Fraction Strips: Subtracting Fractions

Strand: Computation and Estimation

Topic: Using fractions strips to model the concept of subtracting fractions.)

Primary SOL: 4.5 The student will
b) add and subtract fractions and mixed numbers having like and unlike denominators*
* On the state assessment, items measuring this objective are assessed without the use of a calculator.

Related SOL: 4.5 ac

Materials

- Fraction Strips (attached)
- Fraction Differences Solution Mat (attached)
- Fraction Difference Cards (attached)
- Two-color counters (to serve as solution mat markers)
- Copy paper or construction paper
- Colored card stock for Fraction Strips

Vocabulary

common denominator, common factors, common multiples, difference, equation, estimation, factor, fraction, greatest common factor (GCF), improper fraction, least common denominator, least common multiple (LCM), like denominators, mixed number, number sentence, simplest form, simplify, subtract, unlike denominators

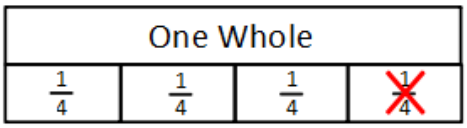
Student/Teacher Actions: What should students be doing? What should teachers be doing?

Note: Before completing this activity, make a complete set of fraction strips for partners to share. Each fraction set should include a copy of each sheet of the Fraction Strips. For example, a complete set will include 10 fraction pieces of the fraction $\frac{1}{2}$. Each sheet should be copied on a different color of card stock and cut into strips. Although it may be easier to manage the strips when left in the complete-strip format, some students will need to have the fractions already cut into units and ready for the lesson. You will also need to prepare a set of Fraction Difference Cards and a Fraction Differences Solution Mat for each partner to share during the game Take One, Mark One.

1. Assign partners based on fraction-number sense, or have the students select a partner. When pairing students, the partners may need to have one student who is more proficient with the concept of fractions paired with another student who may need additional peer support. Give each partner a complete set of the Fraction Strips to share and to use throughout the lesson. Allow students time to explore the Fraction Strip models. Because all Fraction Strips are the same length as the whole, have the student model, for example, that four fourths equals one whole. Ask the following questions for students to discuss with their partner.

- Why is it important to know the size of the whole (or unit) when working with fraction models? *The whole, or unit, is the length that is defined to represent 1. This length can be broken or divided into equal parts or pieces to represent fractional parts of the whole. When fractions are represented given the same-size whole, we can compare them, find equivalent forms, and compute with them. When written symbolically, the denominators of these fractions tell us how many equal parts the whole is divided into.*
- What denominators are included in this set of models? *The denominators in this set of models includes 2, 3, 4, 5, 6, 8, 10, and 12.*
- How many wholes can be made using all of the fourths in the set of models? *If the complete set includes the entire sheet of fourths, then five wholes can be made with the fractional pieces of fourths. There are 20 total fraction pieces, and each whole is made of four pieces. This can be represented as 20 fourths, or symbolically as* $\frac{20}{4}$*, which is equal to 5.*
- How many wholes can be made using all of the halves in the set of models? *If the complete set includes the entire sheet of halves, then five wholes can be made with the fractional pieces of halves. There are 10 total fraction pieces, and each whole is made of two pieces. This can be represented symbolically as 5, or* $\frac{10}{2}$*.*

2. Present the following scenario to the class: "Consider the model which represents one whole. If the whole represents a candy bar and I give one-fourth of it to Sue, how much of the candy bar remains?" Have the partners work together using the fraction strips to model the problems. Then have a class discussion, sharing different strategies used to figure out the answer of $\frac{3}{4}$. Next, ask the students, "If I give an additional three-eighths of the remaining candy bar to Joe, how much of the original candy bar will be left for me?" Encourage the students to explore with their Fraction Strips and work together to discover and justify their solution of $\frac{3}{8}$. Students may use their one-eighths Fraction Strips in exchange for fourths during this work. If the students did not use the concept of finding equivalent fractions, then ask the students to discuss the idea of using eighths when solving this problem. Continue to discuss how fourths can be rewritten as eighths, and record the number sentence that shows this relationship, $\frac{3}{4} = \frac{6}{8}$. Have the students look at the fraction pieces for each and at the number representation. It is important for the students to recognize that $\frac{2}{8}$ is equal to $\frac{1}{4}$ and that half of $\frac{1}{4}$ is $\frac{1}{8}$. When looking at the fraction piece for $\frac{3}{4}$, students should notice that each fourth is divided into half, creating the fraction $\frac{6}{8}$. During the discussion, model for students what this computation looks like pictorially as students share their solutions. For example:



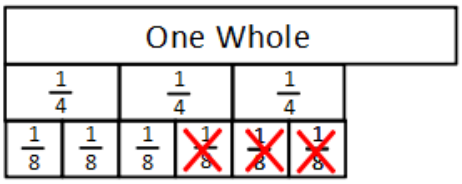
$$1 - \frac{1}{4}$$

$$\frac{4}{4} - \frac{1}{4}$$

$$\frac{3}{4}$$

As a number sentence, the difference looks like this.

