Math
Unit 2
Parts of a Whole

- How do we represent parts of a whole using words, numbers, and symbols?
- What strategies can we use to solve problems with parts of a whole?

Sample Lesson Plans

Parts of a Whole
Lesson 1: Equal Parts

The purpose of this lesson is to help students understand the important convention in math that when we work with parts less than a whole, the whole must be divided into equal parts.

ESSENTIAL QUESTION(S)	How do we represent parts of a whole using words, numbers, and symbols? What strategies can we use to solve problems with parts of a whole?
GUIDING QUESTION	How can we represent amounts less than one whole?

DAILY QUESTION	How do we express parts less than one whole?
CONTENT TARGETS	I can identify amounts less than one whole. (CCSS.MATH.CONTENT.3.NF.A.1)
STANDARDS FOR MATHEMATICAL PRACTICE	MP1: Make sense of problems and persevere in solving them. MP3: Construct viable arguments and critique the reasoning of others.
LANGUAGE TARGETS	I can identify how many parts of a whole something has been divided into. **Identify:** *The _____ is divided into _____ equal parts.* *The _____ has _____ equal parts.* *We can divide this _____ into _____ equal parts.* *I have/He/she has _____ parts of the whole _____.*
VOCABULARY	**division:** equal-sized **fraction:** part, piece, whole, denominator*, numerator* **other:** express
MATERIALS	Dice^ (2 dice per student pair) Student Activity Sheet 1 Exit Ticket Bowls of Rice Activity Sheet Math Journals^

^Not provided in lesson materials.

GENERAL NOTES

This lesson is intended to serve as an informal introduction to fractions, where students can develop their reasoning around working with quantities less than a whole. Students are introduced to this idea through the context of sharing food, which is a common experience. It is not expected for students to express amounts less than a whole using fraction notation. In this lesson, they will use words, pictures, and diagrams to express parts less than a whole. Students will learn to write fractions using fraction notation in Lessons 2 and 3.

*(Note: Before the start of this lesson, you should administer the diagnostic **Beginning Assessment**. This will help you determine each student's entry point into the curriculum as well any misconceptions or potential areas of struggle.)*

This lesson is designed for 1-2 class periods, depending on your students' needs.

OPENING

WARM-UP:

- Distribute one pair of **dice** to each student pair.
- Review rules for the Dice Game:
  - Students roll the **dice** and multiply the numbers that they roll.
  - Whoever has the greatest product wins the round.
  - Best out of 10 rounds is the winner.
- **Model** one round of play for students to ensure understanding.

This Warm-Up is intended to serve as a review of operations and vocabulary (*greater than* and *less than*) from Unit 1. Make sure to listen in to see that they are using these terms as they work with one another.

Provide students with calculators to help them solve their expressions.

CONNECT:

- Say: "In today's warm-up, the winner was the person who had the greatest number possible. Sometimes in real life, it's not fair for one person to have more than another." Prompt students to think about a situation where it is not fair for one person to have more of something than another.
- Have students **turn and talk** to their partners to share their situations.
- Say: "In today's activity, we will be looking at situations where people have to share food fairly."
- Ask students what *sharing fairly* means to them. Discuss and define what it means to be *equal*. Ask if fair means the same as equal, using scenarios to support understanding.

Student responses will vary. Be sure to clarify that when we talk about *fair share* in math, we mean everyone gets the same amount—an ***equal-sized*** part.

- Draw attention to targets.

WORK TIME

PREPARE:

- Distribute **Student Activity Sheet 1**.
- **See-think-wonder:** Have students review and discuss the pictures of the situations with a partner.
- Share several responses as a whole class.
- Optional: Chart student responses.

INTERACT:

- Introduce the task: Using the **Bowls of Rice Activity Sheet**, determine how to share the rice among the members of each family equally.
- Distribute the **Bowls of Rice Activity Sheets**.
- Students should work individually for several minutes, then turn to work with their partners for this task. Encourage students to show their work in whichever way makes sense to them. Many students may want to work directly on the paper, dividing the images of the bowls of rice. Students may also cut out images of the rice to divide into equal ***parts***. This allows all students an entry point to the task.
- **Model** with a simple problem only if they are confused with the directions.

Giving students time to work individually and with peers before any teacher modeling allows students to apply their own reasoning and make sense of the mathematics.

Circulate and monitor: Assess how students are partitioning the bowls of rice. If needed, collect the class to revisit the idea of what it means to be equal--everyone gets the same amount.

- After students have had time to work through the problem, share out as a whole class.

