MA.5.FR.2.2

Overarching Standard: MA.5.FR.2 *Perform operations with fractions.*

Benchmark of Focus

MA.5.FR.2.2	Extend previous understanding of multiplication to multiply a fraction by a fraction, including mixed numbers and fractions greater than 1, with procedural reliability.

Benchmark Clarifications

Clarification 1: Instruction includes the use of manipulatives, drawings, or the properties of operations.

Clarification 2: Denominators limited to whole numbers up to 20.

Related Benchmark/Horizontal Alignment

- MA.5.NSO.2.1/2.4
- MA.5.AR.1.2
- MA.5.GR.2.1

Vertical Alignment

Previous Benchmarks

- MA.4.FR.2.4

Next Benchmarks

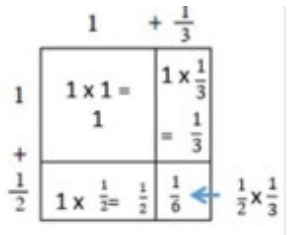
- MA.6.NSO.2.2

Purpose and Instructional Strategies

The purpose of this benchmark is for students to learn strategies to multiply two fractions. This continues the work from Grade 4 where students multiplied a whole number times a fraction and a fraction times a whole number (MA.4.FR.2.4). Proceduralfluency will be achieved in Grade 6 (MA.6.NSO.2.2).

- During instruction, students are expected to multiply fractions including proper fractions,improper fractions (fractions greater than 1), and mixed numbers efficiently and accurately.
- Visual fraction models (area models, tape diagrams, number lines) should be used andcreated by students during their work with this benchmark (MTR.2.1). Visual fractionmodels should show how a fraction is partitioned into parts that are the same as the product of the denominators.

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



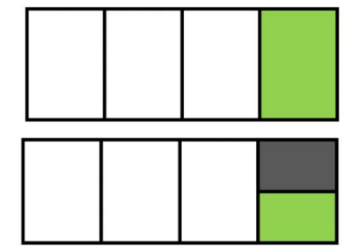
- When exploring an algorithm to multiply fractions $\frac{a}{b} \times \frac{c}{d} = \frac{a \times c}{b \times d}$ make connections to an accompanying area model. This will help students understand the algorithm conceptually
  and use it more accurately.
- Instruction includes students using equivalent fractions to simplify answers; however,putting answers in simplest form is not a priority.

Common Misconceptions or Errors

- Students may believe that multiplication always results in a larger number. Using models when multiplying with fractions will enable students to generalize about multiplication algorithms that are based on conceptual understanding (MTR.5.1).
- Students can have difficulty with word problems when determining which operation to use, and the stress of working with fractions makes this happen more often.
  - For example, the multi-step problem, *"Mark has* $\frac{3}{4}$ *yards of rope and he gives a third of the rope to a friend. How much rope does Mark have left?"* expects students to first find $\frac{1}{3}$ of $\frac{3}{4}$ or multiply $\frac{1}{3} \times \frac{3}{4}$ and then to find the difference to find how much Mark has left. On the other hand, *"Mark has* $\frac{3}{4}$ *yards of rope and gives* $\frac{1}{3}$ *yard of rope to a friend. How much rope does Mark have left?"* only requires finding the difference $\frac{3}{4} - \frac{1}{3}$.

Strategies to Support Tiered Instruction

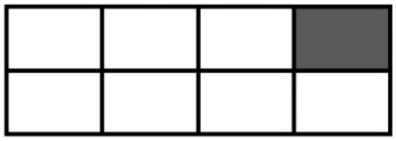
- Instruction involves real-world examples and models which allow students to see that multiplication does not always result in a larger number.
  - For example, the teacher provides the problem: "Tau has $\frac{1}{4}$ of the lasagna pan leftover from the party in the refrigerator. He eats one half of the leftovers for dinner. How much of the lasagna did he eat for dinner?" This can be written as $\frac{1}{4} x \frac{1}{2}$ or $\frac{1}{2}$ "of" $\frac{1}{4}$.