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



$$\frac{3}{4} - \frac{3}{8}$$

$$\frac{6}{8} - \frac{3}{8}$$

$$\frac{3}{8}$$

As a number sentence, the difference looks like this.

$$\frac{3}{4} - \frac{3}{8} = \frac{3}{8}$$

3. Continue to reinforce the importance of determining common denominators with the fraction strips through play of the Take One, Mark One game. Model the game for the class, using the Fraction Strips. Model the problem-solving process for one or two problems in the card set. After modeling with the Fraction Strips, model a pictorial representation of the hands-on work in a labeled drawing, similar to the one shown above. Also include a number sentence that represents the computation problem. The directions for the Take One, Mark One game are as follows:
    - Shuffle the game cards and place them face down in a pile.
    - Player 1 takes the top card from the pile and reads it to player 2.
    - Player 2 uses Fraction Strips to model the subtraction problem. Encourage the students to always begin with a one whole (one unit) strip as a point of reference for the whole, and organize pieces below this whole to accurately represent the fractions in the problem and the resulting difference. Fraction pieces should be substituted as needed to form equivalent fractions with common denominators.
    - After player 2 finds and justifies their solution, player 1 agrees or disagrees respectfully. If there is agreement, player 2 may cover the fraction that represents the difference on the solution mat with a two-color counter. Player 1 should then record their work symbolically on their paper. If there is a disagreement, the students should continue to collaborate until they agree on a solution. Once fractions on the solution mat are covered with a counter, they are unavailable for answers for the remainder of the game.
    - Players switch roles.
    - Players work together to cover as many spaces on the solution mat as possible in the amount of time allowed.
4. Once the students understand how to play Take One, Mark One, give each partner a set of the Fraction Difference Cards, the Fraction Differences Mat, and a set of two-color counters. Students should still have their Fraction Strips from the first part of the lesson. Have partners fold a piece of copy paper or construction paper into fourths. Students should use the quadrants of the paper to record their solutions. The solution to each

problem should include a labeled drawing and a number sentence, similar to what was modeled during the first part of the lesson. Remind students to show which equivalent fractions were used when determining common denominators. The teacher should walk around the room to identify any misconceptions and to monitor the partners as they play the game. Identify students who will need intense remediation. Give formative feedback and redirection as necessary during this time.

5. As you walk around, identify examples of student work, shown on their paper, from the Fraction Difference Cards to share with the class and use for the whole-class discussion. Ask the class whether they agree or disagree with the solution and why, and whether the representation is mathematically accurate.

Assessment

- **Questions**
  - How is subtracting fractions with manipulatives different from adding fractions with manipulatives?
  - Why is it so important to define the whole before solving a subtraction problem?
  - What things are important to think about when determining common denominators for fractions in subtraction problems?
- **Journal/writing prompts**
  - Draw a picture and explain the solution to the following question: Brad has $\frac{2}{3}$ of a pan of brownies at home. When he came home from school, he ate $\frac{1}{2}$ of the brownies in the pan. What fraction of the whole pan of brownies is left?
  - Write a letter to the principal and explaining how finding common denominators is helpful when subtracting fractions.
- **Other Assessments (include informal assessment ideas)**
  - Monitor students as they work on the Take One, Mark One game. Look for proficiency in determining common denominators, working with mixed numbers and improper fractions, accurate representations, and accurate number sentence translations. Also, notice students symbolic recording for accuracy.
  - Present students with an artifact of student work from the Take One, Mark One game. Ask students to individually analyze the work and write about whether they agree or disagree with the solution and why, and whether the representation is mathematically accurate.