Be strategic in how you select students for the whole-class share out. You may want to start with students who had a common misconception about equal share situations or who didn't partition equally. This is a good teachable moment to stress precision in creating equal groups, which aligns to Mathematical Practice Standard 7.

- Refer back to the language frames for the lesson.
- Students share how they divided the bowls of rice using the language frames.

- *The _____ is divided into _____ equal parts.*
- *The _____ has _____ equal parts.*
- *We can divide this _____ into _____ equal parts.*
- *I have/He/she has _____ parts of the whole _____.*

- Students should respond to their classmates' solutions, explaining why they agree or disagree.
  - Listen for: I agree because …, I disagree because …

Having students monitor their own and each other's responses is a good way to develop metacognitive skills over time.

EXTEND:

- Formalize the vocabulary for the day. Explain: "When we talk about the total number of equal ***parts*** we divided our bowl of rice into, we call that number the ***denominator***. When we talk about how many of those equal ***parts*** each person got, that is called the ***numerator***." Have students define these terms in their **Math Journals**.
- Have students discuss how they would explain these terms in their home language. Be aware that not all languages will have a cognate for ***numerator*** and ***denominator***.
- **Model** for students how to write a fraction. Then, have students return to **Student Activity Sheet 1** and write a fraction for each problem that shows what ***part*** of the bowl of rice each person got.

CLOSING

REVIEW TARGETS:

- Draw student attention to targets.
- Share a few specific observations from today's class, acknowledging student understanding of content, use of strategies, collaboration, and efforts with using English.
- Offer specific praise and suggestions to improve.

ASSESS:

- Complete **Exit Ticket**.

When reviewing the **Exit Ticket**, assess if students are able to identify the number of equal parts (denominator) and the number of parts each person gets (numerator). Students should also write this in fraction notation.

Parts of a Whole
Lesson 4: Comparing Unit Fractions

One of the common misconceptions students have when working with fractions is that a larger denominator automatically means the fraction has a greater value. The purpose of this lesson is to disprove this common misconception through the use of concrete fraction manipulatives.

ESSENTIAL QUESTION(S)	How do we represent parts of a whole using words, numbers, and symbols? What strategies can we use to solve problems with parts of a whole?
GUIDING QUESTION	What strategies can we use to compare equivalent and non-equivalent fractions?

DAILY QUESTION	What strategies can we use to compare unit fractions?
CONTENT TARGETS	I can compare fractions with a numerator of one. (CCSS.MATH.CONTENT.3.NF.A.3.D, CCSS.MATH.CONTENT.3.NF.A.2)
STANDARDS FOR MATHEMATICAL PRACTICE	MP1: Make sense of problems and persevere in solving them. MP3: Construct viable arguments and critique the reasoning of others. MP4: Model with mathematics.
LANGUAGE TARGETS	I can make a prediction and confirm whether my prediction is correct. I can evaluate the reasoning of others. I can describe the denominator of a fraction. **Make Predictions:** *I predict that _____ is greater than/less than/ equal to _____. My prediction was _____. I thought _____, but _____. I thought _____ and I was correct.* **Evaluate:** *The student was _____ because she thought _____, but _____.* **Describe:** *When the denominator is _____, the size of the fraction is _____.*
VOCABULARY	**predictions:** predict*/prediction* (guess), estimate **evaluate:** correct, incorrect **fractions:** split into*, divided into* **comparison:** less than* (smaller/shorter), greater than* (larger/bigger/longer), equal to*
MATERIALS	Fraction Strips^ *(Note: These are just equal strips of paper. Cut them out before class.)*

	Student Activity Sheet 4 Fraction Circles Manipulatives (provided in Set 1, Lesson 2)

^Not provided in lesson materials.

GENERAL NOTES

In this lesson, students will make predictions to compare various unit fractions (fractions with a numerator of one). Students will then evaluate their predictions using concrete manipulatives. The reading and writing demands of this lesson are increased as students are asked to read and evaluate the thinking of another student.

This lesson is designed for 1-2 class periods, depending on your students' needs.

OPENING

WARM-UP:

- Distribute **Fraction Strips** to students. Have students fold strips in half and label *0*, *½,* and *1 whole*. Fold strips in half again and label *fourths*. Make connections between ½ and 2/4. Have students fold strips in half again and label *eighths*.

CONNECT:

- Review key fraction vocabulary words. Ask students to identify the words from examples. Ask students to recite formal definitions.
- Review comparison symbols and their meaning: <, >, and =. Give whole number examples and ask students to compare using <, >, or =.
- Explain that today students will be comparing fractions. They will be asked to make ***predictions*** on the size of fractional parts. They will be using fraction manipulatives to test those ***predictions***.
- Draw attention to targets.

