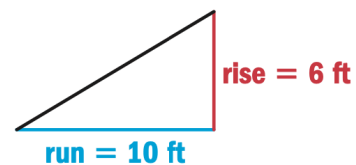Name_____

The Slope of a Line (8.4)

Vocab.

- The _____ of a line is the ratio of the line's vertical change, called the _____ , to its horizontal change, called the _____.

Example 1: Finding Slope

A wakeboard ramp has a rise of 6 feet and a run of 10 feet. Find its slope.

Slope =

rise = 6 ft

run = 10 ft

Answer:

**Note: To determine the slope of a line in a coordinate plane, you can find the ratio of the vertical change between two points on the line and the horizontal change between the points.
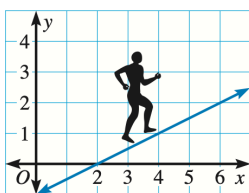
Slope of a Line

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

$$m = \frac{\text{rise}}{\text{run}}$$

$$= \frac{\text{difference of } y\text{-coordinates}}{\text{difference of } x\text{-coordinates}}$$
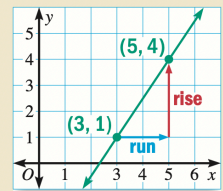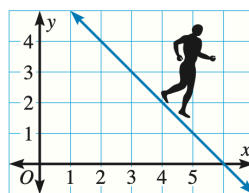
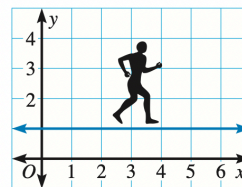**Example** $m = \frac{4-1}{5-3} = \frac{3}{2}$

Comparing Slopes You can use the diagrams below to compare the slopes of different lines. Imagine that you are walking *to the right*.
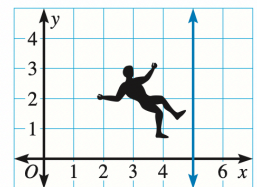

Positive slope
If the line rises, the slope is *positive*.

Negative slope
If the line falls, the slope is *negative*.

Zero slope
If the line is horizontal, the slope is *zero*.

Undefined slope
If the line is vertical, the slope is *undefined*.
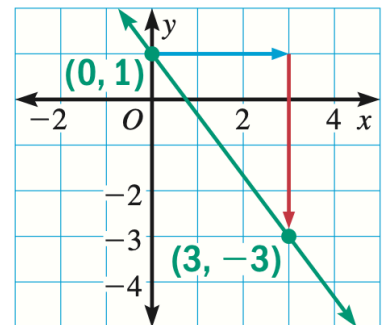
Example 2: Finding positive and negative slope

Find the slope of the line shown.

a.
$$m = \frac{\textcolor{red}{\mathbf{rise}}}{\textcolor{red}{\mathbf{run}}} = \frac{\text{difference of } y\text{-coordinates}}{\text{difference of } x\text{-coordinates}}$$

Answer:

b.
$$m = \frac{\textcolor{red}{\mathbf{rise}}}{\textcolor{red}{\mathbf{run}}} = \frac{\text{difference of } y\text{-coordinates}}{\text{difference of } x\text{-coordinates}}$$

Answer:

Independent Practice: Find the slope of the line through the given points.

1. (1,2),(4,7)

2. (-2,5),(6,1)

Example 3: Zero and undefined slope

a.
$$m = \frac{\textcolor{red}{\mathbf{rise}}}{\textcolor{red}{\mathbf{run}}} = \frac{\text{difference of } y\text{-coordinates}}{\text{difference of } x\text{-coordinates}}$$
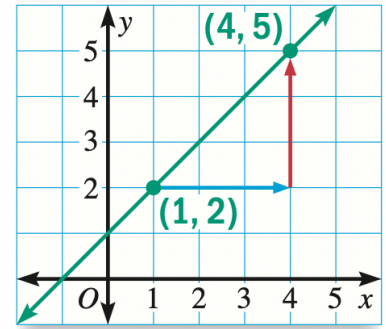
Answer:

