

LEARNING OBJECTIVE: We will work with proportional relationships in terms of average speed and constant speed. (G8M4L9)

CONCEPT DEVELOPMENT: CONSTANT RATE, UNIT RATE, CONSTANT

Rates: A proportional relationship between two quantities.

PROPORTION

Examples:

- Six tacos cost \$7.50 at Taco Bell $\$1.25/\text{taco}$
- I can walk 3 miles in 48 minutes. $16\text{min}/\text{mile}$
- My camera can take 10 pictures in 2 seconds. 5pic./sec
- I can text 120 words every 1.5 minutes. 80wpm

Non-Examples:

- In a race, I spent 43 minutes on the first 4 miles, and 42 minutes on the last 3 miles.
- Each year, I grow 10% bigger than the year before.

$\frac{4}{43} \neq \frac{3}{42}$

• Straight line
• Goes through (0,0)

Age	Wt.
0	10
1	11
2	12
3	13.5
4	14.64

We can express proportional relationships by creating tables.

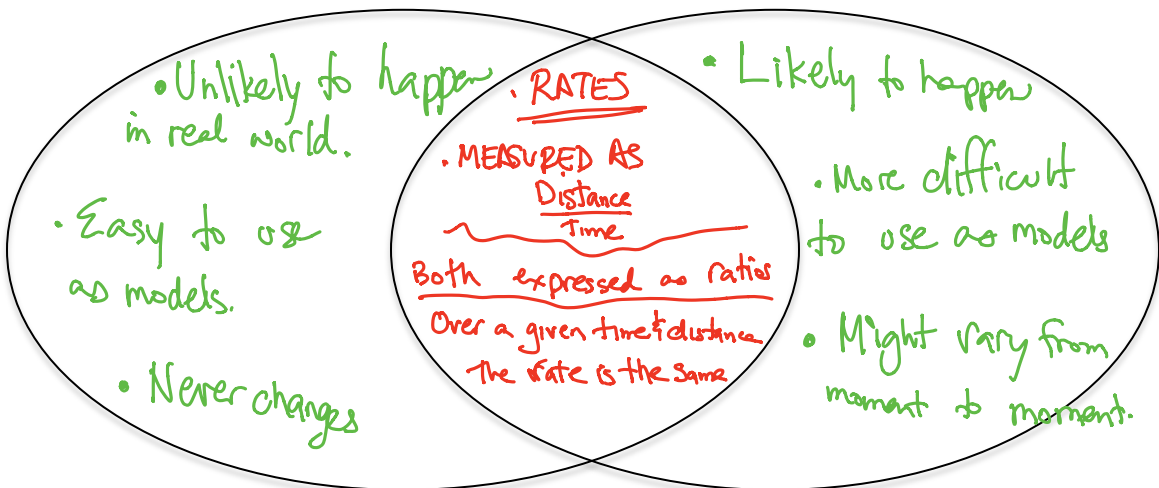
Example: If a 7th grader can write texts at a constant rate of 55 words per minute, we can create the following table:

Time (in minutes)	Words written in a text
1	55
2	110
3	165
4	220
x	y

- Not texting the same word
- Waiting for response.
- Auto correct
- Emoji
- Spelling
- Next word predictor
- Size of buttons
- Type of phone

You can write "y" words in "x" minutes.

Constant Speed v. Average Speed



GUIDED PRACTICE:

Steps to Representing Proportional Relationships in Two Variables

1. Read the problem carefully and set up a rate that can help you measure the constant rate.
2. Let y represent the distance, cost, or other quantity (that is NOT time)
3. Let x represent the time.
4. Set up a proportion and solve for y .

Mason walks at a constant speed from his house to school 1.5 miles away. It took him 25 minutes to get to school.

A plane travels at a constant rate from San Jose to Chicago 1,800 miles away. It takes 4.5 hours to get to Chicago.

How many miles has he walked after 15 minutes?

How far had the plane gone after 2 hours?

Rate = $\frac{\text{Distance}}{\text{Time}}$
(Speed)

$y = \text{distance}$
 $x = \text{time}$



$\frac{1.5}{25} = \frac{y}{15}$

Mason walks 0.9 miles in 15 minutes

$25y = 22.5$
 $y = \frac{22.5}{25} = \frac{9}{10}$

$\frac{1800}{4.5} = \frac{y}{2}$

The plane travels 800 miles in 2 hours

$(1800)2 = 4.5y$

$\frac{3600}{4.5} = \frac{y}{4.5}$

$\frac{7200}{9} = 800$

How many miles has he walked after x minutes?

How many miles has the plane traveled after x hours?

