



PERCENTAGES

Equation Method

See also *Proportion Method* listed further below.

Percentage means per "one-hundred".

To calculate a percentage, you may always use the following equation:

WHAT %? of WHAT ? = WHAT ?

The items on the left side are always multiplied.

The percentage is always written as a decimal.

Examples:

Find: 37% of 29

Using our equation above: 37% of 29 = WHAT?

37% is 37 per 100 which is 37/100

$$.37 \text{ times } 29 = 10.73$$

10.73 is 37% of 29

Find: 48.5% of 7823

Using the equation above: 48.5% of 7823 = WHAT?

48.5% is 48.5 per 100 which is 48.5/100, or .485

$$.485 \text{ times } 7823 = 3794.155$$

3794.155 is 48.5% of 7823

If you only have one item on the left side and one item on the right side, divide both sides by the item on the left.

Examples:

127 is what percentage of 3229?

Rewording the question, we are asking "*What percentage of 3229 is 127?*"

Using the equation above: WHAT %? of WHAT = WHAT?

$$\text{WHAT \%? of } 3229 = 127$$

Since we have a number on the left and a number on the right, we divide both sides by the number on the left.

$$\frac{\text{WHAT \%? of } 3229}{3229} = \frac{127}{3229}$$

Using a calculator, you first enter 127, then press the "divide" button, and enter 3229.

$$\text{WHAT \%?} = .0393310622$$

To change a decimal to a percentage, multiply it by 100.

$$.0393310622 \text{ times } 100 \text{ is } 3.93310622$$

Unless told otherwise, we can usually drop all of the decimals following the first one using "rounding" rules

In this question, we have found that **127 is approximately 3.9% of 3229.**

13.38 is what percentage of 78.56 ?

The question may be rewritten as "*What percentage of 78.56 is 13.38?*"

Using our equation: WHAT %? of 78.56 = 13.38.

Divide both sides by the number on the left.

$$\frac{\text{WHAT \%? of } 78.56}{78.56} = \frac{13.38}{78.56}$$

Using a calculator, enter 13.38 divided by 78.56 to get .1703156823

Multiply .1703156823 by 100. The result is 17.03156823

Drop the decimals after the first one (using rounding rules): 17.0

Thus, 13.38 is approximately 17.0% of 78.56

Proportion Method

We can look at percentages in terms of two fractions that are equal (called a proportion).

The percentage is per 100, so we write the fraction $(\%) / 100$

The second fraction is a little more difficult.

Most percentage problems are written using the words "is" and "and" .

Example,

What percentage **of** 50 **is** 39 ?

27 **is** what percentage **of** 38 ?

Notice that in both cases there is a number next to one of the words.

In the first example, "**of** 50" and "**is** 39" associate 50 with the word "of" and 39 with the word "is" because they are next to these words.

In the second example, "27 **is**" and "**of** 38" associates 27 with "is" and 38 with "of".

We use these associations to form the second fraction: $(\text{is}) / (\text{of})$.

The number next to the word "is" goes on top and the word "of" goes on the bottom of the second fraction.

Examples:

What percentage **of 50 **is** 39 ?**

Write two fractions equal to each other. $(\%) / 100 = (\text{is}) / (\text{of})$.

Place the numbers in their respective places in the fractions.

39 is next to "**is**" and 50 is next to "**of**".

$$(\%) / 100 = (\text{is}) / (\text{of})$$

$$(\%) / 100 = (39) / (50)$$

Now clear the fraction by multiplying by 100.

$$\begin{aligned} \cancel{100} (\%) / \cancel{100} &= 100 (39) / (50) \\ &= 3900 / 50 \\ &= 390 / 5 \\ &= 78 \end{aligned}$$

Thus, 78% of 50 is 39

27 is what percentage of 38 ?

Write two fractions equal to each other. $(\%) / 100 = (\text{is}) / (\text{of})$.

Place the numbers in their respective places in the fractions.

27 is next to "is" and 38 is next to "of".

$$\begin{aligned} (\%) / 100 &= (\text{is}) / (\text{of}) \\ (\%) / 100 &= (27) / (38) \end{aligned}$$

Now clear the fraction by multiplying by 100.

$$\begin{aligned} \cancel{100} (\%) / \cancel{100} &= 100 (27) / (38) \\ &= 2700 / 38 \\ &= 1350 / 19 \\ &= 71.05263158 \\ &= \text{approximately } 71.05 \end{aligned}$$

Thus, 27 is approximately 71.05% of 38.

What is 48.5% of 7823?

Write two fractions equal to each other. $(\%) / 100 = (\text{is}) / (\text{of})$.

Place the numbers in their respective places in the fractions.

It looks like 48.5% is next to "is", but 48.5 has the "%" sign so we place it in the fraction with the percentage sign. The word "**What**" is next to "is" and 7823 is next to "of".

$$(\%)/100 = (\text{is})/(\text{of}).$$

$$(48.5)/100 = (\text{What})/(7823)$$

This time we want to clear the fraction associated with the word "**What**" since the answer to question "What" is unknown.

To clear the fraction we multiply by 7823.

$$(\text{What})/(7823) = (48.5)/100$$

$$\cancel{7823}(\text{What})/(\cancel{7823}) = \cancel{7823}(48.5)/100$$

$$(\text{What}) = 379415.5/100$$

$$(\text{What}) = 3794.155$$

Thus, 3794.155 is 48.5% of 7823?