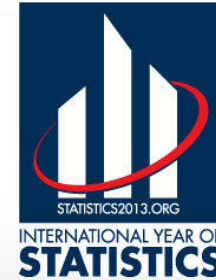




ANNUAL CONFERENCE ON
APPLIED MATHEMATICS AND INFORMATICS



Problem Solving Strategies in Mathematics and Computer Science

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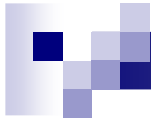
Department of Mathematics and Computer Science

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Introduction

- Ways of Thinking
- Introduction to algorithms
- Data structures
- Breaking problems down [Dynamic programming, Divide and Conquer]
- Graph Algorithms
- Combinatorial Search and Heuristic Methods
- Intractable problems & Approximations
- Nature inspired approaches



Ways of ...

- Exact methods ...
- Approximate methods ...
- Probabilistic and statistic methods ...
- Binary, multi-value, fuzzy & intuitionistic-fuzzy approaches ...
- Uncertainty versus imprecision ...
- Complexity management ...
- Sequential versus parallel, distributed ...



General Problem Solving Strategies

by WIKI (http://en.wikipedia.org/wiki/Problem_solving)

The following techniques are usually called *problem-solving strategies*:

- Abstraction: solving the problem in a model of the system before applying it to the real system
- Analogy: using a solution that solves an analogous problem
- Brainstorming: (especially among groups of people) suggesting a large number of solutions or ideas and combining and developing them until an optimum is found
- Divide and conquer: breaking down a large, complex problem into smaller, solvable problems
- Hypothesis testing: assuming a possible explanation to the problem and trying to prove (or, in some contexts, disprove) the assumption
- Lateral thinking: approaching solutions indirectly and creatively
- Means-ends analysis: choosing an action at each step to move closer to the goal
- Method of focal objects: synthesizing seemingly non-matching characteristics of different objects into something new
- Morphological analysis: assessing the output and interactions of an entire system
- Proof: try to prove that the problem cannot be solved. The point where the proof fails will be the starting point for solving it
- Reduction: transforming the problem into another problem for which solutions exist
- Research: employing existing ideas or adapting existing solutions to similar problems
- Root cause analysis: identifying the cause of a problem
- Trial-and-error: testing possible solutions until the right one is found



Problem Solving Strategies in Mathematics

- MTCL - Make a Table, Chart or List,
- ForUse - Use a Formula
- CoSim - Compute or Simplify
- MMD - Make a Model or Diagram
- GCR - Guess, Check & Revise
- SimCase - Consider a Simpler Case
- Eli - Eliminate
- L4P - Look for Patterns



Introductions to algorithmic problems -> Computer Science

- On Data Structures
- Numerical Problems
- Combinatorial problems
- Graph problems: Polynomial time & Hard problems
- Computational Geometry
- Set & String problems



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