☆**M**STAR
INTERVENTION

Lesson 6: Fractions on the Number Line

Lesson Objective

- Students will locate and name points on a number line, using fractions.

Instructional Materials

Material	Quantity	Description
Scissors	1 per student	
Paper	Several sheets per student	
Colored pencils	1 per student	
How Am I Doing? graph	1 per student	
Computer and Projector	Optional for those using PowerPoint	
PowerPoint slide	Optional	• Define Fractions on a Number Line
Display Masters	1 each	• Preview: Key Ideas: Fractions on the Number Line • Engage Prior/Informational Knowledge: $\frac{5}{8}$ • Engage Prior/Informational Knowledge: Number Line • Demonstrate: Blank Number Line • Demonstrate: Whole Number Line • Demonstrate: Fourths Number Line • Demonstrate: $\frac{7}{4}$
Masters	1 each	• Whole-Number Paper Strips • $\frac{1}{4}$ Paper Strips • $\frac{1}{5}$ Paper Strips • Paper Number Lines *Using the Paper Strips master, cut several paper strips for 1 whole, 1 whole divided into fourths, and 1 whole divided into fifths for each student. Using the Paper Strip Number Line master, cut several number lines for each student.*
Handouts	1 per student	• Cumulative Review • Practice • Independent Practice
Answer Key	1 each	• Cumulative Review • Practice • Independent Practice

Cumulative Review

Have students answer the questions on the Cumulative Review handout. Go over the answers. Correct misconceptions. Have students use a colored pencil to make corrections as needed. Collect student papers to determine who needs additional instruction.

Preview

This lesson will build on students' conceptual knowledge of fractions. Students will interpret and represent fractions on a number line. Students will use the mathematical ideas taught in this lesson to compare and order fractions.

Display and introduce through a brief explanation the key ideas for this lesson:

- Fractions are related to a whole.

- Fractional parts of a whole are equal in area.

Use the Fractions on the Number Line **DM** display master as needed.

Engage Prior/Informal Knowledge

To open the lesson, present questions to activate students' background knowledge related to the content to be taught in this lesson. Ask students questions such as:

- What is a unit fraction? (a fraction with a numerator of 1, 1 part of a whole)

Display the fraction $\frac{5}{8}$. Use the $\frac{5}{8}$ **DM** display master as needed. Ask questions such as:

- What fraction is shaded? ($\frac{5}{8}$)

- Is the fraction shaded less than, equal to, or greater than 1? (less than)

Determine whether students understand the number line. Display a number line

that includes both positive and negative numbers. Use the Number Line **DM** display master as needed. Ask questions such as:

- On a number line, are there any numbers between the whole numbers? (yes)

- If so, what numbers? (fractions $\frac{1}{2}$, $\frac{3}{5}$).

If students cannot answer these questions, stop and explicitly teach the material.

Demonstrate

1. Use the "Define Fractions on a Number Line" PowerPoint presentation as needed to illustrate the lesson information.

2. Create a number line divided into whole numbers.

Distribute several whole-number strips from the paper strips master and a long piece of paper to each student (11 x 14 or 11 x 17).

> **Say:** *1 strip of paper represents 1 whole.*

Demonstrate each step and have students do the same.

Draw a horizontal line across the center of the piece of paper. Have students do the same.

Place whole-number strips above a horizontal line drawn on the paper and label the line "0" at the left edge of the strip. Each time a strip is placed, label the line with whole numbers (1, 2, 3, etc.), making a number line. Have students do the same.

1 TEACHER NOTE

In the following demonstration, you will use area models of unit fractions to help students build a number line to connect their understanding of fractions represented as area models to fractions represented on a number line. Unit fractions are formed by dividing a whole (region, set, or distance on a number line) into equal parts[1].

2 TEACHER NOTE

The number line model for fractions is a length model in which unit fractions are marked as equal lengths between 0 and 1 (and other consecutive numbers), but lengths can get "lost" as students focus on the marks rather than the lengths. The length is important when using the number line to model operations with fractions, as will be done in later lessons[1].

Remind students that whole numbers are a special type of fraction with a denominator of 1.

3. Create a number line divided into fourths.

Distribute several $\frac{1}{4}$ paper strips from the $\frac{1}{4}$ Paper Strips master and a pair of scissors to each student.

> **Say:** *1 paper strip is divided into fourths.*

Cut each of several paper strips divided into fourths into 4 equal parts. Have students do the same.

Emphasize that the area of each part is equal.

4. Explicitly show students the connection between a denominator of 4 and 4 copies of the unit fraction $\frac{1}{4}$.

Explain that each part is labeled " $\frac{1}{4}$ " because 4 copies of the $\frac{1}{4}$ part are needed to make 1 whole.

Demonstrate each step and have students do the same.

Line up several copies of the unit fraction $\frac{1}{4}$ above the paper number line and label each fourth on the number line ($\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$, $\frac{4}{4}$, $\frac{5}{4}$, etc.).

5. Represent fractions on the number line.

> **Say:** *I am finding the fraction $\frac{3}{4}$.*

Trace along the number line to the third copy of the $\frac{1}{4}$ unit fraction.

6. Identify a fraction represented on the number line.

Trace along the number line to find $\frac{6}{4}$.

