Core Content

Cluster Title: Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

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

a. Understand a fraction a/b as a multiple of 1/b. For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation $\frac{5}{4} = 5 \times \left(\frac{1}{4}\right)$.

b. Understand a multiple of a/b as a multiple of 1/b, and use this understanding to multiply a fraction by a whole number. For example, use a visual fraction model to express $3 \times \left(\frac{2}{5}\right)$ as $6 \times \left(\frac{1}{5}\right)$, recognizing this product as $\frac{6}{5}$. (In general, $n \times \left(\frac{a}{b}\right) = \frac{(n \times a)}{b}$.)

c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. For example, if each person at a party will eat $\frac{3}{8}$ of a pound of roast beef, and there will be five people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?

MASTERY Patterns of Reasoning:

Note: Expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.

Conceptual:

Students will understand that a fraction (1/*b)* multiplied by a whole number (n) is *n/b* ($\frac{1}{7} \times 3 = \frac{3}{7}$).

Students will understand that $3 \times \frac{1}{7} = \frac{1}{7} + \frac{1}{7} + \frac{1}{7}$.

Students will understand that $a \times \left(\frac{b}{c}\right) = a \times b \times \left(\frac{1}{c}\right)$ and $a \times b \times \left(\frac{1}{c}\right) = \frac{a \times b}{c}$.

Procedural:

Students can form equivalent expressions by writing fractions as a multiple of a unit fraction (e.g., 4/3 = 4 x (1/3)).

Students can use the associative property of multiplication needed in the problem $a \times \left(\frac{b}{c}\right) = a \times b \times \left(\frac{1}{c}\right)$.

Students can solve word problems involving multiplication of a fraction by a whole number.

Representational:

Students can represent visually 5/4 = 5 x (1/4) using drawings, number lines, and other forms of modeling.

Students can represent visually problems involving $a \times \left(\frac{b}{c}\right) = a \times b \times \left(\frac{1}{c}\right)$.

Supports for Teachers

Critical Background Knowledge

Conceptual:

Students will understand multiples and factors of whole numbers
Students will understand equivalent fractions
Students will understand the relationship between repeated addition and multiplication
Students will understand that n/n = 1
Students will understand the associative property of multiplication with whole numbers.

Procedural:

Students can add fractions referring to the same whole.
Students can decompose a whole number or a fraction into unit fractions.

Representational:

Students can model addition of fractions using various models (set, area, measurement, etc.).

Academic Vocabulary and Notation

unit fractions, multiple, variable, fractional form (5/4), mixed number, associative property

Instructional Strategies Used	Resources Used

Use number lines, fraction strips, area models, set models, rulers, etc. to show multiple addition of unit fractions. Connect this to multiplication of a fraction by a whole number. Emphasize through the use of concrete representations the idea expressed by $n \times \left(\frac{a}{b}\right) = \frac{(n \times a)}{b}$. The algebraic notation is not what students will be responsible for. Be aware that the notation from the standard skips a step: $n \times \left(\frac{a}{b}\right) = (n \times b) \times \frac{1}{b}$ and $(n \times a) \times \frac{1}{b} = \frac{(n \times a)}{b}$.	The web site http://www.ixl.com allows visitors up to 20 problems without purchasing. http://nlvm.usu.edu/en/nav/frames_asid_194_g_2_t_1.html?from=category_g_2_t_1.html http://www.homeschoolmath.net/teaching/f/multiplying_fractions_1.php
Assessment Tasks Used	
Skill-Based Task: Solve. Simplify your answer. 5 x 1/4 = $a \times \frac{1}{6} = \frac{7}{6}$ $6 \times \frac{2}{3} =$	**Problem Task:** Draw a picture to explain why $\frac{8}{5} = 8 \times \frac{1}{5}$. Kathy is having a party. She wants $\frac{2}{3}$ cups of trail mix per guest. She expects 6 guests. How much trail mix should Kathy prepare? Write an equation and justify your solution with a visual model.