CS Standards Crosswalk with CSTA K-12 Computer Science Standards for Resources

http://csta.acm.org/Curriculum/sub/K12Standards.html

CS Resources Name	Google's Exploring Computational Thinking
Website	http://www.google.com/edu/computational-thinking/ Links to all lessons can be found at: http://www.google.com/edu/computational-thinking/lessons.html
Contact Info	Phil Wagner: pwagner@google.com
Please indicate whether your standards are:	**State ☐ District ☐ School ☐ Institution ☐ Curriculum Provider ☒**

Note: Unless otherwise specified, if multiple lessons are listed for a CSTA standard, any one of the listed lessons is considered to be sufficient for meeting the CSTA standard.

CSTA Standard Level/ Grade Level	Strand	CSTA Standard	Resource Name - Location
Level 1 (recommended for grades K–6)			
Level 1/ K-3	Computational Thinking	Recognize that software is created to control computer operations.	
Level 1/ K-3	Computational Thinking	Demonstrate how 0s and 1s can be used to represent information.	

Level 1/ 3-6	Computational Thinking	Understand and use the basic steps in algorithmic problem-solving (e.g., problem statement and exploration, examination of sample instances, design, implementation and testing).	• Ciphering a Sentence - https://docs.google.com/a/google.com/document/d/14pzsXHABr3mIplbN_3Bc6RuZ8XzOiY0YqDNItse64Zo/edit • Machine Testing - https://docs.google.com/a/google.com/document/d/1KhmnubhZdvSmwc32WKBUbEJk3ykcWW4Sse-GoN1o4zA/edit • Guessing Game - https://docs.google.com/a/google.com/document/d/1MiBS1UQgeFRV-OVgesOzxF9QoecaVvGD_rmU0gWi5LM/edit • Indefinite Articles - https://docs.google.com/a/google.com/document/d/1h5-Fp0yxTcpeFRA48OJtkGvT2DHOHIK-6Q2hrXFyCrY/edit • Mystery Word X - https://docs.google.com/a/google.com/document/d/1W-ILKSLHkqRe5ET38wGuxv0acIRmfQNvbZz7ZkfuAkA/edit • Present Participle - https://docs.google.com/a/google.com/document/d/1QTPSdSk2nhXYXQd03tNH7uUSzQpG2Aaid7ljk7IqPwU/edit
Level 1/ 3-6	Computational Thinking	Develop a simple understanding of an algorithm (e.g., search, sequence of events or sorting) using computer-free exercises.	• Ciphering a Sentence - https://docs.google.com/a/google.com/document/d/14pzsXHABr3mIplbN_3Bc6RuZ8XzOiY0YqDNItse64Zo/edit
Level 1/ 3-6	Computational Thinking	Demonstrate how a string of bits can be used to represent alphanumeric information.	
Level 1/ 3-6	Computational Thinking	Describe how a simulation can be used to solve a problem.	
Level 1/ 3-6	Computational Thinking	Make a list of sub-problems to consider while addressing a larger problem.	
Level 1/ 3-6	Computational Thinking	Understand the connections between computer science and other fields.	