$\frac{1.5}{25} = \frac{y}{x}$

$\frac{1800}{4.5} = \frac{y}{x}$

$\frac{25y}{25} = \frac{1.5x}{25}$

$\frac{4.5y}{4.5} = \frac{1800x}{4.5}$

$y = \frac{1.5}{25}x$

$y = \frac{3600}{9}x$

$y = \frac{15}{250}x$

$y = 400x$

$y = \frac{3}{50}x$

$y = .06x$

Jennifer's car travels at a constant speed as she drives across country. It takes her 7 hours to travel 469 miles.

How many miles has she driven in 2.5 hours?

$$\frac{469}{7} = \frac{y}{2.5}$$

$y = 167.5$

Jennifer drove 167.5 miles in 2.5 hours

$$7y = 1172.5$$

$$\frac{7y}{7} = \frac{1172.5}{7}$$

How many miles has she driven in x hours?

$$\frac{469}{7} = \frac{y}{x}$$

$$\frac{y}{x} = 67$$

$y = 67x$

Speed.

Andrew rides the exercise bike at the gym at a constant speed. He is able to go 12 miles in 45 minutes. (.75)

How many miles would Andrew go if he was on the bike for 3.5 hours?

$$\frac{12}{.75} = \frac{y}{3.5}$$

$y = 56$

Andrew rides 56 miles in 3.5 hours

$$.75y = 42$$

$$\frac{.75y}{.75} = \frac{42}{.75}$$

$$y = 56$$

How many miles does Andrew bike in x hours?

$$\frac{12}{.75} = \frac{y}{x}$$

$$\frac{y}{x} = 16$$

$y = 16x$

Evan is 3 miles away from home. He rides on his skateboard further away from home at a constant speed. In 2 hours, he is able to skateboard 16 miles.

If Evan were to skateboard for 5 hours, how far away would he be from home?

$$\frac{16}{2} = \frac{y-3}{5}$$

$y = 43$

Evan would be 43 miles from home.

$$\frac{2(y-3)}{2} = \frac{80}{2}$$

$$y-3 = 40$$

How far away from home would Evan be if he skateboarded for x hours?

$$\frac{16}{2} = \frac{y-3}{x}$$

$$\frac{2(y-3)}{2} = \frac{16x}{2}$$

$$y-3 = 8x$$

$$y = 8x + 3$$

Joe flew in a plane 800 miles from his home to Denver. He got in a rental car and continued his journey away from his home at a constant rate. He was able to drive 360 miles in 8 hours.

How far away from home was Joe after he was driving for 3 hours?

$$\frac{360}{8} = \frac{y-800}{3}$$

$y-800 = 135$

$+800 +800$

$y = 935$

Joe was 935 miles from home.

$$\frac{8(y-800)}{8} = \frac{1080}{8}$$

How far away from home would Joe be after x hours in the car?

$$\frac{360}{8} = \frac{y-800}{x}$$

$$\frac{8(y-800)}{8} = \frac{360x}{8}$$

$$y-800 = 45x$$

$$+800 +800$$

$y = 45x + 800$

NAME: _____

Math _____, Period _____

Mr. Rogove

Date: _____

INDEPENDENT PRACTICE:

<p>Shannon is running around the track at a constant rate. She can run 4 laps in $5\frac{1}{2}$ minutes.</p> <p>How long would it take her to run 6 laps?</p> <p>How long does it take Shannon to run x laps?</p>	<p>Colby is swimming in a lake at a steady rate. He swims 900 yards in 21 minutes.</p> <p>How long does it take him to swim 500 yards?</p> <p>How long would it take him to swim x yards?</p>
<p>Eric drives 25 miles from his home to a bike trail with his bike on the bike rack attached to his car. He then rides his bike further away from home at a constant rate. He rides his bike 162 miles in 9 hours.</p> <p>How far away from home is he after riding his bike for 5 hours?</p> <p>How far away from home is Eric after riding his bike for x hours?</p>	<p>Create your own question here. Share it with the person you're sitting next to.</p>

NAME: _____

Math _____, Period _____

Mr. Rogove

Date: _____

ACTIVATING PRIOR KNOWLEDGE:

We remember how to calculate unit rates...

James can bike 25 miles in 3 hours. How many miles can he bike in one hour?	Chloe can text 190 words in 3 minutes. How many words can she text each minute?
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CLOSURE:

No closure??

TEACHER NOTES:

This might be a review lesson, or maybe not...first chance to introduce two variables. Maps to Module 4, Lesson 10 of ENY.

IM DVD Profits can be group practice problem and closure