WORK TIME

PREPARE:

- Define ***predict*** /making a ***prediction*** and give examples. Make sure students know that this doesn't mean their answers will be correct, but that they are using what they know to form an educated guess.

Note that students are familiar with making predictions or hypotheses from science. Try to link the discussion about making predictions to forming a hypothesis in an experiment.

Most students will identify the fraction with the larger denominator as the larger fraction. This lesson will serve to break down this common misconception.

- Distribute **Student Activity Sheet 4** and ask students to work individually to make ***predictions*** by comparing the fractions using <, >, or =. Be sure to explain that they are only making ***predictions*** about the size. Once they are finished making their ***predictions***, they will be given an opportunity to use the fraction manipulatives to check their ***predictions***.

- **Think-pair-share**: Students explain how/why they made their ***predictions***.

INTERACT:

- **Model** how to do the first problem from **Student Activity Sheet 4**. Ask students to ***predict*** which fraction is greater.
  - *I predict that _____ is greater than/less than/ equal to _____.*
- Use **Fraction Circles Manipulatives** to **model** the process of finding each fraction and then looking at the size of the part. Show how to ***correct*** an ***incorrect prediction*** using the appropriate comparison symbol.
- Distribute the **Fraction Circles Manipulatives** to groups of 2-3. Ask students to work in their groups to test their ***predictions***. If their ***predictions*** are not ***correct***, they will ***correct*** them and record the appropriate comparison symbol on their **Student Activity Sheet 4**.
- As students are working ask if their ***predictions*** were ***correct*** or ***incorrect***.
  - *My prediction was _____.*
  - *I thought _____, but _____.*
  - *I thought _____, and I was correct.*

You may give fractional parts that do not have labels to groups of students who have a strong grasp of the part-to-whole relationship.

Some students may struggle to transfer knowledge from using the concrete manipulatives to the symbol. Try having students lay one fraction manipulative over top of another to compare size. Ask them if the first fraction is less than, greater than, or equal to the second fraction. Then match to the corresponding symbol.

EXTEND:

- Guide students to work in their groups to respond to the questions in the **Student Activity Sheet 4** and evaluate Sally's thinking in question #10. Students should read the questions aloud and respond orally first before they respond in writing.
- Lead a whole-group discussion to summarize the learning. Ask questions and allow several students to share.
  - What did all the fractions have in common?
  - Were your ***predictions correct***? Explain why they were ***correct/incorrect***.
  - When the numerator is 1, how can you tell which fraction will be larger or smaller?
  - Why does this make sense?
- Give an example of a pizza or pie and ask: If you were hungry, would you rather share a pizza with three people or five people? Why?
- Use another food or other realia to act out. Draw a visual model of thirds and another model for fifths. Ask: "What happens to the size of your pizza slice when the denominator increases/when we have to share the pizza with more people?"
- Invite students to write down this example along with visual models in their **Math Journals**. They will summarize their learning using the language frame:
  - *When the denominator is _____, the size of the fraction is _____.*

Students may struggle to understand Sally's thinking. Give an example and use the manipulatives to clarify. If students struggle to answer the questions in their groups, lead a whole-group discussion and write down their thoughts.

CLOSING

REVIEW TARGETS:

- Draw student attention to targets.

- Point out specific observations you made (while you were circulating) on student content understanding, language use, collaboration, or use of strategies.

Circulate and monitor: Observe students working in groups. Look for students' ability to draw out the correct fraction manipulative from the problem, and their ability to compare the size of the fractional part. Assess students' writing from **Student Activity Sheet 4**, especially those who were able to answer the questions in their groups.

ASSESS:

- Use the **dry erase board huddle** to assess group's ability to compare fractions.
- Write two unit fractions on the board. Give each group three minutes to write a sentence (with our without frames) that explains which fraction represents a bigger amount and why.
- If time allows, after groups share, post two more unit fractions for individuals to compare. Give individuals two minutes to work this out on scrap paper and use **equity sticks** to assess.

Parts of a Whole

Lesson 5: Comparing Fractions: Fraction Line Up

The purpose of this lesson is for students to learn how to compare fractions using the common numerator or common denominator methods. While the concept of common denominators are explored, students will not be renaming fractions with common denominators in this lesson.

ESSENTIAL QUESTION(S)	How do we represent parts of a whole using words, numbers, and symbols? What strategies can we use to solve problems with parts of a whole?
GUIDING QUESTION	What strategies can we use to compare equivalent and non-equivalent fractions?

