

**AGENDA****Common Core State Standards Ratios and Proportional Relationships, Grades 6-8****OVERVIEW**

This three-day course explores proportionality, proportional relationships, and proportional reasoning, acknowledging that the ability to reason proportionally is at the forefront of the middle school mathematics curriculum. The course addresses the Common Core standards for ratios and proportional relationships in the middle grades, and supports teachers with strategies to help make the standards accessible to all students.

**OUTCOMES**

- Apply a fundamental understanding of Common Core State Standards Ratios and Proportional Relationships domain for Grades 6 and 7 for the purpose of planning and task selection
- Make connections between the Common Core State Standards Ratios and Proportional Relationships domain in Grades 6 and 7 and the Expressions and Equations in Grades 6 through 8
- Appraise problem-solving activities and investigations that develop proportional reasoning
- Identify proportionality in other domains of the Common Core State Standards
- Use instructional strategies that exemplify the Standards for Mathematical Practice and support students' proportional reasoning

**DAY ONE****WELCOME, INTRODUCTION, AND OVERVIEW**

This introduction includes the course goals, an overview of the Standards for Mathematical Practice, and pertinent logistical information.

**WHAT'S MY SIZE?**

This lesson serves as a problem-solving situation for proportional relationships. Participants will recognize that the ratio of two quantities remains constant as the corresponding values of the quantities change in a proportion. They will identify this ratio as the constant of proportionality.

**FRACTION ACTION**

In this session, participants describe a ratio relationship between two quantities and use ratio reasoning to solve problems, namely finding equivalent fractions.

**REFLECTION ON MORNING**

In this section of the day, participants engage in a problem that allows them to consider the misconceptions and challenges that students must overcome to begin thinking proportionally.

**LUNCH**

**RODS ACROSS THE DESK**

In this session, activities with Cuisenaire rods provide the opportunity to apply ratio and proportion concepts and skills in a problem-solving context. The activities require discussion and explanation of ideas. The comparison of rods, by thinking proportionally, will set the stage for scaling two-dimensional shapes.

**SALE, SALE, SALE!**

In this session, participants make sense of double number line diagrams as a visual representation of a part-whole relationship, as they make connections between characteristics of proportional relationships to percent situations. Throughout the session, participants practice using partitioning and benchmarks as strategies to make sense of percentages.

**DAY ONE CLOSING AND HOMEWORK**

Participants will reflect on the pedagogy, mathematics, and experiences of the day and the implications for their classroom instruction. Before dismissal, the instructor will assign homework, “Which is Juicier?”

**DAY TWO****OPENING AND HOMEWORK DISCUSSION**

This introduction recaps mathematical content from day one, provides an opportunity to review and discuss homework, and extends ideas to lead into the progression of content in day two.

**IT ALL STACKS UP**

Participants actively collect data about two quantities in a real-world problem that change in relationship to one another, and represent the data collected using tables, graphs, and equations. In the context of the investigation, participants compare and contrast two relationships and use this comparison to identify components of proportional relationships.

**PHOTOCOPY PROBLEM**

Proportional relationships involved in enlargements and reductions of geometric figures are explored in this investigation.

**LUNCH****TYPICAL ME**

Proportional reasoning has applications across the strands of the mathematics curriculum. In this session, participants see how proportional reasoning is used to make predictions and generalizations about a population that is larger than the sub-population used for a survey.

**CENTIMETERS TO INCHES**

As participants measure objects in both centimeters and inches, they examine the proportional relationship between centimeters and inches.

**DAY TWO CLOSING AND HOMEWORK**

Participants will reflect on the pedagogy, mathematics, and experiences of the day and the implications for their classroom instruction. Before dismissal, the instructor will assign homework, “Relevant Ratios.”

**DAY THREE****OPENING AND HOMEWORK DISCUSSION**

This introduction reviews mathematical content from the first two days of the course, provides an opportunity to review and discuss homework, and gives participants an opportunity to share unresolved questions.

During this opening segment, participants will discuss the ratios they generated for homework. They will examine the meanings and characteristics of these ratios to focus on the many ways ratios are a part of our everyday lives.

**PERFECT PAINT**

Manipulatives are used to develop the concept of a ratio as a multiplicative comparison of two sets. Participants use sets of cubes to model a paint sample problem.

**POOL HALL MATH**

In this investigation, participants revisit proportional reasoning in a numerical as well as geometric context. They are asked to investigate Pool Hall Math using rectangular tables. Participants are asked to predict where the ball will exit the table and how many hits will occur by the time the ball exits the table.

**LUNCH****DESIGNING FIGURES**

In this investigation, participants use coordinate graphing to model transformations. They describe the effect of dilations and reflections on two-dimensional shapes.

**REMARKABLE RECTANGLES**

Participants investigate the constants of proportionality within similar shapes as “shape ratios”, and the scale factors between pairs of similar shapes as “size ratios.” Participants will do this for a set of rectangles and use these ratios to solve problems.

**REFLECTION AND COURSE CLOSING**

In this session, participants reflect on the experiences of the course and the ways that these experiences will impact 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.