

# MATH NEWS

Grade 5, Module 4, Topic E

## 5<sup>th</sup> Grade Math

Module 4: Multiplication of a Fraction by a Fraction

### Math Parent Letter

This document is created to give parents and students a better 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 E multiplication of a fraction by a fraction - both in fraction and decimal form.

### Topic E: Multiplication of a Fraction by a Fraction

#### Words to know

- multiply
- product
- quotient
- tape diagram
- area model
- convert
- unit fraction
- decimal fraction
- unit
- whole unit

#### Things to Remember!

- **Unit**- one segment of a portioned tape diagram
- **Unit fraction** - A fraction where the top number (the numerator) is 1.
- **Whole unit**- any unit that is partitioned into smaller, equally sized fractional units
- **Decimal fraction**- A decimal fraction is a fraction where the denominator (the bottom number) is a power of ten (such as tenths, hundredths, thousandths, etc).

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### OBJECTIVES OF TOPIC E

- Multiply unit fraction by unit fractions.
- Multiply unity fractions by non-unit fractions.
- Multiply non-unit fractions by non-unit fractions.
- Solve word problems using tape diagrams and fractions-by-fraction multiplications.
- Relate decimal and fraction multiplication.
- Convert measures involving whole numbers, and solve multi-step word problems.
- Convert mixed unit measurements, and solve multi-step word problems.

## Focus Area- Topic E

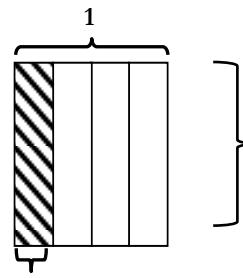
*Multiplication of a Fraction by a Fraction*

**Solve.** Draw a model to explain your thinking.

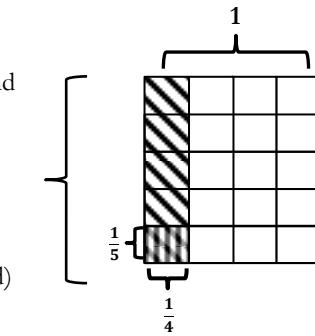
Joseph has  $\frac{1}{2}$  of a pound of strawberries. He gave his teacher  $\frac{1}{5}$  of the strawberries. What fraction of strawberries did Joseph give to his teacher?



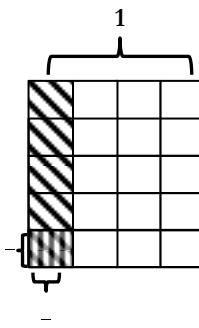
Think: We need to find  $\frac{1}{2} \text{ of } \frac{1}{5}$  strawberries



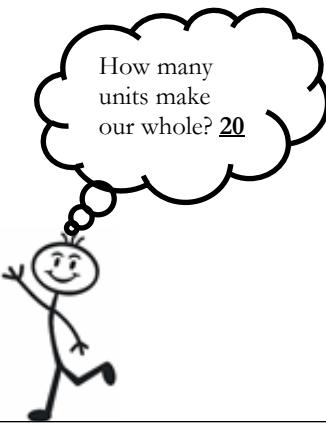
**Step 1:** Draw a rectangle and cut it vertically into 4 equal parts.  
Shade 1 part and label it  $\frac{1}{4}$ .



**Step 2:** We need to find  $\frac{1}{4} \text{ of } \frac{1}{5}$ . Split the whole rectangle into 5 equal parts by drawing horizontal lines. Now, shade 1 of the 5 parts (that are already shaded) and label it  $\frac{1}{20}$ .



How many units make our whole? 20



What's the name of these units? Twentieths

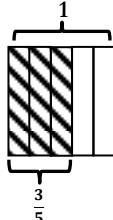
Joseph gave his teacher  $\frac{1}{20}$  of the strawberries.

## Solve. Draw a model to explain your thinking.

Of the students on Nia's track team,  $\frac{3}{5}$  participate in running events. Of the students who participate in running events,  $\frac{2}{3}$  are in the relay race. What fraction of the students on the track team ran in the relay race?

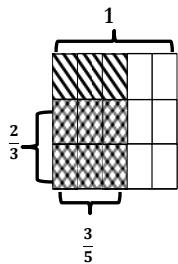


**Think:** We need to find  $\frac{2}{3}$  of  $\frac{3}{5}$ .

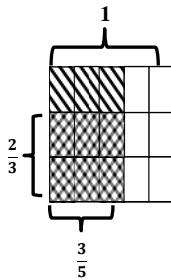


**Step 1:** Draw a rectangle and cut it vertically into 5 equal parts.

Shade 3 parts and label it  $\frac{3}{5}$ .



**Step 2:** Split the rectangle into 3 equal parts by drawing horizontal lines. Now shade 2 of the 3 parts (that are already shaded) and label it  $\frac{2}{3}$ .