DAILY QUESTION	What strategies can we use to compare fractions?
CONTENT TARGETS	I can compare fractions with numerators greater than one. (CCSS.MATH.CONTENT.4.NF.A.2)
STANDARDS FOR MATHEMATICAL PRACTICE	MP3: Construct viable arguments and critique the reasoning of others. MP7: Look for and make use of structure.
LANGUAGE TARGETS	I can explain why my comparison of fractions is correct. **Justify/Explain:** _____ *is greater than/less than/equal to* _____. *I believe this because* _____.
VOCABULARY	**comparison:** less than* (smaller/shorter), greater than* (larger/bigger/longer), equal to* **evaluate:** correct
MATERIALS	Individual whiteboards^ (optional) Math Journals^ Fraction Circles Manipulatives (provided in Set 1, Lesson 2) Student Activity Sheet 5 Fraction Value Line-Up Cards Exit Ticket

^Not provided in lesson materials.

GENERAL NOTES

At this point in the set, students are not expected to rename fractions with common denominators. The lesson focuses on understanding that the denominators need to be the same in order to compare non-unit fractions. Renaming fractions with common denominators will be introduced in Lesson 10.

You should construct a large number line on the floor in advance of this lesson. Students will be using this during the Interact and Extend sections.

This lesson will most likely take two class periods.

OPENING

WARM-UP:

- Write several unit fractions on the board. Ask students to put them in order from least to greatest on an **individual whiteboard** or in their **Math Journals**. **Circulate and monitor** to check for understanding.
- **Think-pair-share:** Ask students to use the language frames to share their answers with a partner and explain the way they ordered their fractions.
  - _____ *is greater than/less than/equal to* _____.
  - *I believe this because* _____.
- Choose a student to share his or her thinking with the group. Some questions to ask include:
  - What strategy did you use to put the fractions in order?
  - What did you notice?
  - Why did you place this fraction where you did?
- Invite students to agree, disagree, or share a different strategy ordering the fractions.

Lead students in an **echo reading** of the fractions to practice pronunciation.

CONNECT:

- Build off of students' responses from the **think-pair-share**. Ask students to talk about the similarities/commonalities between the strategies they used in Lesson 4 and again today in their warm-up.

Allow students to use the **Fraction Circles Manipulatives** as needed.

WORK TIME

PREPARE:

- Show students a visual representation for the fractions 14/15 and 15/16.
- Ask whether they can tell which fraction is bigger than the other by using the representation.
- Elicit student responses.

- Explain: “Most of the time, using a visual model is a good way to tell if fractions are ***greater than***, ***less than***, or ***equal to*** one another. But sometimes, the amounts are so similar in size it’s hard to tell just by looking at them.”
- Say: “Today we will be learning strategies to help us compare and order fractions without a visual model.”

INTERACT:

Comparing Fractions with Common Denominators

- State the purpose for the next activity:” We are going to compare fractions that have common denominators but different numerators.”
- Distribute **Student Activity Sheet 5**.
- **Model** and explain: “When the denominators are the same, we can look at the numerators to determine which fraction is greater. Since the whole has been divided into the *same* number of parts for both fractions, the fraction with the *bigger numerator* tells us that we have more of these parts (e.g., of a pie cut into six slices, three slices is more than two), and therefore a greater quantity.
- Ask students to write the ***greater than*** or ***less than*** symbol to compare the fractions in Part 1 of **Student Activity Sheet 5**.
- Review problems with the whole class.
- Provide praise and corrective feedback as necessary.

Comparing Fractions with Common Numerators

- Prompt students to move along to Part 2 of **Student Activity Sheet 5**.
- Ask them what they notice about the fractions in this set. Elicit: All of the problems have different denominators, but common numerators (e.g., 2/4, 2/6, 2/3). Elicit, as a review, what it means when all fractions have the same denominator (e.g., they all have the same number of parts).
- Explain that today they will learn another strategy for comparing fractions: when numerators are the same. But first, students should try to figure this out.
- Give partners a few minutes to decide which fraction is bigger and why. Hear a few responses, and acknowledge strategies they might have used.
- **Model** using the strategy as you compare two fractions: 2/4 and 2/6. Think aloud as you look at compare these two fractions.
- Think aloud: “OK, I see two fractions: two-fourths and two-sixths. Which one is bigger? Hmm. I know that when the denominator is the same, I just look at the numerator. But here the numerators are the same. This means the number of parts for each fraction is the same. This does not help me decide which is bigger. So now I will look at the denominator. OK, the 4 here means that four people share this candy bar. And the 6 over here means six people share this. You get more if you share with four people, so 2/4 is bigger than 2/6.”
- Follow the model with an explanation, eliciting as much as possible from students.
- Re-establish what you just said: that the same numerator means we have the same number of parts across all the fractions. So we only need to look at the denominators to determine which fraction is greater.
- Elicit the rationale from students. Ask: “Why do we only need to look at the denominator? What does that tell us?”

