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

CONCEPT DEVELOPMENT:

Rates: A proportional relationship between two quantities.

Examples: 3 coughs for 1 sneeze

- Six tacos cost $7.50 at Taco Bell
- I can walk 3 miles in 48 minutes.
- My camera can take 10 pictures in 2 seconds. 10 cows in every sq. ft.
- I can text 120 words every 1.5 minutes.

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.

Swim 5 laps in 10 minutes

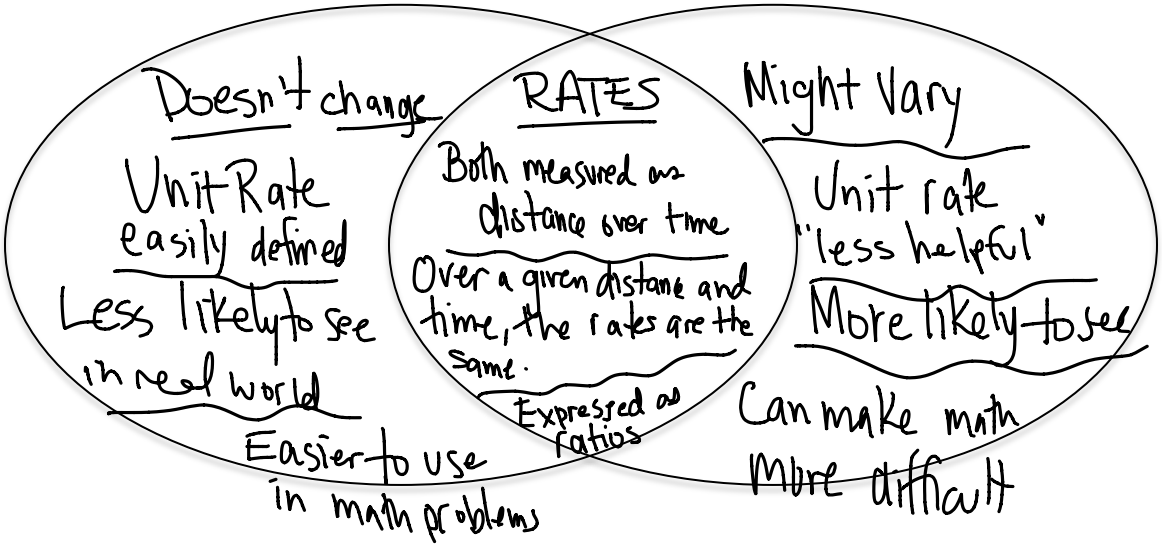
We can express proportional relationships by creating tables.

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) x	Words written in a text y
1	55
2	110
3	165
4	220
10	550
100	5,500

They can type y words in x minutes

Constant Speed v. Average Speed



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RATE = DISTANCE / TIME

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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.

How many miles has he walked after 15 minutes?

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

$1.5(15) = 25y$

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

$0.9 = y$

Mason walked 0.9 miles in 15 minutes

How many miles has he walked after *x* minutes?

DIST/TIME $\left(\frac{y}{x}\right)\frac{x}{} = \left(\frac{1.5}{25}\right)x$

$y = \frac{1.5}{25}x$ ← UNIT RATE

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 far had the plane gone after 2 hours?

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

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

$y = 800$

The plane travels 800 miles in 2 hours

How many miles has the plane traveled after *x* hours?

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

$\frac{y}{x} = 400$

$y = 400x$

unit rate.

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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?

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

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

$y = 167.5$

Jennifer drove 167.5 miles in 2.5 hrs

How many miles has she driven in *x* hours?

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

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

$y = 67x$

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

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

$\frac{12}{45} \times \frac{y}{210}$

$\frac{45y}{45} = \frac{2520}{45}$

$y = 56$

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

Andrew biked 56 miles in 3.5 hours

How many miles does Andrew bike in *x* hours?

$\frac{y}{x} = \frac{12}{45}$

$y = \frac{12}{45}x$

$y = \frac{4}{15}x$

$y = \frac{4}{15}(4)x$

$y = 16x$

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?

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

$2(y-3) = 80$

$2y - 6 = 80$

$y = 43$

Evan is 43 miles from home.

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

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

$x\left(\frac{y-3}{x}\right) = 8x$

$y - 3 = 8x$

$y = 8x + 3$

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?

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

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Independent Practice:

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

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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?

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