Nasco Education

LESSON PLAN

Math

Developed with Kristin Ulrich

Fraction Tower® II

Adding fractions with like and unlike denominators

Volume 8 | Gr. 4

Time: 60 mins.

Materials list

- Fraction Tower® Cubes **(TBI7368)**
- Cards with + and = on them (one of each per student)
- Worksheets (attached with lesson plan download)

Objectives

Students will...

- Decompose fractions in a variety of ways
- Solve addition problems of fractions with both like and unlike denominators
- Create pictorial models that represent different addition of fractions problems

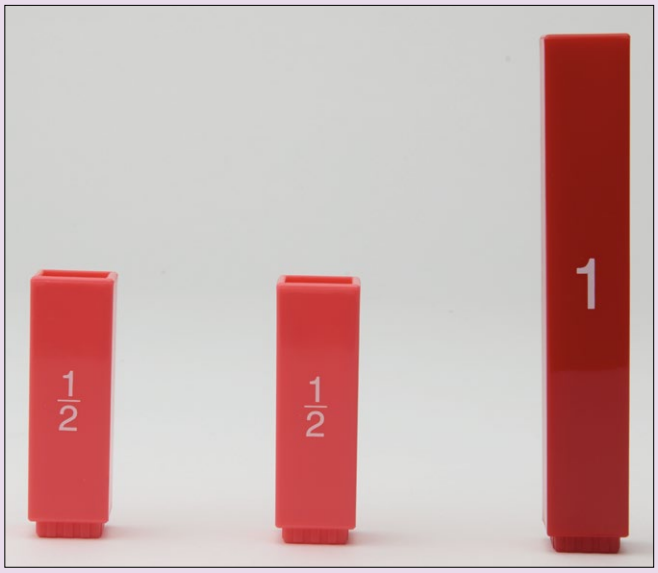
Learning Standards

- Represent a fraction a/b as a sum of fractions 1/b, where a and b are whole numbers and b > 0, including when a > b.
- Decompose a fraction in more than one way into a sum of fractions with the same denominator using concrete and pictorial models and recording results with symbolic representations.

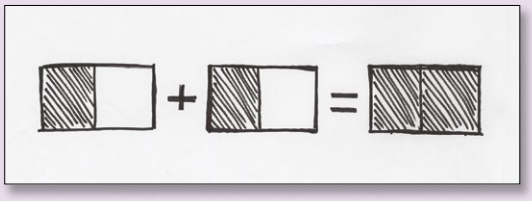
Activity 1

Note: This activity works best with small groups or partners. If each group has two sets of Fraction Towers®, it may be easier for students to visualize. If that is not a possibility, it still works well if each student or small group has one set of Fraction Towers®. This lesson assumes that students are familiar with using Fraction Towers®, as it builds off of concepts learned in *MathWorks Vol. 6 — Fraction Tower®: Comparing and Ordering Fractions*.

1. Distribute Worksheet 1. Have students break apart their pink tower into its two pieces, put the plus sign between them, and put the equals sign after the second pink piece so it mirrors problem 1 on the worksheet. Tell students that to add fractions like these, where the two fractions both have the same denominator, the denominator in the answer will always stay the same. They only need to add the two numerators together. The entire equation should read ½ + ½ = ⅔. Remind students that fractions with the same numerator and denominator always equal 1. Students should already know that if they stack their pink pieces back together, they get 1, so they can visually see this is true. Have students write ½ + ½ = ⅔ (1) for problem 1 on the worksheet.
2. The next step is to create a pictorial model of the problem. Have students draw a rectangle divided into two equal pieces, pointing out that this divided rectangle represents the denominator of the first fraction. Have them shade in one of the two pieces, and state that they are doing this because the numerator of the first fraction is 1. Next, they should put a plus sign, followed by another rectangle divided into two equal pieces, symbolizing the denominator of the second fraction. They will also shade one piece of the second rectangle to represent the numerator of the second fraction. After this rectangle should be an equals sign, followed by another rectangle divided into two equal pieces. Students should shade both halves of this rectangle to represent the answer. This helps reinforce the concept that ⅔ is the same as one whole.
3. To solve problem 2 on Worksheet 1, students will need to break their teal tower apart into two smaller towers, one with three pieces and one with two pieces. Remind students that these smaller towers represent ⅜ and ⅖.
4. Have students put the ⅜ tower first, followed by the plus sign, the ⅖ tower, and the equals sign. This equation should mirror the equation on problem 2 of the worksheet. Ask students what they need to do with the denominators. *(Keep the denominator the same in the answer because both denominators are the same.)* What do they need to do with the numerators? *(Add them together.)* They should come up with an answer of ⅝.
5. Guide students through how to draw the pictorial model of the problem. They should draw a rectangle divided into six equal pieces with three pieces shaded, followed by a plus sign, a rectangle divided into six equal pieces with two pieces shaded, an equals sign, and a rectangle divided into six equal pieces with five pieces shaded. As the students are drawing their pictorial model, make sure to stress that the six equal pieces of each rectangle represents the denominators and the shaded portions represent the numerators.