$\frac{1}{4}$ of the lasagna pan leftover in the refrigerator.

$\frac{1}{2}$ of the lasagna leftover in the refrigerator.

When students think about what is left in the refrigerator now, they must think in terms of the whole pan of lasagna. Tau didn't eat half the pan; he ate half of the portion that was left. So how much of the whole pan did he eat.



$\frac{1}{8}$ of the lasagna pan.

Questions to ask students:

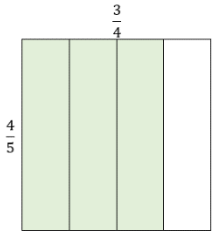
How can you relate what you know about equal groups to model $\frac{2}{3} \times \frac{6}{8}$?

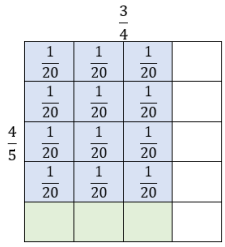
- I can represent $\frac{6}{8}$ using six eighth fraction strips.

I see that I can partition the six eighths into three equal groups to represent the thirds. If I look at two of those groups of thirds, there are two eighths in both those groups, for four eighths. So, $\frac{2}{3} \times \frac{6}{8} = \frac{4}{8}$.

Find the product of $\frac{4}{5}$ and $\frac{3}{4}$.

- Sample answer that indicates understanding… *I know my product will be less than either factor because I am taking a part of a fraction. I can draw an area model to prove my thinking. I draw a rectangle and first decompose it into fourths and shade three of those fourths. I then decompose the fourths into fifths which changes my model into twentieths. The overlap of four fifths and three fourths represents my product which is* $\frac{12}{20}$.





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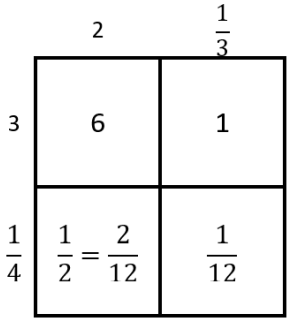
Find the product of $2\frac{1}{3}$ and $3\frac{1}{4}$.

- Sample answer that indicates understanding… *I know that multiplication can be related to area so just like I did with whole numbers I can create an area model with these factors and decompose them into wholes and fractions and determine the partial products. I then add the partial products to get the total product which is* $7\frac{3}{12}$.



Instructional Tasks

Instructional Task 1

Maritza has $4\frac{1}{2}$ cups of cream cheese. She uses $\frac{3}{4}$ of the cream cheese for a banana pudding recipe. After she uses it for the recipe, how much cream cheese will Maritza have left?

Instructional Items

Instructional Item 1

What is the product of $\frac{1}{5} \times 6\frac{1}{2}$?

a. $\frac{6}{10}$

b. $\frac{12}{5}$

c. $6\frac{7}{10}$

d. $1\frac{3}{10}$

Achievement Level Descriptors:

Benchmark	Context	Assessment Limits
MA.5.FR.2.2 Extend previous understanding of multiplication to multiply a fraction by a fraction, including mixed numbers and fractions greater than 1, with procedural reliability. Clarification 1: Instruction includes the use of manipulatives, drawings or the properties of operations. Clarification 2: Denominators limited to whole numbers up to 20	Mathematical	

ALD 2	ALD 3	ALD 4	ALD 5
Multiplies two fractions less than a whole by using models and various strategies.	Multiplies a fraction, including fractions greater than one, by a fraction less than a whole.	Extends previous understanding of multiplication to multiply a fraction by a fraction, including mixed numbers and fractions greater than one, with procedural reliability.	Identifies an error and multiplies a fraction by a fraction, including mixed numbers and fractions greater than one.

Additional Resources:

CPALMS

Khan Academy Multiplying a fraction by a fraction

Multiplying a mixed number by a mixed number

Resources/Tasks to Support Your Child at Home:

Multiplication of Fractions Game