# Summary for Chapters 5 & 6

## Ratios, Proportions, and Percents

$\frac{4}{7}$ can be thought of as "the ratio of 4 to 7."

$\frac{3}{5} = \frac{6}{10}$ is a proportion read "three is to five as six is to ten."

3 and 10 are the extremes.

5 and 6 are the means.

$5 \cdot 6 = 3 \cdot 10$

**Ratio** A means of comparing two numbers or quantities. A ratio can be written as a fraction.

**Proportion** A statement that two ratios are equal.

**Extremes** The first and fourth terms of a proportion.

**Means** The second and third terms of a proportion.

**The Proportion Rule** In a true proportion, the product of the means is equal to the product of the extremes.

Fractions and decimals are other ways of naming parts of a whole.

$21\% = \frac{21}{100} = 0.21$

**Percent** Another way of naming parts of a whole. Percent means per hundredths.

## Solving Proportions for Unknown Values

To solve: $\dfrac{x}{5} = \dfrac{16}{20}$

$20x = 5 \cdot 16$

$20x = 80$

$\dfrac{20x}{20} = \dfrac{80}{20}$

$x = 4$

Check:

$\dfrac{4}{5} = \dfrac{16}{20}$

### To Solve a Proportion

1. Set the product of the means equal to the product of the extremes.
2. Divide both terms of the resulting equation by the coefficient of the unknown.
3. Use the value found to replace the unknown in the original proportion. Multiply to check that the proportion is true.

## Applying Proportions

### To Solve a Problem by Using Proportions

1. Read the problem carefully to determine the given information.
2. Write the proportion necessary to solve the problem, using a letter to represent the unknown quantity. Be sure to include the units in writing the proportion.
3. Solve, answer the question of the original problem, and check the proportion as before.

## Converting Between Fractions, Decimals, and Percents

$37\% = \dfrac{37}{100}$ ←

$37\% = 0.37$ ←

1. *To convert a percent to a fraction,* remove the percent symbol, and write the number over 100.
2. *To convert a percent to a decimal,* remove the percent symbol, and move the decimal point two places to the left.

$0.58 = 58\%$

$\dfrac{3}{5} = 0.60 = 60\%$

3. *To convert a decimal to a percent*, move the decimal point two places to the right, and attach the percent symbol.
4. *To convert a fraction to a percent*, write the decimal equivalent of the fraction, and then change that decimal to a percent.

## Percent Problems

Every percent problem has the following three parts:

1. The **base**. This is the whole in the problem. It is the standard used for comparison. Label the base *B.*
2. The **amount**. This is the part of the whole being compared to the base. Label the amount *A.*
3. The **rate**. This is the ratio of the amount to the base. The rate is written as a percent. Label the rate *R%*.

45 is 30% of 150.
↑      ↑      ↑
A     R%     B

These quantities are related by the percent relationship, the equation

Amount = rate × base

$A = R \times B$

$R = \dfrac{A}{B}$

$B = \dfrac{A}{R}$

## Solving Percent Problems

There are three types of percent problems.

- Finding the amount when the rate and the base are known
- Finding the rate when the amount and the base are known
- Finding the base when the rate and the amount are known

There are two methods for solving these problems.

R    B
↓    ↓
What is 12% of 500?

Amount = 0.12 × 500
       = 60

30 is what percent of 150?

Rate = $\dfrac{30 \leftarrow A}{150 \leftarrow B}$

= 0.2

= 20%

48 is 30% of what number?    B

$B = \dfrac{A}{R}$

Base = 48 ÷ 0.30 = 160

**Method 1** Using the Percent Relationship

**Finding an Unknown Amount**
1. Express the rate in decimal form.
2. Multiply the rate by the base.

**Finding an Unknown Rate**
1. Divide the amount by the base.
2. Convert the decimal to a percent.

**Finding an Unknown Base**
1. Convert the rate to a decimal.
2. Divide the amount by the rate.

✓ **Method 2** Using the **Percent Proportion**
The percent proportion is

$$\dfrac{A}{B} = \dfrac{R}{100}$$

R    B

What is 24% of 300?

$\dfrac{A}{300} = \dfrac{24}{100}$

$100A = 7200$

$A = 72$

To solve a percent problem using this proportion:
1. Substitute the two known values into the proportion.
2. Solve the proportion as before to find the unknown value.

*First, identify the 2 knowns as the A, R%, or B.*

*Second, plug the 2 knowns into either of the two equations (methods).*

*Third, solve for the one unknown.*