Unit 3 Family Support Materials

Extending Operations to Fractions

In this unit, students think about how fractions can be composed (put together) and decomposed (taken apart). They also learn about fraction operations: multiplying fractions and whole numbers, adding and subtracting fractions with the same denominator, and adding tenths and hundredths.

Section A: Equal Groups of Fractions

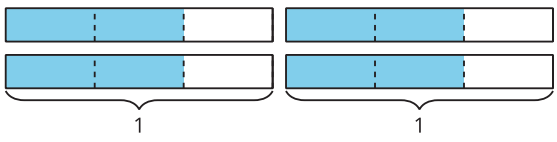
Previously, students thought about multiplication as equal groups of whole numbers of objects, such as 5 bags, with 2 oranges in each bag. In this section, students think about equal groups of fractional pieces, such as 5 plates, with $\frac{1}{2}$ orange on each plate. They see that the amount can be represented by $5 \times \frac{1}{2}$, which is $\frac{5}{2}$.



Students then make sense of diagrams and equations that represent the multiplication of a whole number and a fraction, such as $4 \times \frac{2}{3} = \frac{8}{3}$.

They learn that the numerator in the resulting fraction is the product of the whole number (the 4) and the numerator of the fractional factor (the 2 in $\frac{2}{3}$), and the denominator is the same as in the fractional factor (the 3 in $\frac{2}{3}$).

Diagrams can help students see that some fractions can be represented by more than one multiplication expression. For example, the diagram shows that the following expressions all have the value of $\frac{8}{3}$.



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

$2 \times 4 \times \frac{1}{3}$

$4 \times 2 \times \frac{1}{3}$

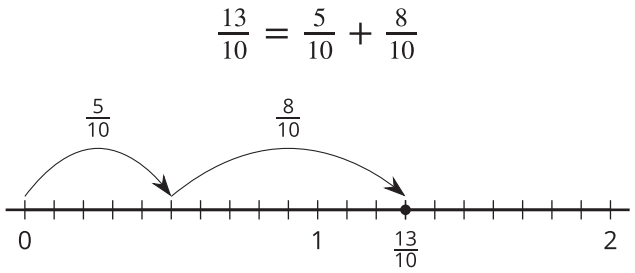
$8 \times \frac{1}{3}$

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Section B: Addition and Subtraction of Fractions

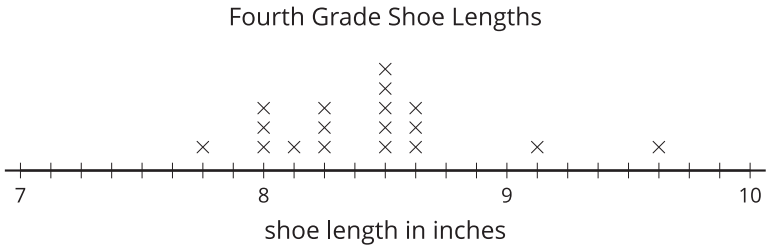
In this section, students learn to add and subtract fractions by decomposing them into sums of smaller fractions, writing equivalent fractions, and using number lines.

Students first think about a fraction as a sum of other smaller fractions. They represent different ways to decompose a fraction by drawing "jumps" on number lines and writing different equations. Later, they use number lines to represent subtraction of fractions.



Working with number lines helps students see that a fraction greater than 1 can be decomposed into a whole number and a fraction, and then written as a mixed number. For example, to find the value of $3 - \frac{2}{5}$, it helps to first decompose the 3 into $2 + \frac{5}{5}$, and then subtract $\frac{2}{5}$ from the $\frac{5}{5}$ to get $2\frac{3}{5}$.

Later in the section, students organize fractional length measurements ($\frac{1}{2}$ inch, $\frac{1}{4}$ inch, and $\frac{1}{8}$ inch) on line plots.



They apply their ability to interpret line plots and to add and subtract fractions to solve problems about measurement data, such as finding the difference between the longest and shortest shoe lengths.

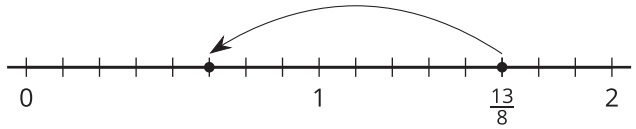
Section C: Adding Tenths and Hundredths

In this section, students learn to add tenths and hundredths. Previously, they learned that $\frac{1}{10} = \frac{10}{100}$. Now, they use this understanding to find equivalent fractions that can help them add tenths and hundredths. Students also strategically use decomposition and the associative and commutative properties to add three or more tenths and hundredths, including mixed numbers.

Try it at home!

Near the end of the unit, ask your fourth grader to solve the following problems:

What equation is represented by the jump on the number line?



Find the value of $\frac{8}{10} + \frac{29}{100}$.

Questions that may be helpful as they work:

- How did you know those fractions were needed for the equation?
- How did you find your answer?
- How could you solve the problem in a different way?

Solution:

$1\frac{5}{8} - 1 = \frac{5}{8}$ or $\frac{13}{8} - \frac{8}{8} = \frac{5}{8}$

$\frac{8}{10} + \frac{29}{100} = \frac{109}{100}$ or $1\frac{9}{100}$

Sample Responses:

- I know that $1\frac{5}{8}$ or $\frac{13}{8}$ was needed for the equation because that was where the jump started. I know that 1 or $\frac{8}{8}$ was needed because that was the length of the jump. I know that $\frac{5}{8}$ is our solution because that is where the jump ended.
- I know that $\frac{8}{10}$ is equal to $\frac{80}{100}$. 80 hundredths + 29 hundredths is equal to 109 hundredths, which is equal to $1\frac{9}{100}$.
- I know that $\frac{29}{100}$ is equal to $\frac{20}{100} + \frac{9}{100}$. I know that $\frac{20}{100}$ is equal to $\frac{2}{10}$. I added the tenths to make a whole: $\frac{2}{10} + \frac{8}{10} = 1$. Then I finished adding the rest of the parts together to get my answer: $1 + \frac{9}{100} = 1\frac{9}{100}$.

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