► Percents

Percent literally means "out of 100." It is easy to compare fractions when they are both out of 100, which is why percents are so useful. For example, 17% is the same as $\frac{17}{100}$. The root *cent* means 100: A *century* is 100 years; there are 100 *cents* in a dollar, etc. Thus, 17% means 17 parts out of 100. Because fractions can also be expressed as decimals, 17% is also equivalent to .17, which is 17 hundredths.

You come into contact with percents every day. Sales tax, interest, and discounts are just a few common examples.

If you're shaky on fractions, you may want to review the fraction section again before reading further.

Changing a Decimal to a Percent and Vice Versa

To change a decimal to a percent, move the decimal point two places to the right and tack on a percent sign (%) at the end. If the decimal point moves to the end of the number, you can eliminate it. If there aren't enough places to move the decimal point, add zeros on the right before moving the decimal point.

To change a percent to a decimal, drop off the percent sign and move the decimal point two places to the left. If there aren't enough places to move the decimal point, add zeros on the left before moving the decimal point.

- Find the whole when the percent of it is given.

  12 is 30% of what number?

  12 is the *is* number and 30 is the *%*: $\frac{12}{of} = \frac{30}{100}$

  Cross-multiply and solve for the *of* number: $12 \times 100 = of \times 30$

  $1{,}200 = of \times 30$

  $1{,}200 = 40 \times 30$

  Thus, 12 is 30% **of 40.**

A common type of percentage question involves finding the percentage of *increase* or *decrease* between two numbers. When solving such questions, it is helpful to use the following formula:

percent of change = amount of change/original amount

To find the *amount of change*, find the difference between the original number and the new number by using subtraction. Put this answer over the *original amount*. After that number is turned into a percentage, it will be your *percent of change*.

Example: If attendance of a class drops from 50 students in the fall semester to 40 students in the spring semester, find the percent of decrease in the class enrollment.

1. Find the amount of change: $50 - 40 = 10$ students

2. Divide the amount of change by the original amount: $\frac{10 \text{ students}}{50 \text{ students}} = \frac{10}{50}$

3. Turn that fraction into a percentage: $\frac{10}{50} = \frac{20}{100} = 20\%$

4. Therefore, the class enrollment dropped by 20%.

Note that if the class enrollment were to rise from 40 students to 50 students, that would not be a 20% increase! Although the amount of change would still be 10 students, the original amount would be 40 students (instead of 50 students), which would change your answer:

1. Amount of change: $50 - 40 = 10$ students

2. Divide the amount of change by the original amount: $\frac{10 \text{ students}}{40 \text{ students}} = \frac{10}{40}$

3. Turn that fraction into a percentage: $\frac{10}{40} = \frac{1}{4} = 25\%$

4. Therefore, the class enrollment would have a percentage increase of 25%.

Find a percent of a whole:

67. 1% of 25 =

68. 18.2% of 50 =

69. 42.5% of 200 =

70. 125% of 60 =

Find what percent one number is of another number:

71. 10 is what % of 20?

72. 16 is what % of 24?

73. 12 is what % of 4?

Find the whole when the percent of it is given:

74. 15% of what number is 15?

75. $37\frac{1}{2}$% of what number is 3?

76. 200% of what number is 20?

Now, try your percent skills on some real-life problems:

77. Last Monday, 20% of 140 staff members were absent. How many employees were absent that day?
  a. 14
  b. 28
  c. 112
  d. 126

78. 40% of Vero's postal service employees are women. If there are 80 women in Vero's postal service, how many men are employed there?
  a. 32
  b. 112
  c. 120
  d. 160

79. There are 780 students at Cliffside Park High School. If 273 of them play at least one sport, what percentage of Cliffside Park High School students play sports?
  a. 27.3%
  b. 2.85%
  c. 30%
  d. 35%

69. 42.5% of 200 =

70. 125% of 60 =

Find what percent one number is of another number:

71. 10 is what % of 20?

72. 16 is what % of 24?

73. 12 is what % of 4?

Find the whole when the percent of it is given:

74. 15% of what number is 15?

75. $37\frac{1}{2}$% of what number is 3?

76. 200% of what number is 20?

Now, try your percent skills on some real-life problems:

77. Last Monday, 20% of 140 staff members were absent. How many employees were absent that day?
   a. 14
   b. 28
   c. 112
   d. 126

78. 40% of Vero's postal service employees are women. If there are 80 women in Vero's postal service, how many men are employed there?
   a. 32
   b. 112
   c. 120
   d. 160

79. There are 780 students at Cliffside Park High School. If 273 of them play at least one sport, what percentage of Cliffside Park High School students play sports?
   a. 27.3%
   b. 2.85%
   c. 30%
   d. 35%

80. Sam's Shoe Store put all of its merchandise on sale for 20% off. If Jason saved $10 by purchasing one pair of shoes during the sale, what was the original price of the shoes?

a. $12
b. $20
c. $40
d. $50

Percent Word Problems

Word problems involving percents come in three main varieties:

- Find a percent of a whole.
  Example: What is 30% of 40?
- Find what percent one number is of another.
  Example: 12 is what percent of 40?
- Find the whole when the percent of it is given.
  Example: 12 is 30% of what number?

While each variety has its own approach, there is a single shortcut formula you can use to solve each of these:

$$\frac{is}{of} = \frac{\%}{100}$$

The *is* is the number that usually follows or is just before the word *is* in the question.

The *of* is the number that usually follows the word *of* in the question.

The % is the number that is in front of the % or *percent* in the question.

Or you may think of the shortcut formula as:

$$\frac{part}{whole} = \frac{\%}{100}$$
$$part \times 100 = whole \times \%$$

To solve each of the three varieties, let's use the fact that the **cross-products** are equal. The cross-products are the products of the numbers diagonally across from each other. Remembering that *product* means *multiply,* here's how to create the cross-products for the percent shortcut:

$$\frac{part}{whole} = \frac{\%}{100}$$
$$part \times 100 = whole \times \%$$

Here's how to use the shortcut with cross-products:

- Find a percent of a whole.
  What is 30% of 40?
  30 is the % and 40 is the *of* number: $\qquad\qquad \frac{is}{40} = \frac{30}{100}$
  Cross multiply and solve for *is*: $\qquad\qquad is \times 100 = 40 \times 30$
  $$is \times 100 = 1{,}200$$
  $$12 \times 100 = 1{,}200$$
  Thus, **12 is** 30% of 40.

- Find what percent one number is of another number.
  12 is what percent of 40?
  12 is the *is* number and 40 is the *of* number: $\quad \frac{12}{40} = \frac{\%}{100}$
  Cross multiply and solve for %: $\qquad\qquad 12 \times 100 = 40 \times \%$
  $$1{,}200 = 40 \times \%$$
  $$1{,}200 = 40 \times \mathbf{30}$$
  Thus, 12 is **30%** of 40.