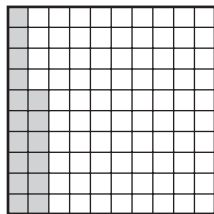# Lesson 12: Percents

The word *percent* is made up of two parts, *per* meaning "out of", and *cent* meaning "one hundred". *Percent* literally means "out of each hundred." A **percent** represents the parts of a whole that is divided into 100 equal parts. The following grid represents a whole unit, or 100%. The grid shows that 16 squares out of 100 are shaded. Therefore, 16% of the grid is shaded.

You can consider a percent as a ratio per 100. In the previous grid, there are 16 shaded squares. There are 100 total squares. The ratio of shaded squares to total squares is 16:100, or $\frac{16}{100}$. If the second part, or denominator, of a ratio is 100, then the first part, or numerator, is the percent.

▷ Example

The ratio of horses to all the animals on a farm is $\frac{11}{100}$. What percent of the animals on the farm are horses?

Because the denominator of the ratio is 100, the numerator must be the percent. Of all the animals on the farm, 11% are horses.

▷ Example

Luz got 88% of the questions right on her science quiz. What ratio represents the number of questions she got right to the total number of questions?

To convert the percent into a ratio, you can use the percent as the numerator and add a denominator of 100. The ratio of questions Luz got right to the total number of questions is, therefore, $\frac{88}{100}$, which can be simplified to $\frac{22}{25}$. The ratio can also be shown as 22:25 or 22 to 25.

◆ **TIP:** A ratio should be simplified using common factors. However, a percent should always be out of 100.

If you know a percent and the whole, you can find the part of the whole that the percent represents. You first need to convert the percent to a ratio as a fraction. Then multiply the whole by the fraction. The product will be that part of the whole.

▷ **Example**

What is 60% of 30?

A tape diagram can help show the relationship of the whole and the part.

30
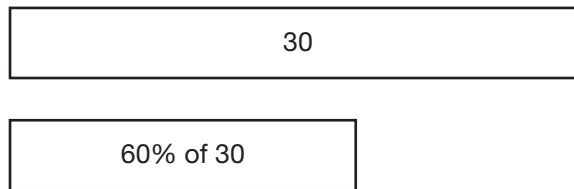
60% of 30

The percent 60% is equal to the ratio $\frac{60}{100}$. Multiply the whole by this ratio. You will need to convert 30 to $\frac{30}{1}$.

$$\frac{30}{1} \times \frac{60}{100} = \frac{30 \times 60}{1 \times 100} = \frac{1800}{100} = 18$$

60% of 30 is 18.

If you know a percent and the part of the whole, you can find the total number of items in the whole. You first need to convert the percent to a ratio as a fraction. Then you can divide the part by the fraction. The quotient will be the total number.

▷ **Example**

85% of what number is equal to 68?

The tape diagram shows the relationship of the whole and the part.

85% of the whole	68
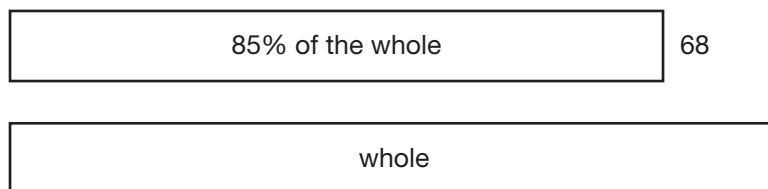
whole

The percent 85% is equal to the ratio $\frac{85}{100}$. Divide the part by this ratio.

$$\frac{68}{1} \div \frac{85}{100} = \frac{68}{1} \times \frac{100}{85} = \frac{68 \times 100}{1 \times 85} = \frac{6800}{85} = 80$$

85% of 80 is equal to 68.

You may need to solve for the part or the whole with a percent when working with real-world problems.

▷ Example

Kevin has 15 pairs of socks. Of his socks, 40% are black. How many pairs of black socks does Kevin have?

This problem provides the total number of pairs of socks and the percent that are black. You need to find the part of the total number. That part will be the number of black socks.

The first step is to convert the percent to a ratio as a fraction: $40\% = \frac{40}{100}$. Then multiply the total by this ratio to find the part. You will need to convert 15 to $\frac{15}{1}$.

$$\frac{15}{1} \times \frac{40}{100} = \frac{15 \times 40}{1 \times 100} = \frac{600}{100} = 6$$

Kevin has 6 pairs of black socks.

▷ Example

There are 13 girls on a school's debate team. If 65% of the team members are girls, how many students are on the debate team in total?

This problem provides the number of girls on a team and the percent that are girls. You need to find the total number. That number will represent the total number of students on the debate team.

The first step is to convert the percent to a ratio as a fraction: $65\% = \frac{65}{100}$. Then divide the part by this ratio to find the whole. You will need to convert 13 to $\frac{13}{1}$.

$$\frac{13}{1} \div \frac{65}{100} = \frac{13}{1} \times \frac{100}{65} = \frac{13 \times 100}{1 \times 65} = \frac{1300}{65} = 20$$

There are a total of 20 students on the school's debate team.