

Math Solutions Professional Learning

AGENDA

College and Career Ready

Making Sense of Math: Reasoning and Discourse

OVERVIEW

Among the highest priorities of current state standards is for students to build a deep understanding of mathematics and use that understanding to reason about problems, make sense of new learning, and communicate their thinking to others.

This full-day course is designed to introduce participants to the processes and habits of mind students need to develop, with particular emphasis on the role of reasoning and discourse in mathematics. During this course, teachers will engage in reasoning and discourse, and discuss the implications for their students. In addition, they analyze the complexity of mathematical tasks and consider strategies for transforming grade-level tasks to increase the level of rigor.

OUTCOMES

- Discern how mathematical tasks and questions differ with respect to the level of thinking required to solve them
- Deepen understanding that learning mathematics involves students' constructing ideas and systems
- Recognize the role of productive discourse in students' mathematical reasoning and sensemaking

DEVELOPING TASKS THAT PROMOTE REASONING

For students to develop habits of mind that rely on reasoning and making sense of mathematics, teachers must provide multiple practice opportunities with mathematical tasks and questions that require students to do more than memorize a procedure or answer.

The National Council of Teachers of Mathematics (NCTM) recommends that teachers use tasks that:

- Invite exploration of important mathematical concepts
- Allow students the opportunity to solidify and extend knowledge
- Encourage students to make connections and develop a coherent framework for mathematical ideas
- Call for problem formulation, problem solving, and mathematical reasoning
- Provide more than one solution path
- Promote the development of all students' dispositions to do math

OPENING—WELCOME, LOGISTICS, AND EXPERIENCES

Participants solve a problem that introduces them to the notion of using open tasks of high cognitive demand to engage students in the processes of thinking and reasoning to make sense of mathematics.

LOGICAL REASONING AND CLASSROOM DISCOURSE

Students should believe that mathematics makes sense. In this introductory experience, participants focus on the role of teachers and students in developing a classroom environment that supports thinking, reasoning, and sensemaking as key components of mathematics instruction and learning.

ASPECTS OF LEARNING

Through a series of mathematical investigations, participants examine progressions of content across their grade-level band domains to identify the mathematical ideas about which students need to reason and make sense.

LUNCH**COMPARING MATHEMATICAL TASKS**

Participants engage in and reflect on two different mathematical tasks. They compare and contrast the two tasks, identifying characteristics of tasks that require the learner to use thinking, reasoning, and problem-solving skills.

TRANSFORMING TASKS

Using two different methods, participants practice transforming grade-level-appropriate tasks from those requiring a low level of thinking and reasoning into those that require a higher level of cognitive demand, as called for in current state standards.

REFLECTION AND CLOSING

Participants take time to reflect on the experiences of the day and the impact that these experiences will have on their classroom instruction.

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, to ask questions that reveal and build understanding, and help students make sense of and solve problems.