

Computational Thinking is Critical Thinking + Computing

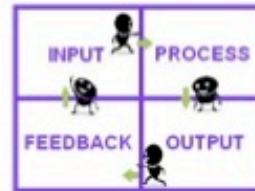
ISTE + CSTA OPERATIONAL DEFINITION OF COMPUTATIONAL THINKING (CT)

CT is a problem solving process:

- Formulating problems so computer can help solve
- Logically organizing and analyzing data
- Algorithmic thinking – series of ordered steps
- Implementing possible solutions to find most effective combination of steps
- Generalizing and transferring problem solving process to other problems

Attitudes enhanced by CT:

- Confidence in dealing with complexity
- Persistence in working with difficult problems
- Ability to deal with open-ended problems
- Ability to communicate and work with others to achieve a common goal



Core Computational Thinking Concepts

1. **Data Collection** ☞ Process of gathering appropriate information
2. **Data Analysis** ☞ Making sense of data, finding patterns, and drawing conclusions
3. **Data Representation** ☞ Depicting and organizing data in appropriate graphs, charts, words, or images
4. **Problem Decomposition** ☞ Breaking down tasks into smaller, manageable parts
5. **Abstraction** ☞ Reducing complexity to define main idea
6. **Algorithms & Procedures** ☞ Series of ordered steps taken to solve a problem or achieve some end
7. **Automation** ☞ Having computers or machines do repetitive or tedious tasks
8. **Simulation** ☞ Representation or model of a process. Running experiments using models.
9. **Parallelization** ☞ Organize resources to simultaneously carry out tasks to reach a common goal.

Past Categories Math	New Math K-5	Common Core K-5	TA Categories (from ISTE)
Number, operation, and quantitative reasoning	Mathematical process standards	Counting/Cardinality, Numbers/Operations	Creative thinking and innovative processes
Underlying processes and mathematical tools	Number and operations	Number & Operations in Base Ten	Collaboration and communication
Patterns, relationships, and algebraic thinking	Algebraic reasoning	Operations and Algebraic Thinking	Acquire and analyze digital content
Measurement	Geometry and measurement	Measurement and Data	Critical thinking skills and problem solving skills
Geometry and spatial reasoning	Data analysis	Geometry	Safe, responsible, legal, ethical behavior
Probability and statistics	Personal financial literacy		Technology systems, concepts, and operations

From ISTE, <http://www.iste.org/learn/computational-thinking>
 Standards Summary from Karen North, knorth@wt.net, www.build-a-brain.com