CHAPTER 5

Family Letter

Section A

What We Are Learning

Ratios, Rates, and Proportions

Vocabulary

These are the math words we are learning:

conversion factor a fraction whose numerator and denominator represent the same quantity but use different units

cross product in a proportion, the product of a numerator on one side with the denominator on the other

equivalent ratio ratios that name the same comparison

proportion an equation that states that two ratios are equivalent

rate a ratio that compares two quantities measured in different units

ratio a comparison of two quantities by division

unit price a unit rate used to compare prices

unit rate a rate in which the second quantity in the comparison is one unit

Dear Family,

The student will be learning about ratios. A **ratio** is simply a comparison of two items by division. Ratios are often expressed as fractions.

The student will use ratios that name the same comparison as another ratio. These ratios are called **equivalent ratios.** One way the student can determine if two ratios are equivalent, or in **proportion,** is if the ratios can be simplified to the same value.

Simplify to tell whether the ratios form a proportion.

$\frac{10}{15}$ and $\frac{24}{40}$

$\frac{10}{15} = \frac{10 \div 5}{15 \div 5} = \frac{2}{3}$ $\qquad$ $\frac{24}{40} = \frac{24 \div 8}{40 \div 8} = \frac{3}{5}$

Since, $\frac{2}{3} \neq \frac{3}{5}$, the ratios are not in proportion.

Another way to determine if two ratios are proportional is to find the cross products of two ratios. If the **cross products** of the ratios are equal, the ratios are in proportion. If the cross products are not equal, the ratios are NOT in proportion.

Tell whether the ratios are proportional.

$\frac{4}{12} \stackrel{?}{=} \frac{3}{9}$

$\frac{4}{12} \times \frac{3}{9}$ Find the cross products.

$36 = 36$

Since the cross products are equal, the ratios are proportional.

The student will apply the properties of proportions to help with problems that involve ratios. When one of the values of a proportion is unknown, the student will learn to solve for that missing value by using cross products or properties of equality.

The student will also use proportions and conversion factors to solve problems involving **rates.**

The student may use some of these common conversions when he or she needs to convert units in order to find a solution.

Measure	Customary System	Metric System
Length and Distance	12 in. = 1 ft 3 ft = 1 yd 5280 ft = 1 mi	10 mm = 1 cm 100 cm = 1 m 1000 m = 1 km
Volume and Capacity	2 cups = 1 pt 2 pints = 1 qt 4 qt = 1 gal	1000 mL = 1 L
Weight and Mass	16 oz = 1 lb 2000 lb = 1 ton	1000 mg = 1 g 1000 g = 1 kg

Mary is filling up the sand box with 8 bags of sand. Each bag weighs 3 lb. Use conversion factors to find how many ounces of sand are in each bag.

The problem gives the ratio 3 lb *to* 1 bag and asks for the answer in *ounces* per bag.

$\frac{3 \text{ lb}}{1 \text{ bag}} \cdot \frac{16 \text{ oz}}{1 \text{ lb}}$ Multiply by the conversion factor.

$= \frac{3 \cdot 16 \text{ oz}}{1 \text{ bag}}$ Cancel the lb units.

$= 48$ oz per bag

Have the student solve proportions that involve real life information. This will allow the student to see the application of this concept outside the classroom.

Sincerely,

CHAPTER 5

Family Letter

Section B

What We Are Learning

Similarity and Scale

Vocabulary

These are the math words we are learning:

corresponding angles matching angles of two or more polygons

corresponding sides matching sides of two or more polygons

indirect measurement a method of using similar figures and proportions to find a measure

similar figures that have the same shape, but not necessarily the same size

scale the ratio between two sets of measurements

scale drawing a drawing that uses a scale to make an object smaller than or larger than the real object

scale factor the ratio used to enlarge or reduce similar figures

scale model a three-dimensional model that accurately represents a solid object

Dear Family,

The student will be studying similar figures. **Similar figures** are figures that are the same shape, but not necessarily the same size. However, the angles of the figures do have to be congruent, and the ratios of corresponding sides must be equivalent. Since the sides of similar figures are proportional, you can find an unknown dimension by using the properties of proportions.

Sam needs to pack a jewelry box that measures 4.5 inches wide and 6 inches long. If he finds a box that is similar with a length of 10 inches, how wide is the box?

$\frac{4.5 \text{ in.}}{6 \text{ in.}} = \frac{x \text{ in.}}{10 \text{ in.}}$ Set up a proportion.

$6 \cdot x = 4.5 \cdot 10$ Find the cross products.

$6x = 45$ Multiply.

$x = \frac{45}{6} = 7.5$ Solve for x.

The width of the box is 7.5 inches.

When an item is too large to view on paper, you need to make a scale drawing or scale model of the item. A **scale drawing** is an accurate two-dimensional representation of an object. A **scale model** is a three-dimensional representation of the actual object. Both the scale model and drawing are similar to the actual object.

A **scale** is used to show the ratio between the dimensions of the scale drawing or model and the actual object. This ratio is the **scale factor.** The student will learn to identify and use the scale to find the dimensions of a scale drawing, model, or actual object.

The length of an object on a scale drawing is 4 cm and its actual length is 400 m.

The scale is 1 cm: _____ m. What is the scale?

$\frac{1 \text{ cm}}{x \text{ m}} = \frac{4 \text{ cm}}{400 \text{ m}}$ Set up a proportion: $\frac{\text{scale length}}{\text{actual length}}$

$400 \cdot 1 = 4 \cdot x$ Find the cross products.

$x = 100$ Solve the proportion.

The scale is 1 cm:100 m.

Family Letter

Section B continued

You can use scale factor and similar figures to find missing measurements of similar figures. This is called **indirect measurement.**

A model of a 16-foot boat was made using the scale 3 in.:4 ft. What is the height of the model?

$\frac{3 \text{ in.}}{4 \text{ ft}} = \frac{3 \text{ in.}}{48 \text{ in.}} = \frac{1 \text{ in.}}{16 \text{ in.}}$ First find the scale factor.

Now that you have the scale factor, you can set up the proportion.

$\frac{1}{16} = \frac{h \text{ in.}}{192 \text{ in.}}$ Convert: 16 ft = 192 in.

$16h = 192$ Cross multiply.

$h = 12$ Solve for the height.

The height of the model is 12 in.

The material in this section has many real-life applications. Have the student explain how to use a scale factor in relation to models and scale drawings. Practice having the student convert model dimensions to actual dimensions.

Sincerely,