Teaching the Lesson

Key Concepts and Skills
- Find equivalent fractions. [Number and Numeration Goal 5]
- Compare and order fractions. [Number and Numeration Goal 6]
- Add fractions with common denominators. [Operations and Computation Goal 4]

Key Activities
Students rename fractions as equivalent fractions. They compare fractions by renaming them as equivalent fractions with a common denominator. They play Build-It to practice comparing and ordering fractions.

Ongoing Assessment:
- Recognizing Student Achievement
  Use Mental Math and Reflexes. [Number and Numeration Goal 6]

Ongoing Assessment:
- Informing Instruction
  See page 620.

Key Vocabulary
Quick Common Denominator (QCD)

Materials
Math Journal 2, pp. 248 and 249
Student Reference Book, pp. 300, 399, and 401
Math Masters, pp. 446 and 447 transparencies of Math Masters, pp. 446 and 447 (optional) • 3" by 5" index cards cut in half (optional) • red and blue colored pencils or markers • scissors • straightedge • calculator

Math Boxes 8-1
Math Journal 2, p. 250
Geometry Template
Students practice and maintain skills through Math Box problems.

Study Link 8-1
Math Masters, p. 221
Students practice and maintain skills through Study Link activities.

1. Teaching the Lesson

Ongoing Learning & Practice

Math Boxes 8-1
Math Journal 2, p. 250
Geometry Template
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Study Link 8-1
Math Masters, p. 221
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Differentiation Options

READINESS
Ordering Fractions on a Rope
rope or heavy string 8’–10’ long • 3" by 5" index cards • thick marker • paper clips
Students make and order fractions on a number line.

ENRICHMENT
Exploring Least Common Multiples
Math Masters, p. 222
Students explore methods for finding least common multiples.

ELL SUPPORT
Building a Math Word Bank
Differentiation Handbook, p. 142
Students define and illustrate the term quick common denominator and identify related words.

Advance Preparation
For Part 1, have students cut out the 16 fraction cards on Math Masters, page 446 before the lesson. They will also need to cut Math Masters, page 447 into halves. You can make a transparency of these Math Masters pages to play the game on the overhead. For the optional Readiness activity in Part 3, hang the string or rope where it will be visible to all students and within their reach during the activity.

Teacher's Reference Manual, Grades 4–6 pp. 62, 63, 141, 142
Mental Math and Reflexes ★
State each fraction and ask students to indicate whether it is closest to the benchmark of 0, \(\frac{1}{2}\), 1, \(\frac{3}{4}\), or 2. Suggestions:

<table>
<thead>
<tr>
<th>Fraction</th>
<th>Closest Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\frac{2}{10})</td>
<td>0</td>
</tr>
<tr>
<td>(\frac{3}{10})</td>
<td>(\frac{1}{2})</td>
</tr>
<tr>
<td>(\frac{5}{10})</td>
<td>1</td>
</tr>
</tbody>
</table>

Math Message
Complete Problems 1–4 at the top of journal page 248.

Ongoing Assessment: Recognizing Student Achievement

Use the Mental Math and Reflexes problems to assess students’ ability to compare fractions. Students are making adequate progress if they indicate the correct benchmark for the \(\bigstar\) and \(\bigstar\) fractions.

[Math Journal 2, p. 248; Student Reference Book, p. 399]

Teaching the Lesson

Math Message Follow-Up

Ask students to compare their answers for the Math Message problems and share how they decided which fraction in each pair is greater. Ask volunteers to share their strategies.

Problem 1 Since the denominators are the same, the wholes are divided into the same number of parts. This means the parts are the same size, so it is easy to compare the number of shaded parts and decide which fraction is greater.

\[\frac{2}{10} < \frac{3}{10} < \frac{5}{10}\]

Problem 2 The numerators are the same, but the denominators are not. This means that there are the same number of shaded parts, but the parts are different sizes. The fewer the number of parts that the whole is divided into, the larger each part is. Therefore, the fraction with the smaller denominator is the greater fraction.

\[\frac{2}{10} < \frac{3}{10} < \frac{5}{10}\]
Problem 3 Neither the numerators nor the denominators are the same. Use a reference number to compare the fractions. One fraction is greater than \( \frac{1}{2} \) and the other fraction is less than \( \frac{1}{2} \).

Problem 4 Each of the fractions is one fractional part less than a whole. The larger the part is, the smaller the denominator is, and the further away the fraction is from one whole. Therefore, the fraction with the smaller denominator is the lesser fraction.

Ask volunteers how they would determine whether \( \frac{3}{5} \) or \( \frac{5}{8} \) is greater. The methods outlined above don’t work in this case. A method that does work is to use the Fraction-Stick and Decimal Number-Line Chart on Student Reference Book, page 399.

Ask a volunteer to explain how to use the chart to determine which fraction is greater. Locate \( \frac{3}{5} \) and \( \frac{5}{8} \) on the chart. Since the line for \( \frac{5}{8} \) is to the right of the line for \( \frac{3}{5} \), we know that \( \frac{5}{8} > \frac{3}{5} \).

