

Percent is a great mathematical tool to express quantities and is used extensively in different things - from interest rates, discounts, and taxes to surveys, census, and so on.

In this reviewer, we'll discuss what percent is and how to solve real-life word problems related to it.

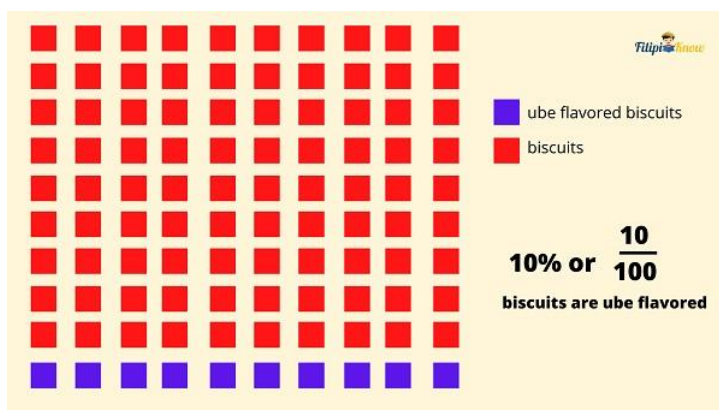
### What does percent mean?

The word “percent” originated from the Latin phrase *per centum* which means “by hundred”. When we say the word “percent”, we are really referring to “parts per 100”. This means that **a percent is a fraction with 100 as the denominator**. The symbol % is used to indicate a percent.

For example, 3% means 3 parts per 100 or  $\frac{3}{100}$ ; 45% means  $\frac{45}{100}$ ; and 92% means  $\frac{92}{100}$ .

### Illustrating percent.

Suppose a vendor has 100 biscuits. If 10% of those biscuits are ube-flavored, this means that  $\frac{10}{100}$  or 10 out of 100 biscuits are ube-flavored.



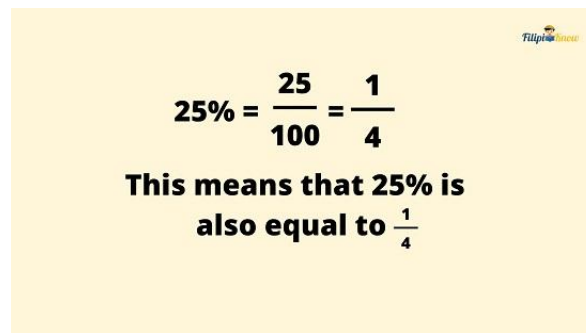
On the other hand, suppose that there are 100 students in a school auditorium. If 42% of those students are honor students, this means that  $\frac{42}{100}$  students or 42 out of 100 students are honor students.

## Expressing Percent as Fraction and Decimal.

Since percent means a fraction with 100 as the denominator, this means that we can express a percent as a [fraction or a decimal number](#).

**To transform a percent to a fraction, just drop the percent sign and put 100 as the denominator.** For instance, 25% is simply  $25/100$ .

Note that when  $25/100$  is reduced to its lowest terms, you will obtain  $1/4$ . This means that 25% is also equivalent to  $1/4$ .

A yellow rectangular box containing the equation  $25\% = \frac{25}{100} = \frac{1}{4}$  and the text "This means that 25% is also equal to  $\frac{1}{4}$ ". The FilipiKnow logo is in the top right corner of the box.
$$25\% = \frac{25}{100} = \frac{1}{4}$$

This means that 25% is also equal to  $\frac{1}{4}$

Furthermore, note that when you transform  $1/4$  into its decimal form using the [steps we have discussed in the previous reviewer](#), you will obtain 0.25. Hence, 25% is also equal to 0.25.

**There is an easier way to transform percent into decimal. Just drop the percent sign and move the decimal point two places to the left of the given number.**

### Convert 54% to decimal form



Start by dropping or removing the percent sign

$$54\% \longrightarrow 54$$

Move the decimal point two places to the left (the decimal point in a whole number can be located in the right of the ones digit)

$$54. \longrightarrow .54 \longrightarrow 0.54$$

Therefore,  $54\% = 0.54$

For example, 54% is equivalent to 0.54

**Example:** Transform 3% to decimal form.

**Solution:**

### Convert 3% to decimal form



Start by dropping or removing the percent sign

$$3\% \longrightarrow 3$$

Move two decimal places to the left (the decimal point in a whole number can be located in the right of the ones digit)

$$3. \longrightarrow .03 \longrightarrow 0.03$$

Therefore,  $3\% = 0.03$

## Percentage.

Suppose that your mom prepared 10 pieces of your favorite cookies. You are really excited to taste those cookies but you realize that 20% of the cookies that your mom prepared were eaten by your brother. *What exactly is the number of cookies eaten by your brother?*