How many units make our whole?  $15 \rightarrow$   
What's the name of these units? Fifteenths

$$\frac{2}{3} \text{ of } \frac{3}{5} = \frac{6}{15} \rightarrow \frac{2}{3} \times \frac{3}{5} = \frac{6}{15}$$

$\frac{6}{15}$  or  $\frac{2}{5}$  of the students ran on the relay race.

**Method 1:** Students will eventually see a pattern and multiply numerator times numerator and denominator times denominator.

$$\frac{2}{5} \times \frac{10}{12} = \frac{2 \times 10}{5 \times 12} = \frac{20}{60} = \frac{1}{3}$$

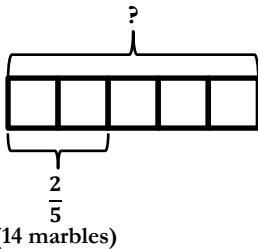
**Method 2:** Students divide by common factors prior to multiplying.

$$\frac{2}{5} \times \frac{10}{12} = \frac{\cancel{2}^1 \times \cancel{10}^2}{\cancel{5}^1 \times \cancel{12}^6} = \frac{2}{6} = \frac{1}{3}$$

A common factor of 2 and 12 is 2.  
A common factor of 10 and 5 is 5.

### Solve Word Problems Using a Tape Diagram:

Dell has 14 blue marbles. His blue marbles make up  $\frac{2}{5}$  of his total number of marbles. How many marbles does Dell have?



$$\begin{aligned} 2 \text{ units} &= 14 \\ 1 \text{ unit} &= 14 \div 2 \\ &= 7 \\ 5 \text{ units} &= 5 \times 7 = 35 \end{aligned}$$

Dell has 35 marbles.

## Relate decimal and fraction multiplication

### Example A:

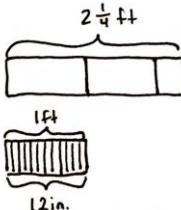
$$\begin{array}{rcl} 0.5 \times 0.3 & \xrightarrow{\text{or}} & 5 \text{ tenths} \\ = \frac{5}{10} \times \frac{3}{10} & & \times 3 \text{ tenths} \\ = \frac{5 \times 3}{10 \times 10} & & 15 \text{ hundredths} = 0.15 \\ = \frac{15}{100} & & \\ = 0.15 & & \end{array}$$

### Example B:

$$\begin{array}{rcl} 2.38 \times 1.8 & \xrightarrow{\text{or}} & 238 \text{ hundredths} \\ = \frac{238}{100} \times \frac{18}{10} & & \times 18 \text{ tenths} \\ = \frac{238 \times 18}{100 \times 10} & & 1904 \\ = \frac{4284}{1000} & & +2380 \\ = 4.284 & & 4284 \text{ thousandths} = 4.284 \end{array}$$

## Convert mixed unit measurements

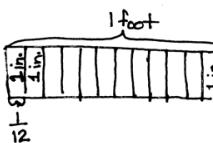
$$2\frac{1}{4} \text{ ft} = \underline{\quad} \text{ in}$$



$$\begin{aligned} 2\frac{1}{4} \text{ ft} &= \underline{\quad} \text{ in} \\ 2\frac{1}{4} \text{ ft} &= 2\frac{1}{4} \times 1 \text{ ft} \\ &= 2\frac{1}{4} \times 12 \text{ in} \\ &= \frac{9}{4} \times 12 \text{ in} \\ &= \frac{9 \times 12^3}{14} \text{ in} \\ &= 27 \text{ in} \end{aligned}$$

We rename 1 foot as 12 inches.

$$9 \text{ inches} = \underline{\quad} \text{ ft}$$

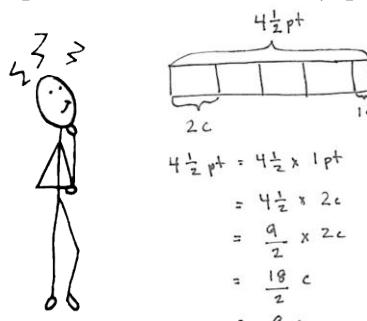


The tape diagram shows 1 foot divided into twelve equal parts. Each section represents 1 inch; therefore 1 inch is  $\frac{1}{12}$  of a foot.

$$\begin{aligned} 9 \text{ inches} &= 9 \times 1 \text{ inch} \\ &= 9 \times \frac{1}{12} \text{ foot} \\ &= \frac{9}{12} \text{ ft} \text{ or } \frac{3}{4} \text{ ft} \end{aligned}$$

We rename 1 inch as  $\frac{1}{12}$  of a foot.

**Problem:** A container can hold  $4\frac{1}{2}$  pints of water. How many cups can 2 containers hold? (1 pint = 2 cups)



$$\begin{aligned} 4\frac{1}{2} \text{ pt} &= 4\frac{1}{2} \times 1 \text{ pt} \\ &= 4\frac{1}{2} \times 2 \text{ c} \\ &= \frac{9}{2} \times 2 \text{ c} \\ &= \frac{18}{2} \text{ c} \\ &= 9 \text{ c} \end{aligned}$$

Two containers can hold 18 cups.