Before This Module

Grade 3 Module 5

Students formalize their understanding of fractions as numbers in grade 3. Using concrete objects and pictorial models, students define 1 of a fractional unit as a unit fraction. They use unit form and fraction form to represent how unit fractions can be iterated to create non-unit fractions. Students represent fractions on a number line, which further helps them solidify their understanding of fractions as numbers. The distance and location on the number line are used to compare fractions with either the same numerator or the same denominator. Students recognize that when two fractions share the same location or are the same distance from zero on the number line, they are equivalent.

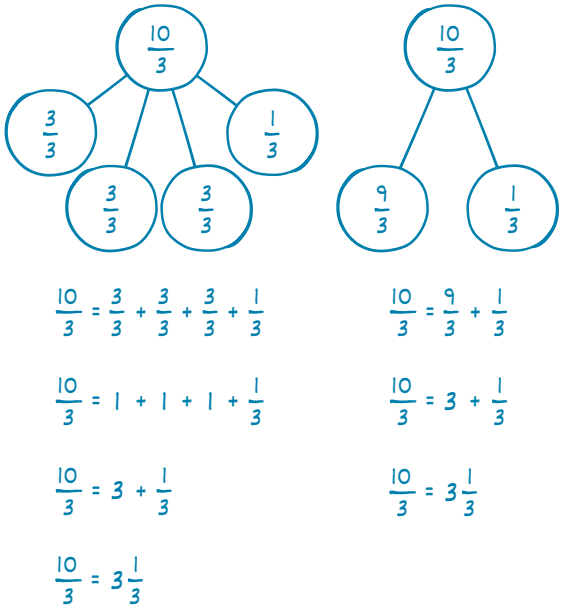
Overview

Foundations for Fraction Operations

Topic A

Fraction Decomposition and Equivalence

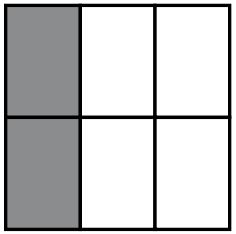
Students decompose fractions into a sum of unit fractions and into a sum of non-unit fractions. They use familiar models such as number bonds, tape diagrams, and number lines to represent fractions. They recognize that the area model may be a useful model to represent fractions. Students decompose fractions greater than 1 into a sum of a whole number and a fraction less than 1. This decomposition helps students rename fractions greater than 1 as equivalent mixed numbers. Students express mixed numbers as a sum of a whole number and a fraction less than 1. Then they rename the whole number as an equivalent fraction that they then add to the fraction. This helps students rename mixed numbers as equivalent fractions greater than 1.



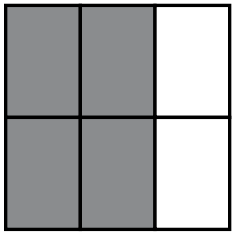
Topic B

Equivalent Fractions

Students generate equivalent fractions and equivalent mixed numbers. They decompose fractional units to find an equivalent fraction with smaller units and record their work with multiplication. They compose fractional units to find an equivalent fraction with larger units and record their work with division. Students use area models, as well as tape diagrams and number lines, to represent fractions and compose or decompose fractional units to generate equivalent fractions.



$\frac{1}{3} = \frac{2 \times 1}{2 \times 3} = \frac{2}{6}$

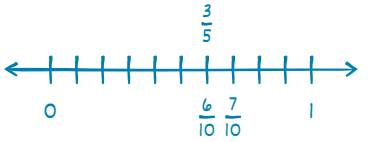
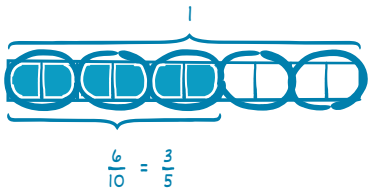


$\frac{2}{3} = \frac{2 \times 2}{2 \times 3} = \frac{4}{6}$

Topic C

Compare Fractions

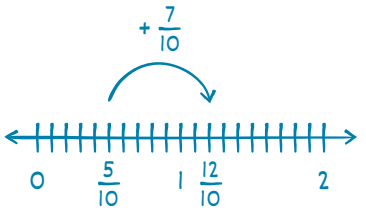
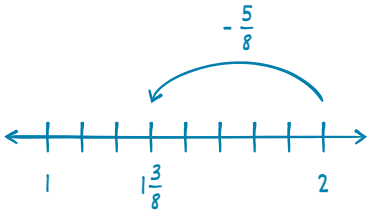
Students use various methods to compare fractions less than 1, fractions greater than 1, and mixed numbers. They consider the relationship between the numbers and use what they know about unit fractions to compare fractions to benchmark numbers such as 0, $\frac{1}{2}$, and 1. When the fractions have related numerators or denominators, students use what they know about generating equivalent fractions to rename one fraction to create a common numerator or common denominator. They rename both fractions as equivalent fractions to compare any two fractions. They use similar methods to compare fractions greater than 1 and mixed numbers.

