

AGENDA**Number and Operations
Grades K-5****OVERVIEW**

This three-day course focuses on the strands of number and operations and algebraic reasoning for students in Grades K–5. The emphasis of this course is on developing a foundation of understanding of early number concepts, the significance of place value, and the four operations. Experiences and discussions support teachers with strategies to help make the standards accessible to all students.

OUTCOMES

This course will enable participants to:

- Articulate key aspects of the standards for number and operations and algebraic reasoning for Grades K-5
- Consider instructional shifts needed to foster the depth of understanding communicated in current standards
- Describe the interconnectedness of place value and the base-ten number system to operations and algebraic thinking
- Characterize teaching strategies that exemplify mathematical processes
- Implement instructional strategies including the use of classroom discussions, small-group work, and the use of concrete materials and contexts to support students' learning

Day One**Opening**

This introduction includes the course goals, an overview of the mathematical process standards, and pertinent logistical information.

Power of Ten

Participants follow a progression of working with smaller numbers up to the strategy of making ten to add two numbers. The session uses games and routines to illustrate how to foster students' understanding of decomposition and developing "ten-ness."

BREAK

Extending Place Value: Balancing Number Puzzles

Through participation in *Balancing Number Puzzles*, participants consider the important connection between place value and computation. Students in grades 3–5 need to extend their understanding about place value with whole numbers into place value with decimals.

LUNCH

A Geometric Model for Multiplication

The *Investigating Rectangles* lesson introduces a geometric model for multiplication. Participants investigate rectangular arrays and make connections between the arrays and the multiplication chart. Participants recognize the benefit of using tools to support students' development of mathematical ideas.

BREAK

Exploring Patterns in Factors and Products

Participants investigate a series or “string” of multiplication equations for the purpose of recognizing and generalizing from patterns. It is through these generalizations that the commutative, associative, and distributive properties for multiplication emerge. Understanding these properties supports thinking strategies for gaining mastery of basic facts.

Closing

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

Day Two

Opening

Introduction to the day includes session goals and logistical information pertinent to the course.

Using Appropriate Tools Strategically: Hundred Charts

The games and routines modeled in this session highlight how the hundreds chart can strengthen students' understanding of place value and develop computation strategies by providing a conceptual framework for students to think about our base-ten number system, and to build a mental model of the mathematical structure of our number system.

BREAK

Division Computation

Participants experience a lesson that uses the book *If You Hopped Like a Frog*, by David M. Schwartz, as a context for introducing an alternative division algorithm that builds on number

sense and knowledge of multiplication of ten and multiples of ten. Participants reflect on the impact of students making sense of computation strategies as opposed to memorizing steps without meaning.

LUNCH

Using Appropriate Tools Strategically: Number Lines

In this session, participants explore the use of the open number line as an efficient tool for representing computation strategies. Participants see firsthand how number lines encourage the use of benchmark numbers, knowledge of tens and/or hundreds, and flexible approaches to addition and subtraction. They also learn how the tool helps students keep track of the different steps they used, and how it allows them to efficiently communicate their strategy to others. When considering the use of tools in lessons, participants recognize the value in highlighting connections between tools and symbols.

BREAK

True, False, and Open Sentences

Current standards call for students to perform computation using strategies based on place value, the properties of operations, and/or the relationships between operations. In this session, participants use mathematical sentences as a context for conversation about important mathematical ideas such as equivalence, number sense, and properties. They also discuss opportunities to bolster students' understanding of the equal sign and properties of operations.

Closing

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

Day Three

Opening

Introduction to the day includes session goals and logistical information pertinent to the course.

Analyzing Types of Word Problems

One way children attach meaning to operations is by manipulating concrete objects and connecting their actions to symbols. Another way to attach meaning to the operations is by solving problems in a context, such as a story problem. As they identify the types that are commonly used in instruction, they recognize the importance of exposing children to a wider variety of problem situations.

BREAK**Procedural Fluency: Alternative Algorithms**

Students need to have a variety of approaches to solving problems so that they can choose an appropriate method for solving the problem based on the numbers involved and the operations needed. During this part of the session, participants identify computation strategies that exist among group members and examine student work to recognize student strategies. They also discuss the implications this has for their instruction and consider needed shifts.

LUNCH**Linking Assessment and Instruction**

Making assessment an integral part of instruction is essential for improving the effectiveness of math instruction. The use of student work samples, vignettes of classroom discussions, and videotaped interviews provide participants the opportunity to discuss assessing conceptual understanding through observation, discussions, and work samples. Participants recognize the importance of crafting questions during lesson planning to increase students' productive math talk.

BREAK**Closing**

In this session, participants create a mind map in order to visualize, generate, structure, and classify the ideas assimilated throughout the course. This session connects back to the course outcomes so that participants are prepared to move forward as they go back to their classrooms and implement the instructional strategies and ideas modeled throughout the course.

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.