

NAME: \_\_\_\_\_

## Purpose

To add fractions with unlike denominators

## Math Words

**addends**

The addends in the number sentence  $120 + 37 = 157$  are 120 and 37.

**common denominator**

The fractions  $\frac{1}{7}$  and  $\frac{3}{7}$  have 7 as a common denominator.

**unlike**

Things that are unlike, like the numbers 3 and 4, are different.

**sum**

The sum of 5 plus 8 is 13.

### Starter Problem

Find the sum. Think about the meaning.

Jen walked  $\frac{1}{4}$  mile to the store and then  $\frac{3}{8}$  mile more to her friend's house. How far did she walk?

NAME: \_\_\_\_\_

## Starter Problem

Find the sum. Think about the meaning.

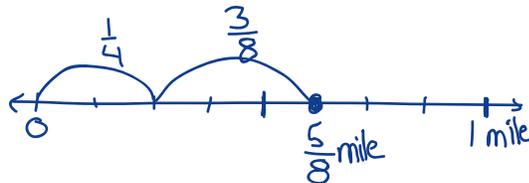
Jen walked  $\frac{1}{4}$  mile to the store and then  $\frac{3}{8}$  mile more to her friend's house. How far did she walk?

## Student Thinking



Alberto

I needed to show one fourth and three eighths together, so I marked the mile into eighths. That's my common denominator. Jen walked five eighths of a mile.



$$\frac{1}{4} + \frac{3}{8} = ?$$

$$\frac{2}{8} + \frac{3}{8} = \frac{5}{8}$$



Glenda

I added the 1 and the 3, then the 4 and the 8, and got four twelfths. It's one third in lowest terms.



$$\frac{1}{4} + \frac{3}{8} = \frac{4}{12} = \frac{1}{3}$$

## Things to Remember

- \* \_\_\_\_\_
- \_\_\_\_\_
- \* \_\_\_\_\_
- \_\_\_\_\_



NAME: \_\_\_\_\_

## Our Turn

Solve. Use a number line or other drawings to help you.

1. Ricky rode his bicycle  $\frac{3}{8}$  of a mile before taking a snack break. Then he rode his bicycle  $\frac{1}{2}$  mile more. How far did he ride in all?

2. Mrs. Wilson mixed  $\frac{1}{2}$  pound of chocolate and  $\frac{1}{3}$  pound of marshmallows to make candy. How much did this mixture weigh?

3.  $\frac{2}{3} + \frac{1}{6} =$  \_\_\_\_\_

NAME: \_\_\_\_\_

## My Turn

Solve. Use a number line or other drawings to help you.

1. John used  $\frac{3}{4}$  yard of black ribbon and  $\frac{1}{8}$  yard of yellow ribbon to make a frame for a picture. What is the total length of ribbon he used?

2. Mr. Nelson mixed  $\frac{1}{3}$  can of yellow finger paint and  $\frac{1}{6}$  can of red finger paint to make orange. How much of a can of orange finger paint did he make?

3.

$$\begin{array}{r} \frac{3}{5} \\ + \frac{1}{3} \\ \hline \end{array}$$

NAME: \_\_\_\_\_

**Multiple Choice Mini Lesson**

Fill in the circle next to the answer you choose.

1.  $\frac{7}{10} + \frac{1}{5} =$  \_\_\_\_\_

$\frac{9}{10}$

$\frac{8}{10}$

$\frac{8}{15}$

 not given

2.  $\frac{3}{4} + \frac{1}{8} =$  \_\_\_\_\_

$\frac{1}{3}$

$\frac{7}{8}$

1

 not given

NAME: \_\_\_\_\_

**Multiple Choice Mini Lesson**

Fill in the circle next to the answer you choose.

1.  $\frac{7}{10} + \frac{1}{5} =$  \_\_\_\_\_

$\frac{9}{10}$

$\frac{8}{10}$

$\frac{8}{15}$

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2.  $\frac{3}{4} + \frac{1}{8} =$  \_\_\_\_\_

$\frac{1}{3}$

$\frac{7}{8}$

1

 not given

NAME:

## Writing Task Mini Lesson

Explain how you know that the sum of  $\frac{2}{3}$  of an hour and  $\frac{1}{6}$  of an hour is  $\frac{5}{6}$  of an hour. You may draw a picture on the back to help you explain.