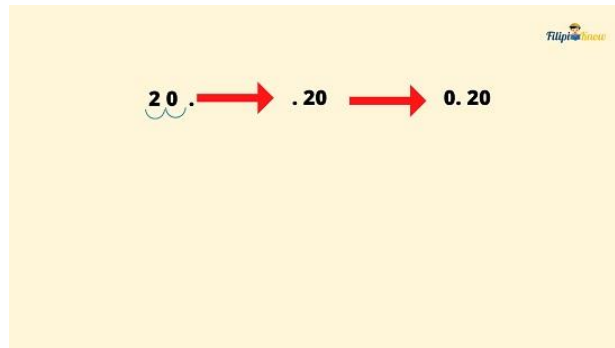
To find out the answer to your question above, you need to determine what is 20% of 10. This case involves the application of percentage.

**The percentage is the result when you multiply a number by a percent.** Going back to your problem about the number of cookies that your brother ate, 20% of 10 can be determined if you multiply 10 by 20%. The result after you multiply the numbers is called the percentage.

### How to Find the Percentage.

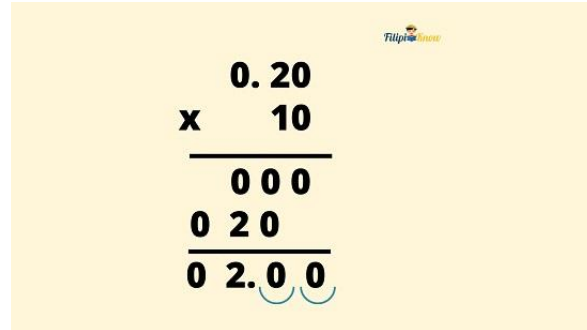
Follow these steps if you want to find the percentage:

**Step 1:** Convert the given percent (the one with the % sign) into decimal.



Again, to convert percent into its decimal form, we just drop the percent sign then move the decimal point two places to the left. Thus, 20% = 0.20

**Step 2:** Multiply the decimal you have obtained from Step 1 to the given number. The result is the percentage.



A vertical multiplication problem on a yellow background. It shows 0.20 multiplied by 10. The result is 2.00, with a blue bracket under the two zeros after the decimal point. A small FilipiKnow logo is in the top right corner of the box.

$$\begin{array}{r} 0.20 \\ \times 10 \\ \hline 000 \\ 020 \\ \hline 02.00 \end{array}$$

To multiply 0.20 by 10, we just ignored the decimal point for a while and multiplied the given decimals just like whole numbers. We have obtained 0200. Since 0.20 has two decimal places while 10 has no decimal place, then the final answer should have two decimal places. We count two digits from the right of 0200 and put the decimal point there. Hence, the answer is 02.00 which is equivalent to 2.

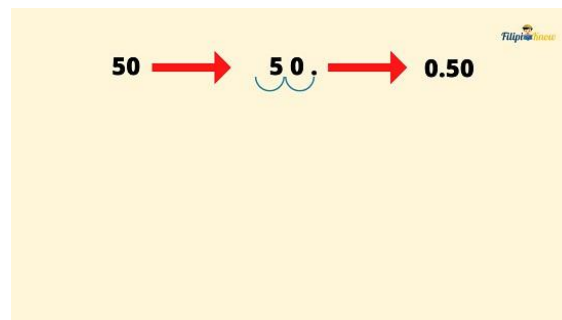
Hence, 20% of 10 is 2. This means that out of 10 cookies that your mother prepared, 2 of those were eaten by your brother.

Let us have another example.

**Example:** What is 50% of 120?

**Step 1:** Convert the given percent (the one with the % sign) into decimal.

We just drop the % sign of 50% and move the decimal point two places to the left.

