Slope

Objective

In this lesson, you will

graph proportional relationships, interpreting the unit rate as slope.

Graphing Proportional Relationships

- The origin is the point where the two axes meet in a coordinate plane.
  - It is represented by the ordered pair (0, 0).
- Since we need two points to graph a line, we need to know a point on the relationship's line other than the origin to graph a proportional relationship.
- When graphing proportional relationships, the origin corresponds to the initial point.

Proportional relationships can be represented in many ways:

a verbal description, an equation, a table and a graph.

Example:
Henry leads a team of hikers for a full-day hike that takes 8 hours.
Every hour, the hikers gain 250 feet in elevation.

- The independent variable is t, time in hours.
- The dependent variable is h, increased elevation in feet, or height.

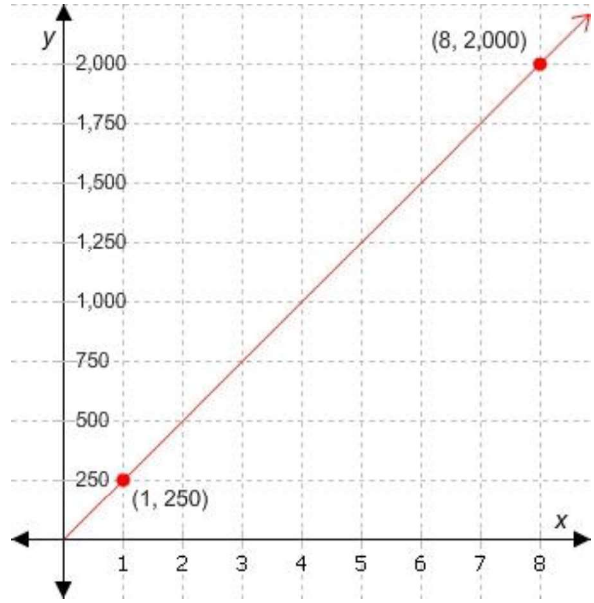
A possible verbal description is "h equals 250 times t."

The equation h = 250t corresponds to this relationship.

Construct a table based on the equation.

Time (hours)	Elevation (feet)
2	*500*
4	**1,000**
6	**1,500**
8	**2,000**

Graph the hikers' progress.



The first point on the line coincides with the __unit__ rate: the rate of increase in elevation of __250__ feet per hour.

The graph starts at the __origin__, because the hikers started at base camp.

The last point on the line indicates the total elevation increase for the duration of the hike.

Interpreting the Unit Rate

The unit rate of the graph of a line is also called the __slope__ (measure of a line's __steepness__).

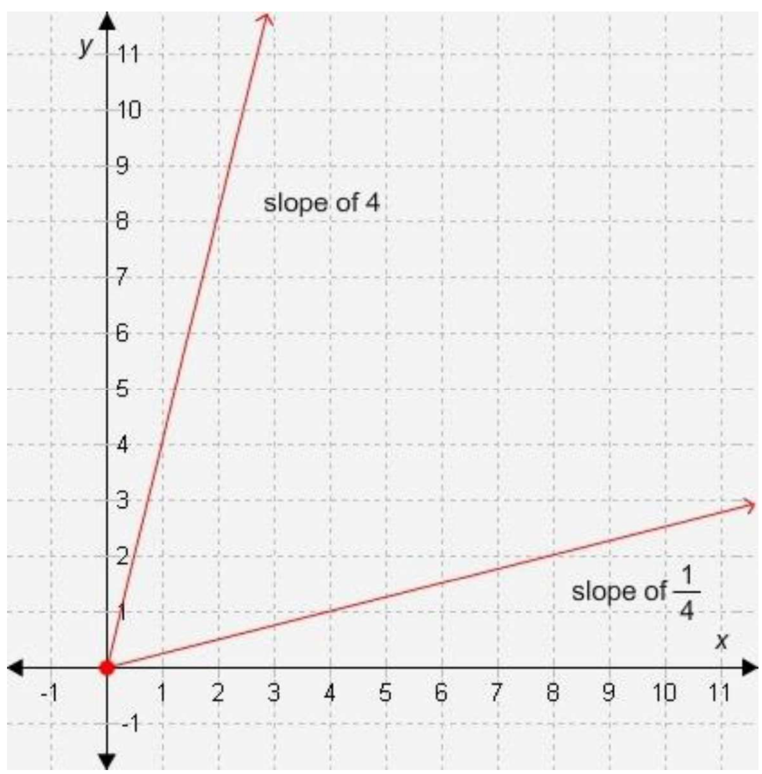
A ◉ greater ○ lower slope means a steeper line will form.

