Fractions ExplorAction 1

Fraction Addition and Subtraction

Students use Fraction Tower® Equivalency Cubes, Fraction Number Lines (Number 4, the tick-marked double line), and Deluxe Rainbow Fraction® Squares to add and subtract fractions. In this activity, students will—

- add and subtract like and unlike fractions,
- model unlike fractions and find equivalent like fractions, and
- play a game.

Common Core State Standard

5.NF.A.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)*

Materials

- Fraction Tower® Equivalency Cubes
- Fraction Number Lines (Number 4, the tick-marked double line)
- Deluxe Rainbow Fraction® Squares
- BLM 2 (Fraction Spinner)
- dry erase markers

Investigate

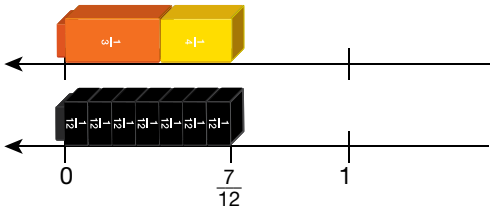
Using the game, as described below, have students explore the following problem.

How many different fraction sums or differences with unlike denominators can be modeled using Fraction Towers?

Each group of 4 students will use two sets of Fraction Towers, a Fraction Number Line (Number 4, the tick-marked double line), and the Fraction Spinner (BLM 2). Have students break apart the sets of cubes, separating them into unit pieces. The pieces are used to build fractions and equivalent fractions during the game. Have students number the number line, 0–3.

To start the game, each student will spin the Fraction Spinner to determine who goes first. The player who spins the greatest fraction goes first. Player 1 spins the spinner and *plays* the fraction that is spun by finding a cube that equals it and placing it on the top number line, left end aligned with 0.

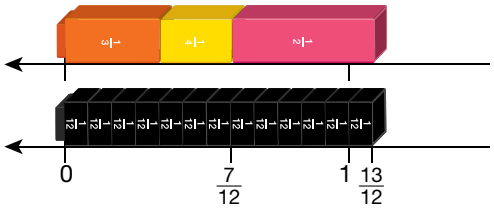
The next player spins the spinner and plays the fraction by adding it to the fraction that was played by Player 1, but *only if* the two fractions are like fractions or can be made equivalent fractions using the cubes. In the latter case, the student builds the two equivalent fractions and models their sum on the bottom line. Students can use dry erase markers to label their fractions. For example—



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

$\frac{4}{12} + \frac{3}{12} = \frac{7}{12}$

After the second player's turn, the third player takes his or her turn. Play continues until a player extends the growing sum to exactly 1 or beyond 1. If a player reaches 1 exactly, that player is the winner. If a player goes beyond 1, then that player wins.



$\frac{7}{12} + \frac{1}{2} = ?$

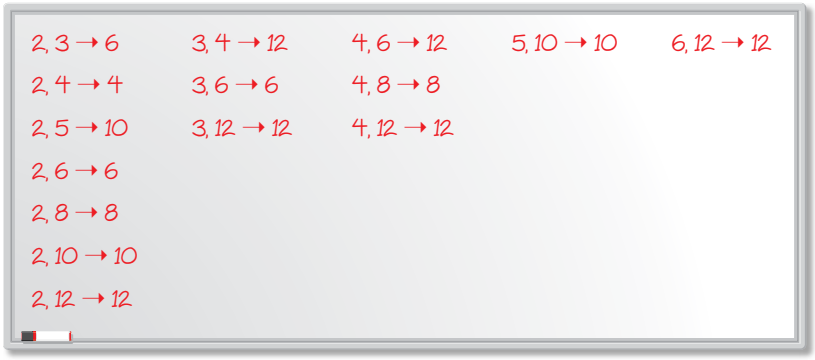
$\frac{7}{12} + \frac{6}{12} = \frac{13}{12}$

$\frac{13}{12}$ is closer to 1 than $\frac{7}{12}$. Player 3 wins.

Students play multiple rounds of the game. For each round, have students record their plays and the sums they build. Students might play a subtraction version of the game. Students can start at 2 and subtract, trying to get as close as possible to 1. Or, students can start at 1 and try to be closest to 0 (without going below 0).

Think and Share

As students play rounds of the game, they should become familiar with the different combinations of unlike denominators for which equivalent fractions can be modeled using Fraction Towers. With students, build an organized list of the combinations. For each combination, indicate the common denominator that is used. The completed list might look like the following.



Use prompts such as these to promote class discussion:

- In which direction do you move on the number line when you add? Subtract? Explain.
- How did you use equivalent fractions to help you find sums and differences?
- To win the game, which is more important, luck or strategy? Explain.
- How could the game be changed so that more strategy is needed to win?

Teacher Talk

Students are familiar with the idea of representing whole numbers on a number line; they know that numbers increase to the right and decrease to the left. Fraction Towers, used with a Fraction Number Line, help students apply these concepts to find sums and differences of fractions. In playing the game, students might reason that—

- If the fractions in question are like fractions, the addition or subtraction is a simple matter of operating on the numerators and keeping the common denominator.
- If the fractions in question are unlike fractions, then equivalent fractions with a common denominator can be used, and these can be treated as like fractions.

In finding a common denominator for two unlike fractions, students might simply search for Fraction Towers that work. But after repeated searching, they will probably realize that the common denominator they're searching for is just one of the given denominators (the one that is a multiple of the other), or it is the product of the given denominators. There is one exception to this among the denominations given in the Fraction Towers set—it is the pairing of fourths and sixths. In this case, finding the common denominator 12 requires a little bit more searching.

Extend

The goal of this variation using Fraction Squares is to add fractions until one player gets a sum of exactly 1 by covering the red square.

When playing, students should do the following:

- After the first player spins, he or she places that fraction piece on top of the red square. The next player spins and adds that fraction to the fraction that was played by Player 1, but *only if* the two fractions are like fractions or can be made equivalent like fractions using Fraction Squares. If so, the student places the fraction piece or pieces that model the sum on top of the red square (if not, it's the next player's turn). If a player spins a fraction that will cause the sum to go over 1, that player's turn is over. Play continues until a player spins a fraction in which the sum is exactly 1—that player is the winner.
- Have students record their sums as they play.
- Play the subtraction game, too, and attempt to find an exact difference of 0.

Look for students to develop their estimation skills as they play the game. Ask students to describe ways in which they can visualize or determine the fraction they need to get an exact sum of 1 or an exact difference of 0.