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# FRACTIONS ARE FOUNDATIONAL

Pre-K–8 mathematics instruction should provide students with a strong sense of number. However, more than occasionally, schools and school districts limit their expectations for students to proficiency with whole numbers. Although I agree that such proficiency and deep understanding are absolutely essential, I believe that work with fractions is equally important. (When I say *fractions* I mean the subset of rational numbers that we typically call fractions, decimals, and percents.)

So why am I on this fractions kick? Well, I've come to this position, because of the following experiences:

> Virtually every time I ask teachers of algebra what they wish their incoming students knew, their response is "fractions." The results of this informal polling were recently validated in the *National Survey of Algebra Teachers* compiled by the National Opinion Research Center at the University of Chicago for the National Mathematics Advisory Panel of the U.S. Department of Education.

> I recently asked fifth-grade students to tell me where to place the fraction 9/5 on a number line. One student informed that I couldn't do that because the "top number" was more than 5, and the number line went only to 1.

> I used to ask my preservice teacher candidates to use models to represent particular fractions or operations involving fractions, with the following restriction: they could not use pizza in their representations. Circular regions are far too dominant as representations of fractions (whether they involve cheese or pepperoni pizza).

Perhaps of greater concern to me is the fact that we recognize the importance of curricular expectations that focus on whole numbers but do not always acknowledge that a similar conceptual base is necessary for fractions, decimals, and percent. Students need opportunities to work with a variety of representations of fractions, including set and region models. They need to develop a concrete realization of a fraction. Just as they use counters to help anchor a mental image of a whole number, they can use number lines to show how a fraction (or decimal or percent) can be inserted between any two fractions, Number lines allow comparisons of fractions, decimals, and percentages and also serve as measurement or iteration models for computation.

As students develop a sense of fractions, they will also recognize that they must approach the ordering of a set of fractions such as 7/8, 3/8, 5/8, and 9/8 differently from a set such as 3/5, 3/7, 3/4, and 3/8. Such experiences provide students with the background that they need to begin finding common denominators, creating equivalent fractions, and adding and subtracting fractions. Students also need to understand what really happens when they multiply and divide fractions. Far too many students are adept at carrying out these procedures without understanding that products typically get smaller when they multiply fractions and that quotients get larger when they divide them. Experiences with rate and proportion provide middle-grades students with everyday situations that involve fractions as well as contextual links to algebra.

Proficiency with fractions is an important foundation for learning more advanced mathematics. Fractions are a student's first introduction to abstraction in mathematics and, as such, provide the best introduction to algebra in the elementary and middle school years. Time and emphasis are necessary for students to develop the links among fractions, decimals, and percents and solve problems involving their use. ∎