Think aloud to identify the fraction.

Emphasize the concept that $\frac{6}{4}$ is 6 copies of the $\frac{1}{4}$ part.

Remind students that whole numbers are a special type of fraction with a denominator of 1. Use fractions less than, equal to, and greater than 1 throughout this lesson.

7. Repeat steps 5 and 6 using many different examples. Be sure to include fractions less than, equal to, and greater than 1.

Ask students questions such as:

- How many $\frac{1}{4}$ parts do you need to make 1 whole? (4) 2 wholes? (8) $\frac{3}{4}$? (3) $\frac{6}{4}$? (6)
- What is an example of a number between 0 and 1? ($\frac{1}{4}$, $\frac{2}{4}$, or $\frac{3}{4}$) 1 and 2? ($\frac{5}{4}$, $\frac{6}{4}$, $\frac{7}{4}$)

Encourage students to use the paper strips as needed. When students answer questions, have them explain their reasoning and thought process.

8. Divide a blank number line into parts to show the fraction $\frac{7}{4}$.

Distribute one blank number line cut from the Paper Number Lines master to each student.

Display a blank number line. Use the Blank Number Line **DM** display master as needed.

> **Say:** *I want you to mark the whole numbers on your number line like this.*

Draw and label the whole numbers (0, 1, 2, 3) Have students do the same. Use the Whole Number Line **DM** display master as needed.
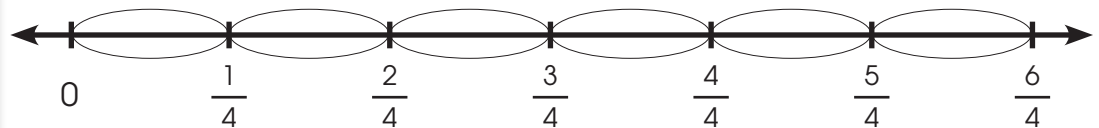
TEACHER NOTE

This is a formal definition of a fraction: If *A* and *B* are counting numbers, and if an object can be divided into *B* parts, then 1/*B* of the object is the amount formed by 1 part, and *A*/*B* of the object is the amount formed by *A* parts (or copies of parts). Use it as appropriate[2].

Say: *I am dividing each whole into 4 equal parts. Each equal part is $\frac{1}{4}$.*

Divide each whole number space into 4 equal parts and make a tick mark at each division. Use the Fourths Number Line as needed.

Say: *Let's count the unit fractions $\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$, $\frac{4}{4}$, $\frac{5}{4}$, $\frac{6}{4}$, $\frac{7}{4}$.*

Slide your finger along the number line or draw ovals as you count. How ovals would look is shown in the diagram below.

Say: *I want to find and label the fraction $\frac{7}{4}$.*

Mark $\frac{7}{4}$ with a point on the number line and label it $\frac{7}{4}$. Have students do the same. Use the $\frac{7}{4}$ **DM** display master as needed.

TEACHER NOTE
When students create pictorial representations of fractions, note that the partitions indicate an understanding of equal parts, even though the parts may not be exactly equal[3].

Practice

WATCH FOR
Some students count the small dividing marks (tick marks) on a number line rather than the intervals. To address this problem, draw thin ovals at each interval. Another method is to have students place their finger on 0, slide their finger to the right, and count aloud each fractional part as they reach a tick mark.

For each practice activity, provide detailed feedback to students, highlighting what was done correctly and what needs improvement. Provide opportunities for students to correct their errors. Collect student work to review and monitor student progress.

Activity 1: Help students practice naming and locating fractions on number lines, using paper strips and paper number lines. Give students several examples, including

fractions less than, equal to, and greater than 1. Use fractions such as $\frac{1}{4}$, $\frac{3}{7}$, $\frac{6}{3}$, $\frac{8}{8}$, etc.

Have students create number lines to show fractions such as $\frac{1}{5}$, $\frac{3}{5}$, $\frac{7}{5}$, and $\frac{5}{5}$. Have students use the paper strips divided into fifths cut from the $\frac{1}{5}$ Paper Strip master as needed. Select a few students to verbalize their reasoning for each step in the process. Listen for the development of any misconceptions within the reasoning.

Activity 2: Have students work in pairs or small groups to complete the activity on the Practice handout. Have students verbalize to their partners their reasoning for each step in the process. Listen for the development of any misconceptions within the reasoning.

Independent Practice

1. Have students work independently to complete the activity on the Independent Practice handout.

2. Go over the answers (students self-check and correct using a colored pencil).

3. Have students record the number correct in the box and complete their How Am I Doing? graph.

4. Collect the papers to review and monitor student progress.

Closure

Review the key ideas. Have students provide examples from the lesson.

- What do you have to remember when drawing a number line?

- How can you identify the denominator of a fraction on a number line?

Clear up any misconceptions. Students who cannot verbalize the characteristics of a well-drawn number line will need additional instruction.

1. National Council of Teachers of Mathematics. (2009). *Focus in grade 3: Teaching with curriculum focal points.* Reston, VA: Author.

2. Beckman, Sybilla. (2011). *Mathematics for elementary teachers with activity manual, 3rd Edition (page 39).* Boston, MA: Addison-Wesley.