Comparing Proportional Relationships

Objective

In this lesson, you will

Using Graphs to Compare

The graph of a proportional relationship is a straight line passing through the _____.

The slope of such a line represents the unit _____.

- A steeper slope means the relationship has a ◯ smaller ◯ greater unit rate.

Identify the _____ and _____ variables to graph a relationship. After graphing two relationships, use the _____ of the lines to compare the two relationships.

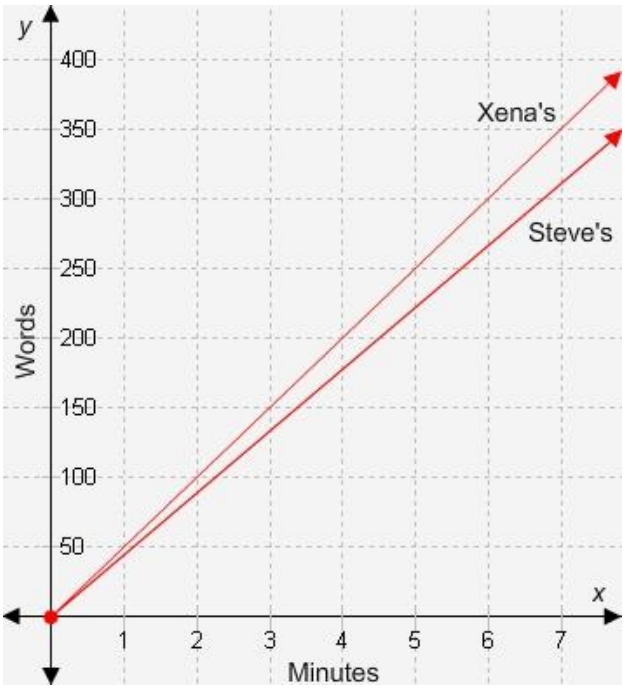
Question

Steve types at a rate of 45 words per minute. He writes an equation relating the number of words he can type, *w*, to the number of minutes he spends typing, *m*.

$$w = 45m$$

Xena recorded the time it took her to type different numbers of words.

Minutes	Words
2	100
4	200
8	400



On the graph, the line representing Xena's rate is ◯ less steep ◯ steeper than the line representing Steve's rate.

So, ◯ Xena's ◯ Steve's typing has the greater unit rate.

That means Xena types ◯ less ◯ more words per minute than Steve.

Comparing Unit Rates

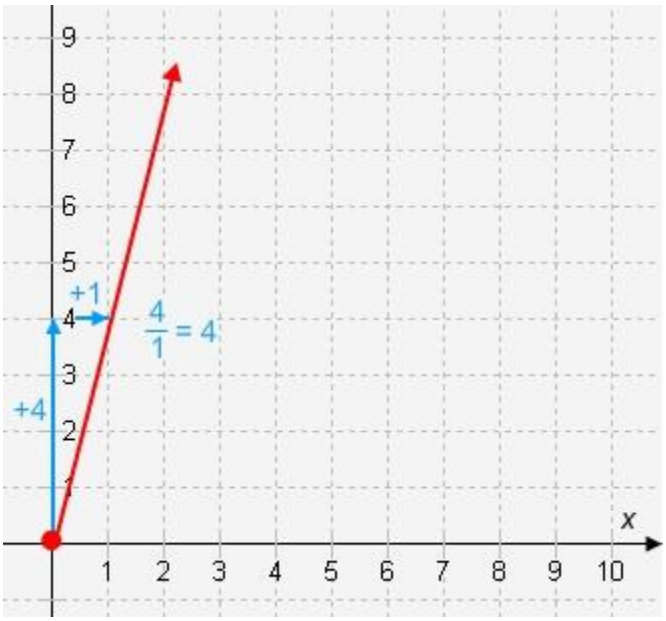
The procedure for finding the unit rate depends on the _____ a relationship is given in.

- The value of *n* is the unit rate for an equation in the following form.

$$y = nx$$

Example: In the equation $y = 4x$, the value of n is _____. So, the unit rate of the relationship is _____.

