

## DRAFT 2016 CSTA K-12 CS Standards: Level 1 (Grades K-5)

The 2011 CSTA K-12 CS Standards were categorized into five conceptual strands (Computational Thinking, Collaboration, Computing Practice & Programming, Computer & Communication Devices; and Community, Global & Ethical Impacts). The DRAFT 2016 CSTA K-12 CS Standards are categorized into five concepts of the K-12 CS Framework, which is currently under development (Computing Devices & Systems, Networks & Communication, Programs & Algorithms, Data & Information, and Impacts of Computing). There is some overlap between strands and concepts, but they are not identical.

Grade(s)	Draft CSTA 2016 K-12 CS Standard	K-12.org Framework Concept	K-12.org Framework Practice
K-2	Locate and identify (using accurate terminology) computing, input, and output devices in a variety of environments (e.g., desktop and laptop computers, tablets, smart devices, monitors, keyboards, mouse, printers, etc.). (Grades K-2)	COMPUTING DEVICES & SYSTEMS	COMMUNICATING ABOUT & WITH COMPUTING
K-2	Demonstrate how to operate a variety of computing devices (e.g. turn on, navigate, open programs or apps, etc.). (Grades K-2)	COMPUTING DEVICES & SYSTEMS	COMMUNICATING ABOUT & WITH COMPUTING
K-2	Recognize that software is created to control computer operations. (Grades K-2)	COMPUTING DEVICES & SYSTEMS	COMMUNICATING ABOUT & WITH COMPUTING
3-5	Explain ethical issues that relate to computers and networks (e.g., equity of access, security, privacy, copyright, and intellectual property). (Grades 3-5)	COMPUTING DEVICES & SYSTEMS	CONNECTING COMPUTING TO CONTEXTS & CULTURES
3-5	Build or program with robotics or other physical computing devices to demonstrate that computers model intelligent behavior. (3-5) Examples could include robots programmed with sensors to respond to user input, avoid obstacles, detect boundaries, or seek specific objects. (Grades 3-5)	COMPUTING DEVICES & SYSTEMS	CREATING COMPUTATIONAL ARTIFACTS
K-5	Identify, using accurate terminology, simple hardware and software problems that may occur during use and apply strategies for solving these problems (e.g., rebooting the device, checking the power, able to access the network, read error messages and discuss them peers and adults, etc.). (Grades K-5)	COMPUTING DEVICES & SYSTEMS	TESTING & ITERATIVE REFINEMENT

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Grade(s)	Draft CSTA 2016 K-12 CS Standard	K-12.org Framework Concept	K-12.org Framework Practice
K-2	Classify and arrange (sort) information into useful order (such as sorting students by birth date) without using a computer. (Grades K-2)	DATA & INFORMATION	CONNECTING COMPUTING TO CONTEXTS & CULTURES
3-5	Gather, manipulate, and evaluate data to explore a real world problem that is of interest to the student. (Grades 3-5)	DATA & INFORMATION	DESIGNING & REPRESENTING COMPUTATIONAL PROBLEMS
3-5	Use outcome data (results) from running a simulation to solve a problem or answer a question in a core subject area, either individually or collaboratively. (Grades 3-5)	DATA & INFORMATION	DESIGNING & REPRESENTING COMPUTATIONAL PROBLEMS
K-2	Demonstrate that computers save information as data that can be stored, searched, retrieved, modified, and deleted. Clarification: Student can demonstrate this by using any application that stores data and allows retrieval, modification, and deletion. The idea of the information being data should be explicitly called out. (Grades K-2)	DATA & INFORMATION	DEVELOPING ABSTRACTIONS
K-2	Explain that networks, like the Internet, link people using computers and other computing devices allowing them to communicate, access and share information. (Grades K-2)	DATA & INFORMATION	DEVELOPING ABSTRACTIONS
3-5	Understand how computers store data (e.g. binary, hexadecimal, RGB). (Grades 3-5)	DATA & INFORMATION	DEVELOPING ABSTRACTIONS

