

Date \_\_\_\_\_

Dear Family,

In Chapter 2, your child will solve a variety of equations in one variable, including equations that result from proportion and percent problems.

An **equation** is a mathematical statement that two expressions are equal. A **solution** to an equation is a value of the variable that makes the equation true.

**Equation:**  $x + 8 = 12$

**Solution:** 4 is a solution because  $4 + 8 = 12$ .

Equations are solved by **isolating the variable** using **inverse operations**. You must perform the same inverse operations on *both sides* of the equation.

$x - 6 = 3$      *x has had 6 subtracted from it.*

$\begin{array}{r} + 6 \\ \hline x \end{array} = 9$      *Undo that by adding 6.*

$x = 9$      *9 is the solution.*

Many equations require multiple steps to isolate the variable. The variable might appear several times, or on both sides of the equation.

**$5(1 - 2x) + 4x = 17$**

$5 - 10x + 4x = 17$      *Distribute 5.*

$5 - 6x = 17$      *Combine  $-10x$  and  $4x$  to get  $-6x$ .*

$\begin{array}{r} -5 \\ \hline -6x \end{array} = 12$      *Subtract 5 from each side.*

$-6x = 12$

$\begin{array}{r} -6x \\ \hline -6 \end{array} = \begin{array}{r} 12 \\ \hline -6 \end{array}$      *Divide both sides by  $-6$ .*

$-6 = -6$

$x = -2$       *$-2$  is the solution.*

A **formula** is an equation that states a relationship between several quantities. Solving a formula for a given variable is similar to solving a multi-step equation.

For example,  $d = rt$  can be written as  $\frac{d}{t} = r$  by dividing both sides by  $t$ .

A **ratio** is a comparison of two quantities. A ratio such as 2 boys to 5 girls can be written as 2:5 or  $\frac{2}{5}$ . A **proportion** is an equation that relates two equivalent ratios. For example,  $\frac{1}{3} = \frac{4}{12}$  is a proportion.

When part of a proportion is unknown, you can use a variable for the unknown quantity and solve by using **cross products**.

$$\frac{1}{16} \times \frac{x}{20}$$
$$1(20) = 16(x) \quad \text{Use cross products.}$$
$$\frac{20}{16} = \frac{16x}{16}$$
$$1.25 = x \quad \text{Divide both sides by 16.}$$

Ratios and proportions have many useful applications, including rates, scale drawings, similarity, and indirect measurement.

A **percent** is a ratio that compares a number to 100. You can solve many percent problems with the proportion  $\frac{\text{part}}{\text{whole}} = \frac{\text{percent}}{100}$ .

**7 is what percent of 35?**

$$\frac{\text{part}}{\text{whole}} = \frac{\text{percent}}{100}$$
$$\frac{7}{35} = \frac{x}{100} \quad \text{7 is the part; 35 is the whole; the percent is unknown.}$$
$$35x = 700 \quad \text{Use cross products.}$$
$$x = 20 \quad \text{Divide both sides by 35.}$$

7 is 20% of 35.

Percents can be used to calculate commissions, interest, tips, markups, and discounts.

**A \$50 coat is on sale for 30% off. Find the discounted price.**

$$30\% \text{ of } \$50 = 0.30(\$50)$$
$$= \$15 \quad \text{The amount of discount.}$$
$$\$50 - \$15 = \$35 \quad \text{The discounted price.}$$

The coat costs \$35 after 30% is discounted.

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