MA.5.FR.2.1

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

Benchmark of Focus

MA.5.FR.2.1 Add and subtract fractions with unlike denominators, including mixed numbersand fractions greater than 1, with procedural reliability.

Example: The sum of $\frac{1}{12}$ and $\frac{2}{24}$ can be determined as $\frac{1}{8}, \frac{3}{24}, \frac{6}{48}, \frac{36}{288}$ or by using different common denominators or equivalent fractions.

Benchmark Clarifications:
Clarification 1: Instruction includes the use of estimation, manipulatives, drawings, or the properties ofoperations.

Clarification 2: Instruction builds on the understanding from previous grades of factors up to 12 and their multiples.

Related Benchmark/Horizontal Alignment

- MA.5.NSO.2.3
- MA.5.AR.1.2
- MA.5.GR.2.1

Vertical Alignment

Previous Benchmarks
- MA.4.FR.1.3
- MA.4.FR.2.1/2.2

Next Benchmarks
- MA.6.NSO.2.3

Purpose and Instructional Strategies

The purpose of this benchmark is for students to understand that when adding or subtracting fractions with unlike denominators, equivalent fractions are generated to rewrite the fractionswith like denominators, with which students have experience from Grade 4 (MA.4.FR.2.2). Procedural fluency will be achieved in Grade 6 (MA.6.NSO.2.3).

- During instruction, have students begin with expressions with two fractions that require the rewriting of one of the fractions (where one denominator is a multiple of the other, like and progress to expressions where both fractions must be rewritten (where denominators are not multiples of one another, like $\frac{4}{5}, \frac{2}{3}, 1\frac{1}{2}, 9\frac{2}{3}$ so that students can explore how both fractions need like denominators to make addition and subtraction easier. Once students have stronger conceptual understanding, expressions requiring adding or subtracting 3 or more numbers should be included in instruction.

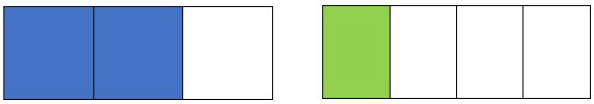
- It is important for students to practice problems that include various fraction models as students may find that a circular model might not be the best model when adding or subtracting fractions because of the difficulty in partitioning the pieces so they are equal(MTR.2.1).
- When students use an algorithm to add or subtract fraction expressions, encourage students' use of flexible strategies. For example, students can use a partial sums strategy when adding $1\frac{2}{3} + 4\frac{2}{5}$ by adding the whole numbers 1 + 4 together first before adding the fractional parts and regrouping when necessary.
- Mental computations and estimation strategies should be used to determine the reasonableness of solutions. For example, when adding $1\frac{2}{3} + 4\frac{2}{5}$ students could reason that the sum will be greater than 6 because the sum of the whole numbers is 5 and the sum of the fractional parts in the mixed numbers will be greater than 1. Keep in mind that estimation is about getting reasonable solutions and not about getting exact solutions, therefore allow for flexible estimation strategies and expect students to justify them.
- Instruction includes students using equivalent fractions to simplify answers.

Common Misconceptions or Errors

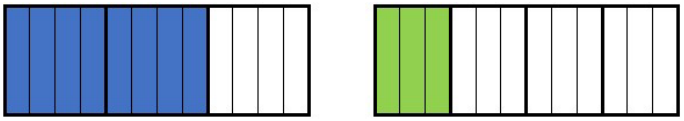
- Students can carry misconceptions from Grade 4 about adding and subtracting fractions and understanding why the denominator remains the same. Emphasize the use of area andnumber line models, and present expressions in numeral-word form to help understand that the denominator is the unit. For example, "5 eighths + 9 eighths are equal to how many eighths?"
- Students often try to use different models when adding, subtracting, or comparing fractions. For example, they may use a circle for thirds and a rectangle for fourths, whencomparing fractions with thirds and fourths.
- Remind students that the representations need to be from the same whole models with the same shape and same size. In a real-world problem, this often looks like same units. For example, "Trey has $1\frac{3}{4}$ cups of water and Rachel has $2\frac{5}{6}$ cups of water. How many cups of water do they have?"

