# Problem Solving

**Instructional programs from prekindergarten through grade 12 should enable all students to--**

- build new mathematical knowledge through problem solving;
- solve problems that arise in mathematics and in other contexts;
- apply and adapt a variety of appropriate strategies to solve problems;
- monitor and reflect on the process of mathematical problem solving.

Problem solving is an integral part of all mathematics learning. In everyday life and in the workplace, being able to solve problems can lead to great advantages. However, solving problems is not only a goal of learning mathematics but also a major means of doing so. Problem solving should not be an isolated part of the curriculum but should involve all Content Standards.

Problem solving means engaging in a task for which the solution is not known in advance. Good problem solvers have a "mathematical disposition"--they analyze situations carefully in mathematical terms and naturally come to pose problems based on situations they see. For example, a young child might wonder, How long would it take to count to a million?

Good problems give students the chance to solidify and extend their knowledge and to stimulate new learning. Most mathematical concepts can be introduced through problems based on familiar experiences coming from students' lives or from mathematical contexts. For example, middle-grades students might investigate which of several recipes for punch giving various amounts of water and juice is "fruitier." As students try different ideas, the teacher can help them to converge on using proportions, thus providing a meaningful introduction to a difficult concept.

Students need to develop a range of strategies for solving problems, such as using diagrams, looking for patterns, or trying special values or cases. These strategies need instructional attention if students are to learn them. However, exposure to problem-solving strategies should be embedded across the curriculum. Students also need to learn to monitor and adjust the strategies they are using as they solve a problem.

Teachers play an important role in developing students' problem-solving dispositions. They must choose problems that engage students. They need to create an environment that encourages students to explore, take risks, share failures and successes, and question one another. In such supportive environments, students develop the confidence they need to explore problems and the ability to make adjustments in their problem-solving strategies.

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