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Grade(s)	Draft CSTA 2016 K-12 CS Standard	K-12.org Framework Concept	K-12.org Framework Practice
K-2	Understand that a wide range of jobs require knowledge or use of computer science. (Grades K-2)	IMPACTS OF COMPUTING	CONNECTING COMPUTING TO CONTEXTS & CULTURES
K-5	Practice responsible digital citizenship (legal and ethical behaviors) in the use of technology systems and software. (Grades K-5)	IMPACTS OF COMPUTING	CONNECTING COMPUTING TO CONTEXTS & CULTURES
3-5	Describe the connections between computer science and other fields. (Grades 3-5)	IMPACTS OF COMPUTING	CONNECTING COMPUTING TO CONTEXTS & CULTURES
3-5	Generate examples of how computing can affect society, and also how societal values should shape computing choices. (Grades 3-5)	IMPACTS OF COMPUTING	CONNECTING COMPUTING TO CONTEXTS & CULTURES
3-5	Evaluate the positive and negative impacts of the pervasiveness of computers and computing in daily life (e.g., downloading videos and audio files, electronic appliances, wireless Internet, mobile computing devices, GPS systems, Internet of Things, wearable computing). (Grades 3-5)	IMPACTS OF COMPUTING	CONNECTING COMPUTING TO CONTEXTS & CULTURES

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3-5	Demonstrate how a device on a network sends and receives information. (Grades 3-5)	NETWORKS & COMMUNICATIONS	DEVELOPING ABSTRACTIONS
3-5	Identify and understand ways that teamwork and collaboration can support problem solving and the software design cycle. (Grades 3-5)	PROGRAMS & ALGORITHMS	COLLABORATION WITH COMPUTING
K-5	Construct and test problem solutions using a block-based visual programming language, both independently and collaboratively (e.g. pair programming). (Grades K-5)	PROGRAMS & ALGORITHMS	CREATING COMPUTATIONAL ARTIFACTS
K-2	Create a design document to illustrate thoughts, ideas, and stories in a sequential (step-by-step) manner. (Grades K-2)	PROGRAMS & ALGORITHMS	DESIGNING & REPRESENTING COMPUTATIONAL PROBLEMS
3-5	Generate a list of sub-problems to consider while addressing a larger problem. (Grades 3-5)	PROGRAMS & ALGORITHMS	DESIGNING & REPRESENTING COMPUTATIONAL PROBLEMS
3-5	Understand that computer program design is an iterative process that includes the following steps: Define the problem, generate ideas, build a program, test the program, improve the program. (Grades 3-5)	PROGRAMS & ALGORITHMS	DESIGNING & REPRESENTING COMPUTATIONAL PROBLEMS
K-5	Construct an algorithm (set of step-by-step instructions) to accomplish a task, both independently and collaboratively. (Grades K-5)	PROGRAMS & ALGORITHMS	DEVELOPING ABSTRACTIONS
K-5	Evaluate and debug the sequencing in an algorithm. (Grades K-5)	PROGRAMS & ALGORITHMS	TESTING & ITERATIVE REFINEMENT

## DRAFT 2016 CSTA K-12 CS Standards: Level 2 (Grades 6-8)

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Grade(s)	Draft CSTA 2016 K-12 CS Standard	K-12.org Framework Concept	K-12.org Framework Practice
6-8	Compare and contrast the capabilities of different hardware and software in computer systems (e.g., processors, display types, input devices, communication and storage capabilities). (Grades 6-8)	COMPUTING DEVICES & SYSTEMS	COMMUNICATING ABOUT & WITH COMPUTING
6-8	Exemplify how computational devices impact the quality of life (both positively and negatively) and enhance the ability of people to perform work, communicate and interact with others. (Grades 6-8)	COMPUTING DEVICES & SYSTEMS	CONNECTING COMPUTING TO CONTEXTS & CULTURES
6-8	Compare and contrast the ways that humans and machines process instructions and sense the world. (Grades 6-8)	COMPUTING DEVICES & SYSTEMS	DEVELOPING ABSTRACTIONS
6-8	Differentiate features of everyday objects that contain computing components (i.e., devices that collect, store, analyze, and/or transmit data; e.g., microwave, smartphone, flash drive). (Grades 6-8)	COMPUTING DEVICES & SYSTEMS	DEVELOPING ABSTRACTIONS
6-8	Apply troubleshooting strategies for solving hardware and software problems (e.g., fixing problems with components of tangible computing and robotics). (Grades 6-8)	COMPUTING DEVICES & SYSTEMS	TESTING & ITERATIVE REFINEMENT
6-8	Describe the trade-off between quality and file size of stored data (e.g., music, video, text, images). (Grades 6-8)	DATA & INFORMATION	COMMUNICATING ABOUT & WITH COMPUTING
6-8	Defend the selection of the data, collection, and analysis needed to answer a question. (Grades 6-8)	DATA & INFORMATION	COMMUNICATING ABOUT & WITH COMPUTING

