A Union of Professionals
Common Core
State Standards

Dear Parents and Guardians,

This letter will address the work your child is doing in seventh grade mathematics this year in Proportion and Percent. These are expectations of the Common Core state Standards that will prepare students to be successful in college or career pths.

Proportion Problems

One of the most important mathematical ideas children learned in sixth grade was that of ratio. Ratio is often used in daily life. You use ratio when you plan food events and e.g., make sure you have at least two hot dogs per person, or go to the grocery store and decide whether it is cheaper to get three cans for $1.29 or five for $2.05. In seventh grade the focus is strongly on proportion.

In proportion problems two quantities are in direct proportion if they maintain the same ratio as quantities increase or decrease.

> **In a proportion, the ratio of two quantities remains constant as the corresponding values of the quantities change. If one quantity is multiplied or divided by a factor than the other quantity must be multiplied or divided by the same factor to maintain a proportional relationship.(NCTM, 2011)**

If 1 ice cream cone costs $1.50, 2 will cost $3.00, 4 will cost $6.00 and so on. Every time you divide the cost by the number of cones the quotient will be $1.50. **Quotients on both sides of a proportion remain constant.**

Changing recipes to make more or less are proportion problems. A party punch recipe may specify 3 quarts of fruit punch for every 2 quarts of ginger ale and 1 quart of ice cream. That ratio is 3:2:1. To make five times as much, use 15 qts of fruit punch, 10 qts of ginger ale and 5 quarts of ice cream to keep the proportion.

In sixth grade students learned how to use tables to solve proportion problems. Here are two samples of what students can do. *The following problem is from the Common Core* Progression on Ratio and Proportion.

> **Slimy Goopy mixture is made by mixing glue and liquid laundry starch in a ratio of 3 to 2. How much glue and how much starch are needed to make 85 cups of Slimy Goopy mixture for the afterschool program?**

Solution A: Using a tape or bar model

51 cups glue and 34 cups starch are needed.

For every 5 cups there are 3 c glue and 2 c starch. Divide 85 by 5 to find out how many 3:2 sets there are.
85 ÷ 5 = 17 Each of the tape units stands for 17 cups. Therefore, we need:

17 x 3 = 51 cups of glue
17 x 2 = 34 cups of starch

This makes 85 cups of Slimy Goop

Solution B: Building a table

		x5	x10	x15	x2	x17 (add x 15 and x2)
Glue	3	15	30	45	6	51
Starch	2	10	20	30	4	34

Totals: 5 cups 25 cups 50 cups 75 cups 10 cups 85 cups

In seventh grade, students will also solve proportions that include **rational numbers or fractions.**

Example:
Annie made some fancy cloth napkins. She could make 2 napkins from every 3/4 ft of material. How much material does she need to make 24 napkins?

NAPKINS	2	4	8	16	20	24
YDS.MATERIAL	$\frac{3}{4}$	$1\frac{1}{4}$	3	6	$7\frac{1}{4}$	$8\frac{1}{2}$

She needs 8 1/2 yards of material.
Children eventually move to thinking of a proportion as:

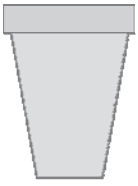
$2 : \frac{3}{4} = 24 : ?$ (12x, 12x) 24 is 12 x 2, so the missing amouint should be 12 x $\frac{3}{4}$.

Telling whether a relationship is proportional

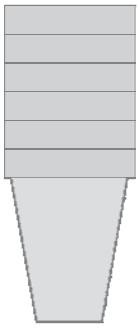
Students will sometimes be asked to determine whether a relationship is or is not proportional.

Paper cups – Grade 7 Student Task

The diagram below shows drawings of one paper cup and of six paper cups that have been *stacked* together.



1 cup



6 stacked cups

Is the height of the stack of cups proportional to the height of one cup? Justify and support your conclusions.

The Answer: No. The height of the stack of cups is not proportional to the height of one cup.

Why the stack is not proportional: If the relationship were proportional there must be a *constant multiplicative relationship* between one cup and its height and the number of cups in the stack and the height of the stack. For instance, if one cup is 10 cm tall, the relationship is 1 cup for every 10 cm of height (1 cup : 10 cm) . To have the same relationship, a stack of 2 cups would be 20cm tall, 6 cups 60 cm tall, etc. We could say that 6 times as many cups should be 6 times as tall. In the situation described the height of 1 cup includes both the rim and the base, but the height of the 6-cup stack includes the rim and base of the first cup, but only the rims of the subsequent cups (due to nesting). You can see in the chart that the relationship of the number of cups to height of the stack is not consistent.

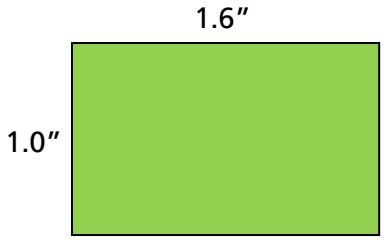
NUMBER OF CUPS	STACK HEIGHT (CM)	RATIO (CUPS:CM)
1	10	1:10
2	12	1:6
3	14	3:14
4	16	1:4
5	18	5:18
6	20	3:10

Proportions and Scale Problems

Scale problems are a new application of proportions in seventh grade. In these geometry problems students may compare lengths or areas of figures. They may make figures larger or smaller in the exact same proportions. To do this they make multiplicative comparisons. *Example:* **Here is a rectangle**. **Draw another rectangle with sides twice as long. Compare the areas of the two rectangles.**

This rectangle is 0.5 in by 0.8 in.