Pose several problems for students to solve with the Fraction-Stick Chart. Suggestions:

**Which is greater?**
- \( \frac{5}{7} \) or \( \frac{7}{10} \)
- \( \frac{4}{5} \) or \( \frac{13}{16} \)
- \( \frac{2}{7} \) or \( \frac{1}{4} \)

**Ongoing Assessment: Informing Instruction**

Watch for students who have trouble isolating the relevant rows when making comparisons on the Fraction-Stick Chart. Have them use a vertical straightedge to find the equivalent decimal for each fraction on the decimal number line. Then compare the decimals or their relative positions. For example, \( \frac{3}{5} \) aligns with 0.6 and \( \frac{5}{8} \) aligns with 0.63; 0.63 is to the right of 0.6, so 0.63 > 0.60, and \( \frac{5}{8} > \frac{3}{5} \).

**Renaming Fractions as Equivalent Fractions**

(Students Reference Book, pp. 399 and 401)

Ask volunteers to guide the class in the steps for using the Fraction-Stick and Decimal Number-Line Chart on page 399 to find equivalent fractions for \( \frac{1}{4} \) and \( \frac{2}{3} \).

Then ask students to explain how they would find equivalent fractions without using this chart. The discussion should include the following methods:

- Use a multiplication table.
- Look up fractions in the table of Equivalent Fractions, Decimals, and Percents (Student Reference Book, page 401). Point out that the first fraction in each row is in simplest form.
- Use the multiplication rule. Multiplying the numerator and denominator of a fraction by the same (nonzero) number yields an equivalent fraction.

**Example:**

\[
\frac{2}{3} = \frac{2 \times 3}{3 \times 3} = \frac{6}{9}
\]
Use the division rule. Dividing the numerator and denominator of a fraction by the same (nonzero) number yields an equivalent fraction.

Example: \[\frac{12}{15} = \frac{12 \div 3}{15 \div 3} = \frac{4}{5}\]

### Comparing Fractions Using Common Denominators

Ask students to compare the fractions \(\frac{2}{3}\) and \(\frac{3}{5}\) and share solution strategies. If the idea is not mentioned, remind students that if two fractions have the same denominator, they only have to compare numerators to tell which is greater. Another approach for comparing fractions is to rename them as equivalent fractions with a common denominator.

Review finding a common denominator and renaming fractions using the **Quick Common Denominator (QCD)** and the multiplication rule, introduced in Lesson 6-10. The QCD is the product of the denominators you are renaming.

To use this method to compare \(\frac{2}{3}\) and \(\frac{3}{5}\):

1. Find the QCD. \(3 \times 5 = 15\).
2. Rename \(\frac{2}{3}\): \(\frac{2 \times 5}{3 \times 5} = \frac{10}{15}\).
3. Rename \(\frac{3}{5}\): \(\frac{3 \times 3}{5 \times 3} = \frac{9}{15}\).

Because \(10 > 9\), \(\frac{10}{15} > \frac{9}{15}\), and \(\frac{2}{3} > \frac{3}{5}\).

Write a few comparison-of-fractions problems on the board or a transparency. Ask students to solve them by renaming the fractions so they have a common denominator. Suggestions:

- \(\frac{3}{4} > \frac{5}{8}\)
- \(\frac{5}{6} > \frac{3}{4}\)
- \(\frac{1}{6} < \frac{2}{9}\)
- \(\frac{6}{9} < \frac{5}{6}\)

Ask volunteers to explain their solutions. The QCD can be used for all of the problems, but emphasize that depending on the fractions involved, it might not be the most efficient method for finding a common denominator.

In the first problem, only one of the fractions, \(\frac{3}{4}\), needs to be renamed because 4 is a factor of 8: \(\frac{3}{4} = \frac{3 \times 2}{4 \times 2} = \frac{6}{8}\). For the last problem, \(\frac{6}{9}\) can be renamed as \(\frac{2}{3}\), and 3 is a factor of 6, so \(\frac{2}{3} = \frac{2 \times 2}{3 \times 2} = \frac{4}{6}\). Since \(\frac{4}{6} = \frac{2}{3}\), then \(\frac{6}{9} < \frac{5}{6}\).

### Finding Equivalent Fractions

(Math Journal 2, pp. 248 and 249)

Ask students to complete journal pages 248 and 249. Circulate and assist.
Students cut out the 16 fraction cards from Math Masters, page 446. They cut Math Masters, page 447 in half to create 2 gameboards. Only one set of cards per partnership is needed to play the game, but a gameboard is required for each student.

Go over the rules on Student Reference Book, page 300, and play a practice round with the class. Remind students to use the benchmarks $\frac{1}{2}$ and 1 as they consider the placement of fractions and make comparisons with the other fractions on their gameboard. Then have partners play several rounds on their own. Remind students that they cannot change the order of their 5 cards. They replace cards until the fractions are in order from smallest to largest. After students have played Build-It several times, suggest that they play without the game-board. Have students store their fraction cards for future use.

