Lesson 6-8

Using Benchmarks with Fraction Addition and Subtraction

Objective To review estimating with fractions using benchmarks.

Key Concepts and Skills

- Identify benchmarks on a number line. [Number and Numeration Goal 6]
- Add and subtract fractions and mixed numbers with like and unlike denominators. [Operations and Computation Goal 4]
- Use benchmarks to estimate sums and differences. [Operations and Computation Goal 6]

Key Activities

Students estimate solutions to number stories involving addition and subtraction of fractions with like and unlike denominators that refer to the same whole. Students use benchmarks, number lines, and number sense of fractions to estimate mentally and assess reasonableness of answers.

Ongoing Assessment: Informing Instruction

See page 418.

Ongoing Assessment: Recognizing Student Achievement

Use journal pages 191 and 192. [Operations and Computation Goal 6]

Materials

- Math Journal 1, pp. 191 and 192
- Math Journal 2, Activity Sheets 5–7

Advance Preparation

Students will need the Fraction Cards from Activity Sheets 5–7 that were first used in Lesson 5-1.

Comparing Fractions with \( \frac{1}{2} \)

Math Masters, p. 175
Math Journal 2, Activity Sheets 5–7
Students sort Fraction Cards using benchmarks and number sense.

Writing Fraction Number Stories

Math Masters, p. 176
Students create and solve fraction number stories and estimate solutions to problems with sums and differences of fractions.

Playing Fraction Top-It (Advanced Version)

Math Journal 2, Activity Sheets 5–7
Student Reference Book, p. 316
Math Masters, p. 493
Students use benchmarks to play an advanced version of Fraction Top-It.
Getting Started

Math Message

Draw and label the benchmarks on the number line in Problem 1, Math Journal 1, page 191. Be prepared to explain your reasoning for the placement.

Study Link 6-7 Follow-Up

Have partners compare answers and resolve differences.

1 Teaching the Lesson

Math Message Follow-Up

(Math Journal 2, Activity Sheets 5–7)

Ask students to share how they decided to label the benchmarks on the number line. Distribute the Fraction Cards from Activity Sheets 5–7. Ask each partnership to find Fraction Cards that are equal to 0, \( \frac{1}{2} \), and 1 to use as a frame of reference. Ask: How can benchmark fractions be useful when operating with fractions? Sample answer: A benchmark is useful for comparing fractions. For example, \( \frac{12}{25} \) is almost half because the numerator (12) is almost half of the whole (25); so using \( \frac{1}{2} \) as the benchmark, you know that \( \frac{12}{25} \) is almost \( \frac{1}{2} \).

Draw and label a number line using the benchmarks 0, \( \frac{1}{2} \), 1, \( 1\frac{1}{2} \), and 2.

\[
\begin{align*}
0 & \quad \frac{1}{2} & \quad 1 & \quad 1\frac{1}{2} & \quad 2
\end{align*}
\]

Ask students where they would place an X to represent the approximate sum for the problem \( \frac{4}{12} \) and \( \frac{3}{8} \).

- What is the sum? \( \frac{7}{12} \) Students should recognize that this is about \( \frac{1}{2} \).
- Should the X be closer to 0 or closer to 1? Why? Sample answers: \( \frac{7}{12} \) is closer from 0 and \( \frac{5}{12} \) from 1. \( \frac{7}{12} \) is greater than \( \frac{1}{2} \), so it is closer to 1.
- Should the X be closer to 0 or \( \frac{1}{2} \)? Why? Sample answers: \( \frac{7}{12} \) is closer to \( \frac{1}{2} \) than to 0, because it is only \( \frac{1}{12} \) away from \( \frac{1}{2} \) and \( \frac{7}{12} \) away from 0. \( \frac{7}{12} \) is greater than \( \frac{1}{2} \), so it is closer to \( \frac{1}{2} \) than to 0.
- Where should the X be placed? A little more than halfway between 0 and 1 Ask a volunteer to place the X to show where \( \frac{7}{12} \) would be on the number line.

