

# Ratios and Rates as Percentages



## Objective

In this lesson, you will

## Percentage



**Percent** means "for every \_\_\_\_\_."

A percentage is a ratio whose second term is \_\_\_\_\_. So, a percentage can also be written as a fraction with a \_\_\_\_\_ of 100.

## Calculating Percentage of a Quantity

To find the specified percentage (called the \_\_\_\_\_) of a quantity, we multiply the original quantity (called the \_\_\_\_\_ value or the base) by the percentage. Percentage, when used in calculations, is expressed as a \_\_\_\_\_ per 100.

$$\text{amount} = \text{base} \times \frac{\text{rate}}{100}$$

**Example:** Tabitha knows that 70% of the girls in her class voted for her. There are 120 girls in Tabitha's class. How many girls voted for Tabitha?

$$70\% \text{ of } 120 = 120 \times \frac{70}{100} = \boxed{\phantom{00}}$$

We can see that \_\_\_\_\_ girls out of 120 voted for Tabitha.

## Calculating Amount

We often find percentages in notices about sales. In sales terms, *amount* in the formula means "amount of \_\_\_\_\_," *base* means "the \_\_\_\_\_ price of the item before discount," and *rate* means "the rate of \_\_\_\_\_."

**Example:** There's a 50% discount on a pair of shoes that have a full price of \$100. What is the new price of the shoes?

$$\text{amount of discount} = \text{base price} \times \text{rate of discount} = \$100 \times \frac{50}{100} = \$\boxed{\phantom{00}}$$

The amount of discount is \$\_\_\_\_\_ on that pair of shoes. Therefore, the price of the shoes after the discount is  $\$100 - \$\_\_\_\_\_ = \$\_\_\_\_\_.$

## Calculating Rate

Rewrite the formula for rate:

$$\text{rate} = \frac{\text{amount}}{\text{base}} \times 100$$

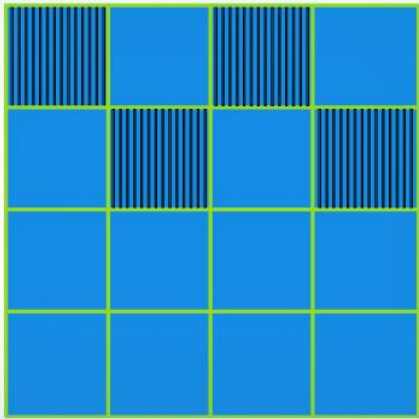
**Example:** Of the 200 students in Tabitha's class, 20 did not attend school on Friday. Find the percentage of students absent on Friday.

$$\text{rate} = \frac{\boxed{\phantom{20}}}{200} \times 100$$

$$\text{rate} = \frac{1}{10} \times 100 = \frac{100}{10} = \boxed{\phantom{10}}$$

So, \_\_\_\_\_% of students were absent on Friday.

**Example:** In the picture, 4 of the 16 squares are striped. Find the percentage of striped squares.



$$\begin{aligned} \text{rate} &= \frac{\text{amount}}{\text{base}} \times 100 \\ &= \frac{\boxed{\phantom{4}}}{16} \times 100 \\ &= \frac{1}{4} \times 100 \\ &= \frac{100}{4} = \boxed{\phantom{25}} \end{aligned}$$

From our calculation, we know that \_\_\_\_\_% of the squares in the picture are striped.

## Calculating Base

Rewrite the original formula for base:

$$\text{base} = \text{amount} \times \frac{100}{\text{rate}}$$

**Example:** Of the total number of students in Nikki's class, 45 have red school bags. These 45 students form 90% of the class. Find the total number of students in Nikki's class.

$$\text{total students} = \text{students with red bags} \times \frac{100}{\% \text{ of students with red bags}}$$

$$\text{total students} = 45 \times \frac{100}{\boxed{\phantom{90}}}$$

$$\text{total students} = 45 \times \frac{10}{9} = \frac{450}{9} = \boxed{\phantom{50}}$$

There are \_\_\_\_\_ students in Nikki's class.

**Example:** Every month, Harry saves \$20, which is 80% of his monthly spending money. With that information, we can use equivalent ratios to find how much total spending money Harry receives each month.

We can say that 80% means that for every \$100 he gets as pocket money, Harry saves \$\_\_\_\_\_. Written as equivalent ratios:

$$\frac{100}{80} = \frac{\text{monthly spending money}}{\boxed{\phantom{000}}}$$

If we simplify this equation to solve for Harry's monthly spending money, we get:

$$\frac{100 \times 20}{\boxed{\phantom{000}}} = \frac{100}{4} = \$ \boxed{\phantom{000}}$$

## Switching Between Percentages and Fractions

To convert a percentage to a fraction, <u>multiply</u> <u>divide</u> the percentage by 100:	$50\% = \frac{50}{100} = \frac{1}{\boxed{\phantom{00}}}$
To convert a fraction to a percentage, we need to <u>multiply</u> <u>divide</u> the fraction by 100 and add the percent symbol:	$\frac{1}{4} \times 100\% = \frac{100\%}{4} = \boxed{\phantom{00}}\%$

## Switching Between Percentages and Decimal Numbers

To convert a percentage to a decimal number, <u>multiply</u> <u>divide</u> the percentage by 100 and convert the fraction to a decimal number:	$18\% = \frac{18}{100} = \boxed{\phantom{00}}$
To convert a decimal number to a percentage, <u>multiply</u> <u>divide</u> the decimal number by 100 and add the percent symbol:	$0.32 = 0.32 \times 100\% = \boxed{\phantom{00}}\%$

You can also convert the decimal number to a fraction before you convert it to a percentage:

$$0.32 = \frac{32}{100} = \boxed{\phantom{00}}\%$$

## Summary

Using the roots of the word *percent*, how can you remember that *percent* means “for every hundred?”