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Grade(s)	Draft CSTA 2016 K-12 CS Standard	K-12.org Framework Concept	K-12.org Framework Practice
6-8	List negative and positive impacts of data collection that is used to make recommendations and predictions of behavior. (Grades 6-8)	DATA & INFORMATION	CONNECTING COMPUTING TO CONTEXTS & CULTURES
6-8	Encode and decode information using encryption / decryption schemes. (e.g., Morse code, Unicode, binary, symbols, student-created codes). (Grades 6-8)	DATA & INFORMATION	DEVELOPING ABSTRACTIONS
6-8	Identify layers of abstraction in different contexts (e.g., video and animation are made of audio and frames made of pixels, made of color codes). (Grades 6-8)	DATA & INFORMATION	DEVELOPING ABSTRACTIONS

6-8	Summarize security risks associated with using weak passwords, lack of encryption and/or insecure transactions. (Grades 6-8)	IMPACTS OF COMPUTING	COMMUNICATING ABOUT & WITH COMPUTING
6-8	Explain how computer science fosters innovation and enhances other careers and disciplines. (Grades 6-8)	IMPACTS OF COMPUTING	COMMUNICATING ABOUT & WITH COMPUTING
6-8	Summarize current events and changes resulting from computing and their effects on education, the workplace, and society. (Grades 6-8)	IMPACTS OF COMPUTING	CONNECTING COMPUTING TO CONTEXTS & CULTURES
6-8	Describe ethical issues that relate to computers and networks (e.g., equity of access, security, privacy, ownership and information sharing). (Grades 6-8)	IMPACTS OF COMPUTING	CONNECTING COMPUTING TO CONTEXTS & CULTURES

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6-8	Exemplify how the Internet impacts global communication and collaboration (including cloud computing, social/economic impacts). (Grades 6-8)	IMPACTS OF COMPUTING	CONNECTING COMPUTING TO CONTEXTS & CULTURES
6-8	Design, develop, and present computational artifacts (e.g., web pages, mobile applications, animations) that have a positive social impact. (Grades 6-8)	IMPACTS OF COMPUTING	CREATING COMPUTATIONAL ARTIFACTS
6-8	Predict the potential social impacts of a computational artifact (student-created app or webpage), both positive and negative (e.g. economic, entertainment, education, political). (Grades 6-8)	IMPACTS OF COMPUTING	CREATING COMPUTATIONAL ARTIFACTS
6-8	Redesign user interfaces (in e.g., web pages, mobile applications, animations) to be more inclusive, without bias, and accessible. (Grades 6-8)	IMPACTS OF COMPUTING	TESTING & ITERATIVE REFINEMENT
6-8	Simulate the flow of information as packets on the Internet and networks. (Grades 6-8)	NETWORKS & COMMUNICATION	COMMUNICATING ABOUT & WITH COMPUTING
6-8	Compare and contrast the trade-offs between physical (wired), wireless, and mobile networks (e.g., speed, security, and cost). (Grades 6-8)	NETWORKS & COMMUNICATION	COMMUNICATING ABOUT & WITH COMPUTING

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Grade(s)	Draft CSTA 2016 K-12 CS Standard	K-12.org Framework Concept	K-12.org Framework Practice
6-8	Solicit, evaluate, and integrate peer feedback as appropriate to develop or refine a solution. (Grades 6-8)	PROGRAMS & ALGORITHMS	COLLABORATION WITH COMPUTING
6-8	Compare different algorithms that may be used to solve the same problem by time, space, or efficiency. (Grades 6-8)	PROGRAMS & ALGORITHMS	COMMUNICATING ABOUT & WITH COMPUTING
6-8	Interpret, modify, and analyze content-specific models (e.g., ecosystems, epidemics, spread of ideas) used to run simulations. (Grades 6-8)	PROGRAMS & ALGORITHMS	CREATING COMPUTATIONAL ARTIFACTS
6-8	Apply an iterative design process (define the problem, generate ideas, build, test, and improve solutions) in problem solving, both individually and collaboratively. (Grades 6-8)	PROGRAMS & ALGORITHMS	CREATING COMPUTATIONAL ARTIFACTS
6-8	Create, analyze, and modify control structures to create programming solutions. (See CS construct progression chart.) (Grades 6-8)	PROGRAMS & ALGORITHMS	CREATING COMPUTATIONAL ARTIFACTS
6-8	Explain the steps of (i.e., step through) an algorithm and predict its outcome. (Grades 6-8)	PROGRAMS & ALGORITHMS	CREATING COMPUTATIONAL ARTIFACTS
6-8	Decompose a problem into sub-problems and demonstrate how the parts can be synthesized to create a solution. (Grades 6-8)	PROGRAMS & ALGORITHMS	DEVELOPING ABSTRACTIONS
6-8	Evaluate the correctness of a program by collecting and analyzing data generated from multiple runs of the program (e.g., transmission rates or computations of mathematical functions). (Grades 6-8)	PROGRAMS & ALGORITHMS	TESTING & ITERATIVE REFINEMENT
6-8	Use debugging and testing methods to ensure program correctness. (Grades 6-8)	PROGRAMS & ALGORITHMS	TESTING & ITERATIVE REFINEMENT



