## Adding Mixed Numbers

### Objectives
To develop addition concepts related to mixed numbers.

### Key Concepts and Skills
- Find equivalent fractions in simplest form. 
  [Number and Numeration Goal 5]
- Convert between and simplify fractions and mixed numbers. 
  [Number and Numeration Goal 5]
- Add fractions and mixed numbers. 
  [Operations and Computation Goal 4]
- Use benchmarks to estimate sums. 
  [Operations and Computation Goal 6]

### Key Activities
Students review fraction addition. They add mixed numbers in which the fractional parts have like or unlike denominators and rename the sums in simplest form. Students use benchmarks to estimate sums.

### Ongoing Assessment:
- **Informing Instruction** See page 626.
- **Recognizing Student Achievement** Use an Exit Slip (Math Masters, page 414).  
  [Number and Numeration Goal 5; Operations and Computation Goal 4]

### Materials
- Math Journal 2, pp. 251 and 252
- Study Link 8-1
- Math Masters, p. 414
- slate  
  Class Data Pad (optional)

### Advance Preparation
- **Teacher’s Reference Manual, Grades 4–6** pp. 142, 143

### Differentiation Options
- **READINESS**
  - Adding Mixed Numbers
    - Math Journal 2, p. 252
    - Students explore an alternate method for adding mixed numbers.

- **EXTRA PRACTICE**
  - Playing Fraction Capture
    - Math Journal 1, p. 198
    - Math Masters, p. 460
    - per partnership: 2 six-sided dice
    - Students practice comparing fractions and finding equivalent fractions.

  - Solving Mixed-Number Addition Problems
    - Math Masters, p. 253A
    - Students practice adding mixed numbers with like and unlike denominators.
### Getting Started

#### Mental Math and Reflexes
Have students rename each fraction as a whole number or mixed number and each mixed number as an improper fraction.

<table>
<thead>
<tr>
<th>3/4</th>
<th>2 1/2</th>
<th>13 3/4</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/2</td>
<td>2/2</td>
<td>5/2</td>
</tr>
</tbody>
</table>

#### Math Message
Solve Problems 1–9 at the top of journal page 251. Use benchmarks to estimate the sums and to check the reasonableness of your solutions.

#### Study Link 8-1 Follow-Up
Have partners compare answers and resolve differences. Ask volunteers to share their explanations for Problems 7, 14, and 21.

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### 1 Teaching the Lesson

#### Math Message Follow-Up
*(Math Journal 2, p. 251)*

Ask students to share their strategies for estimating the sums for Problems 1–6. Make sure students make reference to the benchmarks when estimating their sums.

Ask volunteers to share their strategies for renaming the sums in Problems 3–6 to a whole or mixed number. Encourage students to use their understanding of multiplication facts to recognize when the simplest form will be a whole number. If the sum is an improper fraction and the numerator is not a multiple of the denominator, the simplest form will be a mixed number. If the numerator is a multiple of the denominator, the simplest form will be a whole number. Ask volunteers to explain how to recognize an improper fraction. If the numerator is greater than or equal to the denominator, the fraction is an improper fraction. To support English language learners, write and label examples of improper fractions on the board or Class Data Pad.

Ask students to share their estimating strategies for Problem 7 using benchmarks. Sample answer: 1/6 is less than 1/2, and 2/3 is greater than 1/2. I estimated my answer to be about 1. Survey students for what methods they used to find the common denominators for Problems 7–9. Expect a mixture of the methods discussed in Lesson 8-1. Summarize the methods on the board or Class Data Pad for student reference throughout the lesson.
Adding Mixed Numbers with Fractions Having Like Denominators

Explain that one way to find the sum of mixed numbers is to treat the fraction and whole number parts separately. Write the problem below on the board or a transparency:

\[
\begin{align*}
3 \frac{1}{8} + 5 \frac{3}{8} &= 8 \frac{4}{8} \\
&= 8 \frac{1}{2}
\end{align*}
\]

Add the whole-number parts. Then add the fraction parts.