slope (unit rate) = rate at which the __y__-value changes with a unit increase in the __x__-value

For the line with a slope of 4:

The point (__1__, __4__) corresponds to the unit rate. Its coordinates indicate if the *x*-value changes by 1 unit, the *y*-value changes by __4__ units.

This unit rate gives us the slope of the line, $\frac{\boxed{4}}{\boxed{1}}$.

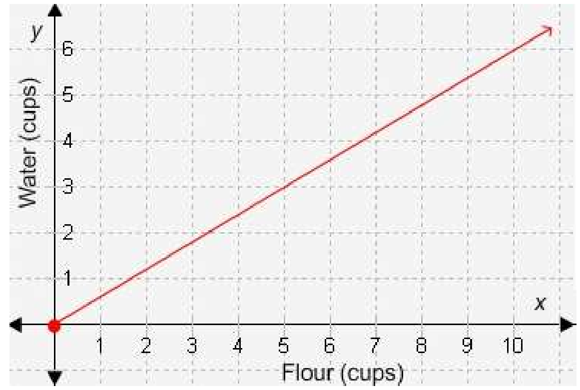


For the other line:

The point $\left(\underline{1}, \frac{1}{4}\right)$ corresponds to the unit rate. Its coordinates indicate if the __x__-value changes by 1 unit, the __y__-value changes by $\frac{1}{4}$ of a unit.

This unit rate gives us the slope of the line, $\frac{\boxed{1}}{\boxed{4}}$.

Lesson Activity



The graph shows how many cups of water are needed for each cup of flour in a pizza dough recipe.

The line contains the points (0,0) and (5,3).

Between these points there is a rise of __3__ units and a run of __5__ units.

Slope is the ratio of rise to run, so the slope of the line is, $\frac{3}{5}$.

Key Terms

The **rise** is the __y__-value of the second point minus the __y__-value of the first point.

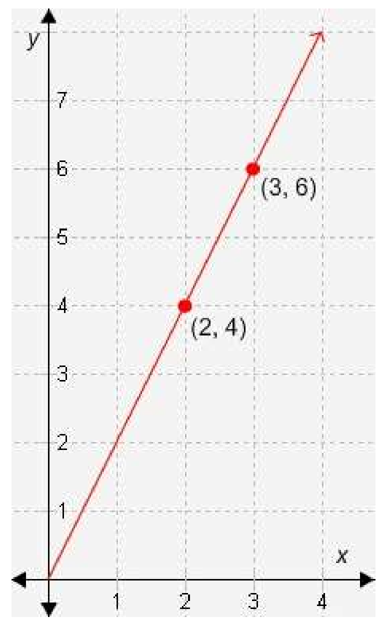
The **run** is the __x__-value of the second point minus the __x__-value of the first point.

We calculate slope using the ratio of rise over run.

So, for any two points (x_1, y_1) and (x_2, y_2), slope = $\frac{y_2 - y_1}{x_2 - x_1}$

Example:
Calculate the slope of the line joining the points (2, 4) and (3, 6).

$$\text{slope} = \frac{6 - \boxed{4}}{\boxed{3} - 2} = \frac{\boxed{2}}{1} = \underline{2}$$



Reversing the order of the points gives ○ a different ◉ the same slope value.

Summary

Suppose Jordan graphed a line with a slope of 3 and Trevor graphed a line with a slope of -3. How would their graphs compare?

answers will vary