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NAME:

## Writing Task Mini Lesson

Explain how you know that the sum of  $\frac{2}{3}$  of an hour and  $\frac{1}{6}$  of an hour is  $\frac{5}{6}$  of an hour. You may draw a picture on the back to help you explain.

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# Adding Fractions

## Lesson at a Glance

### Prior Learning Needed

- Find fractions equivalent to a given fraction
- Use a number line for adding whole numbers

### Lesson Preparation

- Study Lesson Foundation
- Review Teaching Guide and Student Pages
- Prepare stapled packet of Student Pages 1–4 for each student
- Copy and cut in half Student Pages 5 and 6
- Post *Discussion Builders* poster

### Mathematical goals

- \* Understand the need for a common denominator and how to find it
- \* Compute the sum of fractions with unlike denominators

### Mathematical language and reasoning goals

- \* Use good judgment about when to use a paper-and-pencil algorithm and when to compute mentally
- \* Use a number line to represent fraction addition

LESSON ROADMAP			MATERIALS
CORE LESSON: DAY 1	GROUPING	TIME	
<b>Opener</b> <i>Discussion Builders</i> Purpose Math Words Starter Problem	 	 	<ul style="list-style-type: none"> <li>○ <i>Discussion Builders</i> poster</li> <li>○ Projector (optional)</li> <li>○ Student Page 1</li> <li>○ Student Page 2</li> <li>○ Teaching Guide</li> <li>○ Number lines, fraction pieces (suggested)</li> </ul>
<b>Discussion</b> Student Thinking Things to Remember Reflection	 	 	
<b>CORE LESSON: DAY 2</b>			
<b>Review and Practice</b> Review Day 1 Lesson Our Turn My Turn	  	  	
<b>MINI LESSONS: 2–3 DAYS LATER</b>			
<b>Assess and Reinforce</b> Multiple Choice Mini Lesson Writing Task Mini Lesson	 	 	
			<ul style="list-style-type: none"> <li>○ Clipboard Prompts, page 37</li> <li>○ Student Page 2 (completed day 1)</li> <li>○ Student Pages 3 and 4</li> <li>○ Teaching Guide</li> <li>○ Number lines, fraction pieces (suggested)</li> </ul>
			<ul style="list-style-type: none"> <li>○ Student Pages 5 and 6</li> <li>○ Teaching Guide</li> <li>○ Number lines, fraction pieces, sets of 6 or more objects (suggested)</li> </ul>

# Lesson Foundation

## LESSON SNAPSHOT

### Starter Problem

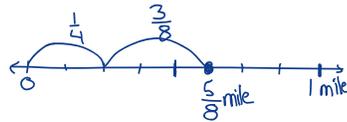
Find the sum. Think about the meaning.  
 Jen walked  $\frac{1}{4}$  mile to the store and then  $\frac{3}{8}$  mile more to her friend's house. How far did she walk?

### Student Thinking



Alberto

I needed to show one fourth and three eighths together, so I marked the mile into eighths. That's my common denominator. Jen walked five eighths of a mile.



$$\frac{1}{4} + \frac{3}{8} = ?$$

$$\frac{2}{8} + \frac{3}{8} = \frac{5}{8}$$



Glenda

I added the 1 and the 3, then the 4 and the 8, and got four twelfths. It's one third in lowest terms.

$$\frac{1}{4} + \frac{3}{8} = \frac{4}{12} = \frac{1}{3}$$



## MATHEMATICAL INSIGHTS & TEACHING TIPS

### Figuring Out the Common Denominator by Using Common Sense

How do you name the amount for  $\frac{1}{4}$  plus  $\frac{3}{8}$ ? Alberto found a way to divide his number line mile into equal parts so he could combine the fractions and name the sum. Perhaps he mentally thought about dividing the number line into fourths, sixths, or eighths and realized that eighths works best to show both  $\frac{1}{4}$  and  $\frac{3}{8}$  on the number line. Eighths is a common denominator for these fractions. He could also have used a common denominator of sixteenths, twenty-fourths, or any other common multiple of 4 and 8, but eighths is the lowest common denominator and gives the sum in lowest terms.

#### Pitfall

Glenda incorrectly added the fractions by adding the numerators and then the denominators. She didn't realize that her answer didn't make sense.

