

AGENDA**Ratios and Proportional Relationships, Grades 6-8**

Two-day Course

OVERVIEW

This two-day course explores ratios, proportional relationships, and proportional reasoning, acknowledging that the ability to reason proportionally is at the forefront of the middle school mathematics curriculum. The course supports teachers with strategies to help make this content accessible to all students.

OUTCOMES

- Articulate the progression of current state standards related to ratios and proportional relationships
- Implement effective instructional strategies such as the use of real-world application, tools, and multiple representations to develop students' mathematical understanding.
- Conduct classroom discussions in ways that support students' understanding of ratios and proportional relationships
- Challenge students with rigorous tasks that build proportional reasoning and engage students in the habits of mathematical thinkers.

Day One**Opening**

During this session, participants review the course outcomes and pertinent logistical information. They engage in a proportional reasoning task to emphasize the effectiveness of such tasks in strengthening students' abilities to think, reason, and make sense of proportional situations. Participants contribute to a set of working agreements and norms that are utilized throughout the course.

Considering Aspects of Learning

The intent of current state standards is to move toward greater focus and coherence in math teaching and learning. In this session, participants identify ways to help students deepen understanding of content addressed in earlier grades while pursuing the ratio and proportion standards for the middle grades.

BREAK

Laying the Foundation of Proportional Reasoning

Participants work to enlarge puzzle pieces so that once enlarged, the new pieces are similar to the original pieces. They recognize that the ratio of two quantities remains constant as the corresponding values of the quantities change in a proportion. Following the experience, participants reflect on the roles of the teacher and students in building a classroom environment that promotes risk-taking and learning with understanding.

LUNCH**Using Tools to Develop Strategies for Solving Proportional Relationship Problems**

In this session, participants broaden their view of tools to include verbal communication, physical materials and written records. Engagement in a problem-solving task provides the opportunity to experience the impact of mathematical discourse, used in conjunction with manipulatives, on student learning. Participants consider how strategies devised by students and discussions about them prepare students to use more efficient, abbreviated procedures with understanding.

BREAK**Generalizing Attributes of Similarity Using Proportional Reasoning**

In this session, participants use coordinate graphing to model transformations and describe the effect of dilations and reflections on two-dimensional shapes. As they work, they consider how the use of carefully chosen questions provides access to, rather than undermines, the mathematical rigor of tasks.

Closing

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

Day Two**Opening**

This introduction recaps mathematical content from day one and leads into the progression of day 2 content.

Using Multiple Representations to Uncover the Structure of Proportional Relationships

Using a real-world context, participants collect data about two quantities that change in relationship to one another, and represent the data collected using tables, graphs, and equations. They use what they discover from the various representations to identify characteristics of proportional relationships.

Break

Applying Proportional Thinking to Make Predictions and Generalizations

Proportional reasoning has applications across the strands of the mathematics curriculum. In this session, participants see how proportional thinking is used to make predictions about a larger population from a smaller data set. After engaging in a mathematical experience, participants consider how to facilitate a whole group summary discussion so that students have access to the lesson learning goal and can recognize and record new learning.

Lunch**Planning Questions to Build and Reveal Understanding of Unit Rate**

This investigation provides another opportunity for participants to consider ratios and their associated rate. Participants measure objects in both centimeters and inches, represent the data in a table, graph, and equation, and use these representations to find the unit rate. As participants use multiple representations to investigate unit rate, they plan questions that support students learning and provide valuable formative assessment information.

Break**Deepening Proportional Reasoning Knowledge and Skills Through Constructive Struggle**

In this session, participants experience a proportional reasoning problem involving percentages. They communicate orally about their solutions and write to explain their thinking. As they work, participants consider the importance of constructive struggle to students' ability to build a deep understanding of ratios and proportional relationships called for in current state standards.

Closing

This session connects back to the course outcomes so that participants are prepared to implement both the instructional strategies and content lessons 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.
- Proportion is a relationship of equality between two ratios. In a proportion, the ratio of two quantities stays constant while the values of the quantities change.