CSTA Standard Level/ Grade Level	Strand	CSTA Standard	Resource Name - Location
Level 2 (recommended for grades 6–9) Computer Science and Community			
Level 2/ 6-9	Computational Thinking	Use the basic steps in algorithmic problem-solving to design solutions (e.g., problem statement and exploration, examination of sample instances, design, implementing a solution, testing and evaluation).	• Stochastic and Deterministic Modeling - https://docs.google.com/document/d/1NhgA1Zk5vWxICMgtCAMag0P2-OcEGH1n3g95qR8BiSQ/edit The CSTA standard is partially met by the activities in this lesson.
Level 2/ 6-9	Computational Thinking	Describe the process of parallelization as it relates to problem solving.	
Level 2/ 6-9	Computational Thinking	Define an algorithm as a sequence of instructions that can be processed by a computer.	• Functions and Algorithms - https://docs.google.com/a/google.com/document/d/1Nti9clzwIK8F8iH5nd_ILuV1M1VZvq5fQ2TCbcOorvM/edit
Level 2/ 6-9	Computational Thinking	Evaluate ways that different algorithms may be used to solve the same problem.	
Level 2/ 6-9	Computational Thinking	Act out searching and sorting algorithms.	
Level 2/ 6-9	Computational Thinking	Describe and analyze a sequence of instructions being followed (e.g., describe a character's behavior in a video game as driven by rules and algorithms).	• Functions and Algorithms - https://docs.google.com/a/google.com/document/d/1Nti9clzwIK8F8iH5nd_ILuV1M1VZvq5fQ2TCbcOorvM/edit
Level 2/ 6-9	Computational Thinking	Represent data in a variety of ways including text, sounds, pictures and numbers.	• Using Data from Sensors - https://docs.google.com/a/google.com/document/d/1ssgpHJvakOqm0nwY-fgn_iaYxrDuuoWQhlNB0nTJ4ro/edit • What is Data - https://docs.google.com/a/google.com/document/d/1POUDkpBZphwHsE2TYEsa-vEXIWIZrjlO0DWpfXjrxyc/edit • Visualizing Westward Expansion - https://docs.google.com/a/google.com/document/d/1k0n6B8fJMPAGdLIRCdXn790vqKIyrqTZfP8CJvcS-ls/edit
Level 2/ 6-9	Computational Thinking	Use visual representations of problem states, structures and data (e.g., graphs, charts, network diagrams, flowcharts).	• Using Data from Sensors - https://docs.google.com/a/google.com/document/d/1ssgpHJvakOqm0nwY-fgn_iaYxrDuuoWQhlNB0nTJ4ro/edit

			• Working with Large Tables of Data - https://docs.google.com/a/google.com/document/d/1c5t0hMy-d3myB8bduTDcF5VeQGb_Lfhw8TeI80mlqlk/edit • Surveying and Estimating Large Quantities - https://docs.google.com/a/google.com/document/d/1uo228qncwZqJkNe09MoycQVo5AzC5haSt9Wuc0gsrJI/edit • Analyzing Discrete and Continuous Data in a Spreadsheet - https://docs.google.com/a/google.com/document/d/1pHDNnqfCB0wecBGNPrmcDhwAitU3a54VBl-pylP_0CE/edit • Analyzing Discrete and Continuous Data on a Map - https://docs.google.com/a/google.com/document/d/1vG_UoXxmfC5TLvZ9pmG8YPDBJwATD-gcYI6xrjA1M3w/edit • Fraction Addition and Common Denominators - https://docs.google.com/a/google.com/document/d/1p-LbyZ_uuuDaqn7h4xklfQSqKfXgl3Ze_D9NASAt0iw/edit • Combinations with Repeats - https://docs.google.com/a/google.com/document/d/1Ic47L_v0qY7g3gr58Jv7kWH4-s9YqeUKW5TyyD0NzbA/edit • Sorting the World's Cities with Excel - https://docs.google.com/a/google.com/document/d/1JT8yTMuQLnOFpMdVvIgO0C64osoBq8JiYvyLkL0RFro/edit
Level 2/ 6-9	Computational Thinking	Interact with content-specific models and simulations (e.g., ecosystems, epidemics, molecular dynamics) to support learning and research.	• Modeling in Biology - https://docs.google.com/a/google.com/document/d/1WGqXEZyVdqDkSut1qDhP7A4eMuuS_BZFjYKRU5_G0rw/edit
Level 2/ 6-9	Computational Thinking	Evaluate what kinds of problems can be solved using modeling and simulation.	• Stochastic and Deterministic Modeling - https://docs.google.com/document/d/1NhgA1Zk5vWxICMgtCAMag0P2-OcEGH1n3g95qR8BiSQ/edit
Level 2/ 6-9	Computational Thinking	Analyze the degree to which a computer model accurately represents the real world.	• Continuous vs Discrete Data - https://docs.google.com/a/google.com/document/d/1sXQ-dqSPyoHTi5FHqCaCHaql8yxssMbf2mSiVo199S4/edit
Level 2/ 6-9	Computational Thinking	Use abstraction to decompose a problem into sub problems.	• Multiplying by Numbers between Zero and One - https://docs.google.com/a/google.com/document/d/1fVkEDKc28Z3yTvaHwQsMGt5qV1YxTwscJfEr8p4lG28/edit
Level 2/ 6-9	Computational Thinking	Understand the notion of hierarchy and abstraction in computing including high level languages, translation, instruction set and logic circuits.	
Level 2/ 6-9	Computational Thinking	Examine connections between elements of mathematics and computer science including binary numbers, logic, sets and functions.	Mathematical concepts are included throughout these lessons. Here are a few examples: • Logic: Randomness in Stochastic Models - https://docs.google.com/document/d/1t6fjSEJFSgiIy4Oad8aAGK1FgrK6pdA3kNJYzUaTeeM/edit • Sets: Ex: Combinations with Repeats - https://docs.google.com/document/d/1Ic47L_v0qY7g3gr58Jv7kWH4-s9YqeUKW5TyyD0NzbA/edit