Most students can mentally change  $\frac{1}{4}$  into  $\frac{2}{8}$ , but they should also know how to multiply the numerator and denominator of  $\frac{1}{4}$  by the same number (2) to get an equivalent fraction. So an equivalent fraction for  $\frac{1}{4}$  is  $\frac{2}{8}$ . An alternate method for students who have been introduced to fraction multiplication is to multiply  $\frac{1}{4}$  by  $\frac{2}{2}$ , or another fraction form of 1, to get an equivalent fraction.

## MATHEMATICAL INSIGHTS & TEACHING TIPS (CONTINUED)



*Prompt students to use reasoning to find a common denominator by saying, “How many parts would you divide a number line into to show  $1/10$  plus  $2/5$ ? Would eighths work? tenths? twelfths?”*

### Understanding Addition of Fractions with Unlike Denominators

It makes sense to add the number of parts (the numerators) if the size of the parts (the denominators) in both fractions is the same. The sum gives the new number of parts. Glenda did not understand that it never makes sense to add denominators since they just tell the size of the parts that are being combined or counted. So, if you add  $1/8$  and  $1/8$ , you get  $2/8$ , or 2 parts each having a size of one eighth. You need a common denominator to add  $1/4$  and  $3/8$  because the sizes of the parts are different (fourths and eighths).

### Visualizing Adding Fractions

To add fractions and check the reasonableness of sums, it helps to visualize combining or putting together the fraction amounts. Working with a variety of models, such as a rectangle, a set of objects, and a number line, helps draw attention to the correct use of denominators. The number line can help students see connections between whole numbers, decimals, and fractions, and it shows a fraction in relation to other numbers, including 0 and 1.

## MATHEMATICAL DISCUSSION SUPPORT

Ask students questions that prompt them to explain why certain denominators make sense and others do not. Relate the choice of a common denominator to the need to be able to show both fractions with a model. For example, since 10 is not a multiple of 4, it doesn't make sense to rename the fraction  $1/4$  in tenths. Instead, it is easy to rename  $1/4$  as  $2/8$  because 8 is a multiple of 4.



Point out that the denominator names what size fraction piece is being counted by the numerator. So, in the fraction  $1/4$ , 1 (the numerator) tells how many fourths (the denominator). Ask students to identify the numerator and denominator in different fractions. Note that we don't read halves as “twos,” thirds as “threes,” or fourths as “fours.” The different endings for the denominators of a fraction denote how many equal parts the whole is divided into.

**Core Lesson  
Day 1**

**Opener**

**Review Discussion Builders**

Read the poster. Suggest a section to focus on today:  
*Presenting Alternative Ideas, Expanding on Others' Ideas, or Posing Additional Questions.*

**Purpose**

Distribute stapled packets of Student Pages 1–4. Project an image of page 1 (optional).  
Call on a student to read the purpose.

**Math Words**

- Point to and say the first math word. Ask students to repeat it aloud or silently.
- Read the sentence containing the word.
- Give an example using objects or drawings.
- Repeat for the other math words.

**Starter Problem**

Read the Starter Problem. Call on a student to restate it in his/her own words.



Think about what the Starter Problem means.  Try to use what you understand to solve the problem on your own.

I'll walk around and write notes about things we need to discuss. Look out for pitfalls! 

Look at your work. It's easy to have a pitfall in this type of problem. You might also have made a pitfall if your answer is less than  $\frac{1}{2}$ .

Don't worry. Next we'll discuss how two imaginary students solved this problem. One has a pitfall! You may keep your solution private, but bring up your ideas in the discussion.

**STUDENT PAGE 1**

**Purpose**

To add fractions with unlike denominators

**Math Words**

**addends** The addends in the number sentence  $120 + 37 = 157$  are 120 and 37.

**common denominator** The fractions  $\frac{1}{7}$  and  $\frac{3}{7}$  have 7 as a common denominator.

**unlike** Things that are unlike, like the numbers 3 and 4, are different.

**sum** The sum of 5 plus 8 is 13.

**Starter Problem**

Find the sum. Think about the meaning.

Jen walked  $\frac{1}{4}$  mile to the store and then  $\frac{3}{8}$  mile more to her friend's house. How far did she walk?

