SOLVING PERCENT PROBLEMS

**Percent Equation**

In problems involving the percent equation, two parts of the equation are given, the other part is unknown.

**P**ercent • **B**ase = **A**mount

To write the equation, identify the given and unknown parts using the guide below:

"of" translates to "multiply"
"is" translates to "**=**"
The base usually follows "of"
The amount usually follows "is"
"what" identifies the unknown

*When the percent is given, <u>convert</u> the percent <u>to decimal</u> form.*

**EXAMPLE 1:** 15 is what percent of 120?

To solve the problem, identify the given and unknown parts:

Given: Base = 120                     Unknown: Percent = x
       Amount = 15

Equation:    120 • x = 15

$$\frac{120 \cdot x}{120} = \frac{15}{120}$$

$$120\overline{)15.000} = 0.125$$

$$x = 0.125 = 12.5\%$$

**Percent Proportion**

Problems involving the percent equation can also be solved with the proportion:

$$\frac{Percent}{100} = \frac{Amount \text{ (is)}}{Base \text{ (of)}}$$

*When the percent is given, drop the percent sign and place the percent over 100.* Cross multiply to solve the proportion.

**Example 2:** 27 is 45% of what number?

Given:       Percent = 45%           Unknown: Base = x
             Amount = 27

Proportion:    $\frac{45}{100} = \frac{27}{x}$

Next, cross multiply to solve the proportion:

$$\frac{45}{100} = \frac{27}{x}$$

$$45(x) = 27(100)$$

$$45x = 2700$$

$$\frac{45x}{45} = \frac{2700}{45}$$

$$45\overline{)2700}$$    quotient 60

$$x = 60$$

## Percent of Increase or Decrease

To find the percent of increase or decrease,

1)  Subtract the *new amount* from the *original amount* to find the *decrease.* Subtract the *original amount* from the *new amount* to find the *increase*.
2)  Solve for the percent. The *"original amount"* is the *"base;"* the *"increase"* or *"decrease"* is the *"amount."*

**Example 3:** The amount in a savings account increased from $560 to $672. Find the percent of increase.

1)  Find the increase:

New Amount – Original Amount = Increase

    $672     –      $560    =   $112

2)  Solve for the percent:

Given:   Base = $560                 Unknown: Percent = x
          Amount = $112

Proportion:   $\dfrac{x}{100} = \dfrac{112}{560}$

Cross-multiply to solve:

$$\frac{x}{100} = \frac{112}{560}$$

$$560(x) = 112(100)$$

$$560x = 11,200$$

$$\frac{560x}{560} = \frac{11,200}{560}$$

$$560\overline{)11,200}$$    quotient 20

$$x = 20\%$$

The percent of increase is 20%

**Price Increases and Discounts**

Suppose a shirt is on sale for 40% of the original price.  If the total cost, including the discount, is $27.00, what was the price of the shirt before the discount?

The discount is 40% of the original price.  If we let x = the original price or the shirt, then

Discount  = 40%(Original Price) = 40%(x) = 0.4x

The total cost of the shirt, including the discount, is found by subtracting the amount of the discount from the original price of the shirt:

Original Price – Discount = Total Cost

x  – 0.4x  $27.00

To find the original price of the shirt, solve the equation for x:

$$x - 0.4x = 27$$
$$0.6x = 27$$
$$\frac{0.6x}{0.6} = \frac{27}{0.6}$$
$$x = 45$$

$$0.6\overline{)27.0}\; = 45.$$

The price of the shirt before the discount was $45.00.

**Simple Interest**

The amount of simple interest earned when $1000 is invested at 4.5% for 1 year is found using the formula **I = Prt**, where **I** is the interest earned, **P** is the principal or amount invested, **r** is the interest rate (percent) and **t** is the time:

I = Prt
I = 1000(0.045)(1) = $45.00

The amount in the account at the end of one year is found by adding the interest earned to the principal:

Principal + Interest = Amount.

$1000 +  $45  = $1045

**EXAMPLE 4:**  Money is invested at a simple interest rate of 5%.  At the end of one year the amount in the account is $3,675.  How much was the original investment?

To find the amount of the original investment, let x = the Principal.  Given r = 5% = 0.05 and t = 1, the interest earned on the principal is given by

I = Prt
I = (x)(0.05)(1) = 0.05x

At the end of one year the amount in the account is found by adding the interest to the principal:

Principal + Interest = Amount

x + 0.05x = $3,675

To find the original investment, solve the equation for x:

$$x + 0.05x = 3,675$$
$$1.05x = 3,675$$
$$\frac{1.05x}{1.05} = \frac{3,675}{1.05}$$
$$x = 3,500$$

$$1.05\overline{)3,675.00}. \quad = 3500.$$

The amount of the original investment was $3,500.