Dear Family,

The next Unit in your child's mathematics class this year is *Comparing and Scaling: Ratios, Rates, Percents, and Proportions.* Students work within many different problem situations to make comparisons using ratios, fractions, percents, and rates. Students explore these concepts by making sense of surveys, scaling recipes for different numbers of people, analyzing prices for better deals, and calculating commissions from the selling prices of cars.

Unit Goals

This Unit has two broad goals. One is to help students develop the ability to compare quantitative information by using ratios, fractions, decimals, rates, unit rates, and percents. Another is to encourage students to use those comparisons to scale rates and ratios up and down.

Additionally, in this Unit students will learn different ways of reasoning in proportional situations, as well as how to recognize when such reasoning is appropriate.

Homework and Conversations About the Mathematics

You can help your child with homework and encourage sound mathematical habits during this Unit by asking questions such as:

- *Why is a ratio a good means of comparison? How can you scale a ratio up or down?*
- *How can you use proportions to solve problems?*
- *When quantities have different units of measure, how can you compare them?*
- *When can you use subtraction to make a comparison? When can you use division?*

You can help your child with his or her work for this Unit in several ways:

- Ratios, proportions, and percents are everywhere. When you see one of these concepts in a newspaper or magazine, point it out to your child. Discuss with your child what information the numbers give about the situation.
- If you keep track of your car mileage, you may want to share this with your child. If you use other modes of transportation, such as a bus or subway, you may want to discuss the cost of the transportation per week, per month, and per year.
- Ask your child to pick a question in the Unit that was interesting to him or her. Discuss the question together.

Common Core State Standards

While all of the Standards of Mathematical Practice are developed and used by students throughout the curriculum, this Unit focuses on reasoning abstractly and quantitatively. Students attend to finding the meaning of quantities, not just computing them. *Comparing and Scaling* focuses on the Ratios and Proportional Relationships domain. As students explore ratios, rates, percents, and proportions, several standards from the Expressions & Equations domain are also addressed.

Some of the important mathematical ideas that your child will learn in *Comparing and Scaling* are listed on the back of this letter.

If you have any questions or concerns about this Unit or your child's progress in the class, please feel free to contact me. All of us here are interested in your child and want to ensure that this year's mathematics experiences are enjoyable and promote a firm understanding of mathematics.

Sincerely,

Important Concepts	Examples
Ratio A comparison of two quantities	Ratios can be written in several forms. You can write the ratio of 3 cups of water to 2 cups of lemonade concentrate as 2 to 3, 2 : 3, or $\frac{2}{3}$.
Proportions A proportion is a statement of equality between two ratios.	*Kendra takes 70 steps on the treadmill to run 0.1 mile. When her workout is done, she has run 3 miles. How many steps has she taken?* Proportion: $\frac{70 \text{ steps}}{0.1 \text{ mile}} = \frac{x \text{ steps}}{3 \text{ miles}}$ $\frac{70 \text{ steps} \times 30}{0.1 \text{ miles} \times 30} = \frac{21{,}00 \text{ steps}}{3 \text{ miles}}$ Solution of the proportion
Two Types of Ratios Ratios can be *part-to-part* or *part-to-whole* comparisons. Part-to-whole comparisons can be written as fractions or percents. Part-to-part comparisons can be written in fraction form, but do not represent a fraction.	*The ratio of concentrate to water in a mix for lemonade is 3 cups concentrate to 16 cups water. What fraction of the mix is concentrate?* $\frac{3}{16}$ is the part-to-part comparison. This does not mean that the fraction of mix that is concentrate is $\frac{3}{16}$. Find the total, 19 cups, to write the fraction of the mix that is concentrate. Write a part-to-whole comparison using a fraction, $\frac{3}{19}$, or a percent, $3 \div 19 = 0.15789\ldots \approx 15.8\%$, to describe the part that is concentrate.
Rate A comparison of measures with two different units	Examples of rates: miles to gallons, sandwiches to people, dollars to hours, calories to ounces, kilometers to hours
Unit Rate A rate in which the second quantity is 1 unit	Students sometimes find unit rates difficult because they have two options when dividing the two numbers of a rate. Tracking the units helps students think through such situations. The goal is to build flexibility in using either set of unit rates to compare the quantities. *Sascha rides 6 miles in 20 minutes during the first leg of his bike ride. During the second leg, he rides 8 miles in 24 minutes. During which leg is Sascha faster?* $\frac{6 \text{ miles}}{20 \text{ minutes}} = 0.3$ miles per minute $\quad \frac{8 \text{ miles}}{24 \text{ minutes}} = 0.333$ miles per minute The times, 1 minute, are the same, so 8 miles in 24 minutes is faster. You can divide the other way as well: $\frac{20 \text{ minutes}}{6 \text{ miles}} = 3.333$ minutes per mile $\quad \frac{24 \text{ minutes}}{8 \text{ miles}} = 3$ minutes per mile The distances, 1 mile, are the same, and 3 minutes per mile is faster.
Scaling Ratios (and Rates) Finding a common denominator or common numerator to make comparisons easier	*Which is cheaper, 3 roses for \$5 or 7 roses for \$9?* Scale the costs to be the same by finding a common denominator. Use a common multiple of 5 and 9: $\frac{3 \text{ roses}}{\$5} = \frac{3 \text{ roses} \times 9}{\$5 \times 9} = \frac{27 \text{ roses}}{\$45}, \frac{7 \text{ roses}}{\$9} = \frac{7 \text{ roses} \times 5}{\$9 \times 5} = \frac{35 \text{ roses}}{\$45}$ 7 roses for \$9 gives more roses for the same amount of money. Or, scale the numerators to be the same: $\frac{3 \text{ roses}}{\$5} = \frac{3 \text{ roses} \times 7}{\$5 \times 7} = \frac{21 \text{ roses}}{\$35}, \frac{7 \text{ roses}}{\$9} = \frac{7 \text{ roses} \times 3}{\$9 \times 3} = \frac{21 \text{ roses}}{\$27}.$ 21 roses for \$27 is cheaper than 21 roses for \$35.
Proportional Relationship A relationship in which you multiply one variable by a constant number to find the value of another variable	*The price of one pizza is \$13.* To find the cost C of any number of pizzas n, multiply the number of pizzas by 13. The unit rate 13 is also called the *constant of proportionality, k*. The relationship appears as a straight line on a graph. The equation can be written as $y = kx$. In this case, $C = 13n$.