Section 3

Proportions

Proportions involve setting up an equation with two equivalent fractions. In this section you will learn how to identify the pieces of information given in these types of problems. This will make them easier to set up and solve.

Step 1
Set Up A Proportion--Determine the Amounts and Their Categories

Begin by setting up a blank proportion, which is one fraction bar set equal to another fraction bar. In a Proportions Word Problem, you will always be given three pieces of information. The information given will be three different amounts that fall into two categories.

In order to determine what category the amount falls into, look at the noun that follows the amount. For example, our problem states "**3 dogs**", "**3**" is the *amount* and "**dogs**" is the *category*. Similarly, if it says "8 months", "8" is the amount and months is the category.

Step 2
Fill In The Blanks Of The First Fraction

As you read through the problem, you will come across your first piece of information. This will be an amount with its category. Write this information in the *numerator* of the first fraction (the fraction to the left of the equal sign).

As you continue to read, you will come across the second piece of information which will be another amount with its category. Write this second piece of information in the *denominator* of the same first fraction.

Step 3
Fill In The Blanks Of The Second Fraction

The placement of the third piece of information is **key to the successful set up of the proportion**. The third piece of information is the final amount and category given in the word problem. The category of this third amount will match one of the categories you have already written in the first fraction.

- If the category matches the category in the **numerator** of the first fraction, write this amount with its category in the *numerator* of the second fraction.

- If the category matches the category in the **denominator** of the first fraction, write this amount with its category in the *denominator* of the second fraction.
- Put a **question mark** in the remaining blank of the second fraction to indicate the question you are being asked in the word problem.

Step 4
Solve the Equation

Rewrite the proportion as a mathematical equation. Use the amounts only (no categories) and replace the question mark with a variable. Then solve the equation using the method taught by your instructor.

EXAMPLES

EXAMPLE 1 Tara can type 4 pages of her term paper in 30 minutes. How long will it take her to type the term paper if it has 14 pages?

SOLUTION

Step 1	Set up a blank proportion. The amounts and categories are: 4 pages, 30 minutes, 14 pages.	$\dfrac{\quad\quad}{\quad\quad} = \dfrac{\quad\quad}{\quad\quad}$
Step 2	Fill in the blanks of the first fraction. "4 pages" belongs in the numerator and "30 minutes" belongs in the denominator.	$\dfrac{4 \text{ pages}}{30 \text{ minutes}} = \dfrac{\quad\quad}{\quad\quad}$
Step 3	Fill in the second fraction. "14 pages" is the same category as the numerator of the first fraction, so make sure to place it in the numerator of the second fraction. Put a question mark in the missing blank.	$\dfrac{4 \text{ pages}}{30 \text{ minutes}} = \dfrac{14 \text{ pages}}{?}$
Step 4	Rewrite the equation with amounts only and replace the question mark with a variable. Solve the equation.	$\dfrac{4}{30} = \dfrac{14}{x}$ $x = 105$

Answer: It will take Tara 105 minutes.

HELPFUL HINT

- You can't always determine the category by the one word that follows the amount. For example, a problem may say "4 cups of water" and "6 cups of juice". Be careful: One category is "cups of **water**", while the other category is "cups of **juice"**.

- Use common sense. The word following the amount is not always the category. For instance, if the question says "$8.00", 8 is the amount and $ (dollars) is the category.

EXAMPLE 2 If 3 ounces of medicine must be mixed with 5 ounces of water, how many ounces of medicine must be mixed with 15 ounces of water?

SOLUTION

Step 1	Set up a blank proportion. The amounts and categories are: 3 ounces of medicine, 5 ounces of water, and 15 ounces of water. To determine the correct categories, see *Step 1 Helpful Hint*.	$$\underline{\qquad} = \underline{\qquad}$$
Step 2	Fill in the blanks of the first fraction. "3 ounces of medicine" belongs in the numerator and "5 ounces of water" belongs in the denominator.	$$\frac{3 \text{ oz. medicine}}{5 \text{ oz. water}} = \underline{\qquad}$$
Step 3	Fill in the second fraction. "15 ounces of water" is the same category as the denominator of the first fraction, so make sure to place it in the denominator of the second fraction. Put a question mark in the missing blank.	$$\frac{3 \text{ oz. medicine}}{5 \text{ oz. water}} = \frac{?}{15 \text{ oz. water}}$$
Step 4	Rewrite the equation with amounts only and replace the question mark with a variable. Solve the equation	$$\frac{3}{5} = \frac{x}{15}$$ $$x = 9$$

Answer: 9 ounces of medicine.

Proportions: Exercise Set

1. A concrete cement mixer uses 4 tanks of water to mix 15 bags of cement. How many tanks of water are needed to mix 30 bags of cement?

2. Katelyn drives her car 235 miles in 5 hours. At this rate how far will she travel in 7 hours?

3. A Toro lawn mower uses 5 tanks of gas to cut 18 acres of lawn. How many acres could be cut using 8 tanks of gas?

4. If 4 small pizzas cost $15.00, find the cost of 7 small pizzas.

5. In the first 4 games of the season, the Hurricanes Football team scored a total of 68 points. At this rate, how many points will the team score in 11 games?

6. A farmer knows that of every 50 eggs his chickens lay, only 45 will be sold. If his chickens lay 1000 eggs in a week, how many of them will be sold?

7. Alonzo Mourning scored 162 points in 9 games. At this rate, how many points will he score in 20 games.

8. At Rainbow TV Service, Al can repair 6 televisions in 2 weeks. How many televisions can Al repair in 10 weeks?

9. In a 10 game season, Willis McGahee rushed for 1250 yards. On the average how many yards did he rush for in 5 games?

10. If 8 bandanas cost $22.00, how much would 12 bandanas cost?

11. Adrienne paid $34.50 for 3 books. How much would she pay for 11 books?

12. American Idol auditioned 18,500 people in 2 cities. At that same rate, how many people auditioned in 7 cities?

13. Seven cups of oatmeal contain 378 grams of carbohydrates. How many grams of carbohydrates would there be in 4 cups of oatmeal?

14. If Skye uses10 apples to make 3 apple pies, how many pies could Skye make if she uses 30 apples?

15. A male astronaut that weighs 195 pounds on Earth would weigh 33 pounds on the moon. If a female astronaut weighs 17 pound on the moon, what would her weight be on Earth? (Round your answer to the nearest pound.)

16. To make a really great punch, mix 2 quarts of Sprite with 6 quarts of pineapple sherbet. How many quarts of Sprite would you need when you use 11 quarts of pineapple sherbet?

17. In the course of 2 days, Lifetime TV airs 5 reruns of *The Nanny*. How many reruns would air over the course of 12 days?

18. Amber, a standard poodle, can run around the block 5 times in 12 minutes. If she always runs at the same speed, how many times could she run around the block in 48 minutes?

19. If it takes Kelli 20 minutes to learn one dance routine, how long would it take her to learn 6 dance routines?

20. On a road map, 4 inches represents 50 miles. How many inches would represent 125 miles?