Operations with Rational Numbers: Not Just the Rules

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Think about your instruction or the mathematics program you use. What opportunities do the students have to use a variety of models to solve problems, understand concepts, or generalize ideas about fractions?

What models are used in the program or in the classroom?

Area	**Set**
☐ Part to whole ☐ Equivalence, comparing, ordering ☐ Operations	☐ Part to whole ☐ Equivalence, comparing, ordering ☐ Operations
Number Line	**Summary – In this program models …**
☐ Part to whole ☐ Equivalence, comparing, ordering ☐ Operations	☐ are never used ☐ are sometimes used ☐ permeate instruction

Are students provided with the opportunity to…

Answer questions in which models are given? ☐ Never ☐ Occasionally ☐ Throughout	Use manipulatives to solve problems? ☐ Never ☐ Occasionally ☐ Throughout
Use student drawn models to solve problems? ☐ Never ☐ Occasionally ☐ Throughout	Use models to help develop concepts or generalize ideas? ☐ Never ☐ Occasionally ☐ Throughout
Are there adjustments that I need to make to my instruction to assure that students experience a variety of models? If yes, describe.	

Adapted from Petit, Marjorie, Laird, Robert, and Marsden, Edwin (2010). *A Focus on Fractions: Bringing Research into the Classroom*, Routledge Taylor & Francis Group, p. 25.

Name That Fraction

Locate the fraction $\frac{7}{8}$ on the number line below.

Starting at 0, can you reach $\frac{7}{8}$ in seven jumps? What size jumps did you make? List them here.

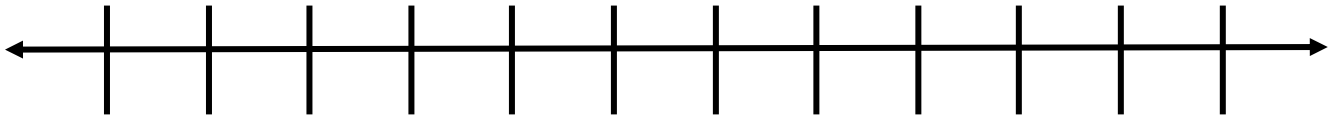
Starting at 0, can you reach $\frac{7}{8}$ in five jumps? What size jumps did you make? List them here.

Can you do this a different way? How?

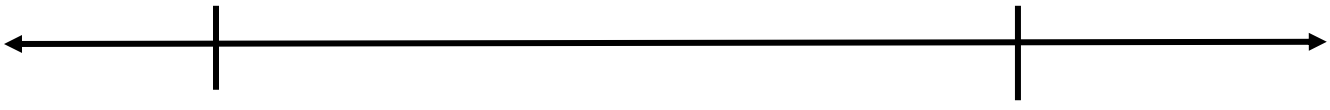
Starting at 0, can you reach $\frac{7}{8}$ in four jumps? What size jumps did you make? List them here.

Can you do this a different way? How?

Starting at 0, can you reach $\frac{7}{8}$ in one jump? What size jump did you make? List it here.



0 **1**



0 **1**

Red Light–Green Light

Who is winning the *Red-light, Green-light* race? Here is the fraction of the distance covered from the start by the racers.

Mary: $\frac{3}{4}$	Harry: $\frac{1}{2}$	Larry: $\frac{5}{6}$	Han: $\frac{5}{8}$	Miguel: $\frac{5}{9}$	Angela: $\frac{2}{3}$

1. Predict.
   a. Who do you think is winning?

   b. Who can you rule out?

2. Explain how you decided who is winning the race:

3. Place each person in their approximate place along the race track:

4. More people arrive to play. Assign a fractional distance to how far they have traveled based on this information:
   a. Alicia is between Harry and Han._____
   b. Benjamin is between Larry and Angela _____
   c. Corey is between Han and Miguel. _____

Based on **Teaching Student Centered Mathematics (2nd Edition)** Activity 12.2, p. 209 (Gr. 3-5); Activity 8.1, p. 108 (Gr. 6-8), developed by Jennifer Bay-Williams.

Adding Fractions

Matt, Sam, and Carmen each added the numbers $\frac{3}{4}$ and $\frac{3}{8}$.

	Does the method for adding fractions make sense? Why or why not? Explain.
Matt's Method: "I halved $\frac{1}{4}$ then added." $1 - \frac{1}{4} = \frac{3}{4}$ $\frac{1}{8} + \frac{1}{8} = \frac{1}{4}$ $\frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{1}{8} + \frac{3}{8} = \frac{9}{8}$	
Sam's Method: "I broke apart the $\frac{3}{8}$ to get an easier number." $\frac{3}{4} + \frac{1}{4} = 1$ $\frac{1}{8} + \frac{2}{8} = \frac{3}{8}$ $1 + \frac{1}{8} = 1\frac{1}{8}$	
Carmen's Method: "I found common denominators." $\frac{3}{4} \times \frac{2}{2} = \frac{6}{8}$ $+ \quad \frac{3}{8}$ ——————— $\frac{9}{8} = 1\frac{1}{8}$	

Resources

A Focus on Fractions, Bringing Research to the Classroom. Marjorie M. Petit, Robert E. Laird, and Edwin L. Marsden. Routledge. 2010.

Connecting Arithmetic to Algebra: Strategies for Building Algebraic Thinking in the Elementary. Susan Jo Russell, Deborah Schifter and Virginia Bastable. Heinemann. 2011.

Developing Essential Understanding of Rational Numbers, Grades 3-5. Carne Clarke, William Fisher, Rick Marks, Sharon Ross, Rose Mary Zbiek. NCTM. 2010

Elementary and Middle School Mathematics: Teaching Developmentally (8th Edition) (Teaching Student-Centered Mathematics. John A. Van de Walle, Karen S. Karp and Jennifer M. Bay-Williams. Pearson. 2012.

Extending Children's Mathematics: Fractions & Decimals: Innovations In Cognitively Guided Instruction. Susan B. Empson and Linda Levi. Heinemann. 2011.

Putting Essential Understanding of Fractions into Practice in Grades 3-5. Kathryn Chval, John Lannin, Dustin Jones, Barbara Dougherty. NCTM. 2013.