			• Functions and Algorithms - https://docs.google.com/document/d/1Nti9clzwIK8F8iH5nd_ILuV1M1VZvg5fQ2TCbcOorvM/edit The CSTA standard is partially met by the activities in these lessons.
Level 2/ 6-9	Computational Thinking	Provide examples of interdisciplinary applications of computational thinking.	This collection includes lessons in a broad range of curriculum areas; it is searchable by core subject area, specific subject, and grade level. Here are a few examples: • English Language Arts: The Present Participle - https://docs.google.com/document/d/1QTPSdSk2nhXYXQd03tNH7uUSzQpG2Aaid7ljk7IqPwU/edit • History Social Science: Finding Patterns in Spelling Errors and History - https://docs.google.com/document/d/1G_90nccOmCkoy8H34dOhSuweDsxbb3GTwCgTrIQ_-tU/edit • Mathematics: Area of a Circle - https://docs.google.com/document/d/1Wo057nM83pz_M2u9AVBzdWm7vHGxJyfwkfyH0JD8WHA/edit • Science: Modeling in Physics with Computational Thinking - https://docs.google.com/document/d/1MRA-c-nIGyi9auwK7muDK6o2JQGGnzBgohzfi4eyNQg/edit

CSTA Standard Level/ Grade Level	Strand	CSTA Standard	Resource Name - Location
Level 3 (recommended for grades 9–12) Applying ***Level 3A:*** (recommended for grades 9 or 10) ***Computer Science in the Modern World***			
Level 3A/ 9-12	Computational Thinking	Use predefined functions and parameters, classes and methods to divide a complex problem into simpler parts.	
Level 3A/ 9-12	Computational Thinking	Describe a software development process used to solve software problems (e.g., design, coding, testing, verification).	
Level 3A/ 9-12	Computational Thinking	Explain how sequence, selection, iteration, and recursion are building blocks of algorithms.	
Level 3A/ 9-12	Computational Thinking	Compare techniques for analyzing massive data collections.	• Sorting Data - https://docs.google.com/a/google.com/document/d/13lx_cZdWuOjcrJsn4kpMibs0zy-Xr43QXeG3aSzniMA/edit • Sorting the World's Cities with Python - https://docs.google.com/a/google.com/document/d/1udkKvzNhvNsUEKp4iy0scZUwB2E8gPu-nZ4jeU1QjQo/edit The CSTA standard would be met with the combination of **Sorting Data** and **Sorting the World's Cities with Python**, including the comparison in the second lesson. The following lesson has enabling activities that could be early steps in the learning process that would lead to meeting the standard: • Working with Large Tables of Data - https://docs.google.com/a/google.com/document/d/1c5t0hMy-d3myB8bduTDcF5VeQGb_Lfhw8TeI80mlqlk/edit
Level 3A/ 9-12	Computational Thinking	Describe the relationship between binary and hexadecimal representations.	

Level 3A/ 9-12	Computational Thinking	Analyze the representation and trade-offs among various forms of digital information.	
Level 3A/ 9-12	Computational Thinking	Describe how various types of data are stored in a computer system.	
Level 3A/ 9-12	Computational Thinking	Use modeling and simulation to represent and understand natural phenomena.	• Modeling in Physics - https://docs.google.com/document/d/1MRA-c-nIGyi9auwK7muDK6o2JQGGnzBgohzfi4eyNQg/edit • Modeling in Chemistry - https://docs.google.com/a/google.com/document/d/1Zh63H3W3GRufVm2LNp1zt1xB9IaqjtLhfICLN5aP0U8/edit • Randomness in Stochastic Models - https://docs.google.com/a/google.com/document/d/1t6fjSEJFSgiIy4Oad8aAGK1FgrK6pdA3kNJYzUaTeeM/edit The following lesson has enabling activities that could be early steps in the learning process that would lead to meeting the standard: • Modeling in Biology - https://docs.google.com/a/google.com/document/d/1WGqXEZyVdgDkSut1qDhP7A4eMuuS_BZFjYKRU5_G0rw/edit
Level 3A/ 9-12	Computational Thinking	Discuss the value of abstraction to manage problem complexity.	
Level 3A/ 9-12	Computational Thinking	Describe the concept of parallel processing as a strategy to solve large problems.	
Level 3A/ 9-12	Computational Thinking	Describe how computation shares features with art and music by translating human intention into an artifact.	

