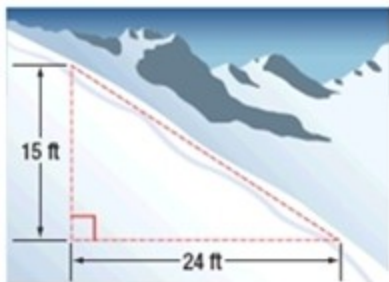


3-2 Slope

1. Find the slope of a ski run that descends 15 feet for every horizontal change of 24 feet.



SOLUTION:

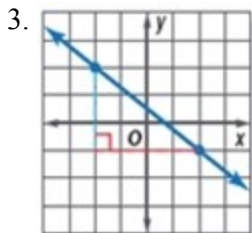
Slope is the ratio of the rise, or vertical change, to the run, or horizontal change. Use the definition of slope and rise = -15 feet and run = 24 feet. Simplify.

$$\begin{aligned}\text{slope} &= \frac{\text{rise}}{\text{run}} \\ m &= \frac{-15}{24} \text{ or } -\frac{5}{8}\end{aligned}$$

ANSWER:

$$-\frac{5}{8}$$

Find the slope of each line.



SOLUTION:

Slope is the ratio of the rise, or vertical change, to the run, or horizontal change. Use the definition of slope and rise = -3 units and run = 4 units. Simplify.

$$\begin{aligned}\text{slope} &= \frac{\text{rise}}{\text{run}} \\ m &= \frac{-3}{4} \text{ or } -\frac{3}{4}\end{aligned}$$

ANSWER:

$$-\frac{3}{4}$$

3-2 Slope

The points given in the table lie on a line. Find the slope of the line.

5.

x	0	1	2	3
y	3	5	7	9

SOLUTION:

Choose two points from the table to find the changes in the x - and y -values. Substitute the values from points (0, 3) and (3, 9) into the definition of slope. Simplify.

$$\text{slope} = \frac{\text{change in } y}{\text{change in } x}$$

$$m = \frac{9 - 3}{3 - 0}$$

$$m = \frac{6}{3} \text{ or } 2$$

ANSWER:

2

Find the slope of the line that passes through the pair of points.

7. $C(2, 5), D(3, 1)$

SOLUTION:

Use the slope formula. Substitute $(x_1, y_1) = (2, 5)$ and $(x_2, y_2) = (3, 1)$. Simplify.

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

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

$$m = \frac{-4}{1} \text{ or } -4$$

ANSWER:

-4

3-2 Slope

9. **Justify Conclusions** Wheelchair ramps for access to public buildings are allowed a maximum of one inch of vertical increase for every one foot of horizontal distance. Would a ramp that is 10 feet long and 8 inches tall meet this guideline? Explain your reasoning to a classmate.

SOLUTION:

Translate “maximum of one inch of vertical increase for every one foot of horizontal distance” into the inequality $m \leq \frac{1 \text{ in.}}{1 \text{ ft}}$ or $m \leq \frac{1}{12}$ when all units are inches and m is the slope of the wheelchair ramp. Given that the ramp would be 10 feet long and 8 inches tall, convert 10 feet to 120 inches. To find the slope of the ramp, use 8 inches for the rise and 120 inches for the run. This represents a slope of $\frac{8}{120}$ or $\frac{1}{15}$.

$\frac{1}{15} < \frac{1}{12}$, so the ramp meets the guidelines.

ANSWER:

yes; $\frac{1}{15} < \frac{1}{12}$

12. **Persevere with Problems** Two lines that are parallel have the same slope. Determine whether quadrilateral $ABCD$ is a parallelogram. Justify your reasoning.



SOLUTION:

Find the slope of each side of the parallelogram by finding the changes in the x - and y -values.

Slope of \overline{AB} : substitute the values from points (1, 0) and (9, 1) into the definition of slope. Simplify.

$$\text{slope} = \frac{\text{change in } y}{\text{change in } x}$$

$$m = \frac{1 - 0}{9 - 1}$$

$$m = \frac{1}{8}$$

Slope of \overline{BC} : substitute the values from points (9, 1) and (10, 4) into the definition of slope. Simplify.

$$\text{slope} = \frac{\text{change in } y}{\text{change in } x}$$

$$m = \frac{4 - 1}{10 - 9}$$

$$m = \frac{3}{1} \text{ or } 3$$

Slope of \overline{CD} : substitute the values from points (10, 4) and (2, 3) into the definition of slope. Simplify.

3-2 Slope

$$\text{slope} = \frac{\text{change in } y}{\text{change in } x}$$

$$m = \frac{3-4}{2-10}$$

$$m = \frac{-1}{-8} \text{ or } \frac{1}{8}$$

Slope of \overline{DA} : substitute the values from points (2, 3) and (1, 0) into the definition of slope. Simplify.

$$\text{slope} = \frac{\text{change in } y}{\text{change in } x}$$

$$m = \frac{0-3}{1-2}$$

$$m = \frac{-3}{-1} \text{ or } 3$$

\overline{AB} and \overline{CD} both have slope $\frac{1}{8}$, so these sides are parallel. \overline{BC} and \overline{DA} both have slope 3, so these sides are parallel. Since both pairs of sides are parallel, $ABCD$ is a parallelogram.