Remind students to think of the denominator as the number of people sharing that piece of food. The smaller the number, the fewer the people you share with, so the bigger the pieces you get!

- Continue with the teaching. Since the whole has been divided into a *different* number of parts for both fractions, the fraction with the *smaller denominator* tells us that each part is bigger (e.g., a pie cut into three slices has larger slices than a pie cut into six slices), and therefore a greater amount.
- Ask students to join you to try another example from the worksheet.
- Release the task and the rest of the problems to partners to do on their own.
- Ask students to place the ***greater than*** or ***less than*** symbol to compare the fractions in Part 2.
- Review problems with the whole class.
- Provide praise and corrective feedback as necessary.
- Guide students to understand that when we have a common numerator or a common denominator, we can then compare their sizes easily or order them without relying on a visual model.

Based on the management needs of your students as well as the available space in your classroom, you may choose to have students work in a hallway or open space for this activity. Students may also want to use the number line on the floor.

Circulate and monitor student collaboration and understanding. Listen to student conversations. Ask questions to prompt strategy use. Do not rescue students from struggle by providing answers.

Ask students to create their own fraction comparison problem. Then have them switch problems with a partner and solve each other's problems. Ensure students justify their answers to one another.

EXTEND:

Value Line-Up Activity

- Explain the activity: "Physically form a number line arranging fractions, from least to greatest using the strategies we learned today."
- **Model** using one example.
- Hand each student a **Fraction Value Line-Up Card**.
- Depending on the number of students in the classroom, you may want to start by calling 3-5 students at a time. Let the students move around and find their place on the number line. Repeat until all students have come up and found their place on the number line. Encourage them to help one another and discuss the mathematics. If one student is in the wrong place, let another student explain where he should move and why.
    - _____ *is greater than/less than/equal to* _____.
    - *I believe this because* _____.
- Ask students to give a thumbs up when they think they are all in the right place.

Share Out

- Teacher begins to call out the correct order, one fraction at a time. Students need to listen as the teacher calls out the fractions to ensure they are in the right place. If they are in the wrong place, they need to step out of line and listen for their fraction to go in the right place.
- When there is a student in the wrong place, ask the class to collectively decide where that student should move.
- Questions to ask during this share out phase could include:
    - Where should this fraction be placed? How can you tell?
    - Which is the smallest? Which is the greatest? How can you tell?

- Guide students to the realization that the largest fraction is closest to one, while the smallest is closest to zero on the number line. Since 1/2 sits exactly between 1 and 0, this can be a useful marker for students.
- Also make sure that students are spacing themselves appropriately on the number line. For example, ¼ should be, within reason, halfway between 0 and ½.

Three sets of equivalent fractions have been embedded into the **Fraction Value Line-Up Card** "deck." Ask students who had the equivalents how and why they chose to stand where they did.

- Assign additional practice problems as needed.

CLOSING

REVIEW TARGETS:

- Draw student attention to targets.
- Have students self-assess using **traffic lights**. Be aware that some students may need a reminder of what each of the colors mean.
- Share a few specific observations from today's class, acknowledging student understanding of content, use of strategies, collaboration, and efforts with using English.

ASSESS:

- Complete **Exit Ticket**.

Parts of a Whole

Lesson 10: Adding and Subtracting Fractions with Unlike Denominators

The purpose of this lesson is for students to understand that fractions cannot be added or subtracted if they have unlike denominators. They must use their knowledge of equivalent fractions along with the fraction manipulative to create equivalent fractions first, before adding or subtracting.

ESSENTIAL QUESTION(S)	How do we represent parts of a whole using words, numbers, and symbols? What strategies can we use to solve problems with parts of a whole?
GUIDING QUESTION	What strategies and math tools can we use to solve problems with fractions?