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Grade(s)	Draft CSTA 2016 K-12 CS Standard	K-12.org Framework Concept	K-12.org Framework Practice
9-10	Develop criteria for evaluating a computer system for a given purpose (e.g., system specification needed to run program student designed, hardware needed to run game X). (Grades 9-10)	COMPUTING DEVICES & SYSTEMS	CONNECTING COMPUTING TO CONTEXTS & CULTURES
9-10	Create or remix a program that uses different forms of input and output. (Grades 9-10)	COMPUTING DEVICES & SYSTEMS	CREATING COMPUTATIONAL ARTIFACTS
9-10	Create a model of the unique features of computers embedded in mobile devices and vehicles. (e.g., cardboard model) (Grades 9-10)	COMPUTING DEVICES & SYSTEMS	DEVELOPING ABSTRACTIONS
9-10	Demonstrate the multiple levels of abstraction that support program execution including programming languages, translations, and low-level systems including the fetch-execute cycle (e.g, model, dance, create a play/presentation). (Grades 9-10)	COMPUTING DEVICES & SYSTEMS	DEVELOPING ABSTRACTIONS
9-10	Illustrate how various types of data are stored in a computer system (e.g., examples of how sound and images are stored). (Grades 9-10)	DATA & INFORMATION	COMMUNICATING ABOUT & WITH COMPUTING
9-10	Differentiate between information access and distribution rights (e.g., write, discuss). (Grades 9-10)	DATA & INFORMATION	COMMUNICATING ABOUT & WITH COMPUTING

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9-10	Compare and Contrast the viewpoints on cybersecurity from the perspective of security experts and the perspective of privacy advocates. (Grades 9-10)	DATA & INFORMATION	CONNECTING COMPUTING TO CONTEXTS & CULTURES
9-10	Explain the principles of security by examining encryption, cryptography, and authentication techniques. (Grades 9-10)	DATA & INFORMATION	DESIGNING & REPRESENTING COMPUTATIONAL PROBLEMS
9-10	Apply basic techniques for locating and collecting small and large-scale data sets (e.g., user surveys). (Grades 9-10)	DATA & INFORMATION	DESIGNING & REPRESENTING COMPUTATIONAL PROBLEMS
9-10	Apply basic techniques for locating and collecting small and large-scale data sets (e.g., user surveys). (Grades 9-10)	DATA & INFORMATION	DESIGNING & REPRESENTING COMPUTATIONAL PROBLEMS
9-10	Convert between binary, decimal and hexadecimal representations of data. (Grades 9-10)	DATA & INFORMATION	DEVELOPING ABSTRACTIONS
9-10	Analyze the representation and trade-offs among various forms of digital information (e.g., lossy versus lossless compression). (Grades 9-10)	DATA & INFORMATION	DEVELOPING ABSTRACTIONS
9-10	Explain the social and economic implications associated with unethical computing practices (e.g., software piracy, hacking, VW motors, Lenovo computers). (Grades 9-10)	IMPACTS OF COMPUTING	COLLABORATION WITH COMPUTING

