



## AFT EDUCATIONAL RESEARCH AND DISSEMINATION COURSE OVERVIEW

### Course: Thinking Mathematics 3: Fractions, Decimals, Ratio

#### Summary

Participants in Thinking Mathematics 3 extend the application of the Ten Principles drawn from research to work with fractions, decimals, and ratios. They examine differences between whole numbers and common and decimal fractions and why students have difficulty with the latter. They learn how students can make sense of these numbers and provide techniques to help students visualize and understand why dividing by a fraction makes a number larger and multiplying by a fraction makes a number smaller.

#### Course Content

##### *Fundamental Differences*

This unit prompts different representations and interpretations for rational numbers, examines the density of numbers between any two whole numbers, and highlights the fundamental differences between whole and rational numbers that contribute to students' common errors.

##### *Representations for Understanding Fractions and Decimals*

This unit explores concrete and other visual representations for rational numbers, and connects some representations to the recording process.

##### *Fraction Sense*

Here, the focus is on establishing number sense for common and decimal fractions, percents, and ratios. Participants work with varied representations, notations, and what constitutes a basic unit. They focus on use of benchmarks as a tool to develop a sense of relative magnitude and assess reasonableness of answers in this domain.

##### *Interpretations*

In this unit, participants learn various formal interpretations of rational numbers, identify the characteristics of each interpretation, and have an opportunity to create situational stories of each kind.

##### *Addition/Subtraction*

Participants examine various strategies for solving situational problems that require recomposition, front-end calculation, negative numbers, and mental strategies. Benchmarks assist in assessing the reasonableness of answers.

##### *Multiplication/Division*

This section clarifies the place of context, language, and notation in building meaning for multiplication and division of common and decimal fractions. Participants will develop, use, and record alternative strategies, with special attention given to the common and decimal fraction connection and the mathematics behind the traditional algorithm.

### ***Assessment Issues***

This section starts by identifying important understandings students should gain during the study of rational numbers. Participants examine student work, identify the common errors cited in research, and think about possible interventions. They learn characteristics of higher and lower-level tasks and apply that understanding. Finally, they examine student work on a rational number task and come to agreement on how to assess it.

### **Key Researchers**

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