## Discussion

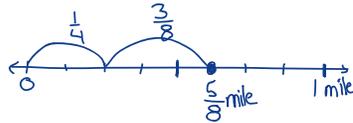
### Student Thinking

STUDENT PAGE 2



Alberto

I needed to show one fourth and three eighths together, so I marked the mile into eighths. That's my common denominator. Jen walked five eighths of a mile.



$$\frac{1}{4} + \frac{3}{8} = ?$$

$$\frac{2}{8} + \frac{3}{8} = \frac{5}{8}$$

Ask students to refer to page 2. Read the statement marked OK.

Explain that this statement is about the same problem students worked on earlier.



We can learn a lot about the math by studying what this student did.

Read each sentence silently and look at the drawing. Think about what they mean. 

Now talk with a partner about what each sentence and each part of the drawing means.

Listen in, ask questions, and observe. Note potential contributions for the discussion.



Alberto needed to show both fourths and eighths on his number line. Who can show why it is more sensible to divide the mile into 8 parts, rather than 4, 6, or 10 parts?

Why does it help to have both fractions named in eighths? Why does he call "eighths" a common denominator for  $\frac{1}{4}$  plus  $\frac{3}{8}$ ? Who can write another name for  $\frac{1}{4}$  on the number line?

Look at how Alberto recorded his work. Talk to your neighbor about how you know that  $\frac{1}{4} + \frac{3}{8}$  is the same as  $\frac{2}{8} + \frac{3}{8}$ . 

Alberto rewrote the original problem using a different fraction for  $\frac{1}{4}$ . Why did he do this? Why did he choose to have both fractions in eighths?

Who can prove that  $\frac{1}{4} + \frac{3}{8}$  is equal to  $\frac{2}{8} + \frac{3}{8}$ ? Explain how you know Jen walked  $\frac{5}{8}$  mile.

Call on students to state things to remember about solving problems like this.

Start a Things to Remember list on the board.

MORE DAY 1

**Core Lesson  
Day 1  
(continued)**

Discussion

Student Thinking, continued

STUDENT PAGE 2



Glenda

I added the 1 and the 3, then the 4 and the 8, and got four twelfths. It's one third in lowest terms.

Pitfall

$$\frac{1}{4} + \frac{3}{8} = \frac{4}{12} = \frac{1}{3}$$

Read the statement marked Pitfall. Remind students that this is a common pitfall.



Glenda made a pitfall when she added the denominators. Talk with your neighbor about why her answer doesn't make sense. 

Is Glenda's answer is too high or too low? Explain.

Why was it helpful for Alberto to rewrite the number sentence in the problem as  $2/8 + 3/8$ ?

Who can show why it makes sense that  $2/8$  plus  $3/8$  is  $5/8$  and not  $5/16$ ?

Draw a number line on the board to show 1 mile divided into 8 equal parts. Ask students to talk with a neighbor about which one of the following problems would be most difficult to solve using this number line and why. Remind them to look out for pitfalls. Call on students to explain.

$1/2$  mile +  $1/4$  mile

$1/4$  mile +  $1/3$  mile

$1/8$  mile +  $1/4$  mile

Things to Remember

Call on students to add to the Things to Remember list on the board. Read the list.

Help students summarize and record two important Things to Remember.

Things to Remember List (sample)

1. It is a pitfall to add the denominators when you add fractions.
2. A common denominator is used so each fraction you are adding has the same total number of parts.

Reflection

Ask students to reflect on the discussion process using one of the sample prompts.

Reflection Prompts (sample)

- Name a *Discussion Builder* that we used today. How did it help the discussion?
- What *Discussion Builder* could we use next time to make the discussion even better?
- What did someone do or say today that helped you understand the math?

## Review and Practice

## Review

Ask students to review page 2 to jog their memory.

Read the statement marked OK. Call on a student to explain how the problem was solved.

Read the statement marked Pitfall. Call on a student to explain why it is incorrect.

Call on two or three students to read an item on their Things to Remember list.

## STUDENT PAGE 2



Alberto

I needed to show one fourth and three eighths together, so I marked the mile into eighths. That's my common denominator. Jen walked five eighths of a mile.



OK



Glenda

I added the 1 and the 3, then the 4 and the 8, and got four twelfths. It's one third in lowest terms.

$$\frac{1}{4} + \frac{3}{8} = \frac{4}{12} = \frac{1}{3}$$

Pitfall

## Our Turn

Ask students to refer to page 3.