DAILY QUESTION	How do I add and subtract fractions with unlike denominators?
CONTENT TARGETS	I can add and subtract fractions with unlike denominators by creating equivalent fractions. I can write my answer in lowest terms. (CCSS.MATH.CONTENT.5.NF.A.1)
STANDARDS FOR MATHEMATICAL PRACTICE	MP1: Make sense of problems and persevere in solving them. MP5: Use appropriate tools strategically. MP7: Look for and make use of structure. MP8: Look for and express regularity in repeated reasoning.
LANGUAGE TARGETS	I can explain and sequence the steps I take to add and subtract fractions with unlike denominators. **Summarizing:** *The sum/difference of _____ and _____ is _____.* **Sequencing:** *First, I _____. Second, I _____. Then, I _____.*
VOCABULARY	**fraction operations:** like denominator*, unlike denominator*, common denominator*, simplify* (reduce) **calculators:** press, button, clear
MATERIALS	Student Activity Sheet 10 Fraction Circles Manipulatives (provided in Set 1, Lesson 2) Calculators^ Exit Ticket^

^Not provided in lesson materials.

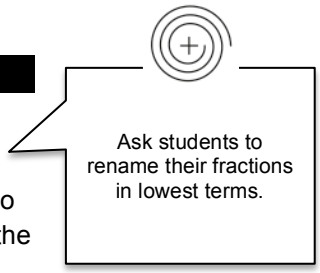
GENERAL NOTES

It is important for students to have access to concrete fraction manipulatives in order to model addition and subtraction of fractions with unlike denominators. This lesson will also introduce students to the use of a calculator to perform fraction operations.

You will need to create an **Exit Ticket** in advance of class. Have a few different problems (adding/subtracting fractions with unlike denominators) typed out on quarter or half sheets of paper, with differing difficulty levels.

This lesson is designed for 1-2 class periods, depending on your students.

OPENING



WARM-UP:

- Distribute **Fraction Circles Manipulatives**, and have students work with partners to add and subtract fractions with ***like denominators***. Ask pairs of students to name the sum or difference.

CONNECT:

- Elicit from students the steps needed to add or subtract fractions with ***like denominators***.
- Explain that today we will be adding and subtracting fractions that do not have the same denominators (***unlike denominators***). We will be learning strategies to add and subtract fractions without a ***common (same) denominator***.
- Draw attention to targets.

WORK TIME

PREPARE:

- Pose a problem: “I am making a birthday cake for my friend, and the recipe calls for ¼ cup of white sugar and ⅜ cup of brown sugar. How can I find the total amount of sugar needed for the recipe?”
- Give students a few minutes to try to solve the problem on their own using the **Fraction Circles Manipulatives**. **Circulate and monitor** to gauge understanding.
- Using a successful student example, **model** how to combine ¼ and ⅜ with the fraction manipulatives. Use **Think-pair-share** to elicit more student responses.

The most common misconception is to add the fractions by adding the numerators and the denominators. When students propose this idea, show the matching fraction (4/12) piece and compare it to the size of the combined ¼ and ⅜ pieces to show they are not equal. Remind students of how they added

fractions in the previous lesson.

- Explain to students that they will be discovering a strategy to add fractions that do not share the same denominator. Remind them to use the same steps/rules they took in the previous lesson when adding and subtracting fractions.

INTERACT:

*(Note: Use the **catch and release** protocol throughout this section.)*

Introduce the Task, Release the Task

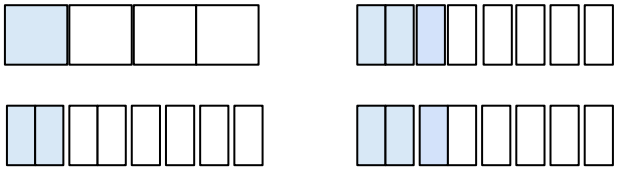
- Distribute **Student Activity Sheet 10** to groups of 2-3 students along with sets of fraction manipulatives.
- Give students ample time to discover ways to add the fractions. If students continue to struggle ask leading questions to assist them in the discovery of creating equivalent fractions with the same denominator.
    - Ask: “How did you add fractions in the last lesson? Is there a way you can get these fractions to have the same denominator? What other pieces or ways can you represent this fraction?”
- As students begin to create equivalent fractional parts, encourage them to record their work on **Student Activity Sheet 10**. They should multiply the numerator and denominator by the same number and re-write the fractions with ***common denominators*** underneath the original problem. Ask students to draw a pictorial representation of their work below the fraction problem. They should draw the original fractions first, and the equivalent fractions with ***common denominators*** underneath. They should also draw a picture of the sum.