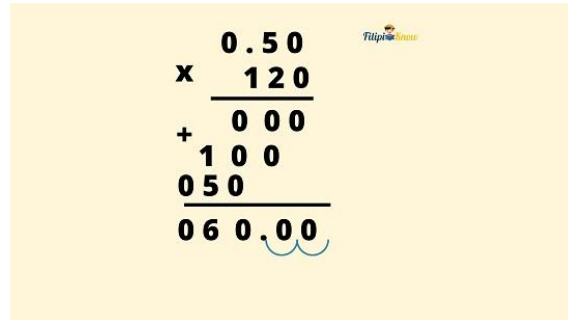


A diagram on a yellow background showing the conversion of 50 to 0.50. It starts with the number 50, followed by a red arrow pointing to 50. (with a blue bracket under the 0), followed by another red arrow pointing to 0.50. A small FilipiKnow logo is in the top right corner of the box.

$$50 \rightarrow 50. \rightarrow 0.50$$

Thus,  $50\% = 0.50$

**Step 2:** Multiply the decimal you have obtained from Step 1 to the given number. The result is the percentage.



A handwritten multiplication problem on a yellow background. It shows  $0.50$  multiplied by  $120$ . The calculation is done in two steps: first,  $0.50$  is multiplied by  $0$  to get  $000$ ; then,  $0.50$  is multiplied by  $12$  to get  $050$ . These two results are added together to get the final answer,  $060.00$ . A blue bracket is drawn under the last two digits,  $.00$ , to indicate that the decimal point should be placed two digits from the right.

To multiply  $0.50$  by  $120$ , we just ignored the decimal point for a while and multiplied the given decimals just like whole numbers. Through this process, we have obtained  $06000$ . Since  $0.50$  has two decimal places while  $120$  has no decimal place, then the final answer should have two decimal places. We count two digits from the right of  $06000$  and put the decimal point there. Hence, the answer is  $060.00$  which is equivalent to  $60$ .

Hence,  $50\%$  of  $120$  is  $60$ .

### Simple Tricks in Computing Percentages.

We always want to make our computations in mathematics faster and accurate. For this reason, I will share with you two tricks that you can use when computing percentages.

**Trick #1: You can actually compute some percentages using only mental computation.**

If you want to determine the  $25\%$ ,  $50\%$ ,  $75\%$ , or  $100\%$  of a number, you can do so without the help of pen and paper.

$25\%$  is equivalent to  $25/100$  or  $1/4$ . Hence, **to find the  $25\%$  of a number, just divide the given number by 4.**

**Example:**  $25\%$  of  $40$  is just  $40 \div 4 = 10$

50% is equivalent to  $50/100$  or  $1/2$ . Thus, **to find the 50% of a number, just divide the given number by 2. This means that 50% of a number is just half of the given number**

**Example:** 50% of 40 is just  $40 \div 2 = 20$

75% is equivalent to  $75/100$  or  $3/4$ . Thus, **to find the 75% of a number, multiply the given number by 3 and then divide the result by 4.**

**Example:** 75% of 40 is just  $40 \times 3 = 120 \div 4 = 30$

100% is equivalent to  $100/100$  or 1. Thus, **100% of a number is the number itself.**

**Example:** 100% of 40 is just 40 itself.

**Trick #2: X% of a number Y is equal to Y% of number X.**

This trick means that we can transfer the % sign to the other number and the result will be the same.

**Example:** What is 40% of 25?

Using trick #2, we can transfer the % sign from 40% to 25. Thus, we have 25%. This means that 40% of 25 is the same as 25% of 40.

Thus, applying our first trick on finding the 25% of a number,  $40 \div 4 = 10$ , Hence, 40% of 25 is 10.

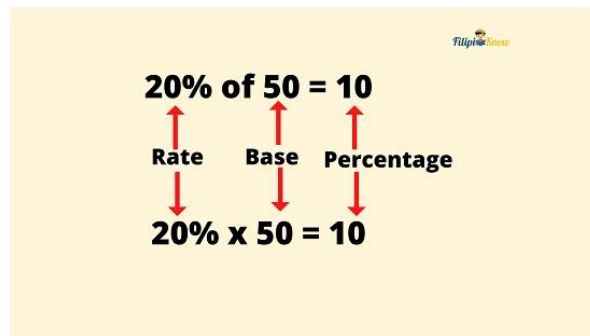
**Example:** What is 92% of 50?

92% of 50 is the same as 50% of 92. Hence, we can just simply divide 92 by 2 to obtain the answer,  $92 \div 2 = 46$

Therefore, 92% of 50 is 46.

### Base and Rate.

The base is the amount you are taking a percent of. Meanwhile, the rate is the percent you are calculating.