### Playing Build-It

(Student Reference Book, pp. 300, 399; Math Masters, pp. 446, 447)

Students cut out the 16 fraction cards from Math Masters, page 446. They cut Math Masters, page 447 in half to create 2 gameboards. Only one set of cards per partnership is needed to play the game, but a gameboard is required for each student.

Go over the rules on Student Reference Book, page 300, and play a practice round with the class. Remind students to use the benchmarks $\frac{1}{2}$ and 1 as they consider the placement of fractions and make comparisons with the other fractions on their gameboard. Then have partners play several rounds on their own. Remind students that they cannot change the order of their 5 cards. They replace cards until the fractions are in order from smallest to largest. After students have played Build-It several times, suggest that they play without the game-board. Have students store their fraction cards for future use.

### Ongoing Learning & Practice

#### Math Boxes 8•1

(Math Journal 2, p. 250)

**Mixed Practice** Math Boxes in this lesson are paired with Math Boxes in Lesson 8-3. The skill in Problem 5 previews Unit 9 content.

#### Study Link 8•1

(Math Masters, p. 221)

**Home Connection** Students practice comparing fractions. Remind students that they can decide which fraction is greater by using the strategies discussed in the lesson such as comparing each fraction to $\frac{1}{2}$ or finding the Quick Common Denominator. Students also find decimal equivalents for fractions.

### Differentiation Options

#### READINESS

**Small-Group Activity**

#### Ordering Fractions on a Rope

To provide experience with ordering fractions, have students order fractions on a number line. Ask each student to write a fraction greater than 0 and less than 1 on a 3 in. by 5 in. card. Consider assigning denominators to small groups and having them compare their numerators in the groups to avoid duplications.
Comparing Fractions

Students link two paper clips together and attach their card to it. They go to the number line string one (or a few) at a time to hang their fraction cards in order, between 0 and 1. Do not worry about spacing. It is more important that the fraction cards be placed in the correct order. The task will become more difficult as additional fractions are added to the string. If two fractions are equivalent, clip the fraction cards together as illustrated.

ENRICHMENT

Exploring Least Common Multiples
(Math Masters, p. 222)

To apply students’ understanding of equivalent fractions, have them explore finding the least common multiple of two or more numbers. Students find the least common multiple by making lists and using the prime factorization of numbers. When students have completed the page, have them solve the following problems:

- \( \frac{4}{9} + \frac{5}{6} + \frac{1}{4} = \frac{55}{36} \), or \( \frac{19}{36} \)
- \( \frac{8}{20} + \frac{8}{90} = \frac{248}{180} \), or \( \frac{4}{15} \)
- \( \frac{11}{15} + \frac{22}{49} = \frac{869}{735} \), or \( \frac{134}{735} \)

In the third problem, the least common multiple and the quick common denominator are the same. Ask volunteers to share how they decide on a method to find common denominators. Sample answer: Choose the most efficient method depending on the numbers. With smaller numbers or by first using prime factorizations, you can do the computations faster, because you can do much of it mentally.

ELL SUPPORT

Building a Math Word Bank
(Differentiation Handbook, p. 142)

To provide language support for fraction concepts, have students use the Word Bank Template found on Differentiation Handbook, page 142. Ask students to write the term quick common denominator, draw pictures relating to the term, and write other related words. See the Differentiation Handbook for more information.

Studying Link Master

Name Date Time

Comparing Fractions

Lesson 8-1

Exploring Least Common Multiples
(Math Masters, p. 221)

Teaching Master

Name Date Time

Exploring Least Common Multiples

One way to find a common denominator is to use the least common multiple. The LCM is the smallest number that is a multiple of the given denominators.

You can find the least common multiple by making lists of multiples.

Find the least common multiple for \( \frac{3}{8} \) and \( \frac{5}{9} \). List the multiples of each denominator.

- Multiples of 8: 8, 16, 24, 32, 36, 44, ...
- Multiples of 9: 9, 18, 27, 36, 45, ...

Another way to find the least common multiple is to use prime factorization.

Find the least common multiple for 5 and 7.

**Step 1** Use factor trees to find the prime factorization.

**Step 2** Count the appearance of each different prime number.

- Note only the largest count.
- Each prime factor appears 3 times in the prime factorization of 5.
- There is one 3 in the prime factorization of 7.

**Step 3** Write a multiplication expression using these counts.

- \( 3 \times 3 \times 3 \times 5 \times 7 = 285 \) is the least common multiple of 5 and 7.

Use the prime factorization method to find the LCM.

\( 9, 12, 18, 27, 36, 180 \), \( 30, 45, 90, 135 \), \( 60, 120, 180 \), \( 15, 30, 45 \), \( 10, 20, 30, 50 \)

LCM: 90

What might be an advantage or disadvantage to using the prime factorization method to find the least common multiple?

Answers vary.