# MATH NEWS

Grade 5, Module 4, Topic F

## 5th Grade Math

*Module 4: Multiplication and Division of Fractions and Decimal Fractions*

**Math Parent Letter**

This document is created to give parents and students an understanding of the math concepts found in Eureka Math (© 2013 Common Core, Inc.) that is also posted as the Engage New York material which is taught in the classroom. Grade 5 Module 4 of Eureka Math (Engage New York) covers Multiplication and Division of Fractions and Decimal Fractions. This newsletter will discuss Module 4, Topic F. In this topic students will reason about the size of products when quantities are multiplied by numbers larger than 1, smaller than 1, and by 1.

**Topic F:** Multiplication with Fractions and Decimals as Scaling and Word Problems

**Words to know:**

- multiply
- factor
- equivalent
- product
- scaling
- benchmark fraction

**Things to Remember!**

**Product –** the answer in multiplication

Example: $\underbrace{\frac{2}{3} \times \frac{1}{3}}_{\text{factors}} = \frac{2}{9} \longleftarrow$ product

(a number multiplied by another number)

**Scaling** – may or may not change the size of a quantity

***Misconception***: Students believe that multiplication always makes a quantity bigger. That is **not** always true. Suppose there are 6 students standing in line and $\frac{1}{2}$ are wearing red shirts. How many students are wearing red shirts? $\frac{1}{2} \times 6 = 3$ students

The product is smaller than the original number.

### OBJECTIVES OF TOPIC F

- Explain the size of the product, and relate fraction and decimal equivalence to multiplying a fraction by 1.
- Compare the size of the product to the size of the factors.
- Solve word problems using fraction and decimal multiplication.

## Focus Area– Topic F

*Module 4: Multiplication and Division of Fractions and Decimal Fractions*

***Multiplying a number times a number equal to 1, results in the original number.***

Let's test this statement. We know $\frac{2}{2}, \frac{4}{4}, \frac{10}{10}$, and $\frac{6}{6}$ are examples of fractions that equal 1 whole.

Example 1: $6 \times \frac{2}{2} = \frac{6 \times 2}{2} = \frac{12}{2} = 6$ ✔

Example 2: $3 \times \frac{10}{10} = \frac{3 \times 10}{10} = \frac{30}{10} = 3$ ✔

Example 3: $\frac{2}{5} \times \frac{4}{4} = \frac{2 \times 4}{5 \times 4} = \frac{8}{20} = \frac{8 \div 4}{20 \div 4} = \frac{2}{5}$ ✔

Example 4: $\frac{1}{7} \times \frac{6}{6} = \frac{1 \times 6}{7 \times 6} = \frac{6}{42} = \frac{6 \div 6}{42 \div 6} = \frac{1}{7}$ ✔

***The examples above prove the statement that multiplying a number times a number equal to 1, does result in the original number. Therefore, if the **scaling factor is equal to** 1, the **original number does not change**.

***Multiplying a number times a number less than 1 results in a product less than the original number.***

Let's test this statement.

Example 1: $6 \times \frac{2}{3} = \frac{6 \times 2}{3} = \frac{12}{3} = 4 \quad (4 < 6)$ ✔

Example 2: $3 \times \frac{7}{10} = \frac{3 \times 7}{10} = \frac{21}{10} = 2\frac{1}{10} \quad (2\frac{1}{10} < 3)$ ✔

Example 3: $\frac{2}{5} \times \frac{3}{4} = \frac{2 \times 3}{5 \times 4} = \frac{6}{20}$

In order to prove that $\frac{6}{20}$ is less than $\frac{2}{5}$, we rename $\frac{2}{5}$ with a denominator of 20. ( $\frac{2 \times 4}{5 \times 4} = \frac{8}{20}$ ) Now we can see that $\frac{6}{20} < \frac{8}{20}$. ✔

Example 4: $\frac{1}{7} \times \frac{1}{6} = \frac{1 \times 1}{7 \times 6} = \frac{1}{42} \quad (\frac{1}{42} < \frac{1}{7})$ ✔

***The examples above prove the statement that multiplying a number times a number less than 1, does result in a product less than the original number. Therefore, if the **scaling factor is less than 1**, the **product will be less than the original number**.

