

# Key Concepts

Lesson  
8-4

## Percent of Change

**Objective** Teach students how to compute the percent of change of a certain quantity.

**Note to the Teacher** *When a certain quantity changes, it is often important to know by what percent it changed. For example, the statement that there was an inflation of 5% in housing prices in the last year, means that the cost of housing went up 5% during the year. In this lesson, students will learn how to compute the percent of change.*

## Calculating Percent of Change

There are two methods for calculating the percent of change that you should explain to your students.

**Method 1** Find the difference of the quantities (the *change*), and compute what percent this difference is of the original quantity.

$$\text{percent of change} = \frac{\text{new quantity} - \text{original quantity}}{\text{original quantity}} \times 100$$

If the result is positive, the change is an *increase*; if the result is negative, the change is a *decrease*.

**Method 2** Write a proportion equation in the form

$$\frac{\text{new value}}{\text{original value}} = \frac{x}{100},$$

and solve for  $x$ . The resulting percent is then compared to 100% to determine the percent increase or the percent decrease. If the result is greater than 100%, the change is an *increase*; if the result is less than 100%, the change is a *decrease*.

**Example 1 Find the percent change from 160 to 180.**

**Solution Method 1** Since the change is from 160 to 180, the new quantity is 180. Then the original quantity is 160. Use the percent of change formula given above.

$$\begin{aligned}\text{percent of change} &= \frac{180 - 160}{160} \times 100 \\ &= \frac{20}{160} \times 100 \\ &= \frac{1}{8} \times 100 \\ &= \frac{100}{8} \text{ or } 12.5\end{aligned}$$

**Method 2** Since the change is from 160 to 180, the new value is 180 and the original value is 160. Use the proportion equation.

$$\begin{aligned}\frac{180}{160} &= \frac{x}{100} \\ 180 \cdot 100 &= 160 \cdot x \quad \text{Cross multiply.} \\ \frac{18,000}{160} &= x \quad \text{Divide each side by 160.} \\ 112.5 &= x\end{aligned}$$

So, 180 is 112.5% of 160. Since 100% of a number is equal to that number, then 180 is a 112.5 – 100 or 12.5 percent increase from 160.

The percent of change from 160 to 180 is a 12.5% *increase*.

Notice that a shortcut for the calculations in Method 2 above is to simply divide the new quantity by the original quantity,  $\frac{180}{160} = 1.125$ ; subtract 1 (which is 100% written as a decimal) from the quotient to get 0.125; and then express this decimal as a percent, 12.5%.

Here is another example.

**Example 2 The usual price of a hamburger at Mike's Diner is \$2.50. Last Sunday they had a special, and charged only \$2.00 for a hamburger. What percent of change did this represent?**

**Solution Method 1** The difference in the two quantities is  $\$2.00 - \$2.50 = -\$0.50$ . The negative difference means that the price *decreased*.

$$\begin{aligned}
 \text{percent of change} &= \frac{2.00 - 2.50}{2.50} \times 100 \\
 &= \frac{-0.50}{2.50} \times 100 \quad \textit{The numerator} \\
 &= -\frac{1}{5} \times 100 \quad \textit{is negative.} \\
 &= -20
 \end{aligned}$$

**Method 2** Let's use the shortcut calculation discussed following Example 1.

**Step 1** Divide. Use a calculator.  $\frac{2.00}{2.50} = 0.8$

**Step 2** Subtract 1.  $0.8 - 1 = -0.2$

**Step 3** Write the decimal as a percent.  $-0.2 \rightarrow -20\%$

So, there was a 20% *decrease* in the price of a hamburger.

Do one final example on the chalkboard, to make sure the students understand the methods.

**Example 3** When Susan brought her dog home from the pound, it weighed 35 pounds. One year later Susan's dog weighed 45 pounds. What percent of change in weight did this represent?

**Solution Method 1** The difference in the two quantities is  $45 - 35 = 10$  pounds. The positive difference means that the dog's weight *increased*.

$$\begin{aligned}
 \text{percent of change} &= \frac{45 - 35}{35} \times 100 \\
 &= \frac{10}{35} \times 100 \\
 &= \frac{2}{7} \times 100 \\
 &\approx 28.57
 \end{aligned}$$

**Method 2** Use the shortcut calculations.

**Step 1** Divide.  $\frac{45}{35} \approx 1.2857$

**Step 2** Subtract 1.  $1.2857 - 1 = 0.2857$

**Step 3** Write the decimal as a percent.  $0.2857 \rightarrow 28.57\%$

So, the dog's weight increased approximately 28.6%.

