

Operations and Algebraic Thinking

The term *operations* seems rather straightforward, as it has traditionally been the focus of elementary mathematics education. **Operations** consist of the use of numbers to add, subtract, multiply, and divide.

Algebraic Thinking has two components—the development of *mathematical thinking tools* and the study of fundamental *algebraic ideas*. Mathematical thinking tools include the analytical habits of mind, such as problem solving, representation, and reasoning skills. The study of fundamental algebraic ideas consists of the content domain in which mathematical thinking tools develop.

The two components work together. Whereas mathematical thinking tools imply the application of thinking and reasoning processes, algebraic ideas comprise the “meat” for study, such as algebraic variables, expressions, and properties. In order to think logically (e.g., to use a mathematical thinking tool such as deductive reasoning), a child needs something to think about (e.g., showing why addition is commutative). When applying the most current view, which embraces the development of mathematical thinking tools, it becomes exciting to envision first grade children developing their Algebraic Thinking.

The Grade 1 Common Core State Standards for Operations and Algebraic Thinking specify that children should—

- Represent and solve problems involving addition and subtraction.
- Understand and apply properties of operations and the relationship between addition and subtraction.
- Add and subtract within 20.
- Work with addition and subtraction equations.

The following hands-on activities enable teachers to help children learn the concepts of operations and algebraic thinking in a rich and meaningful way. As children work through the activities, teachers will want to help them learn to make sense of problems and persevere at solving them when they become difficult.

To help children become proficient problem solvers, it will be important that teachers lead children to develop self-regulatory strategies, such as focusing on the critical information in a given problem, taking reasonable risks, remaining flexible, and figuring out what they know and do not know. These strategies enable children to become more sophisticated problem solvers by helping them “push through” problems when necessary.