ANSWER:

$$\text{Slope of } \overline{AB}: m = \frac{1-0}{9-1} \text{ or } \frac{1}{8}$$

$$\text{Slope of } \overline{BC}: m = \frac{4-1}{10-9} \text{ or } 3$$

$$\text{Slope of } \overline{CD}: m = \frac{3-4}{2-10} \text{ or } \frac{1}{8}$$

$$\text{Slope of } \overline{DA}: m = \frac{0-3}{1-2} \text{ or } 3$$

Since \overline{AB} and \overline{CD} are parallel, and \overline{BC} and \overline{DA} are parallel, quadrilateral $ABCD$ is a parallelogram.

13. **Model with Mathematics** Give three points that lie on a line with each of the following slopes.

a. 5

b. $\frac{1}{5}$

c. -5

SOLUTION:

Sample answers are given.

a. 5

A slope of 5 could be rewritten $\frac{5}{1}$. Since slope is defined as $\frac{\text{Rise}}{\text{Run}}$, this slope is a rise of 5 and a run of 1. The first point (1, 1) is randomly chosen. The next point would be one unit to the right and five units up.

$$(1 + 1, 1 + 5) = (2, 6)$$

3-2 Slope

From there the next point would be one more unit to the right and another five units up.

$$(2 + 1, 6 + 5) = (3, 11)$$

b. $\frac{1}{5}$

Since slope is defined as $\frac{\text{Rise}}{\text{Run}}$, this slope is a rise of 1 and a run of 5. The first point (1, 1) is randomly chosen. The next point would be one unit to the right and five units up .

$$(1 + 5, 1 + 1) = (6, 2)$$

From there the next point would be one more unit to the right and another five units up.

$$(6 + 5, 2 + 1) = (11, 3)$$

c. -5

A slope of -5 could be rewritten $\frac{5}{-1}$. Since slope is defined as $\frac{\text{Rise}}{\text{Run}}$, this slope is a rise of 5 and a run of -1. The first point (1, 1) is randomly chosen. The next point would be one unit to the left and five units up.

$$(1 - 1, 1 + 5) = (0, 6)$$

From there the next point would be one more unit to the left and another five units up.

$$(0 - 1, 6 + 5) = (-1, 11)$$

ANSWER:

Sample answers are given.

a. (1, 1), (2, 6), (3, 11)

b. (1, 1), (6, 2), (11, 3)

c. (1, 1), (0, 6), (-1, 11)

3-2 Slope

15. Wyatt is flying a kite in the park. The kite is a horizontal distance of 24 feet from Wyatt's position and a vertical distance of 72 feet. Find the slope of the kite string.

SOLUTION:

Slope is the ratio of the rise, or vertical change, to the run, or horizontal change. Use the definition of slope and rise = 72 feet and run = 24 feet. Simplify.

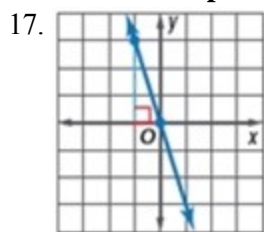
$$\text{slope} = \frac{\text{rise}}{\text{run}}$$

$$m = \frac{72}{24} \text{ or } 3$$

ANSWER:

3

Find the slope of the line.



SOLUTION:

Slope is the ratio of the rise, or vertical change, to the run, or horizontal change. Use the definition of slope and rise = -3 units and run = 1 unit. Simplify.

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

$$m = \frac{-3}{1} \text{ or } -3$$

ANSWER:

-3

3-2 Slope

Use Math Tools The points given in the table lie on a line. Find the slope of each line.

19.

x	-2	-1	1	2
y	-4	-2	2	4

SOLUTION:

Choose two points from the table to find the changes in the x - and y -values. Substitute the values from points $(-2, -4)$ and $(2, 4)$ into the definition of slope. Simplify.

$$\text{slope} = \frac{\text{change in } y}{\text{change in } x}$$

$$m = \frac{4 - (-4)}{2 - (-2)}$$

$$m = \frac{8}{4} \text{ or } 2$$

ANSWER:

2

Find the slope of the line that passes through the pair of points.

21. $G(-6, -1), H(4, 1)$

SOLUTION:

Use the slope formula. Substitute $(x_1, y_1) = (-6, -1)$ and $(x_2, y_2) = (4, 1)$. Simplify.

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

$$m = \frac{1 - (-1)}{4 - (-6)}$$

$$m = \frac{2}{10} \text{ or } \frac{1}{5}$$

ANSWER:

$\frac{1}{5}$