Extensions and Connections (for all students)

- Have students create a new set of fraction difference cards and solution for the Take One, Mark One game.
- Present a contextual problem and have students use their fraction strips to explore situations that require regrouping. For example, it is $2\frac{1}{4}$ miles from Kendra's house to her friend's house in the same neighborhood. Kendra rode her bike $1\frac{3}{8}$ mile before she

had a flat tire. She decided to walk the rest of the way to her friend's house. How far did she walk?

Strategies for Differentiation

- Some students with processing disabilities may need to work longer with fraction models before they are able to represent their work in a drawing or with a number sentence.
- Some students may need a formal recording sheet versus plain folded paper to remember the expectations for their representations for Take One, Mark One game.
- Access virtual manipulative activities using fraction bars/strips at the National Library of Virtual Manipulatives **website**.

Note: The following pages are intended for classroom use for students as a visual aid to learning.

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Fraction Strips — One Whole (One Unit)

1
1
1
1
1

Fraction Strips — Halves

$\frac{1}{2}$	$\frac{1}{2}$
$\frac{1}{2}$	$\frac{1}{2}$
$\frac{1}{2}$	$\frac{1}{2}$
$\frac{1}{2}$	$\frac{1}{2}$
$\frac{1}{2}$	$\frac{1}{2}$

Fraction Strips — Fourths

$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$

Fraction Strips — Eighths

$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$
$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$
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Fraction Strips — Fifths

$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$
$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$
$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$
$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$
$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$

Fraction Strips — Tenths

$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
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Fraction Strips — Thirds

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

Fraction Strips — Sixths

$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$
$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$
$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$
$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$
$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$

Fraction Strips — Twelfths

$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$
$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$
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Fraction Differences Solution Mat

$\frac{1}{5}$	$\frac{2}{3}$	$\frac{4}{3}$	$\frac{7}{10}$	$\frac{3}{8}$
$\frac{3}{2}$	$\frac{1}{2}$	$\frac{1}{8}$	$2\frac{1}{8}$	$\frac{9}{10}$
$\frac{3}{10}$	$\frac{5}{8}$	$\frac{1}{4}$	$\frac{3}{4}$	$\frac{5}{3}$
$\frac{3}{4}$	$\frac{7}{5}$	$\frac{5}{4}$	$\frac{2}{5}$	$\frac{3}{8}$
$\frac{1}{6}$	$\frac{1}{10}$	$\frac{3}{5}$	$1\frac{3}{4}$	$\frac{1}{2}$

Fraction Difference Cards

Start with $\frac{3}{8}$. Subtract $\frac{1}{4}$.	Start with $\frac{7}{8}$. Subtract $\frac{1}{2}$.
Start with $\frac{1}{2}$. Subtract $\frac{4}{10}$.	Start with $\frac{15}{12}$. Subtract $\frac{3}{4}$.
Start with $\frac{18}{10}$. Subtract $\frac{4}{5}$.	Start with $\frac{8}{10}$. Subtract $\frac{3}{5}$.
Start with $\frac{8}{4}$. Subtract $\frac{2}{8}$.	Start with $\frac{6}{4}$. Subtract $\frac{3}{4}$.

Start with $\frac{17}{8}$. Subtract $\frac{3}{2}$.	Start with $\frac{5}{6}$. Subtract $\frac{2}{3}$.

Fraction Difference Cards

Start with $\frac{12}{9}$. Subtract $\frac{2}{3}$.	Start with $\frac{12}{10}$. Subtract $\frac{2}{5}$.
Start with $\frac{20}{12}$. Subtract $\frac{1}{3}$.	Start with $1\frac{8}{10}$. Subtract $1\frac{3}{5}$.
Start with $\frac{3}{2}$. Subtract $\frac{11}{8}$.	Start with $\frac{7}{5}$. Subtract $\frac{9}{10}$.
Start with 1. Subtract $\frac{6}{12}$.	Start with $\frac{13}{8}$. Subtract $\frac{3}{4}$.
Start with $\frac{11}{10}$. Subtract $\frac{2}{5}$.	Start with $\frac{12}{8}$. Subtract $\frac{1}{2}$.

Fraction Difference Cards

Start with $1\frac{2}{5}$. Subtract $\frac{1}{2}$.	Start with $1\frac{11}{12}$. Subtract $\frac{1}{3}$.
Start with $\frac{18}{10}$. Subtract $\frac{2}{5}$.	Start with $\frac{14}{8}$. Subtract $\frac{2}{4}$.
Start with $1\frac{2}{3}$. Subtract 0.	Start with $2\frac{3}{8}$. Subtract $1\frac{1}{4}$.