A rectangle scaled with sides twice
As long will be 1.0 in by 1.6 in.



Area of original rectangle = .4 sq. in.
Ares of new rectangle is 1.6 sq. in.

The new area when we doubled the sides of the rectangle is four times what it was originally! If students create several figures and scale them up by different numbers, sides twice as long, sides three times as long, sides four times as long, they will find that each time, **the area increases by square of the scale factor!** There is a grid paper attached with which students can explore this concept.

Percent and Discount Problems

Students will also be dealing with percent problems.

A $225 coat is on sale at a 60% discount. How much will it cost?

Here are three ways students can figure this out.

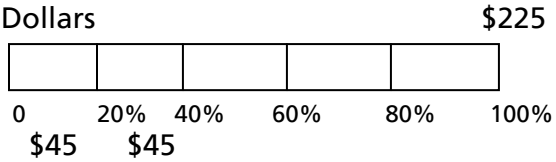
Solution A:

If a $225 coat is 60% off it costs 40% of the original price. Multiply by .40.

$225
x.40
$90.00 The coat will cost $90.

Solution B.
Multiply $225 by .60 ($135) and subtract that amount from the original price.
$225 – 135 = $90

Solution C:
Use a bar model to start your thinking.



The sale price is $45 + $45 or $90.

Five equal units make up the $225 price.
Each unit is $225÷5 or $45.
I multiply 2 x $45 to know what 40% of the original cost is.

You can find a detailed explanation of proportion at:

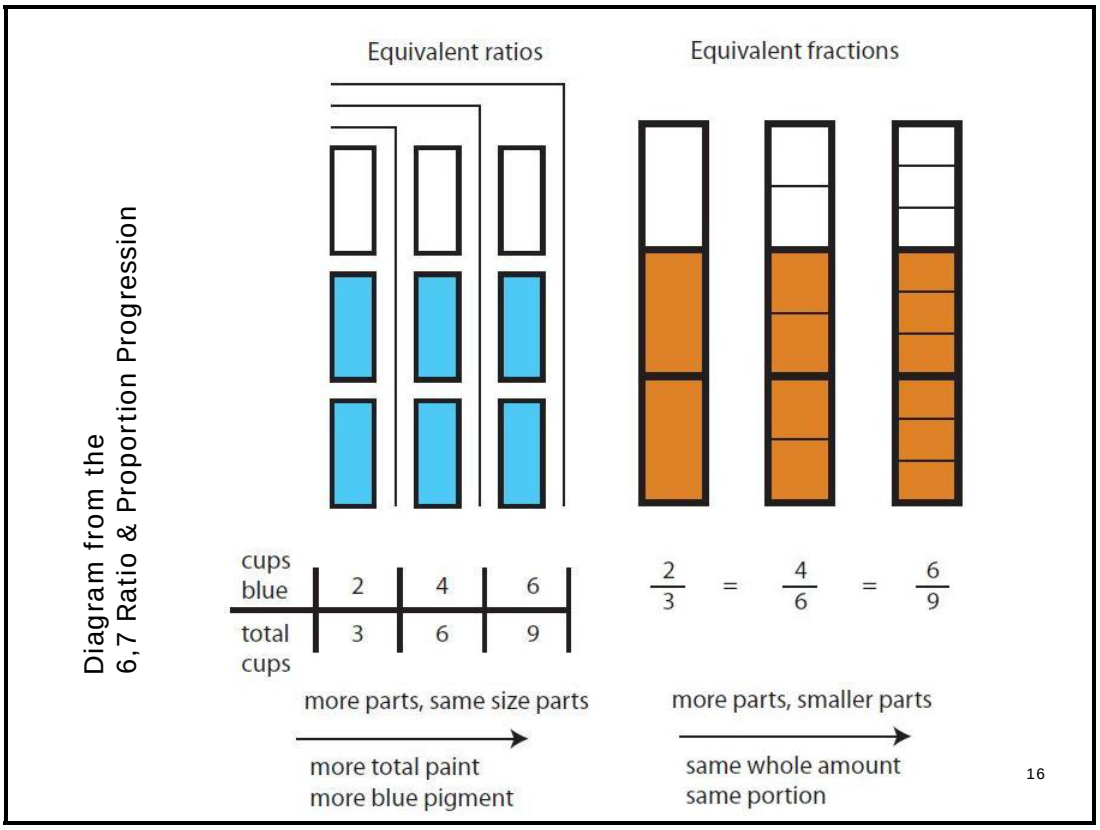
http://commoncoretools.files.wordpress.com/2012/02/ccss_progression_rp_67_2011_11_12_corrected.pdf

Your child can find more proportion problems for practice at:

http://www.ixl.com/math/grade-7/solve-proportions-word-problems

You can find excellent bar model examples for percent problems under Grade 6 at:
http://www.singaporemathteacher.com/

"Equivalent ratios" below shows what happens when you scale up from 5 cups to 15 cups. Some students may confuse their previous work with equivalent fractions with equivalent ratios. The illustration will show them that when they create equivalent fractions, the amount of "stuff" stays the same, but when they create equivalent ratios, the amount of "stuff" increases.



Grade 7 Teacher

An exploration of Scaling

What happens to the area of a figure when you lengthen its sides by doubling? By tripling? By making them four times as long?

Use the grid paper to help you explore and find out.