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Level 3B: (recommended for grades 10 or 11) ***Computer Science Concepts and Practices***			
Level 3B/ 9-12	Computational Thinking	Classify problems as tractable, intractable, or computationally unsolvable.	
Level 3B/ 9-12	Computational Thinking	Explain the value of heuristic algorithms to approximate solutions for intractable problems.	
Level 3B/ 9-12	Computational Thinking	Critically examine classical algorithms and implement an original algorithm.	
Level 3B/ 9-12	Computational Thinking	Evaluate algorithms by their efficiency, correctness, and clarity.	• Measuring the Complexity of a Function or Algorithm - https://docs.google.com/document/d/1mBRoeS7oe1C87Mk-x2X28Kto5K9_Z1Hebjq4weShrsg/edit The CSTA standard is partially met by the activities in this lesson.
Level 3B/ 9-12	Computational Thinking	Use data analysis to enhance understanding of complex natural and human systems.	• Finding Patterns in Spelling Errors and History - https://docs.google.com/document/d/1G_90nccOmCkoy8H34dOhSuweDsxbb3GTwCgTrIQ_-tU/edit • Correlation vs Causation - https://docs.google.com/a/google.com/document/d/1_3pp2cWwEvGI8W7BnwKGuYZ2i9iNs8agYKyIzfdkwNw/edit • Energy Analysis - https://docs.google.com/a/google.com/document/d/1YSJbfV7fJc6NNXjrdXYdlYAfClxyRcQZdaCm6lKAOMs/edit
Level 3B/ 9-12	Computational Thinking	Compare and contrast simple data structures and their uses (e.g., arrays and lists).	
Level 3B/ 9-12	Computational Thinking	Discuss the interpretation of binary sequences in a variety of forms (e.g., instructions, numbers, text, sound, image).	
Level 3B/ 9-12	Computational Thinking	Use models and simulations to help formulate, refine, and test scientific hypotheses.	• Area of a Circle - https://docs.google.com/a/google.com/document/d/1Wo057nM83pz_M2u9AVBzdWm7vHGxJyfwkfyH0JD8WHA/edit

			• Energy Analysis - https://docs.google.com/a/google.com/document/d/1YSJbfV7fJc6NNXjrdXYdlYAfClxyRcQZdaCm6lKAOMs/edit • Aggregation and Decomposition - https://docs.google.com/a/google.com/document/d/1pJ3FWtE96HvoY8FXeunLmEikJlVdHL1SJm7m3RKaLyQ/edit The following lesson has enabling activities that could be early steps in the learning process that would lead to meeting the standard: • Cell Biology Filter Design and Construction - https://docs.google.com/a/google.com/document/d/1_eJhjjsNQA0Za9B4BuAeXlMV3wgimgItgbmZfFlKQlc/edit
Level 3B/ 9-12	Computational Thinking	Analyze data and identify patterns through modeling and simulation.	• Modeling in Chemistry - https://docs.google.com/a/google.com/document/d/1Zh63H3W3GRufVm2LNp1zt1xB9IaqjtLhfICLN5aP0U8/edit • Modeling in Biology - https://docs.google.com/a/google.com/document/d/1WGqXEZyVdgDkSut1qDhP7A4eMuuS_BZFjYKRU5_G0rw/edit • Application and Modeling of Standard Deviation - https://docs.google.com/a/google.com/document/d/1QCI4n_-G6g6iTBNeu1qaaz6R95HvQ3VD4a95g0bUETo/edit The following lesson has enabling activities that could be early steps in the learning process that would lead to meeting the standard: • Linear Association - https://docs.google.com/a/google.com/document/d/19Fb9CnWLXTcIeemRhjsjzouYtEFzxa-1XPNaYBFPKe0/edit
Level 3B/ 9-12	Computational Thinking	Decompose a problem by defining new functions and classes.	
Level 3B/ 9-12	Computational Thinking	Demonstrate concurrency by separating processes into threads and dividing data into parallel streams.	