Key Concepts

Using the Percent Proportion

Objective Teach students to use the concept of percent and to relate it to fractions.

Note to the Teacher *In this lesson, students will study the concept of percent and how to find percentages. Begin by explaining that a percent is a ratio that compares a number to one hundred. Then discuss the following examples.*

Finding Percentages

Example 1 **In a class of 20 students, 12 are girls. What percent of the students are girls?**

Solution A percent is a ratio with a denominator of 100. To find the percent of students that are girls, set up a proportion and then solve.

$\frac{12}{20} = \frac{x}{100}$ *x represents the percent of students that are girls.*

$12 \cdot 100 = 20 \cdot x$ *Find the cross products.*

$\frac{1200}{20} = \frac{20x}{20}$ *Divide each side by 20.*

$60 = x$

So, 60% of the students in the class are girls.

Here's another example of how to write a fraction as a percent.

Example 2 **Express $\frac{3}{7}$ as a percent.**

Solution Set up a proportion. Then solve.

$\frac{3}{7} = \frac{x}{100}$ *x represents the percent.*

$3 \cdot 100 = 7 \cdot x$ *Find the cross products.*

$\frac{300}{7} = \frac{7x}{7}$ *Divide each side by 7.*

$42.9 \approx x$

So $\frac{3}{7}$ is approximately 42.9%.

In everyday life, we encounter many forms of percents. Consider the following example.

Note to the Teacher *Do Example 3 on the chalkboard. Be sure to point out to students that the word "of" represents multiplication.*

Example 3 **Enrico and Ian went to lunch. The total amount of the bill was $18, including tax. If they want to leave a 15% tip, how much of a tip should they leave?**

Solution You need to find 15% of $18. First, substitute a multiplication sign for the word "of."

$$15\% \text{ of } \$18 \Rightarrow 15\% \times 18$$

Then multiply.

$$15\% \times 18 = \frac{15}{100} \times 18 \qquad \textit{Rewrite 15\% as } \frac{15}{100}.$$

$$= \frac{15 \times 18}{100}$$

$$= \frac{270}{100} \text{ or } 2.7 \quad \textit{Simplify.}$$

Since 15% of $18 is $2.70, Enrico and Ian should leave a tip of $2.70.

The following example shows another type of percent problem.

Example 4 **180 is 30% of what number?**

Solution Let n represent the number we need to find. Translate the problem.

$$\underbrace{180}_{180} \ \underbrace{is}_{=} \ \underbrace{30\%}_{30\%} \ \underbrace{of}_{\times} \ \underbrace{what\ number?}_{n}$$

Now, solve for n.

$$180 = 30\% \times n$$

$$180 = \frac{30}{100} \times n \qquad \textit{Rewrite 30\% as } \frac{30}{100}.$$

$$180 = \frac{30n}{100}$$

$$100 \cdot 180 = 100 \cdot \frac{30n}{100} \qquad \textit{Multiply each side by 100.}$$

$$18{,}000 = 30n$$

$$\frac{18{,}000}{30} = \frac{30n}{30} \qquad \textit{Divide each side by 30.}$$

$$600 = n$$

So, 180 is 30% of 600.

Check the answer. The statement *180 is 30% of 600* means that $180 = \frac{30}{100} \times 600$. Multiply to see if we get 180. The answer is correct.

Let's do one more example that deals with money.

Example 5 **Marlene and her family went out to dinner. The service at the restaurant was excellent so she decided to leave a 20% tip. If she left $11 as the tip, how much did dinner cost?**

Solution Let c represent the cost of dinner. You know that Marlene left a 20% tip and that the amount of the tip was $11. Thus, we have $11 is 20% of c. Substituting an equals sign for the word "is" and a multiplication sign for the word "of", the following equation results.

$$11 = 20\% \times c$$

To find the cost of dinner, solve for c.

$$11 = 20\% \times c$$

$$11 = \frac{20}{100} \times c \qquad \textit{Rewrite 20\% as } \frac{20}{100}.$$

$$11 = \frac{20c}{100}$$

$$100 \cdot 11 = 100 \cdot \frac{20c}{100} \qquad \textit{Multiply each side by 100.}$$

$$1100 = 20c$$

$$\frac{1100}{20} = \frac{20c}{20} \qquad \textit{Divide each side by 20.}$$

$$55 = c$$

So the dinner cost $55.

Note to the Teacher *Computing with percents is an important skill. Make sure your students are given lots of problems to practice. This will help them solidify their understanding of the concept of percent as well as make them more proficient with their computations.*