MA.4.FR.2.1

Overarching Standard: ***MA.4.FR.2*** *Build a foundation of addition, subtraction and multiplication operations with fractions.*

Benchmark of Focus

MA.4.FR.2.1: Decompose a fraction, including mixed numbers and fractions greater than one, into a sum of fractions with the same denominator in multiple ways. Demonstrate each decomposition with objects, drawings and equations.

Examples: $\frac{9}{8}$ can be decomposed as $\frac{8}{8}+\frac{1}{8}\,or\,as\,\frac{3}{8}+\frac{3}{8}+\frac{3}{8}$.

Benchmark Clarifications

Clarification 1: Denominators are limited to 2, 3, 4, 5, 6, 8, 10, 12, 16 and 100

Related Benchmark/Horizontal Alignment

- MA.4.FR.1.3
- MA.4.AR.1.2

Vertical Alignment

Previous Benchmarks	Next Benchmarks
MA.3.FR.1.1/1.2	MA.5.FR.2.1

Terms from the K-12 Glossary

- Expression

Purpose and Instructional Strategies

The purpose of this benchmark is to build students' understanding from Grade 3 that each fraction is composed as the sum of its unit fractions. Decomposing fractions becomes the foundation for students to make sense of adding and subtracting fractions, much like decomposing whole numbers provided the foundation for adding and subtracting whole numbers in the primary grades.

- During instruction, students should show multiple ways to decompose a fraction into equivalent addition expressions with the support of models (e.g., objects, drawings and equations).

Common Misconceptions or Errors

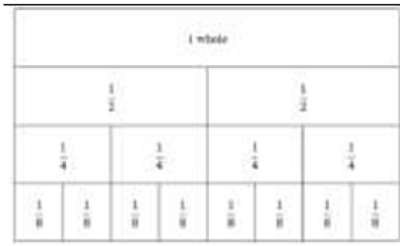
- Students may have difficulty decomposing mixed numbers and fractions greater than one because of misunderstanding of flexible fraction representations (e.g., $\frac{4}{4}$ is equivalent to 1). It is helpful when students' expressions are accompanied by a model that justifies them.

Strategies to Support Tiered Instruction

- Instruction includes fraction tiles or fraction kits to physically place and see equivalent fractions of a model.

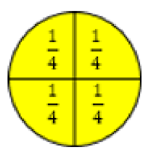
- Example:

- The teacher provides instruction that models how fractions can be decomposed in multiple ways.
  - For example, using the same fraction tiles as above, students decompose $\frac{1}{2}$ in multiple ways with the understanding that the value does not change: $\frac{1}{2}=\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}$ or $\frac{1}{8}+\frac{1}{8}+\frac{2}{8}=\frac{1}{2}$ or $\frac{1}{2}=\frac{1}{8}+\frac{3}{8}$.



$$\frac{1}{2}=\frac{1}{4}+\frac{1}{4}$$

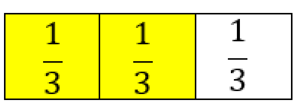
  - For example, using fraction circles, students combine 4 one-quarter circles and then see that there are 4 pieces that make up the whole circle. Equations are accompanied by a model that justifies them.



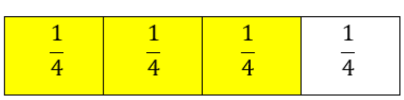
$$\frac{1}{4}+\frac{1}{4}+\frac{1}{4}+\frac{1}{4}=\frac{4}{4}$$

Questions to ask students:

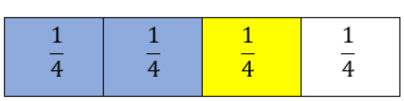
- **Joe says the sum of $\frac{1}{3}+\frac{1}{3}=\frac{2}{6}$. Do you agree or disagree? Create a model to prove your thinking**
- Sample answer that indicates understanding: I disagree with Joe. The sum is $\frac{2}{3}$.



- **Use a model to prove how the expression $\frac{2}{4}+\frac{1}{4}$ *is the same as* $\frac{1}{4}+\frac{1}{4}+\frac{1}{4}$. What fraction are both expressions equivalent to?**
- Both expressions are equivalent to $\frac{3}{4}$. They represent two different ways to decompose $\frac{3}{4}$.



$$\frac{1}{4}+\frac{1}{4}+\frac{1}{4}=\frac{3}{4}$$



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

- **How can you explain that $\frac{4}{3}$ Is equivalent to the expression $\frac{1}{3}+\frac{3}{3}$?**

- Sample answer that indicates understanding: The sum of $\frac{\mathbf{1}}{\mathbf{3}} + \frac{\mathbf{3}}{\mathbf{3}} = \frac{\mathbf{4}}{\mathbf{3}}$. $\frac{4}{3}$ is also a fraction greater than one, equivalent to $1\frac{1}{3}$. I know this because $\frac{3}{3} = 1\ whole$.

$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$
$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$

Instructional Tasks

Instructional Task 1

Part A. Use a visual fraction model to show one way to decompose $\frac{5}{9}$. Make sure to label each fraction part in the model, and write an equation to show how you decomposed $\frac{5}{9}$.

Part B. Show how you could decompose $\frac{5}{9}$ in a different way using a visual fraction model. Again, make sure to label each fraction part in the model, and write an equation to show how you decomposed $\frac{5}{9}$.

Instructional Items

Instructional Item 1

Which sums show ways to express $\frac{8}{3}$?

a. $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$

b. $\frac{1}{3}+\frac{1}{3}+\frac{1}{3}+\frac{1}{3}+\frac{1}{3}+\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$

c. $\frac{3}{3}+\frac{3}{3}+\frac{1}{3}$

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

e. $\frac{3}{3}+\frac{3}{3}+\frac{3}{3}$

Achievement Level Descriptors

Benchmark	Context	Assessment Limits
MA.4.FR.2.1 Decompose a fraction, including mixed numbers and fractions greater than one, into a sum of fractions with the same denominator in multiple ways. Demonstrate each decomposition with objects, drawings, and equations. Example: $\frac{9}{8}$ can be decomposed as $\frac{8}{8}+\frac{1}{8}$ or as $\frac{3}{8}+\frac{3}{8}+\frac{3}{8}$. Clarification 1: Denominators are limited to 2, 3, 4, 5, 6, 8, 10, 12, 16 and 100.	Mathematical	The addition expression must include at least one non-unit fraction.

ALD 2	ALD 3	ALD 4	ALD 5
decomposes fractions less than one into a sum of two fractions where all fractions have the same denominator.	decomposes fractions, including fractions greater than one, into a sum of fractions with the same denominator.	decomposes fractions, including mixed numbers and fractions greater than one, into a sum of fractions with the same denominator in multiple ways.	N/A

Additional Resources:
CPALMS Resources

Resources/Tasks to Support Your Child at Home:
Khan Academy: Decomposing a Fraction Visually

Activity: When cutting any food at home, have your child discuss how to share the food into equal parts. For example, how can we cut a whole pizza into equal slices? What expression would that represent? (example, if there are 8 slices, each piece is $\frac{1}{8}$, so the whole pizza would be decomposed into $\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}+\frac{1}{8}$).