## *Multiplying a number times a number greater than 1, results in a product greater than the original number.*

Let's test this statement.

Example 1: $6 \times \frac{4}{3} = \frac{6 \times 4}{3} = \frac{24}{3} = 8$ $(8 > 6)$

Example 2: $3 \times \frac{15}{10} = \frac{3 \times 15}{10} = \frac{45}{10} = 4\frac{5}{10}$ $(4\frac{5}{10} > 3)$

Example 3: $\frac{2}{5} \times \frac{7}{4} = \frac{2 \times 7}{5 \times 4} = \frac{17}{20}$

Using the benchmark fraction of $\frac{1}{2}$, we know that $\frac{2}{5}$ is less than $\frac{1}{2}$ and $\frac{17}{20}$ is greater than $\frac{1}{2}$. $\frac{17}{20} > \frac{2}{5}$

Example 4: $\frac{1}{7} \times \frac{11}{6} = \frac{1 \times 11}{7 \times 6} = \frac{11}{42}$

Using the benchmark fraction of $\frac{1}{2}$ does help us determine if $\frac{11}{42}$ is greater than $\frac{1}{7}$, since both fractions are less than $\frac{1}{2}$. In order to prove that $\frac{11}{42}$ is greater than $\frac{1}{7}$, we rename $\frac{1}{7}$ with a denominator of 42. ( $\frac{1 \times 6}{7 \times 6} = \frac{6}{42}$ ) Now we can see that $\frac{11}{42} > \frac{6}{42}$.

***The examples above prove the statement that multiplying a number times a number greater than 1, does result in a product greater than the original number. Therefore, if the **scaling factor is greater than 1**, the **product will be greater than the original number.**

**Practice Problem:** Without doing any calculating, choose a fraction to make the number sentence true. Explain how you know.

| | | |
|---|---|---|
| $\frac{1}{4}$ | $\frac{8}{8}$ | $\frac{9}{6}$ |

a. 15 x ___ = 15 $(15 \times \frac{8}{8} = 15)$

Since $\frac{8}{8}$ equal to 1, then the original number 15 does not change.

b. ___ x 15 < 15 $(\frac{1}{4} \times 15 < 15)$

Since $\frac{1}{4}$ is less than 1, then the product will be less than 15.

c. 15 x ___ > 15 $(15 \times \frac{9}{6} > 15)$

Since $\frac{9}{6}$ is greater than 1, then the product will be greater than 15.

## *Application Problem:*

**At the book fair, Van spent all of his money on new books. Paul spent $\frac{2}{3}$ as much as Van. Elliot spent $\frac{4}{3}$ as much as Van. Who spent the most money? Who spent the least?**

Paul and Elliot are being compared to Van. Van spent all his money which is considered 1 whole in this problem. Using what we learned about scaling factor, $\frac{2}{3}$ is less than 1 so Paul spent less than Van. $\frac{4}{3}$ is greater than 1, so Elliot spent more than Van.

Let's draw tape diagrams to represent each.

Van  Van spent $\frac{3}{3}$ of his money.

Paul  Paul spent $\frac{2}{3}$ as much as Van and drawing shows that the amount is less than Van.

Elliot  Elliot spent $\frac{4}{3}$ as much as Van and drawing shows that the amount is greater than Van.

***At the book fair, Elliot spent the most and Paul spent the least.***

## *Scaling with Decimals*

Whether you are working with fractions or decimals, the scaling factor statements still apply.

**Problem**: Without calculating, fill in the blank using one of the scaling factors to make each number sentence true. Explain how you know.

| | | |
|---|---|---|
| 1.024 | 1.00 | 0.761 |

a. 4.72 x _______ < 4.72 (4.72 x **0.761** < 4.72 )

Since **0.761** is less than 1, then the product will be less than 4.72.

b. _____ x 4.72 > 4.72 ( **1.024** x 4.72 > 4.72 )

Since **1.024** is greater than 1, then the product will be greater than 4.72.

c. 4.72 x _____ = 4.72 (4.72 x **1.00** = 4.72)

Since **1.00** is equal to 1, then 4.72 does not change.