

MATHEMATICAL THINKING

K-2

Mathematical thinking includes specific types of thinking that are unique to mathematics. These types of thinking connect content and competencies. In the field of mathematics education there are some broad types of thinking and reasoning that develop across the grades.

TYPES OF MATHEMATICAL THINKING

Problem-solving
Algebraic thinking
Additive thinking
Multiplicative thinking
Spatial reasoning
Proportional reasoning
Statistical thinking
Functional reasoning

In K-2, the focus is on developing problem-solving, algebraic thinking, spatial reasoning and additive thinking.

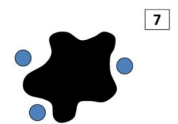
PROBLEM-SOLVING

Problem-solving is at the heart of what mathematics is. Problem-solving involves a process of understanding the problem, devising a plan (choose a strategy), carry out the plan and look back (analyze, reflect). This process was first described by George Polya in 1945 and still hold true today. Problem-solving also requires mathematical habits of mind and dispositions that include perseverance, taking risks and flexible thinking. With K-2 students, math problems may arise through play, inquiry, reading a children's book or other areas of interest. In grades 1 and 2, addition and subtraction word or story problems may be presented. Support students' problem-solving thinking by asking questions such as: *What do you know about this problem? What strategy could you try? Is there a different way you could solve this problem? How do you know this solution makes sense?*



ALGEBRAIC THINKING

Algebraic thinking is comprised of recognizing patterns, identifying relationships, making generalizations and analyzing change. With K-2 students we practice reading and creating patterns and identifying the pattern unit, begin to look at growing/increasing patterns with concrete materials and identifying the "missing part" in addition and subtraction equations. Creating math stories about building and changing quantities supports algebraic thinking as does the instructional math routine Splat!



ADDITIVE THINKING

Additive thinking builds on students' understanding of counting and number relationships. Additive thinking involves strategies such as making a ten, decomposing or compensating with numbers to add or subtract. K-2 students demonstrate fluency with being able to play with numbers in different ways and move on from "counting all" or "counting on" as a way of thinking about combining or separating quantities.



SPATIAL REASONING

Spatial reasoning is a growing area of importance in mathematics as it is directly linked to overall school success. Spatial reasoning is embedded in many areas of mathematics learning and involves dynamic processes that often involve mental imagery and visualization as we think about shape and size in space, position, perspective, and transformations of shapes. K-2 students develop spatial reasoning through block play, coding with materials and creating math stories and maps.