For example, if there are 50 students in a classroom and 20% of those students are honor students, it follows that 10 students in that classroom are honor students. 50 is the base since it is the amount we are taking a percent of. Meanwhile, 20% is the rate since it is the percent we are calculating. Lastly, 10 is the percentage.

The product of the base and the rate is the percentage.

$$\text{Percentage} = \text{Base} \times \text{Rate}$$

**Example:** Determine the percentage, base, and rate if 20% of 90 is 18.

**Solution:**

Since,  $90 \times 20\% = 90 \times 0.20 = 18$ , then 90 is the base, 20% is the rate, and 18 is the percentage.

### Calculating Percentage, Base, and Rate.

**Formula to Find the Percentage.**

The formula to find the percentage, as we have stated, is:

$$\text{Percentage} = \text{Base} \times \text{Rate}$$





We can manipulate the mathematical equation above to obtain the formulas for computing the base and the rate:

**Formula to Find the Base.**

$$\text{Base} = \text{Percentage} \div \text{Rate}$$

**Formula to Find the Rate.**

$$\text{Rate} = \text{Percentage} \div \text{Base}$$

**Example 1:** If 10% of a number is 90, what is the number?

**Solution:**

We can interpret this question as 10% of \_\_\_\_\_ = 90. Since “of” is a signal word for multiplication, it also implies  $10\% \times \text{_____} = 90$

This means that 10% is the rate while 90 is the percentage. The unknown number is the base. Thus, we need to compute the base.

Using the formula to find the base:

$$\text{Base} = \text{Percentage} \div \text{Rate}$$

$$\text{Base} = 90 \div 10\%$$

Convert the given percent into decimal:

$$\text{Base} = 90 \div 0.10$$

Now that you have already transformed the rate into decimal form, you may now divide 90 by 0.10 to obtain the answer.

To [perform division with decimal numbers](#), we need to transform the divisor (0.10) into a whole number by moving two decimal places to the right. Thus, the new divisor is 10. We also move two decimal places for the dividend (90). Thus, the new dividend is 9000.



We move the decimal point two places to the right of 0.10 so that it will be a whole number

$$0.10 \longrightarrow 10$$

We also move two decimal point places to the right of 90

$$90 \longrightarrow 9000$$

We now perform long division with our new dividend and divisor:

$$\begin{array}{r} 900 \\ 10 \overline{) 9000} \\ \underline{90} \phantom{00} \\ 0 \phantom{00} \\ \underline{0} \phantom{0} \\ 0 \\ \underline{0} \\ 0 \end{array}$$

To find the base, we compute  $90 \div 0.10 = 900$

Hence, the base is 900.

**Example 2:** What percent of 720 is 90?

**Solution:**

We can translate the question above in this form: \_\_\_\_\_% of 720 is 90 or \_\_\_\_\_% x 720 = 90. Therefore, 720 is the base while 90 is the percentage. The missing number is the rate.

We will now use the formula for finding the rate.

$$\text{Rate} = \text{Percentage Base}$$

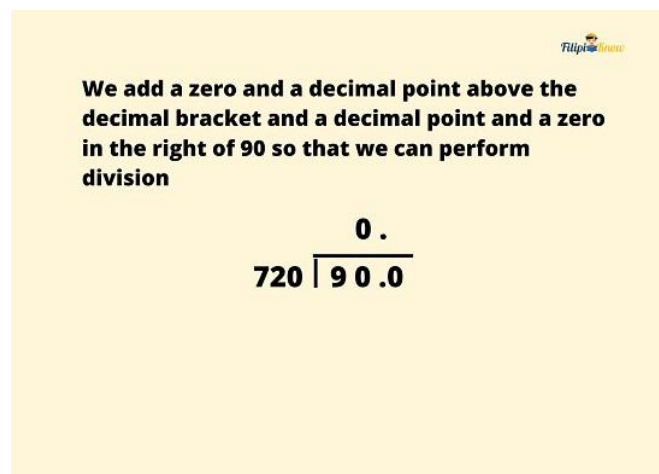
Again, based on the given problem, the percentage is 90 while the base is 720

$$\text{Rate} = 90 \div 720$$

Notice that the dividend (the first number) is smaller than the divisor (the second number). In this case, you may apply the same [steps in transforming fractions into decimal form](#) because  $90 \div 720$  is actually a proper fraction which is  $90/720$ .

