Objective   Constant of Proportionality

Warm-Up

Washington Middle School collects canned food for a local community food bank. Last year, there were 210 students enrolled at the school and they collected 110 cans of food.

1. Write the ratio representing the number of cans of food contributed to the total number of students in the school.

2. What is the unit rate of cans contributed per student?

3. This year, 240 students are enrolled in the school. Assume the number of cans of food contributed per student for both years is the same. How many cans of food should the school expect to be contributed this year?

Title IX addresses the number of athletics opportunities provided to each gender, but the actual participation at schools may differ. Also, the same person may participate in multiple sports.

At Vista Middle School, 5 out of every 7 girls play sports. The guidance counselor, Ms. Shanahan, and the athletics director, Coach Culpepper, are completing reports about the students at Vista Middle School.

Consider the information each person knows and use the constant of proportionality to write equations for each situation.

Guidance Counselor

Ms. Shanahan knows the number of girls in the school on a given day, and she needs to be able to calculate the expected number of girls who play sports.

Athletics Director

Coach Culpepper knows the number of girls participating in sports during a given season, and she needs to be able to calculate the expected number of total girls in the school.

1. Determine the constant of proportionality for each situation.

a. Guidance Counselor

b. Athletics Director

2. Define variables for the quantities that are changing in these situations.

3. Use the constants of proportionality to write equations to determine the information needed by each person.
a. Guidance Counselor   b. Athletics Director

In terms of proportionality, Ms. Shanahan could state that the number of girls who play sports is proportional to the number of total girls in the school at a constant rate equal to the constant of proportionality.

4. Write Coach Culpepper's situation using the language of proportionality and include the value for the constant of proportionality.

5. Consider the given equations, where y represents the dependent or output quantity and x represents the independent or input quantity.
a. Describe how the first equation represents the constant of proportionality.

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

$$\frac{y}{x} = \frac{k}{1}$$

$$y = kx$$

b. Explain how the second equation represents proportional relationships.

c. Describe how the first equation was rewritten to create the third equation.

d. Explain the meaning of the constant of proportionality, k, in the third equation.

6. Identify the constant of proportionality in each equation and describe its meaning.

a. d = 2r, where d represents the diameter of a circle and r represents the radius of a circle.

b. P = 3s, where P represents the perimeter and s represents the sides of an equilateral triangle.

A chemist must use a solution that is 30% of reagent and 70% of water for an experiment. A solution is a mixture of two or more liquids. A reagent is a substance used in a chemical reaction to produce other substances.

1. Define variables for the quantities that are changing in this problem situation.

2. Write an equation for the amount of water needed based on the amount of reagent. What is the constant of proportionality?

3. Use your equation from Question 2 to write an equation for the amount of reagent needed based on the amount of water. Explain your reasoning.

4. Use your equations to answer each question.

a. If the chemist uses 6 liters of reagent, how many liters of water will she need to make her 30% solution?

b. If the chemist uses 77 milliliters of water, how many milliliters of reagent will she need to make her 30% solution?

5. Write an equation to show that y is directly proportional to x using the constant of proportionality given. Then solve for the unknown value.

a. k = 0.7 and y = 4

b. $k = \frac{3}{11}$ and x = 9

c. k = 5 and x = $1\frac{1}{2}$

d. $k = \frac{1}{6}$ and y = $3\frac{1}{3}$

Consider the equation y 5 kx. Use the value of the constant of proportionality assigned to you to answer the questions. You will present your work to your class.

1. Write a scenario for a proportional relationship that would be represented by the equation. Clearly define your variables and identify the direction of the proportional relationship.

2. Interpret the constant of proportionality in the context of your scenario.

3. Write and solve at least 2 questions that could be solved using your equation.

Homework HW

LESSON 3.2b
Complying with title IX

Objective Constant of Proportionality

Practice

1. Analyze each table or problem situation to determine if the relationship is proportional. State a constant of proportionality if possible. Show your work.

a.

Girls	Boys
7	14
9	21
11	22

b. A baby blue whale weighed 5520 pounds at birth. After two days, the baby weighed 5710. After 14 days, the baby weighed 8180 pounds.

2. Maya's construction company builds brick houses. The number of bricks her crew installs varies directly with the number of hours they work.

Hours Worked	Bricks Installed
8	1680
7	1470
6	1260

a. Define variables for the quantities that are changing in this problem situation.

b. Analyze the table to determine the constant of proportionality.

c. What does the constant of proportionality mean in this situation?

d. Write an equation to show the relationship between the number of hours worked, the number of bricks installed, and the constant of proportionality.

e. Use your equation to determine how many bricks Maya's crew can install in 5.5 hours.

f. Use your equation to determine how many hours it will take Maya's crew to install 840 bricks.

3. Given a value for the input variable, x, and the output variable, y, calculate the constant of proportionality.

a. $x = 21$ and $y = 6$

b. $x = 60$ and $y = 18$

c. $x = 2\frac{2}{5}$ and $y = 7\frac{1}{2}$

d. $x = 4\frac{8}{11}$ and $y = 3\frac{6}{11}$