Ask students to solve the following problem:

\[
2 \frac{7}{8} + 3 \frac{5}{8}
\]

Discuss students’ solution strategies. Make sure the following strategy is presented:

1. Add the whole-number parts. 
2. Add the fraction parts.

\[
\begin{align*}
5 \frac{12}{8} &= 5 + \frac{12}{8} \\
&= 5 + 1 \frac{4}{8} = 6 \frac{4}{8} \\
&= 6 \frac{1}{2}
\end{align*}
\]

3. Rename \(5 \frac{12}{8}\) in simplest form.

\[
\frac{12}{8} = \frac{8}{8} + \frac{4}{8} = 1 + \frac{4}{8} = 1 \frac{4}{8}
\]

Since \(\frac{12}{8} = 1 \frac{4}{8}\), then \(5 \frac{12}{8} = 5 + 1 + \frac{4}{8} = 6 \frac{4}{8}\), or \(6 \frac{1}{2}\).

Model renaming \(\frac{12}{8}\) with a picture.

Pose a few more addition problems in which the addends are mixed numbers with like denominators. Suggestions:

- \(3 \frac{1}{4} + 4 \frac{3}{7} 8\)
- \(1 \frac{3}{4} + 2 \frac{2}{3}\)
- \(6 \frac{2}{3} + 2 \frac{1}{9}\)
- \(8 \frac{7}{10} + 5 \frac{9}{10}\)
- Madeleine purchased \(3 \frac{5}{8}\) yards of red ribbon and \(4 \frac{3}{8}\) yards of purple ribbon. How much ribbon did Madeleine purchase? \(8 \frac{3}{8}\), or \(8 \frac{1}{2}\) yards
- Mr. Marcus’s class ate \(6 \frac{3}{4}\) pizzas and Mr. Samuel’s class ate \(4 \frac{2}{4}\) pizzas. How many pizzas did the two classes eat? \(11 \frac{1}{2}\) pizzas
Adding Mixed Numbers with Fractions Having Unlike Denominators

Write the following problem on the board, and ask students to find the sum:

\[ \frac{3}{4} + 2 \frac{7}{8} \]

After a few minutes, ask students to share solution strategies. Make sure the following method is discussed:

1. Find a common denominator for \(\frac{3}{4}\) and \(\frac{7}{8}\), which is 8, 16, 24, 32, ...
2. Rename the fraction parts of the mixed numbers so they have the same denominator. In this case, the least common denominator, 8, is the easiest to use.

\[ \frac{3}{4} \rightarrow \frac{6}{8} \]
\[ + \frac{27}{8} \rightarrow + \frac{27}{8} \]

3. Add.

\[ \frac{513}{8} = 5 + \frac{5}{8} + \frac{5}{8} = 5 + \frac{10}{8} = 6 \frac{2}{8} \]

4. Rename the sum.

Pose a few more problems that involve finding common denominators to add mixed numbers. Suggestions:

- \(2 \frac{1}{2} + 4 \frac{3}{8} = 6 \frac{7}{8}\)
- \(5 \frac{3}{8} + 1 \frac{5}{6}, 7 \frac{2}{3}, \text{or } 7 \frac{1}{2}\)
- \(3 \frac{3}{4} + 2 \frac{1}{4} = 6 \frac{1}{20}\)
- Juanita needs \(1 \frac{7}{8}\) yards of fabric for a dress and \(5 \frac{1}{6}\) yards for a jacket. How many total yards does she need? \(7 \frac{1}{24}\) yards
- The costumes for the lead roles in the school musical require \(4 \frac{5}{8}\) yards of one type of fabric and \(2 \frac{1}{3}\) yards of another type of fabric. How much fabric needs to be purchased? \(6 \frac{25}{24}\) yards

Adding Mixed Numbers

(Math Journal 2, pp. 251 and 252)

Have students complete journal pages 251 and 252. Circulate and assist.

Ongoing Assessment: Recognizing Student Achievement

Use an Exit Slip (Math Masters, page 414) to assess students’ facility with adding mixed numbers. Have students explain how they found the answer to Problem 4 on journal page 252. Students are making adequate progress if their responses demonstrate an understanding of renaming fractions to have common denominators and to be in simplest form.