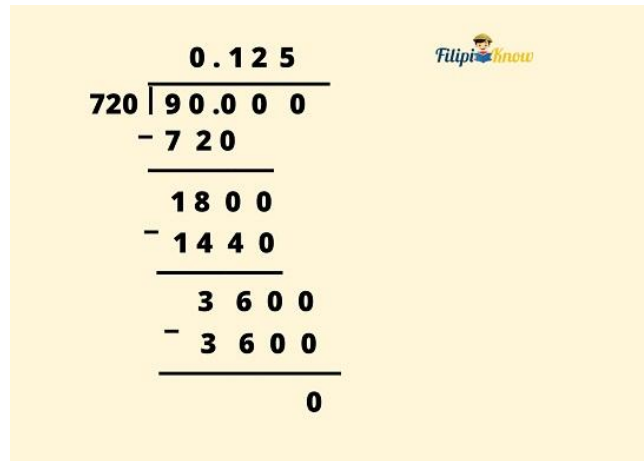
Let us divide 90 by 720 using the steps in [transforming fractions into decimal form](#).

We start by adding some zeros and decimal points so we can proceed with the division process.

A yellow rectangular box containing text and a division diagram. The text reads: "We add a zero and a decimal point above the decimal bracket and a decimal point and a zero in the right of 90 so that we can perform division". Below the text is a long division diagram: 
$$\begin{array}{r} 0. \\ 720 \overline{) 90.0} \end{array}$$

The diagram shows the number 90.0 being divided by 720. A horizontal line is drawn above the 0 in 90.0, and a vertical line is drawn to the left of the 90.0, forming a bracket. The number 0. is written above the horizontal line, and the number 720 is written to the left of the vertical line.

We can now divide 900 by 720.



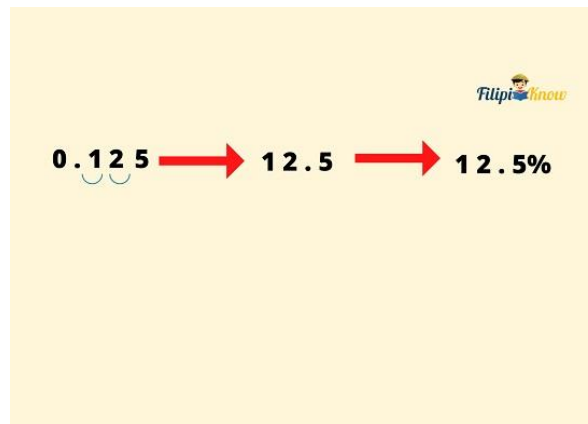
A long division problem showing 900 divided by 720. The quotient is 0.125. The process involves adding three zeros to the dividend (900.000) and performing three steps of division, each time bringing down a zero to the remainder.

$$\begin{array}{r}
 0.125 \\
 720 \overline{) 900.000} \\
 \underline{- 720} \phantom{00} \\
 1800 \\
 \underline{- 1440} \\
 3600 \\
 \underline{- 3600} \\
 0
 \end{array}$$

Take note that everytime the remainder becomes smaller than the divisor, we just add zeros to 900 and to the remainder so we can continue the division process.

The quotient we obtained is 0.125. Thus, 0.125 is our rate.

However, rate must always be expressed with a percent sign. To do this, we just multiply 0.125 by 100 or move two decimal places to the right of it and put a percent sign. Thus, 0.125 is equal to 12.5%.

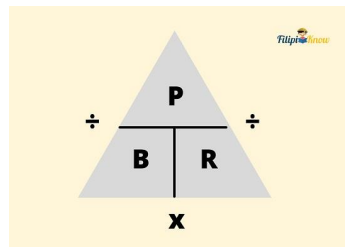


Therefore, the rate is 12.5%

## The Percentage, Base, and Rate Triangle.

What if you forgot the formula to determine the percentage, base, or rate in a certain problem? Don't worry because there is actually a fun way to derive these formulas.

Shown below is the **Percentage, Base, and Rate Triangle**. It is a triangle divided into three portions where P (for percentage) is written on the upper portion and B (for base) and R (for rate) are written on the lower portions. There are also division signs in the outer left and outer right parts of the triangle as well as a multiplication sign below it.



## How to Use the Percentage, Base, and Rate Triangle.

Suppose you are looking for the base. What you have to do is to cover the B in the triangle and look at the remaining letters and the operation between them. Notice that if you cover B, the remaining letters are P and R with a division sign between them. This means that to find the base, you need to divide P by R.

