

MATH NEWS

Grade 5, Module 4, Topic E

5th 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
- quotient
- area model
- unit fraction
- unit
- product
- tape diagram
- convert
- decimal fraction
- 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 unit 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.
- Covert measures involving whole numbers, and solve multi-step word problems.
- Covert mixed unit measurements, and solve multi-step word problems.

Focus Area– Topic E

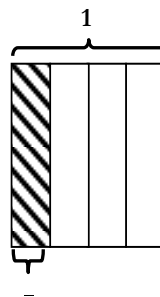
Multiplication of a Fraction by a Fraction

Solve. Draw a model to explain your thinking.

Joseph has $\frac{1}{4}$ 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?

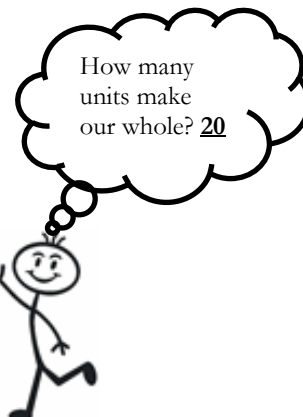
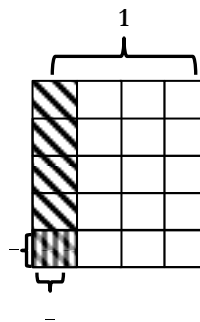
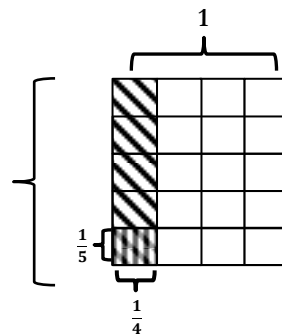


Think: We need to find $\frac{1}{5}$ of $\frac{1}{4}$ strawberries



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 $\frac{1}{5}$ of $\frac{1}{4}$. 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.

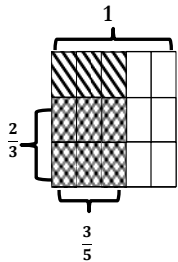
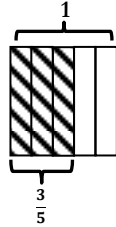
Solve. Draw a model to explain your thinking.

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?

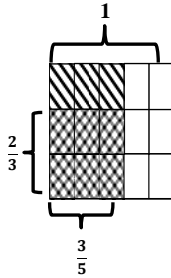


Think: We need to find $\frac{2}{3}$ of $\frac{3}{5}$.

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**
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.

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

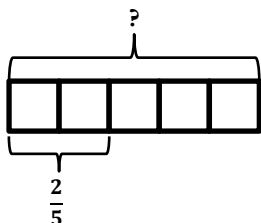
Method 2: Students divide by common factors prior to multiplying.

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

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?



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

(14 marbles)

Dell has 35 marbles.

Relate decimal and fraction multiplication

Example A:

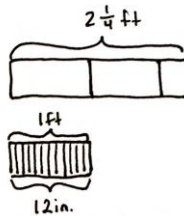
$$\begin{aligned} 0.5 \times 0.3 &\xrightarrow{\text{or}} 5 \text{ tenths} \\ &= \frac{5}{10} \times \frac{3}{10} \quad \underline{\times 3 \text{ tenths}} \\ &= \frac{5 \times 3}{10 \times 10} \quad 15 \text{ hundredths} = 0.15 \\ &= \frac{15}{100} \\ &= 0.15 \end{aligned}$$

Example B:

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

Convert mixed unit measurements

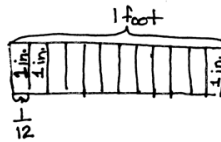
$2\frac{1}{4}$ ft = _____ in



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

We rename 1 foot as 12 inches.

9 inches = _____ ft

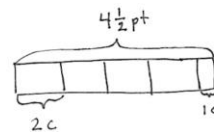


The tape diagram shows 1 foot divided into twelve equal parts. Each section represents 1 inch; therefore 1 inch is $\frac{1}{12}$ of a foot.

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

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)



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

$9 \text{ c} \times 2 = 18 \text{ c}$
Two containers can hold 18 cups.