Mental Math and Reflexes

Pose fraction addition and subtraction problems. Have students estimate whether the sum or difference is closest to 0, \( \frac{1}{2} \), or 1. Students should be prepared to explain their thinking.

\[
\begin{align*}
\frac{1}{12} + \frac{4}{8} & = \frac{11}{12} \\
\frac{1}{12} + \frac{3}{12} & = \frac{2}{2} \\
\frac{2}{3} + \frac{4}{8} & = \frac{14}{12} \\
\frac{3}{4} + \frac{1}{2} & = \frac{5}{2} \\
\frac{1}{2} + \frac{1}{12} & = \frac{13}{12} \\
\frac{14}{9} + \frac{7}{8} & = \frac{11}{8} \\
\frac{4}{7} - \frac{7}{62} & = \frac{5}{62} \\
\frac{3}{2} - \frac{2}{4} & = \frac{1}{2} \\
\frac{2}{3} & = \frac{4}{9} \\
\frac{1}{5} & = \frac{11}{7} \\
\end{align*}
\]
Auditory  *  Kinesthetic  *  Tactile  *  Visual

Adjusting the Activity

Have students label the benchmarks on the number line with equivalent fractions of twelfths. For example, under 0, record \( \frac{0}{12} \); under \( \frac{1}{2} \), record \( \frac{6}{12} \); and so on. Students can see the equivalent fractions with the benchmarks.

Ask students to take out the \( \frac{4}{12} \) and \( \frac{3}{12} \) cards from the Fraction Cards. Ask: How could I use shading on the two cards to show whether or not the sum of \( \frac{4}{12} \) and \( \frac{3}{12} \) is closest to 0, \( \frac{1}{2} \), or 1? Sample answer: You can lay the blue shaded parts of the two cards together and see that the sum is about \( \frac{1}{2} \).

If necessary, show students how to match the shaded parts of the Fraction Cards.

Ask: How much greater than \( \frac{1}{2} \) is the actual sum? \( \frac{1}{12} \)

Ask: Where would you place an X to represent the sum of \( \frac{4}{12} \) and \( \frac{3}{12} \)?

Ask a volunteer to place the X to show where the sum would be.

Expect that students will know that the sum of the two fractions is about 1, but do not expect students to find the exact sum of \( \frac{4}{12} \) and \( \frac{3}{12} \). Adjusting the Activity

Have students label the benchmarks on the number line with equivalent fractions of twelfths. For example, under 0, record \( \frac{0}{12} \); under \( \frac{1}{2} \), record \( \frac{6}{12} \); and so on. Students can see the equivalent fractions with the benchmarks.

Pose additional problems as necessary. Encourage students to use their slates to draw number lines or use Fraction Cards to estimate solutions using benchmark fractions.
Using Benchmarks to Estimate Sums and Differences of Fractions

Have students use the Fraction Cards, number lines, or a mental strategy to estimate sums and differences for fraction number stories. Remind students to use 0, 1/2, and 1 as the benchmarks as they solve the problems. Pose the following problems:

- Juan and Liz ordered two small pizzas, one cheese and one veggie. Juan ate 5/8 of the cheese pizza, and Liz ate 3/8 of the veggie pizza. Estimate the amount of pizza they ate together. About 1 pizza
- Jake watched 1 1/3 hours of TV on Saturday and 1 3/4 hours of TV on Sunday. About how much TV did he watch over the weekend? About 3 hours
- Mark bought 2 1/2 yards of fabric to make a blanket. He used 1 7/8 yards. About how much fabric does he have left? About 1/8 yard
- McKenna has a piece of yarn that is 3 1/8 yards long. She needs about 7/8 of a yard to make a necklace. About how many necklaces can she make? About 3

Using Benchmarks and Number Sense to Mentally Estimate Solutions

Pose the following problems orally. Have students justify their solutions as they share their responses and reasoning.

- Is 1/12 + 1/38 closer to 0 or to 1/8? Sample answer: Both 1/12 and 1/38 are very close to 0, so their sum is closer to 0 than 1/8.
- Is 12/13 + 7/8 closer to 1 or to 2? Sample answer: Closer to 1 because 12/13 is close to 1 and 7/8 is close to 1
- Is 1/9 + 1/12 closer to 0 or to 1? Sample answer: Closer to 0 because 1/9 is almost 0 and 1/12 is close to 0
- Is 1/2 - 7/17 closer to 1/2 or to 0? Sample answer: Closer to 0 because 7/17 is almost 1/2
- Is 18/19 + 23/32 closer to 2 or to 3? Sample answer: Closer to 3 because 23/32 is close to 2 and 18/19 is close to 1

Using Benchmarks and Number Sense to Solve Fraction Problems

(Math Journal 1, pp. 191 and 192)

Students work with a partner. Have students use benchmarks to estimate the sums or differences for fraction number stories on journal pages 191 and 192. Bring the class together to share solution strategies.
2 Ongoing Learning & Practice

Reviewing Fractions and Division
(Math Journal 1, pp. 192A and 192B; Student Reference Book, pp. 62, 63, 78C, and 78D)

Students review the relationship between fractions and division. Refer students to pages 62, 63, 78C, and 78D of the Student Reference Book to review improper fractions, mixed numbers, and connections between fractions and division. Have students complete journal pages 192A and 192B to practice solving problems that involve division and fractions.