- For a graphed relationship, the slope of the line gives us the unit rate. Below is a graph that shows a line with a slope of _____. Therefore, the unit rate for this relationship is also _____.



- For a relationship given in a table, the unit rate is the change in the ◯independent ◯dependent values over the change in the ◯independent ◯dependent values. This table also represents a relationship with the unit rate of _____.

x	*y*
1	4
3	12
5	20

+2, +2 (*x*) +8, +8 (*y*)

$$\frac{8}{2} = 4$$

Lesson Activity

Comparing Unit Rates

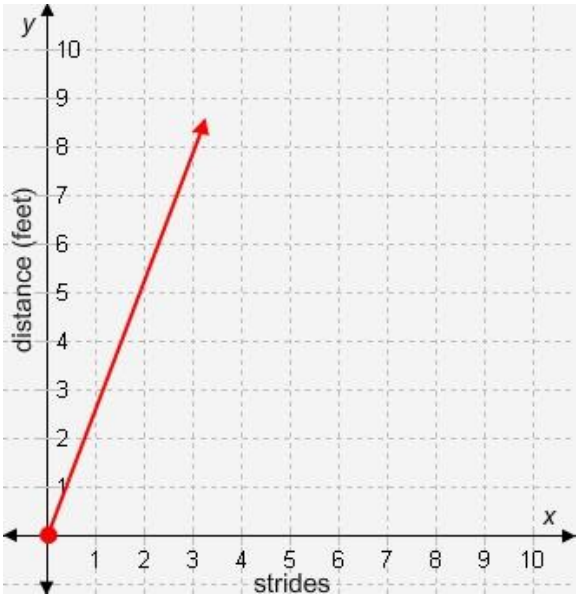
Activity

Oliver and Robin have different stride lengths and want to compare them.

Oliver uses a table to represent the distance he travels in feet related to the number of strides he takes.

Number of Strides	Distance (feet)
2	7
4	14
6	21

Robin draws a graph to represent the distance he travels with respect to the number of strides he takes.



Question 1

Part A Using Oliver's table, how can you find the unit rate?	For every increase of _____ strides, the distance Oliver travels increases by _____ feet. The change in _____ divided by the change in _____ gives the unit rate.
Part B What is Oliver's distance per stride?	$\text{Oliver's distance per stride} = \frac{\text{distance}}{\text{strides}}$ $= \frac{\square \text{ feet}}{\square \text{ strides}}$ $= 3\frac{1}{2}$ feet per stride

Question 2

Part A Using Robin's graph, how can you find the unit rate?	Consider the origin (0, 0) and another point, such as (3, _____). The unit rate is the _____. So, the _____ over the _____ between these two points gives the unit rate.
Part B What is Robin's distance per stride?	$\text{Robin's distance per stride} = \frac{\text{rise}}{\text{run}}$ $= \frac{\square}{\square}$ $= 2\frac{2}{3}$ feet per stride

Question 3

Whose distance per stride is longer, Oliver's or Robin's?	◯ Oliver's ◯ Robin's stride is longer because $3\frac{1}{2}$ is ◯ less ◯ greater than $2\frac{2}{3}$.

Example: Peter is a gardener. He mows 1,000 square yards every hour. Another gardener, Paul, recorded the square yards he mows every three hours. The table represents his relationship. Compare the two proportional relationships.

Hours	Area (square yard)
3	4,500
6	9,000
9	13,500

✓ Peter's unit rate of mowing is _____ square yards per hour. To find Paul's unit rate, divide the area mowed by _____. So, 4,500 divided by _____ gives his unit rate: _____ square yards per hour. Paul's mowing rate is ◯ higher ◯ lower than Peter's rate. Therefore, we can conclude that Paul mows ◯ slower ◯ faster than Peter does.

Summary

Why is unit rate the only attribute we use to compare proportional relationships? Consider the graph of a proportional relationship and the attribute(s) that all proportional relationships share to help you answer this question.