

Core Content

Cluster Title: Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

Standard 4: Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

a. Interpret the product $(a/b) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. For example, use a visual fraction model to show $(2/3) \times 4 = 8/3$, and create a story context for this equation. Do the same with $(2/3) \times (4/5) = 8/15$. (In general, $(a/b) \times (c/d) = ac/bd$.)

MASTERY Patterns of Reasoning:

Conceptual:

Students will understand a number sentence can be restated as a word sentence. Examples: $5 \times 3/4$ is the same as 5 groups of $3/4$, $1/2 \times 1/2$ is the same as $1/2$ of a group of $1/2$.

Students will understand that a whole number multiplied by a fraction can be represented as repeated addition.

Example: $6 \times 3/4 = 3/4 + 3/4 + 3/4 + 3/4 + 3/4 + 3/4$.

Students will be able to create a story context for an equation of the form $(a/b) \times q$.

Procedural:

Students can multiply a fraction by a whole number.

Students can multiply a fraction by a fraction including improper fractions and mixed numbers.

Representational:

Students can use area models to represent multiplication of a fraction by a whole number and a fraction by a fraction.

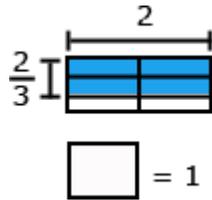
Supports for Teachers

Critical Background Knowledge	
<p>Conceptual: Students will understand multiplication and division of whole numbers. Students will understand 5×7 is 5 groups of 7.</p> <p>Procedural: Students can multiply and divide whole numbers fluently. Students can solve a two-step problem. Students can represent a whole number as a fraction. For example, $12 = 12/1$.</p> <p>Representational: Students can represent problems with visual fraction models.</p>	
Academic Vocabulary and Notation	
partition, factors, products, numerator, denominator, fraction, whole number	
Instructional Strategies Used	Resources Used
<p>Teacher’s Note: When multiplying a problem such as $3/5 \times 6$, the operations can be thought of in more than one way. Examples: $3 \times (6 \div 5)$ or $(3 \times 6)/5$ OR $(3 \times 6) \div 5$ or $18 \div 5$ ($18/5$)</p> <p>Represent problems such as: $1/3 \times 5$ as finding $1/3$ of 5 or $1/2 \times 1/2$ as finding half of a half.</p> <p>Students create a story context for $3/5 \times 6$. Examples: Isabel had 6 feet of wrapping paper. She used $3/5$ of the paper to wrap some presents. How much does she have left?</p>	3-5 Fractions-Rectangle Multiplication: http://nlvm.usu.edu/en/nav/frames_a_sid_194_g_2_t_1.html?from=topic_t_1.html

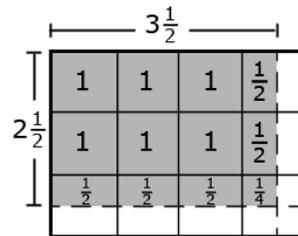
Every day Tim ran $\frac{3}{5}$ of mile. How far did he run after 6 days? (Interpreting this as $6 \times \frac{3}{5}$.)

Use area models. Examples:

$$2 \times \frac{2}{3} = \frac{4}{3}$$



$$2\frac{1}{2} \text{ groups of } 3\frac{1}{2}$$



Using the standard algorithm, the problem $\frac{2}{3} \times \frac{4}{5}$ can be represented as $\frac{2 \times 4}{3 \times 5}$.

Visual fraction models can be used to represent the following example:

Three-fourths of a class is girls. Two-thirds of the girls are having pizza for lunch. What fraction of the girls is eating pizza?

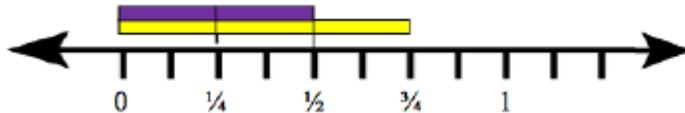
This question is asking what $\frac{2}{3}$ of $\frac{3}{4}$ is, or what is $\frac{2}{3} \times \frac{3}{4}$.

Examples of visual fraction models:

Area Model:



Number Line Model:



Many of the images and explanations in the Instructional Strategies are from the site below:
<http://www.ncpublicschools.org/docs/acre/standards/common-core-tools/unpacking/math/5th.pdf>

Assessment Tasks Used

Skill-Based Task:

Interpret the product with a visual model.

$\frac{1}{3} \times 5 =$

$2\frac{1}{4} \times 3 =$

$\frac{1}{3} \times \frac{7}{8} =$

Problem Task:

Find the product and create a story context for this problem:
 $\frac{4}{5} \times \frac{3}{4}$.

Use a visual model to solve this problem:
 George drank $\frac{3}{4}$ of $\frac{1}{2}$ gallon of milk. How much of the gallon did he drink? How much of the gallon is left?