

# Percent

Percent means **per one hundred**, or **divide by 100**. The “%” symbol is used to denote percent.

$$100\% = \frac{100}{100} = 1$$

## To Write a Percent as a Decimal

Move the decimal 2 places to the left ←

$$25\% = .25$$

$$365\% = 3.65$$

$$2.5\% = 0.025$$

## To Write a Decimal As a Percent

Move the decimal 2 places to the right →

$$.456 = 45.6\%$$

$$.37 = 37\%$$

$$2.5 = 250\%$$

## To Write a Percent as a Fraction

Remember the % means divide by 100 & reduce!

$$27\% = \frac{27}{100} \quad 365\% = \frac{365}{100} = 3\frac{13}{20} \quad 2.5\% = \frac{2.5}{100} = \frac{25}{1000} = \frac{1}{40}$$

## To Write a Fraction as a Percent

Convert the denominator to 100, then the top number is the percent.

$$\frac{7}{8} = \frac{7 * 12.5}{8 * 12.5} = \frac{87.5}{100} = 87.5\%$$

Or divide the bottom number into the top number & then convert the resulting decimal to a percent.

$$\frac{5}{12} = .41\bar{6} = 41.\bar{6}\% \approx 41.7\%$$

## Solving Problems involving Percent

There are 2 basic methods for solving percent problems. We either set it up as an equation or as a proportion. Some problems work easier in one method, and some are easier in the other. Use the method that works for you.

of means multiplication (•)  
is means equals (=)  
what (or similar) means the unknown number.

Part of Equation  
or Proportion

Percent (p)

Base (b)

Amount (a)

How It's Identified

% or percent

Appears after of

Part compared to base  
or part of base

### Basic Percent Equation

$$\text{percent} \cdot \text{base} = \text{amount} \quad \text{or} \quad \text{amount} = \text{percent} \cdot \text{base}$$

20% of 50 is 10

$$20\% \cdot 50 = 10$$

$$(.20)(50) = 10$$

Normally we convert the percent to a decimal when we put it into the equation.

### Basic Percent Proportion

$$\frac{\text{amount}}{\text{base}} = \frac{\text{percent}}{100} \longrightarrow \frac{a}{b} = \frac{p}{100} \longrightarrow \frac{10}{50} = \frac{20}{100}$$

Since the percent goes on top of 100, all we do is write the number in front of the percent symbol.

Use the following to see if your answers are reasonable.

100% of a number, the amount is the number

a percent greater than 100% the amount is a number larger than the original number

a percent less than 100% the amount is a number less than the original number

$$\begin{aligned} \text{What number is 30\% of 260?} &\rightarrow a = .30 \cdot 260 & \frac{a}{260} &= \frac{30}{100} \\ 78 \text{ is what percent of 260?} &\rightarrow 78 = p \cdot 260 & \frac{78}{260} &= \frac{p}{100} \\ 78 \text{ is 30\% of what number?} &\rightarrow 78 = .30 \cdot b & \frac{78}{b} &= \frac{30}{100} \end{aligned}$$

In each of the above cases just solve for the variable, that is get the letter by itself.

Example:

The freshman class of 625 students is 20% of all students at State College. How many students go to State College?

625 students is 20% of how many students

$625 = .20b \rightarrow$  divide both sides by .2  $\rightarrow 3125 = b$ , so there are 3125 students

Or  $\frac{625}{b} = \frac{20}{100} \rightarrow$  use the cross multiply method  $\rightarrow 625 \cdot 100 = 20 \cdot b \rightarrow$  divide both sides by 20  $\rightarrow 3125 = b$

$$\text{percent increase} = \frac{\text{amount increase}}{\text{original amount}} \quad \text{percent decrease} = \frac{\text{amount decrease}}{\text{original amount}}$$

In each the quotient will be a decimal, but write it as a percent.

## Sales Tax and Total Price

$$\begin{aligned}\text{sales tax} &= \text{tax rate} \cdot \text{purchase price} \\ \text{total price} &= \text{purchase price} + \text{sales tax}\end{aligned}$$

## Calculating Commissions

A **wage** is payment for performing work. An employee who is paid a **commission** as a wage is paid a percent of his or her total sales.

## Commission

$$\text{commission} = \text{commission rate} \cdot \text{sales}$$

## Discount and Sale Price

$$\begin{aligned}\text{amount of discount} &= \text{discount rate} \cdot \text{original price} \\ \text{sale price} &= \text{original price} - \text{amount of discount}\end{aligned}$$

## Calculating Simple Interest

**Interest** is money charged for using other people's money. Money borrowed, loaned, or invested is called the **principal amount**, or simply principal. The **interest rate** is the percent used in computing the interest (usually per year). **Simple interest** is interest computed on the original principal.

## Simple Interest

$$\begin{aligned}\text{simple interest} &= \text{principal} \cdot \text{rate} \cdot \text{time or } I = P \cdot R \cdot T \\ &\text{where the rate is understood to be per year and time is in years.}\end{aligned}$$

## Finding the Total Amount of a Loan or Investment

$$\text{total amount (paid or received)} = \text{principal} + \text{interest}$$

## Finding the Monthly Payment of a Loan

$$\text{monthly payment} = \frac{\text{principle} + \text{interest}}{\text{total number of payments}}$$

## Calculating Compound Interest

**Compound interest** is computed on not only the principal, but also on the interest already earned in previous compounding periods. If interest is **compounded annually** on an investment, this means that interest is added to the principal at the end of each year and next year's interest is computed on this new amount.

## Finding Total Amounts with Compound Interest

$$A = P \left( 1 + \frac{r}{n} \right)^{nt}$$

where A is the total amount, P is the principle, r is the rate, n is the number of times a year it is compounded, t is time in years.