Strategies to Support Tiered Instruction

- Instruction includes concrete models and drawings that help solidify understanding that when adding and subtracting with unlike denominators, the value of the fractional parts remains the same.
    - For example, students create a model for each of the fractions in the problem $\frac{2}{3} - \frac{1}{4}$

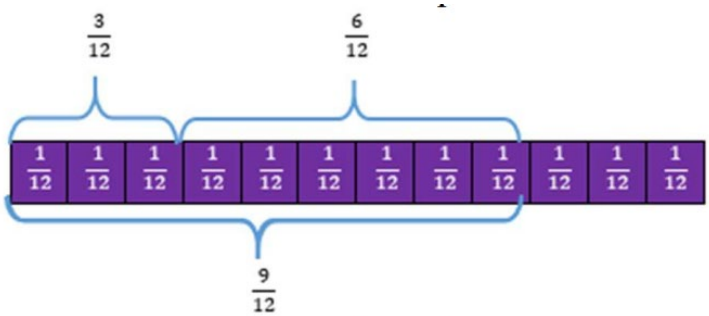


It is important for students to draw these two models the same size. Once the models are created, students will then need to be able to make the all the pieces within each model the same size to be able to subtract. They then divide each piece of the $\frac{2}{3}$ model into fourths. They then divide each piece of the $\frac{1}{4}$ model into thirds. Now both models are divided in to 12 pieces and the subtraction problem can be represented as $\frac{8}{12} - \frac{3}{12}$. It is important to note that the area of the models did not change. Just because the fraction changed, the value of the fraction did not change.



Now, students can subtract the same size pieces. So, $\frac{2}{3} - \frac{1}{4} = \frac{5}{12}$

- Instruction includes concrete models and drawings that help solidify understanding that when adding and subtracting with unlike denominators, students are adding and subtracting pieces of the whole.
    - For example, the teacher emphasizes the use of area and number line models and presents expressions in numeral-word form to help understand that one over the denominator is the unit.
    - For example, "3 *twelfths* + 6 *twelfths* are equal to how many *twelfths*?" The denominator is 12 so one unit is equal to 1 twelfth.



$$\frac{3}{12} + \frac{6}{12} = \frac{9}{12}$$

Questions to ask students:

Ask students why we need like denominators to add/subtract fractions.

Sample answer that indicates understanding: Both fractions need to have the same size parts for us to add or subtract the number of parts represented.

Sample answer that indicates an incomplete understanding or misconception: if we don't make the denominators the same, the answer will be wrong.

Ask students why we do not add/subtract the denominators.

Sample answer that indicates understanding: The denominator indicates the size of the parts that are being added/subtracted. We only need to add/subtract the amount being represented, which is the numerator.

Ask students to find the sum of $\frac{2}{3}$. and $\frac{3}{5}$.

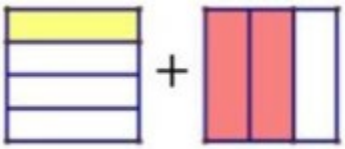
Sample answer that indicates understanding: I need to rename the denominators into a common unit which is fifteenths because I know that 3 × 5 = 15. When I rename the denominators, I must rename the numerators, so my equivalent fractions are $\frac{10}{15} + \frac{9}{15} = \frac{19}{15}$

I have more parts than I need to make a whole so I can rename this fraction into a mixed number $1\frac{4}{15}$.

Instructional Tasks

Instructional Task 1

Write an expression for the visual model below. Then find the sum.



Instructional Task 2

Use a visual fraction model to find the value of the expression $\frac{3}{5} + \frac{4}{15}$

Instructional Task 3

Find the value of the expression $3\frac{5}{6} + \frac{3}{8}$

Instructional Task 4

Find the differences $\frac{5}{7} - \frac{2}{3}$ and $2\frac{1}{4} - \frac{4}{6}$

Instructional Items

Instructional Item 1

Find the sum $\frac{5}{8} + \frac{7}{16}$

Instructional Item 2

Find the difference $2\frac{1}{4} - \frac{3}{8}$

Achievement Level Descriptors:

Benchmark	Context	Assessment Limits
MA.5.FR.2.1 Add and subtract fractions with unlike denominators, including mixed numbers and fractions greater than 1, with procedural reliability. Example: The sum of $\frac{1}{12}$ and $\frac{1}{24}$ can be	Mathematical	Items may not use the terms "simplify" or "lowest terms." Numerical expressions or equations must be provided without models.

determined as $\frac{1}{8}, \frac{3}{24}, \frac{6}{48}$ *or* $\frac{36}{288}$ by using different common denominators or equivalent fractions.			
ALD 2	**ALD 3**	**ALD 4**	**ALD 5**
Adds and subtracts fractions less than a whole with unlike denominators, using models and various strategies.	Adds and subtracts fractions including mixed numbers and fractions greater than one, with unlike denominators, using models and various strategies.	Adds and subtracts fractions with unlike denominators, including mixed numbers and fractions greater than one, with procedural reliability.	Solves for an unknown numerator or denominator given the sum or difference.

Additional Resources:

CPALMS

Khan Academy Adding Fractions with Unlike Denominators

Khan Academy Adding Mixed Numbers with Unlike Denominators

Khan Academy Subtracting Fractions with Unlike Denominators

Khan Academy Subtraction Mixed Numbers with Unlike Denominators

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Resources/Tasks to Support Your Child at Home:

Adding and Subtracting Fractions Game