Step 1



Step 2

Practice 1

Students should complete problems 4-6 on Worksheet 1 independently. They should use their Fraction Towers® to work the problems even if they are picking up on the pattern. Students should also be sure to draw a pictorial model of each problem.

Checking for Understanding 1

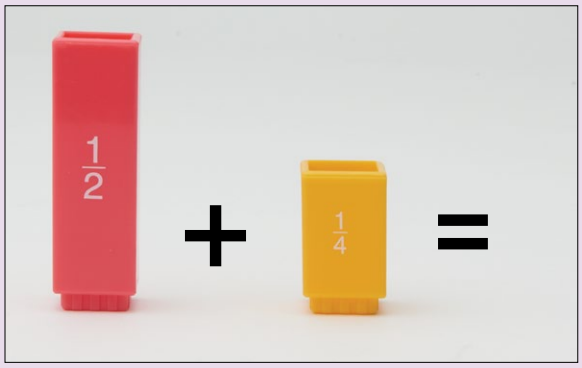
Circulate around the room as students are working to check for understanding. Several students can also come up and draw their pictorial models for each of the problems.

6. Problem 3 is the last problem you and the students will work on together. Students should use their purple tower this time. Have students make one smaller tower with seven pieces. Make sure they realize this tower represents ⅞. They should put their plus sign after the ⅞ tower, then place one tenths piece after it for ⅒. The equals sign should follow the ⅒ piece. Students should notice that the denominators are once again the same, meaning that only the numerators need to be added. They should come up with ⅘ for an answer.
7. For the pictorial model, as students draw the problem, keep reinforcing that the rectangles split into 10 equal pieces represent the denominator and that the shaded portions of the rectangles represent the numerators. Their pictorial model should consist of a rectangle split into 10 equal pieces with seven pieces shaded, a plus sign, a rectangle split into 10 equal pieces with one piece shaded, an equals sign, and a rectangle split into 10 equal pieces with eight pieces shaded.

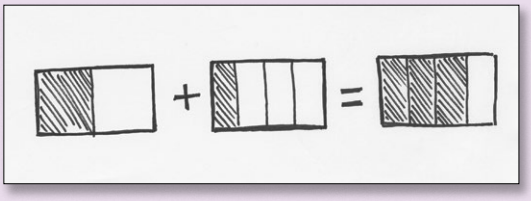
Activity 2

Note: This is meant to be an introduction to adding fractions with different denominators. There are many steps to this process. This activity introduces students to the concepts and helps them visualize how an answer can be formulated.

1. Hand out Worksheet 2. Tell students that, up to this point, they have been adding fractions together that have the same denominator; but now they are going to see what happens when they add two fractions together that have different denominators. Ask students to create ½ using their pink tower and ¼ using their yellow tower. They will put the ½ first, followed by a plus sign, the ¼ piece, and the equals sign, mirroring problem 1 on Worksheet 2. Ask students to name the denominators *(2 and 4)*.
2. Ask students to name the least common multiple (LCM) of 2 and 4 *(4)*. The LCM determines which color tower should be used to help solve the problem *(yellow)*. First, they will need to stack the two addends together into a tower consisting of a pink and a yellow piece. Next, they will make a yellow tower that's exactly the same height as the yellow and pink tower. Remind students that when two towers are exactly the same height, they are equivalent to each other. They should discover that a group of three yellow pieces is equivalent to a group containing one pink and one yellow piece, meaning that ½ + ¼ = ¾. Have students fill that in on their worksheet for problem 1.
3. Guide students in drawing the pictorial model of the problem. As they draw the model, ask them questions such as, "If we start with ½, how many equal pieces does the rectangle need to have?" *(2)* "How many of those pieces should be shaded?" *(1)* Do this with the other two rectangles. They should end up drawing one rectangle divided into two equal pieces with one piece shaded, a plus sign, a rectangle divided into four equal pieces with one piece shaded, an equals sign, and a rectangle divided into four equal pieces with three pieces shaded.
4. For problem 2 on Worksheet 2, students will need the yellow tower to make ¾ and the black tower to make 10/12. They should insert the plus sign between the two numbers and the equals sign after 10/12. Ask students to name the two denominators *(4 and 12)* and the least common multiple (LCM) of the two denominators *(12)*.



