line shown.

When you calculate a slope, be sure to use the x- and y-coordinates of the two points in the same order.

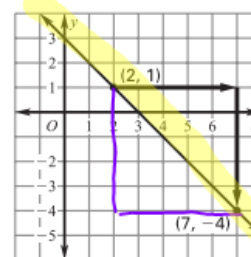
a. $m = \frac{\text{rise}}{\text{run}} = \frac{\text{difference of y-coordinates}}{\text{difference of x-coordinates}}$
 $= \frac{y_2 - y_1}{x_2 - x_1} = \frac{7 - 2}{4 - 1} = \frac{5}{3}$



(x_2, y_2) (x_1, y_1)

Answer: The slope is $\frac{5}{3}$.

b. $m = \frac{\text{rise}}{\text{run}} = \frac{\text{difference of y-coordinates}}{\text{difference of x-coordinates}}$
 $= \frac{y_2 - y_1}{x_2 - x_1} = \frac{-4 - 1}{7 - 2} = \frac{-5}{5} = -1$



Answer: The slope is -1 .

Checkpoint Find the slope of the line through the given points.

slope
 $\frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$

1. $(2, -2), (0, 4)$
 x_1, y_1, x_2, y_2
 $\frac{4 - (-2)}{0 - 2} = \frac{6}{-2} = -3$

$\frac{-3}{1}$ or -3

$\frac{3}{-1}$ or $-\frac{3}{1}$

2. $(7, 5), (3, 2)$
 x_1, y_1, x_2, y_2
 $\frac{2 - 5}{3 - 7} = \frac{-3}{-4} = \frac{3}{4}$

$\frac{3}{4}$

3. $(-2, 4), (6, 2)$
 x_1, y_1, x_2, y_2
 $\frac{2 - 4}{6 - (-2)} = \frac{-2}{8} = -\frac{1}{4}$

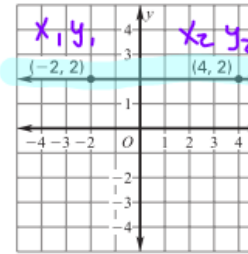
$-\frac{1}{4}$ or $\frac{1}{-4}$

$-\frac{1}{4}$

Example 3 Zero and Undefined Slope

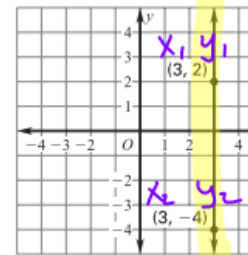
Find the slope of the line shown.

$$\begin{aligned}
 \text{a. } m &= \frac{\text{rise}}{\text{run}} \\
 &= \frac{\text{difference of y-coordinates}}{\text{difference of x-coordinates}} \\
 &= \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - 2}{4 - (-2)} \\
 &= \frac{0}{6} = 0
 \end{aligned}$$



Answer: The slope is 0 . horizontal lines have zero slope

$$\begin{aligned}
 \text{b. } m &= \frac{\text{rise}}{\text{run}} \\
 &= \frac{\text{difference of y-coordinates}}{\text{difference of x-coordinates}} \\
 &= \frac{y_2 - y_1}{x_2 - x_1} = \frac{-4 - 2}{3 - 3} = \\
 &= \frac{-6}{0}
 \end{aligned}$$



Answer: The slope is undefined vertical lines have

✔ **Checkpoint** Find the slope of the line through the given points. undefined slope
Tell whether the slope is positive, negative, zero, or undefined.

4. $(3, -1), (3, 5)$

5. $(-2, 5), (3, 4)$

6. $(1, -1), (7, -1)$