



## Grade-Level Mathematics Content Workshops

Participants will attend a series of three workshops within their grade-band groups. Workshop leaders will engage participants in hands-on activities focused on developing algebraic reasoning:

### Grade 6

Key mathematical content: ratio and rate; expressions and equations (writing, interpreting); variable; using expressions and formulas; understanding equality; using equations to model relationships between two quantities; equivalent expressions; comparing ratios

Key instructional practices: Creating and critiquing arguments; developing generalizations and conjectures; promoting student discourse; using small groups in multiple ways; creating questions to elicit critical thinking; adapting tasks; using writing in mathematics classes

The sessions for grade 6 will focus on concepts related to ratio, rate, and variable as fundamental concepts in the development of an understanding of expressions and equations. The three components of algebraic reasoning are forming, reasoning with, and applying generalizations. Participants in these sessions will—

- **discuss** the challenges of implementing, and teaching strategies for facilitating, a classroom environment conducive to student learning;
- **investigate** the connections between ratios and algebraic reasoning with expressions and equations;
- **explore** characteristics of tasks that develop generalizations about relationships between dependent and independent variables;
- **connect** concepts, multiple representations, and skills with algebraic expressions to number concepts and skills;
- **examine** and generalize multiple solution processes for equations and inequalities through student discourse; and
- **model** relationships between and among quantities with equations, inequalities, graphs, tables, diagrams, and natural language.

### Grade 7

Key mathematical content: applying proportional relationships; expressions and linear equations; scale; slope; distinguishing proportional relationships; equivalent expressions; solving problems by using algebraic expressions and equations (real world and mathematical); unit rate, including graphs on the coordinate plane; using inequalities and equations to solve problems

Key instructional practices: Creating and critiquing arguments; developing generalizations and conjectures; promoting student discourse; using small groups in multiple ways; creating questions to elicit and build critical thinking; adapting tasks; using writing in mathematics classes



The sessions for grade 7 will focus on expressions and equations as fundamental concepts in the development of an understanding of functions. The three components of algebraic reasoning are forming, reasoning with, and applying generalizations. Participants in these sessions will—

- **discuss** the challenges of implementing, and teaching strategies for facilitating, a classroom environment conducive to student learning;
- **investigate** relationships between proportional reasoning and algebraic concepts such as slope;
- **explore** the characteristics of tasks that develop generalizations about proportional and nonproportional relationships;
- **connect** concepts and multiple representations of inequalities and equations to problem-solving strategies;
- **examine** the importance and relevance of developing a relational understanding of equality through student discussions; and
- **model** unit rate through multiple representations, using student discourse to develop connections with the concept of function.

## Grade 8

Key mathematical content: linear equations and systems to solve problems; special linear equations; slope as rate of change; linear and nonlinear functions; integer exponents; defining, comparing, and evaluating functions; using functions to model relationships between quantities; graphing proportional relationships

Key instructional practices: Creating and critiquing arguments; developing generalizations and conjectures; promoting student discourse; using small groups in multiple ways; creating questions to elicit and build critical thinking; adapting tasks; using writing in mathematics classes

The sessions for grade 8 will focus on concepts related to functions that lead to an understanding of relationships among quantities represented in multiple ways. The three components of algebraic reasoning are forming, reasoning, and applying generalizations. Participants in these sessions will—

- **discuss** the challenges of implementing, and teaching strategies for facilitating, a classroom environment conducive to student learning;
- **investigate** multiple representations of functions and their connections with other domains;
- **explore** explanations and understandings related to the development of the concept of function;
- **connect** proportional reasoning and slope to representations of linear relationships, applying this reasoning to solve simultaneous equations;
- **examine** the construction of functions, with a focus on using these constructions to determine and analyze rates of change; and
- **model** multiple representations of proportional, linear, and nonlinear relationships.

## Mathematics Teaching Practices Workshops

Participants will attend a series of three workshops that focus on productive teaching practices that promote mathematical thinking in the classroom. These practices link to *Principles to Actions* and the Standards for Mathematical Practice.



### **Facilitating Effective Mathematical Discourse**

Mathematical discourse is central to meaningful learning of mathematics. Purposefully facilitated mathematical discourse builds on student thinking and leads student learning in a productive direction, supporting the Standards for Mathematical Practice with students actively engaged in explaining their reasoning and considering the mathematical explanations and strategies of their classmates. In this session, we apply the processes of selecting, sequencing, and connecting using student work from a task completed in a content session.

### **Building Student Responsibility within the Community**

Several elements are essential to establishing a classroom community that fosters student learning. In this session, we will consider group organization and dynamics, productive learning environments, student expectations, and student accountability. Through consideration of a video exemplar, implications from research and current theory, and classroom experiences, we will discuss how these elements support the Standards for Mathematical Practice and build student responsibility within the classroom community.

### **Posing Purposeful Questions**

Different types of questions can be asked in a mathematics class, each with a particular purpose. In this session, we will focus on six different types of questions, providing a structure to help participants generate other questions of this type. We will explore three ways to extend and deepen students' understandings using skill problems as the foundation for the questions. We will then look to class discussions and opportunities to enhance student discourse. These six question types support the Standards for Mathematical Practice and help create a classroom environment that promotes high student engagement and critical thinking.