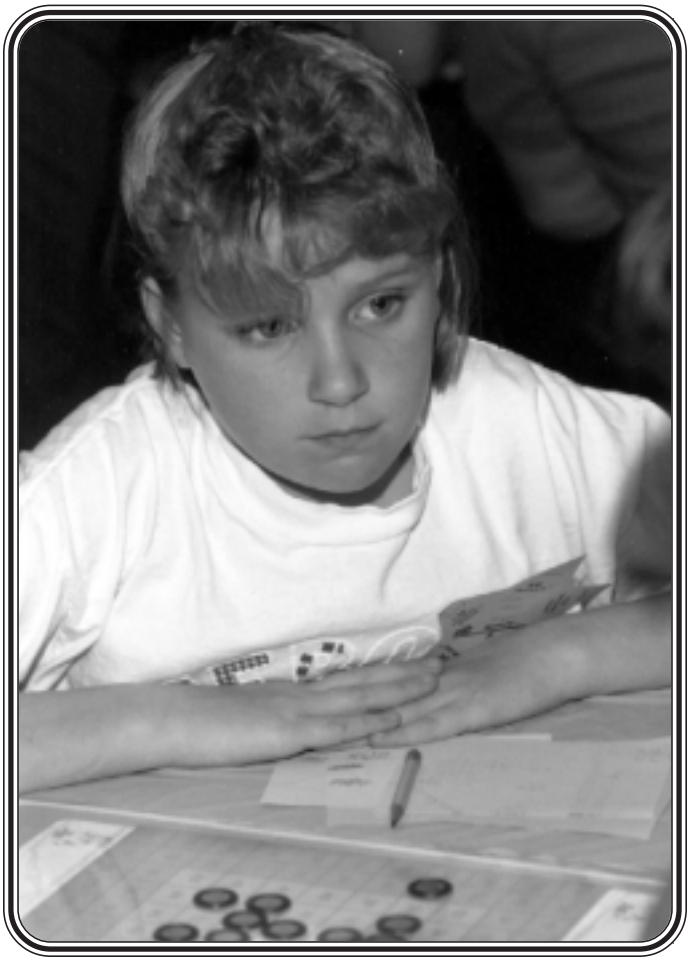
ACTIVE PROBLEM SOLVING

Routine And Nonroutine Problem Solving

Futurists continue to stress that our future is going to undergo change at a rate even greater than present generations have experienced. This implies that today's and future problems will have a dynamic component. Such problems change or evolve as they are being studied. It is evident then that a fundamental skill for dealing with the future is active problem solving, i.e., the ability to solve problems which are undergoing change during the process of resolution.

Problem solving can be divided into two categories, routine and nonroutine:

Routine problem solving stresses the use of sets of known or prescribed procedures (algorithms) to solve problems. The strength of this approach is that it is easily assessed by paper-pencil tests. Since today's computers and calculators can quickly and accurately perform the most complex arrangements of algorithms for multi-step routine problems, the typical workplace does not require a high level of proficiency in routine problem solving. However, today's workplace does require many employees to be proficient in nonroutine problem solving.



Nonroutine problem solving, stresses the use of heuristics and often requires little to no use of algorithms. Unlike algorithms, heuristics are procedures or strategies that do not guarantee a solution to a problem but provide a more highly probable method for discovering the solution. Building a model and drawing a picture of a problem are two basic problem-solving heuristics. Other heuristics include describing the problem situation, making the problem simpler, finding irrelevant information, working backwards, and classifying information.

There are two types of nonroutine problem solving situations, static and active: Static nonroutine problems

have a fixed known goal and fixed, known elements that are used to resolve the problem. Solving a jigsaw puzzle is an example of a static nonroutine problem. Given all pieces to a puzzle and a picture of the goal, learners are challenged to arrange the pieces to complete the picture. Various heuristics such as classifying the pieces by color, connecting the pieces which form the border, or connecting the pieces which form a salient feature to the puzzle, such as a flag pole, are typical ways in which people attempt to resolve such problems. Active nonroutine problem solving may have a fixed goal with changing elements, a changing goal or alternative goals with fixed elements, or changing or alternative goals with changing elements. The heuristics used in this form of problem solving are known as strategies. People who study such problems must learn to change or adapt their strategies as the problem unfolds.

The **Mathematics Pentathlon**® program provides experiences in thought processes necessary for active problem solving. The five Pentathlon games within a two-grade division level rely to a great extent on the use of strategies. The series of 20 games which comprise the **Mathematics Pentathlon** provide students with experiences in **deductive and inductive reasoning** through the repeated use of sequential thought as well as nonlinear, intuitive thinking. Such forms of thought are directly related to real-life problem-solving situations. Furthermore, the increased use of simulation games in business, industry, government and education involves these types of thinking skills. Also, the field of robotics and an ever-growing number of technologies require such abilities.

A Chart summarizing the differences between routine and nonroutine problem solving can be found by clicking on the link titled "Problem Solving Chart" found on the home page.