

Agenda:

1) Bell Ringer-

2) Lesson 7: Unit Rate as a
Constant of Proportionality

3) Homework: lesson 7 (#1-4)
page 51-52 in workbook



Lesson 7: Unit Rate as the Constant of Proportionality

Classwork

Example 1: National Forest Deer Population in Danger?

Wildlife conservationists are concerned that the deer population might not be constant across the National Forest. The scientists found that there were 144 deer in a 16 square mile area of the forest. In another part of the forest, conservationists counted 117 deer in a 13 square mile area. Yet a third conservationist counted 216 deer in a 24 square mile plot of the forest. Do conservationists need to be worried?

- a. Why does it matter if the deer population is not constant in a certain area of the national forest?

over population
hunting
food supply

- b. What is the population density of deer per square mile?

Table:

x square miles	deer y
16	144
13	117
24	216

unit Rate = $\frac{y}{x}$

The Unit Rate of deer per 1 square mile is 9.

Constant of Proportionality: 9

Meaning of Constant of Proportionality in this problem:

9 deer per square mile

✓

- c. Use the unit rate of deer per square mile to determine how many deer are there for every 207 square miles.

$$\begin{array}{r|l} \text{mi} & \text{deer} \\ 207 & ? \\ \hline \end{array}$$

$$\begin{array}{r} 207 \\ \times 9 \\ \hline 1863 \end{array} \text{ deer}$$

- d. Use the unit rate to determine the number of square miles in which you would find 486 deer?

54
sq. miles

$$\begin{array}{r|l} \text{mi} & \text{deer} \\ ? & 486 \\ \hline \end{array}$$

$$\begin{array}{r} 54 \\ 9 \overline{) 486} \\ \underline{-45} \\ 36 \\ \underline{-36} \\ 0 \end{array}$$

Vocabulary:

A constant specifies a unique number.

A variable is a letter that represents a number.

$$y = 9x$$

If a proportional relationship is described by the set of ordered pairs that satisfies the equation $y = kx$, where k is a positive constant, then k is called the constant of proportionality. It is the value that describes the multiplicative relationship between two quantities, x and y . The (x, y) pairs represent all the pairs of values that make the equation true.

Note: In a given situation, it would be reasonable to assign any variable as a placeholder for the given quantities. For example, a set of ordered pairs (t, d) would be all the points that satisfy the equation $d = rt$, where r is the positive constant, or the constant of proportionality. This value for r specifies a unique number for the given situation.

Example 2: You Need WHAT???

Brandon came home from school and informed his mother that he had volunteered to make cookies for his entire grade level. He needed 3 cookies for each of the 96 students in 7th grade. Unfortunately, he needed the cookies for an event at school on the very next day! Brandon and his mother determined that they can fit 36 cookies on two cookie sheets.

- a. Is the number of cookies proportional to the number of sheets used in baking? Create a table that shows data for the number of sheets needed for the total number of cookies needed.

Table:

$$\begin{array}{r} 96 \\ \times 3 \\ \hline 288 \\ \text{cookies} \end{array}$$

sheet	cookies
1	18
2	36
4	72
6	108
8	144
16	288
1	18

$$36 \div 2 = 18$$

The Unit Rate is 18.

Constant of Proportionality: 18

Meaning of Constant of Proportionality in this problem:

18 cookies per 1 sheet

- b. It took 2 hours to bake 8 sheets of cookies. If Brandon and his mother begin baking at 4:00 pm, when will they finish baking the cookies?

hr	sheets
2	8
4?	16

start 4:00
 + 4
 end ? 8:00

Example 3: French Class Cooking

Suzette and Margo want to prepare crepes for all of the students in their French class. A recipe makes 20 crepes with a certain amount of flour, milk, and 2 eggs. The girls know that they already have plenty of flour and milk but need to determine the number of eggs needed to make 50 crepes because they are not sure they have enough eggs for the recipe.

- a. Considering the amount of eggs necessary to make the crepes, what is the constant of proportionality?

$$\begin{array}{r} \text{eggs} \backslash \text{creps} \\ 2 \mid 20 \\ ? \mid 50 \end{array}$$

$$20 \div 2 = 10$$

- b. What does the constant or proportionality mean in the context of this problem?

you can make ~~20~~₁₀ crepes with 1 egg

- c. How many eggs will be needed for 50 crepes?

$$50 \div 10 = 5 \text{ eggs}$$

Lesson Summary:

If a proportional relationship is described by the set of ordered pairs that satisfies the equation $y = kx$, where k is a positive constant, then k is called the *constant of proportionality*.

~~Problem Set~~

Homework

For each of the following problems, define the constant of proportionality to answer the follow-up question.

1. Bananas are \$0.59/pound.
 - a. What is the constant of proportionality? $\$0.59 \text{ per pound}$
 - b. How much does 25 pounds of bananas cost? $.59 \times 25 =$
2. The dry cleaning fee for 3 pairs of pants is \$18.
 - a. What is the constant of proportionality?
 - b. How much will the dry cleaner charge for 11 pairs of pants?

3. For every \$5 that Micah saves, his parents give him \$10.
 - a. What is the constant of proportionality?
 - b. If Micah saves \$150, how much money will his parents give him?

4. Each school year, the 7th graders who study Life Science participate in a special field trip to the city zoo. In 2010, the school paid \$1260 for 84 students to enter the zoo. In 2011, the school paid \$1050 for 70 students to enter the zoo. In 2012, the school paid \$1395 for 93 students to enter the zoo.
 - a. Is the price the school pays each year in entrance fees proportional to the number of students entering the zoo?
 - b. Explain why or why not.
 - c. Identify the constant of proportionality and explain what it means in the context of this situation.
 - d. What would the school pay if 120 students entered the zoo?
 - e. How many students would enter the zoo if the school paid \$1,425?

"Unit Price Project"

Name: _____ date: _____
Mrs. Bennett Math 7

Student Task Sheet

In the ratios and proportions unit we have been studying, you have learned to find unit rates and unit prices. You have also learned to compare unit prices.

In this assignment I am asking you to calculate the unit price of 10 different household items. Display your items on a poster. Next to each item you should include your calculations to find each unit price. Your poster should include a title as well. To go along with your poster you must write a paragraph detailing your findings? Some things you may want to include in your paragraph are which item had the lowest unit price and which item had the highest unit price. You could also compare different brands of the same item. For example, maybe Tide detergent is less expensive per ounce than All detergent. You may want to write about the usefulness of comparing unit prices.

You will be graded on:

Completion:

- Poster with title and 10 objects
- Calculations are included for each item
- Paragraph summarizing findings

Mathematical Concepts:

- Proportions showing all calculations
- Correct mathematical work
- Paragraph correctly compares items

Presentation:

- Title
- Labels
- Proportions are shown
- Paragraph has no spelling or grammatical errors

Timeliness:

- Poster is due 2 weeks from today
- Due date __/ __/ __

