

Key Concepts



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 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 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*.

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

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%.

