

AGENDA**Mathematical Thinking: Representations, Procedural Fluency
Grades K–12****OUTCOMES**

This course is designed to help teachers:

- Expand their understanding of procedural fluency to include carrying out procedures flexibly, accurately, and appropriately
- Connect multiple representations for the purpose of helping all students better understand underlying mathematical ideas
- Consider students' use of tools and representations for the purpose of assessing student understanding

Opening

This introduction includes the course goals, an overview of the course, and pertinent logistical information. Participants solve a problem to consider the big ideas of the course—procedural fluency and representations.

Understanding Procedural Fluency

Procedural fluency refers to knowledge of procedures, knowledge of when and how to use them appropriately, and skill in performing them flexibly, accurately, and efficiently. In this session, participants reflect on what *flexibly* and *efficiently* mean as they engage in mental math and estimation tasks. Using their own experiences, participants consider how to use developmentally appropriate problems to support students' development of flexibility and efficiency.

BREAK**Using Tools to Develop Understanding**

Mathematical tools are used for three main purposes: to provide a convenient and permanent record of mathematical activity; to provide a way of communicating with others; and to aid thinking. This session focuses on three kinds of tools: language, materials, and symbols. In this session, participants gain more experience with the properties and relationships of figures through the use of tools and discussion of the relevant mathematical concepts. They focus on the role of teacher questioning in directing students' work with various tools in ways that support developing understanding of important mathematics.

LUNCH

Connecting Multiple Representations

In this portion of the day, participants explore multiple representations of a mathematics problem and discuss the role of representations in communicating mathematical approaches, arguments, and understandings. As participants experience how different representations highlight different aspects of the concept, they recognize that when instruction includes the use of representations that are familiar to students—relevant situations, manipulatives, pictures, spoken language, graphs, or equations—students interpret, communicate, and discuss the idea with others to make connections among these representations, and build deeper understanding of the underlying mathematics.

Closing

Teachers need opportunities to translate professional learning experiences to practical classroom application. During this session, participants reflect on the experiences of the day and plan what they will do differently in their classrooms as a result of their new or deepened understanding.

MATH SOLUTIONS GUIDING PRINCIPLES

Drawing upon academic work and our own classroom-grounded research and experience, Math Solutions has identified the following four instructional needs as absolutely essential to improving instruction and student outcomes:

- Robust Content Knowledge
- Understanding of How Students Learn
- Insight into Individual Learners through Formative Assessment
- Effective Instructional Strategies

These four instructional needs drive the design of all Math Solutions courses, consulting, and coaching. We consider them our guiding principles and strive to ensure that all educators

- Know the math they need to teach—know it deeply and flexibly enough to understand various solution paths and students’ reasoning.
- Understand the conditions necessary for learning, what they need to provide, and what students must make sense of for themselves.
- Recognize each student’s strengths and weaknesses, content knowledge, reasoning strategies, and misconceptions.
- Have the expertise to make math accessible for all students, ask questions that reveal and build understanding, and help students make sense of and solve problems.