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 showing 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.

$\boldsymbol{x - 6 = 3}$	*x has had 6 subtracted from it.*
$+ 6 \quad + 6$	*Undo that by adding 6.*
$x \quad = 9$	*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.

$\boldsymbol{5(1 - 2x) + 4x = 17}$

$5 - 10x + 4x = 17$	*Distribute 5.*
$5 \quad -6x \quad = 17$	*Combine −10x and 4x to get −6x.*
$-5 \qquad\qquad -5$	*Subtract 5 from each side.*
$-6x = 12$	
$\frac{-6x}{-6} = \frac{12}{-6}$	*Divide both sides by −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**.

$$\frac{1}{16} \times \frac{x}{20}$$

$1(20) = 16(x)$ *Use cross products.*

$\frac{20}{16} = \frac{16x}{16}$ *Divide both sides by 16.*

$1.25 = x$

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?

$$\frac{\text{part}}{\text{whole}} = \frac{\text{percent}}{100}$$

$\frac{7}{35} = \frac{x}{100}$ *7 is the part; 35 is the whole; the percent is unknown.*

$35x = 700$ *Use cross products.*

$x = 20$ *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% of \$50 = 0.30(\$50)

= \$15 *The amount of discount.*

\$50 – \$15 = \$35 *The discounted price.*

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

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