(Number and Numeration Goal 5; Operations and Computation Goal 4)
2 Ongoing Learning & Practice

Math Boxes 8•2
(Math Journal 2, p. 253)

Mixed Practice Math Boxes in this lesson are paired with Math Boxes in Lesson 8-4. The skill in Problem 6 previews Unit 9 content.

Writing/Reasoning Have students write a response to the following: Explain your strategy for finding the values of the variables in Problem 5. Sample answer:

I looked for the common factor of the numerators or denominators that were complete. Then I used the multiplication rule or the division rule to multiply or divide to find the values for the variables.

NOTE Alternately, students may use a table or chart to find an equivalent fraction with the given denominator or numerator.

Study Link 8•2
(Math Masters, p. 223)

Home Connection Students practice adding mixed numbers and renaming improper fractions as mixed numbers in simplest form.

3 Differentiation Options

Adding Mixed Numbers
(Math Journal 2, p. 252)

To explore mixed-number addition, have students use an opposite-change algorithm. Have students change one of the addends to a whole number. Pose the following problem:

\[ 1 \frac{2}{3} + 7 \frac{5}{6} \]

1. Change \( 1 \frac{2}{3} \) to a whole number by adding \( \frac{1}{3} \): \( 1 \frac{2}{3} + \frac{1}{3} = 2 \).

2. Subtract \( \frac{1}{3} \) from \( 7 \frac{5}{6} \): \( 7 \frac{5}{6} - \frac{1}{3} = 7 \frac{1}{2} \).

3. Add the new addends: \( 2 + 7 \frac{1}{2} = 9 \frac{1}{2} \), or \( 9 \frac{1}{2} \).

This strategy is most efficient when the sum of the fraction parts is greater than 1. Discuss how to recognize that the fraction parts are greater than 1. Have students use this method to solve the following problems:
- \( \frac{3}{2} + 7 \frac{8}{10} = 11 \frac{3}{10} \)
- \( \frac{2}{3} + 6 \frac{9}{12} = 9 \frac{6}{12} \), or \( 9 \frac{1}{2} \)
- \( 5 \frac{8}{9} + 7 \frac{1}{3} = 13 \frac{2}{9} \)
- \( 4 \frac{8}{10} + 3 \frac{5}{6} = 8 \frac{19}{30} \)

Before students begin journal page 252, have them identify problems for which this algorithm might apply. Problems 4–6

### EXTRA PRACTICE

#### Playing Fraction Capture

*(Math Journal 1, p. 198; Math Masters, p. 460)*

Students practice comparing fractions and finding equivalent fractions by playing *Fraction Capture*. Players roll dice, form fractions, and claim corresponding sections of squares. The rules are on *Math Journal 1*, page 198, and the gameboard is on *Math Masters*, page 460.

### EXTRA PRACTICE

#### Solving Mixed-Number Addition Problems

*(Math Masters, p. 253A)*

Students practice adding mixed numbers with like and unlike denominators and use reasoning skills to compare sums of mixed numbers with whole numbers.
LESSON 8.2 Solving Mixed-Number Addition Problems

Add. Write each sum as a mixed number in simplest form. Show your work.

1. \(5 \frac{1}{5} + 2 \frac{4}{5} = \) __________
2. \(3 \frac{2}{5} + 5 \frac{3}{10} = \) __________

3. \(4 \frac{3}{4} + 2 \frac{1}{12} = \) __________
4. \(4 \frac{2}{3} + 2 \frac{3}{4} = \) __________

5. Josiah was painting his garage. Before lunch, he painted \(1 \frac{2}{3}\) walls. After lunch, he painted another \(1 \frac{5}{3}\) walls. How many walls did he paint during the day?
   __________

6. Julie’s mom made muffins for Julie and her friends to share. Julie ate \(1 \frac{3}{4}\) muffins. Her friends ate \(3 \frac{1}{2}\) muffins. How many muffins did Julie and her friends eat altogether?
   __________

Without adding the mixed numbers, insert <, >, or =. Explain how you got your answer.

7. \(1 \frac{3}{8} + 6 \frac{2}{3} \) __________ 8

8. \(5 \) __________ \(2 \frac{1}{5} + 2 \frac{7}{8}\)