Catch

- Once you notice that some groups are finding equivalent fractions in order to add, signal all students back to attention to clarify for other groups of students who are still struggling.
- Ask: “Can you add the fractions together if the denominators are different? What do you need to do first before combining the fractions?”
- Point out what students are doing well in their collaboration.
- Find groups who have been able to create equivalent fractions with a ***common denominator*** to share their strategies with the whole class. Connect the various solution paths students have discovered, and use this connection to guide students toward understanding. **Model** student strategies, or allow the students to use visual models to help explain their methods.
- Return to the birthday cake problem (from the Prepare section). **Model** the solution for the entire class, using the concrete manipulatives as well as recording the visual representation and any necessary work (creating equivalent fractions, re-writing fractions with a ***common denominator***, adding fractions together, etc.). Show that the new fractions are equivalent to the original fractions, but they have the same denominator, so students may now use the same rules they used before when adding fractions.

1/4 + 3/8 =

2/8 + 3/8 =



You may need to assist groups with more than one example. Release students to work, but be aware of groups who are still struggling to create the equivalent fractions or those who are struggling to record their work on the paper.

You may need to assist some groups with more than one example.

Release

- Have students return to working in groups to solve the remainder of problems on page 1 of **Student Activity Sheet 10**. Students should continue drawing models for each problem, showing the original fractions, the equivalent fractions with ***common denominators***, and the sum. They should also record their work for creating equivalent fractions.
- Students will answer the written questions on the handout (#7-8) in their groups. Make sure they first read the questions aloud and then respond orally using the language frames before they write their responses.
  - *All the denominators are _____.*
  - *First, I _____. Second, I _____. Then, I _____. Last, I _____.*
- Students will move on to subtract fractions on page 2 of the handout using the same strategy. Encourage them to ***simplify*** their answers when they are finished subtracting.
- Students will again answer the second set of questions in their groups. Make sure they first read the questions aloud and then respond orally using the language frames before they write their responses.

If groups finish early, encourage students to simplify their answers. Have them find an equivalent fraction that has lower terms.

Circulate and monitor: Observe student work on **Student Activity Sheet 10**. Are students able to record their work? Can they create equivalent fractions and show how they did this? Do they re-write the equivalent fractions with common denominators? Are they able to explain the steps they took in order to add and subtract fractions with unlike denominators?

EXTEND:

- Share out: How do you add and subtract fractions with different denominators? What is the first step? What is the next step? What do you always need to do at the end?
- Have students record their method, step by step, in their **Math Journals** along with examples and visual models.
- Explain to students that they have another math tool to add and subtract fractions that they may use. Discuss the benefits of using a **calculator**. **Model** for students how to add and subtract fractions with the **calculator**. Pass out **calculators** to students and have them practice the adding and subtracting all the problems to check their answers.

Students have not had many opportunities to use calculators. Vocabulary, such as ***press***, ***button***, and ***clear***, may need to be reviewed.

- Once students have checked their work using the **calculators**, they may notice some answers were different than what they found. Point out that a **calculator** may give the answer in simplest form. Discuss this by asking:
    - Were any of your answers different than the answer you got on the **calculator**? Why do you think that is?
    - Does the **calculator** give the answer you wrote or does it give you an answer in simplest form?
    - How do you know if your answer is equivalent to the answer the **calculator** gives you?

CLOSING

REVIEW TARGETS:

- Draw student attention to targets.
- Share a few specific observations from today's class, acknowledging student understanding of content, use of strategies, collaboration, and efforts with using English.
- Inform students that next they will be working on multiplying and dividing fractions.

ASSESS:

- Give students an **Exit Ticket** with two fractions to add with ***unlike denominators***. Most students will likely not be able to do this successfully at this point, so use data from the **Exit Ticket** to expand instruction in subsequent lessons.

Parts of a Whole

Lesson 12: Finding the Product of Two Fractions

The purpose of this lesson is to understand how the products of fractions differ from those with whole numbers, as well as learn strategies for calculator use.

ESSENTIAL QUESTION(S)	How do we represent parts of a whole using words, numbers, and symbols? What strategies can we use to solve problems with parts of a whole?
GUIDING QUESTION	What strategies and math tools can we use to solve problems with fractions?

DAILY QUESTION	How does multiplying with fractions compare to multiplication with whole numbers?
CONTENT TARGETS	I can use fraction models to show that multiplication of fractions is the same as repeated addition. (CCSS Content Standard 4.NF.4)
LANGUAGE TARGETS	I can compare and explain patterns I see when multiplying fractions. **Compare:** *Multiplying with fractions is similar to/different from multiplying with whole numbers because* _____. **Summarize/Explain:** *I see/notice* _____. *The product of* _____ *and* _____ *is* _____.
VOCABULARY	*(Review multiplication and fraction vocabulary from previous lessons.)*
MATERIALS	Student Activity Sheet 12 Fraction Strips^ *(Note: These are just equal strips of paper. Cut them out before class.)* Fraction Circles Manipulatives (provided in Set 1, Lesson 2) Calculator^ Math Journals^ Exit Ticket

^Not provided in lesson materials.