Use the Benchmarks 0, $\frac{1}{2}$, and 1	Create a Common Denominator	Create a Common Numerator
$\frac{1}{2} \_\_\_ \frac{5}{8}$ $\frac{1}{2}$ is equivalent to $\frac{4}{8}$, and $\frac{4}{8}$ is less than $\frac{5}{8}$. So $\frac{1}{2}$ is also less than $\frac{5}{8}$. $\frac{4}{5} \_\_\_ \frac{5}{6}$ Both fractions are only 1 fractional unit away from 1. $\frac{1}{6}$ is smaller than $\frac{1}{5}$, so $\frac{5}{6}$ is closer to 1 than $\frac{4}{5}$.	$\frac{7}{10} \_\_\_ \frac{3}{5}$  $\frac{3}{5} = \frac{2 \times 3}{2 \times 5} = \frac{6}{10}$. $\frac{7}{10} > \frac{6}{10}$ because both fractions have the same fractional unit and 7 is greater than 6. So $\frac{7}{10} > \frac{3}{5}$.	$\frac{6}{10} \_\_\_ \frac{3}{4}$  $\frac{6}{10} = \frac{6 \div 2}{10 \div 2} = \frac{3}{5}$. $\frac{3}{5} < \frac{3}{4}$ because fifths are smaller units than fourths and 3 of a smaller unit is less than 3 of a larger unit. So $\frac{6}{10} < \frac{3}{4}$.

Topic D

Add and Subtract Fractions

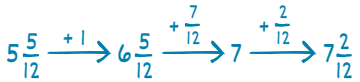
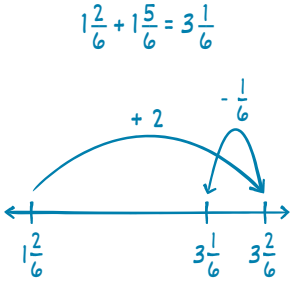
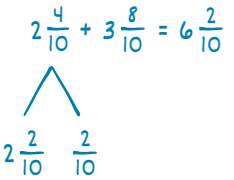
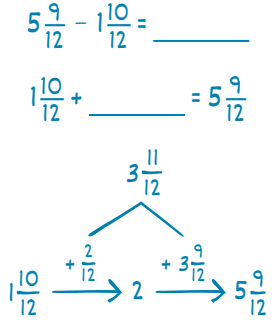
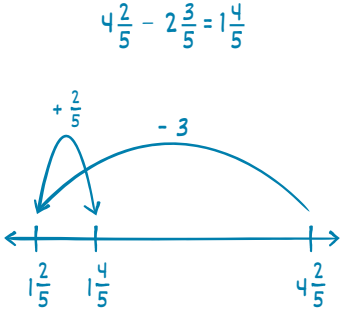
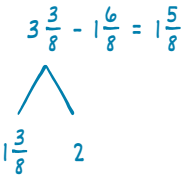
Students estimate to assess reasonableness when solving word problems to establish an underlying theme for the topic. They add and subtract fractions with like units and subtract a fraction from a whole number. Using unit form and a number line helps students relate their previous work with adding and subtracting whole numbers to adding and subtracting fractions. They see similar part-total relationships and the importance of adding and subtracting like units. Students may apply their part-total understanding to think of a subtraction problem as an unknown addend problem. In an optional lesson, students add fractions with related units by generating equivalent fractions.

Add or Subtract by Using Unit Form or Fraction Form	Add or Subtract by Using a Number Line	Subtract by Renaming or Decomposing the Total
5 twelfths + 2 twelfths = 7 twelfths $\frac{5}{12} + \frac{2}{12} = \frac{7}{12}$	$\frac{5}{10} + \frac{7}{10} = \frac{12}{10}$ 	$1 - \frac{5}{6} = \frac{1}{6}$ $\frac{6}{6} - \frac{5}{6} = \frac{1}{6}$
4 fifths − 3 fifths = 1 fifth $\frac{4}{5} - \frac{3}{5} = \frac{1}{5}$	$2 - \frac{5}{8} = 1\frac{3}{8}$ 	$2 - \frac{3}{10} = 1\frac{7}{10}$ 

Topic E

Add and Subtract Mixed Numbers

Students add a fraction to a mixed number and add two mixed numbers. They also subtract a fraction from a mixed number and subtract two mixed numbers. Students apply previously learned strategies for adding and subtracting whole numbers to add and subtract mixed numbers. They use number bonds, the arrow way, and an open number line to represent and record the addition and subtraction. Understanding a mixed number as a sum of a whole number and a fraction helps students as they compose and decompose mixed numbers to add and subtract. Students create and interpret line plots, including solving addition and subtraction problems with fractional data.

Add or Subtract by Counting On by Using the Arrow Way	Add or Subtract by Using Compensation on an Open Number Line	Add by Decomposing a Part or Subtract by Decomposing the Total
		
		

Topic F

Repeated Addition of Fractions as Multiplication

Students use what they know about multiplying whole numbers to multiply fractions and mixed numbers by whole numbers. They use unit form and the associative property to multiply a fraction by a whole number (e.g., $3 \times \frac{5}{6} = (3 \times 5)$ sixths). To multiply a mixed number by a whole number, students express the mixed number as a sum and then apply the distributive property.

$3 \times \frac{5}{6} = (3 \times 5)$ sixths

$= \frac{3 \times 5}{6}$

$= \frac{15}{6}$

After This Module

Grade 4 Module 5

Students extend their understanding of tenths and hundredths as fractional units to recognizing tenths and hundredths as place value units. They write tenths and hundredths in fraction form and in decimal form. Students apply their understanding of comparing and adding fractions to compare and add tenths and hundredths as decimal numbers.

Grade 5 Module 2

Students add and subtract fractions and mixed numbers with related or unlike units. They use benchmark numbers to estimate mentally and assess the reasonableness of answers. Students apply the same methods to generate equivalent fractions and make like units before they add or subtract by using familiar methods.