Math Boxes 6-8
(Math Journal 1, p. 193)

Mixed Practice Math Boxes in this lesson are paired with Math Boxes in Lesson 6-10. The skills in Problem 5 previews Unit 7 content.

Study Link 6-8
(Math Masters, p. 174)

Students practice estimating sums when adding fractions.
3 Differentiation Options

**Comparing Fractions with \( \frac{1}{2} \)**

*(Math Masters, p. 175; Math Journal 2, Activity Sheets 5–7)*

Partners work together to sort the Fraction Cards into three groups: fractions that are equal to \( \frac{1}{2} \), less than \( \frac{1}{2} \), or greater than \( \frac{1}{2} \). First have students locate the \( \frac{1}{2} \) card and place it face up. Remind students that the blue shading on the card is a model or picture for the area of \( \frac{1}{2} \). Tell students they will use the \( \frac{1}{2} \) card as a benchmark to determine if each Fraction Card is less than \( \frac{1}{2} \), greater than \( \frac{1}{2} \), or equal to \( \frac{1}{2} \).

![Card example]

**Writing Fraction Number Stories**

*(Math Masters, p. 176)*

Students use *Math Masters*, page 176 to write a number story using fraction addition or subtraction. Ask students to exchange and solve each other’s problems using benchmarks to estimate the solution. Students should draw a picture or model for how they solved the problem.

**Playing Fraction Top-It (Advanced Version)**

*(Math Journal 2, Activity Sheets 5–7; Student Reference Book, p. 316; Math Masters, p. 493)*

To further explore using benchmarks, have students play an advanced version of *Fraction Top-It*. In playing this version, students apply their knowledge of benchmarks to estimate sums and compare them. Each player draws two Fraction Cards from the deck and records them on *Math Masters*, page 493. Players then decide which symbol, \(<\), \(>,\) or \(=\), should be used to compare the two expressions.

**Example:**

<table>
<thead>
<tr>
<th>Round</th>
<th>Player 1</th>
<th>(&lt;), (&gt;), or (=)</th>
<th>Player 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(\frac{1}{2} + \frac{5}{6})</td>
<td>(&gt;)</td>
<td>(\frac{3}{4} + \frac{1}{5})</td>
</tr>
</tbody>
</table>
6.8 Estimating with Fractions

Circle the best estimate for each situation described below.

1. The sum of $\frac{3}{4}$ and $\frac{18}{19}$ is closest to
   - 0
   - 1
   - 2

2. The sum of $\frac{1}{11}$ and $\frac{1}{15}$ is closest to
   - 0
   - 1
   - 2

3. The sum of $\frac{9}{10}$ and $\frac{1}{32}$ is
   - less than 1
   - greater than 1

4. Use the circle below to draw a spinner as follows:
   - Shade a red sector that is more than $\frac{1}{8}$ of the circle, but less than $\frac{1}{4}$ of the circle.
   - Shade a blue sector that is more than $\frac{1}{4}$ of the circle, but less than $\frac{1}{2}$ the circle.

5. The number line below shows an estimate for the sum of $\frac{6}{13}$ and $\frac{1}{8}$.
   Explain why the sum is greater than $\frac{1}{2}$.

---

174
Comparing Fractions with $\frac{1}{2}$

Use the Fraction Cards from Math Journal 2, Activity Sheets 5–7. Sort the cards into three piles.

- Fractions less than $\frac{1}{2}$
- Fractions equal to $\frac{1}{2}$
- Fractions greater than $\frac{1}{2}$

Place the cards next to one another to check your work. When you are finished, write the fractions in each pile in the correct box below.

| Less than $\frac{1}{2}$ | Equal to $\frac{1}{2}$ | Greater than $\frac{1}{2}$ |
**Top-It Record Sheet**

<table>
<thead>
<tr>
<th>Round</th>
<th>Player 1</th>
<th>&gt;, &lt;, =</th>
<th>Player 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>