Steps 1-2



Step 3

5. Based on the LCM, students should use the black tower to help them figure out the answer. First, they should stack their two addends into a tower consisting of three yellow pieces and one black piece. Next, they should make a black tower that is the same height as the yellow and black tower, remembering that when the two towers are exactly the same height, they are equivalent to each other. They should discover that it takes 10 black pieces to equal the height of the yellow and black tower, meaning that ¾ + 1/12 = 10/12.
6. Guide students in drawing the pictorial model of the problem, much like you did for the previous problem. The students should draw a rectangle divided into four equal pieces with three pieces shaded, a plus sign, a rectangle divided into 12 equal pieces with one piece shaded, an equals sign, and a rectangle divided into 12 equal pieces with 10 pieces shaded.
7. Problem 3 will be the last problem you and the students do together. Students will need to work with a partner or a small group to complete this problem because they will need two sets of Fraction Towers® to solve the problem.
8. Have students use one pink piece to represent ½ and three blue tower pieces to represent ⅜. As in all the other problems, they should use these two smaller towers to create the equation ½ + ⅜ = ___. Seeing that the denominators are 2 and 8, they should determine that the LCM of 2 and 8 is 8 and they will need to use their blue eighths pieces to figure out the answer.
9. Students should make a tower by stacking the two addends together. This tower will have one pink piece and three blue pieces. They should then create a second tower with the blue pieces that is the same height as the first. Remind students that when two towers are exactly the same height, they are equivalent. They should have had to combine pieces from both their blue tower and their partner's blue tower to make a tower with seven pieces, or equaling ⅞.
10. Proceed with the pictorial model the same way you did for the last two problems. The students should be able to draw a rectangle divided into two equal pieces with one piece shaded, a plus sign, a rectangle divided into eight equal pieces with three pieces shaded, an equals sign, and a rectangle divided into eight equal pieces with seven pieces shaded.

Practice 2

Students should complete problems 4-8 with their partner or small group. Some of the problems will require two sets of Fraction Towers®. Remind students to be sure that they find the LCM of each denominator.

Checking for Understanding 2

After students have completed problem 4, check for understanding by using the following line of questioning:

1. What's the LCM of 2 and 10? *(10)*
2. What did your two-color tower look like? *(1 pink piece and 3 purple pieces)*
3. How many purple pieces did it take to make a tower the exact same height? *(8)*
4. What does ½ + ³⁄₁₀ equal? *(⁸⁄₁₀)*
5. What would my pictorial model for ½ look like? *(2 equal pieces with 1 shaded)*
6. What would my pictorial model for ³⁄₁₀ look like? *(10 equal pieces with 3 shaded)*
7. What would my pictorial model for ⁸⁄₁₀ look like? *(10 equal pieces with 8 shaded)*

Intervention

- Pair struggling students with students who are finding success with this work so that they can teach one another.
- Work on more problems that have common denominators.
- Only do the first four problems on Worksheet 2.

Extension

- Have students put the final answer in lowest terms.
- Have students explore problems with answers greater than 1.
- Have students explore with adding three addends (1/2 + 1/3 + 1/4).

Fraction Tower® II: Adding fractions with like denominators — **worksheet 1**

Volume 8

Name: _____ Date: _____

Directions: Solve each problem. Draw a pictorial model that represents each addition problem in the space provided below.

1. $\frac{1}{2} + \frac{1}{2} =$ _____

2. $\frac{3}{6} + \frac{2}{6} =$ _____

3. $\frac{7}{10} + \frac{1}{10} =$ _____

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

5. $\frac{5}{12} + \frac{3}{12} =$ _____

6. $\frac{1}{8} + \frac{8}{8} =$ _____

Fraction Tower® II: Adding fractions with unlike denominators — **worksheet 2**

Volume 8

Name: _____ Date: _____

Directions: Use your Fraction Towers® to represent each problem. Write down the least common multiple (LCM) of the two denominators, then use your Fraction Towers® to help you solve the problem. Draw a pictorial model that represents each addition problem in the space provided below.

1. ½ + ¼ = _____ LCM = _____

2. ¾ + 1/12 = _____ LCM = _____

3. ½ + ⅜ = _____ LCM = _____

4. ½ + 3/10 = _____ LCM = _____

5. 4/6 + ¼ = _____ LCM = _____

6. $\frac{1}{6} + \frac{5}{12} =$ _____ LCM = _____

7. $\frac{6}{8} + \frac{1}{4} =$ _____ LCM = _____

8. $\frac{7}{12} + \frac{1}{4} =$ _____ LCM = _____

Challenge: Create two problems on your own, complete with pictorial models.

1. _____ + _____ = _____ LCM = _____

2. _____ + _____ = _____ LCM = _____