Operations and Algebraic Thinking

Previously, students applied **operations** (addition, subtraction, multiplication, and division) as they worked with whole numbers. In fifth grade, they develop fluency with addition and subtraction of whole numbers and learn about multiplication and division of fractions.

Students in fifth grade develop flexibility in writing and interpreting numerical expressions. They work with expressions that include grouping symbols as they refine their use of the order of operations. Students work with whole numbers in the beginning and then progress to working with decimals and fractions.

Algebraic thinking has two components–the use of mathematical thinking tools and the study of fundamental algebraic ideas. Mathematical thinking tools include the analytical habits of mind (e.g., problem solving and reasoning skills). Algebraic ideas consist of the content domain in which mathematical thinking tools are applied. Fifth graders use their algebraic thinking skills in this domain to analyze patterns and relationships. As fourth graders, they generated numerical patterns when given one rule. Now they generate patterns given two rules, and they graph the output and make sense of the relationship it expresses.

The Grade 5 Common Core State Standards for Operations and Algebraic Thinking specify that students should–

- Write and interpret numerical expressions.
- Analyze patterns and relationships.

The following hands-on activities will help students explore the concepts of operations and algebraic thinking in meaningful ways. Using concrete models, students will more readily formulate important generalizations about numerical expressions and patterns. And by posing structured questions and encouraging discussion, teachers can help students discover and build their own understanding.