Use the procedure below and the Clipboard Prompts to discuss students' solutions. Discuss the problems one at a time.

Read the problem.

Ask students to work with a neighbor to solve it.

Discuss one or two students' solutions.

Answer 1.  $\frac{7}{8}$  mile  
Key 2.  $\frac{5}{6}$  pound  
3.  $\frac{5}{6}$

## STUDENT PAGE 3

## Our Turn

Solve. Use a number line or other drawings to help you.

- Ricky rode his bicycle  $\frac{3}{8}$  of a mile before taking a snack break. Then he rode his bicycle  $\frac{1}{2}$  mile more. How far did he ride in all?
- Mrs. Wilson mixed  $\frac{1}{2}$  pound of chocolate and  $\frac{1}{3}$  pound of marshmallows to make candy. How much did this mixture weigh?
- $\frac{2}{3} + \frac{1}{6} =$  \_\_\_\_\_

## My Turn

Ask students to solve the problems on page 4. Remind them to watch out for pitfalls!

After allowing time to work, read the answers. Have students use pens to mark and revise their papers.

Answer 1.  $\frac{7}{8}$  yard of ribbon  
Key 2.  $\frac{1}{2}$  can  
3.  $\frac{14}{15}$

## STUDENT PAGE 4

## My Turn

Solve. Use a number line or other drawings to help you.

- John used  $\frac{3}{4}$  yard of black ribbon and  $\frac{1}{8}$  yard of yellow ribbon to make a frame for a picture. What is the total length of ribbon he used?
- Mr. Nelson mixed  $\frac{1}{3}$  can of yellow finger paint and  $\frac{1}{6}$  can of red finger paint to make orange. How much of a can of orange finger paint did he make?

$$\begin{array}{r} 3 \\ 5 \\ + \\ 1 \\ 3 \\ \hline \end{array}$$

**Mini Lessons**  
(2–3 Days Later)

Assess and Reinforce

**Multiple Choice Mini Lesson**

Distribute Student Page 5.

Problem 1



Please read problem 1.

Talk with your neighbor about which choices don't make sense. 

Why is it a pitfall to choose 8/15?

Who can prove why the correct choice is 9/10?



Help students compare their answers to benchmarks such as forms of 1. For example, they should explain why the sum would be close to 10/10.

Problem 2



Read the problem and find the correct choice. 

Which response is correct? Explain why.

Why is it a pitfall to choose 1/3?

**STUDENT PAGE 5**

**Multiple Choice Mini Lesson**

Fill in the circle next to the answer you choose.

1.  $\frac{7}{10} + \frac{1}{5} =$  \_\_\_\_\_

- $\frac{9}{10}$         $\frac{8}{10}$         $\frac{8}{15}$        not given

2.  $\frac{3}{4} + \frac{1}{8} =$  \_\_\_\_\_

- $\frac{1}{3}$         $\frac{7}{8}$        1       not given

**STUDENT PAGE 6**

**Writing Task Mini Lesson**

Explain how you know that the sum of  $\frac{2}{3}$  of an hour and  $\frac{1}{6}$  of an hour is  $\frac{5}{6}$  of an hour. You may draw a picture on the back to help you explain.

**Sample Explanation:** I need a common denominator. That's the number of pieces that I cut something into to show thirds and sixths. I changed both fractions to sixths.  $\frac{4}{6}$  plus  $\frac{1}{6}$  is equal to  $\frac{5}{6}$ . You don't add denominators since they just tell how big the piece is. The numerator tells how many pieces.

**Writing Task Mini Lesson**

Distribute Student Page 6.

Ask a student to read the task. Call on students to respond with their ideas.

Jot the ideas on the board.

Write an explanation together using their ideas. Read it aloud.

Ask students to write an explanation on their page.



**Mathematical Discussion Support**

Invite students to use drawings or materials, such as a number line, fraction pieces, or a set of six or more small objects, to help them describe their ideas.

In order to use reasoning to find the common denominator, help students learn to ask themselves questions, such as:

How many beans should I put in the bag so I can show  $\frac{2}{3}$  and  $\frac{1}{6}$ ?

How many parts should I cut the rectangle into to show  $\frac{2}{3}$  and  $\frac{1}{6}$ ?