GENERAL NOTES

As in Lesson 11, teachers have the option of trying to move their students to deriving the algorithm for fraction multiplication. While it is ideal that students be able to do so, note that doing so without the conceptual understanding does not support the development of student reasoning appropriately. The goal with all Bridges math lessons is to build conceptual understandings before introducing algorithm. *Students tend to struggle with fraction multiplication because the products of fractions are smaller than their factors. This goes against their intuition and often previous instruction that multiplication makes things bigger.* This lesson is designed to help students see patterns in the products of fractions.

This lesson is designed for 1-2 class periods, depending on your students' needs.

OPENING

WARM-UP:

- Write the problem *½ x 3* on the board as a warm-up problem.
- Remind students that another way to say ½ x 3 is ½ of 3. If they are being asked to find a fraction *of* a number, that is a key word for multiplication.
- Allow students to solve the word problem using manipulatives, or the **calculator**, if they wish.

Lead students in an **echo reading** of the problems to practice reading multiplication problems in both ways using the words "times" and "of."

It is important for students to know that multiplication involving fractions is commonly expressed using the word "of." Be sure to add this to your classroom word wall and have students annotate word problems when they encounter fraction multiplication.

CONNECT:

- Distribute **Student Activity Sheet 12**.
- Ask students to take a look at the type of problems they see.
- Have them **turn and talk** to a partner to discuss what is the same and different about the type of problems they solved in Lesson 11.
- Elicit responses. Then explain to students that in real life we aren't always taking a fractional amount of a whole number. Sometimes we're taking a part of an amount less than a whole or a part of a part. Ask for student examples from their own experiences.
- Ask students to think of other situations where we're taking a part of a part. Possible responses include: drinking from a glass that is half full, taking a slice of pizza from a whole pie and cutting it in half to share, etc.
- Call attention to the learning targets of the day.

Provide some real-life examples for students so they can see relevance. Consider using non-linguistic representations such as images, videos, or educational technology to support these ideas.

WORK TIME

PREPARE:

- Distribute **Fraction Strips** and/or **Fraction Circles Manipulatives** to students.
- **Model** how to find the product of two fractions using the materials.

It's helpful to have the manipulatives prepared in advance. Consider sending students home with the **Fraction Strips** and an envelope so they can cut the strips out as part of their homework. Note that students also used **Fraction Strips** in Lesson 4.

You may choose to model how to work with one or both types of manipulatives twice. The first time, **model** and only have students watch. Then, repeat and have students perform the operation along with you.

INTERACT:

Finding the Product with Fraction Strips

- Have students complete the problems on **Student Activity Sheet 12** using the **Fraction Strips**.
- After students complete the problems, guide them to make careful observations of the products on their **Student Activity Sheet** to help them arrive at the understanding when multiplying fractions the product is smaller in value. Sample questions to support students as they work during this time include:
  - What do you notice about the products?
  - Can you tell me about the size of the product compared to the factors?
  - Why do you think this is?

Students may struggle to identify that the products are smaller. A diagram showing an example equation with factors and product labeled and visual representation of the fractions may be useful here.

Finding the Product with a Calculator

- Distribute **calculators** to students.
- **Model** how to find the product of two fractions using the **calculator**. Encourage students to take notes in their **Math Journals**.
- Have students return to **Student Activity Sheet 12** and confirm their answers using the **calculator**.
- **Circulate and monitor** students as they work, assisting as necessary.

Ask students if they can see a pattern in the products that could help them find a rule for finding the products of any fractions.

Teachers may want to consider creating an anchor chart that outlines the steps for how to enter the fractions in the **calculator**.

Students can be paired or work individually, based on their needs.

- Share out responses as a class. Guide students to note any discrepancies between using the **calculator** and fraction manipulatives.

EXTEND:

- Guide students to summarize their noticings from the day.
    - *Multiplying with fractions is similar to/different from multiplying with whole numbers because* _____.
- Be sure to reinforce the fact that the product of two fractions will always be smaller than its factors. Refer to a problem from the previous lesson, as appropriate, to help guide students' thinking.

CLOSING

REVIEW TARGETS:

- Draw student attention to targets.
- Have students self-assess using traffic lights.
- Offer specific praise and suggestions to improve.

ASSESS:

- Distribute the **Exit Ticket**.