b. $m = \dfrac{\textbf{rise}}{\textbf{run}} = \dfrac{\text{difference of } y\text{-coordinates}}{\text{difference of } x\text{-coordinates}}$
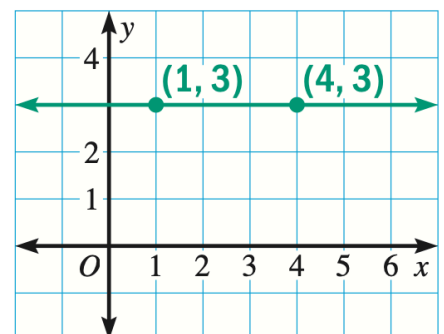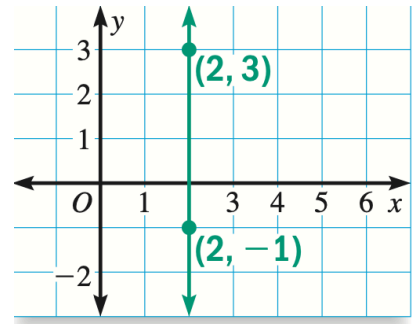

Answer:

Independent practice: Find the slope of the line through the given points. Tell whether the slope is *positive, negative, zero, or undefined.*

1. *(2,3),(4,5)*   2. *(6,3),(6,-1)*   3. *(-7,4),(5,4)*

Omit example 4.

Slope Intercept Form (8.5)

Slope-Intercept Form

Words A linear equation of the form $y = mx + b$ is said to be in **slope-intercept form** . The slope is **m** and the y-intercept is **b**.

Algebra $y = mx + b$ **Numbers** $y = 2x + 3$
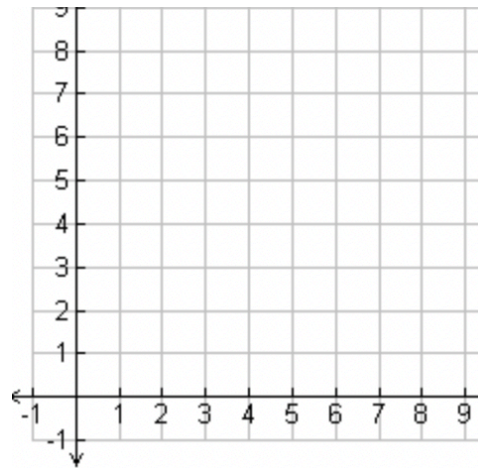
Example 1: Identifying the slope and y-intercept

a.   y=x-4   b.   3x+5y=10

Example 2: Graphing an equation in slope intercept form

Graph. $y = -\frac{2}{3}x + 4.$

Example 3: Using slope and y- intercept form in real life

The temperature at Earth's surface averages about 20□C. In the crust below the surface, the temperature rises by about 25□C per kilometer of depth.

a. Write an equation that approximates the temperature below Earth's surface as a function of depth.

b. Underground bacteria exist that can survive temperatures of up to 110□C. Find the maximum depth at which these bacteria can live.

**Note: Parallel and Perpendicular Lines: There is an important relationship between the slopes of two nonvertical lines that are parallel or perpendicular.
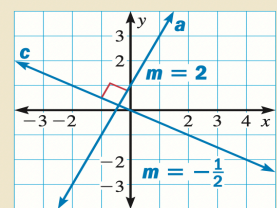
Slopes of Parallel and Perpendicular Lines

Two nonvertical parallel lines have the same slope. For example, the parallel lines a and b below both have a slope of 2.
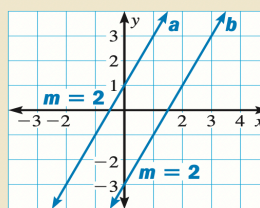
Two nonvertical perpendicular lines, such as lines a and c below, have slopes that are negative reciprocals of each other.

$a \parallel b$

$a \perp c$

Example 4: Finding Slopes of Parallel and Perpendicular Lines

Find the slope of a line that has the given relationship to the line with equation

4x + 3y = -18.

  a. Parallel to the line

b. Perpendicular to the line