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Grade(s)	Draft CSTA 2016 K-12 CS Standard	K-12.org Framework Concept	K-12.org Framework Practice
9-10	Discuss implications of the collection and large scale analysis of information about individuals (e.g., how grocery /dept stores collect and use personal data). (Grades 9-10)	IMPACTS OF COMPUTING	COMMUNICATING ABOUT & WITH COMPUTING
9-10	Describe the major applications of artificial intelligence and robotics. (Grades 9-10)	IMPACTS OF COMPUTING	COMMUNICATING ABOUT & WITH COMPUTING
9-10	Describe how computation shares features with creating and designing an artifact.(Grades 9-10)	IMPACTS OF COMPUTING	COMMUNICATING ABOUT & WITH COMPUTING
9-10	Demonstrate how computing enhances traditional forms and enables new forms of experience, expression, communication, and collaboration (e.g., Virtual Reality). (Grades 9-10)	IMPACTS OF COMPUTING	CONNECTING COMPUTING TO CONTEXTS & CULTURES
9-10	Explain the impact of the digital divide on access to critical information (e.g., education, healthcare, medical records, access to training). (Grades 9-10)	IMPACTS OF COMPUTING	CONNECTING COMPUTING TO CONTEXTS & CULTURES
9-10	Explain the impact of computing technology on business and commerce. (Grades 9-10)	IMPACTS OF COMPUTING	CONNECTING COMPUTING TO CONTEXTS & CULTURES
9-10	Compare the positive and negative impacts of computing on behavior and culture (e.g., Evolution to Uber: in 1970s OK to hitch-hike; 1980s dangerous to hitch-hike; 2015 OK to share ride with person met few minutes ago on app; airbnb - worldwide accommodation searches in homes, apts., etc.). (Grades 9-10)	IMPACTS OF COMPUTING	CONNECTING COMPUTING TO CONTEXTS & CULTURES

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9-10	Evaluate a computational artifact for its effectiveness for people with disabilities (e.g., compare sample code with accessibility standards, build in access from phase 1 of design). (Grades 9-10)	IMPACTS OF COMPUTING	TESTING & ITERATIVE REFINEMENT
9-10	Describe the underlying process of Internet-based services. (e.g., illustrate how info flows in a global network (e.g., current term cloud services). (Grades 9-10)	NETWORKS & COMMUNICATION	COMMUNICATING ABOUT & WITH COMPUTING
9-10	Illustrate the basic components of computer networks (e.g., draw diagram of network including routers, switches, and end user devices, create model with string & paper). (Grades 9-10)	NETWORKS & COMMUNICATION	DEVELOPING ABSTRACTIONS
9-10	Design and develop a software artifact working in a team. (Grades 9-10)	PROGRAMS & ALGORITHMS	COLLABORATION WITH COMPUTING
9-10	Demonstrate how diverse collaboration impacts the design and development of software products (e.g., students show their own artifacts and demonstrate how collaboration made product better, diverse team approach, Team of engineers working on car design, reflection piece, portfolio approach, etc.). (Grades 9-10)	PROGRAMS & ALGORITHMS	COLLABORATION WITH COMPUTING

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9-10	Compare a variety of programming languages available to solve problems and develop systems. (Grades 9-10)	PROGRAMS & ALGORITHMS	COLLABORATION WITH COMPUTING
9-10	Explain security issues that might lead to compromised computer programs (e.g., circular references, ambiguous program calls, lack of error checking, and field size checking). (Grades 9-10)	PROGRAMS & ALGORITHMS	COMMUNICATING ABOUT & WITH COMPUTING
9-10	Classify and define the different types of software licenses in order to understand how to apply each one to a specific software example. (Grades 9-10)	PROGRAMS & ALGORITHMS	CONNECTING COMPUTING TO CONTEXTS & CULTURES
9-10	Understand the notion of hierarchy and abstraction in computing including high-level languages, translation, instruction sets, and logic circuits. (Grades 9-10)	PROGRAMS & ALGORITHMS	CONNECTING COMPUTING TO CONTEXTS & CULTURES
9-10	Design, develop, and implement mobile computing applications. (Grades 9-10)	PROGRAMS & ALGORITHMS	CREATING COMPUTATIONAL ARTIFACTS
9-10	Create software solutions by applying analysis, design and implementation techniques. (Grades 9-10)	PROGRAMS & ALGORITHMS	CREATING COMPUTATIONAL ARTIFACTS
9-10	Demonstrate code reuse by creating programming solutions using APIs and libraries (e.g., using text to speech in App Inventor, using Twitter API). (Grades 9-10)	PROGRAMS & ALGORITHMS	CREATING COMPUTATIONAL ARTIFACTS

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9-10	Illustrate the flow of execution and output of a given program (e.g., Flow and control diagrams). (Grades 9-10)	PROGRAMS & ALGORITHMS	CREATING COMPUTATIONAL ARTIFACTS
9-10	Illustrate how mathematical and statistical functions, sets, and logic are used in computation. (Grades 9-10)	PROGRAMS & ALGORITHMS	CREATING COMPUTATIONAL ARTIFACTS
9-10	Design algorithms using sequence, selection, iteration and recursion. (Grades 9-10)	PROGRAMS & ALGORITHMS	DESIGNING & REPRESENTING COMPUTATIONAL PROBLEMS
9-10	Explain, represent, and understand natural phenomena using modeling and simulation (e.g., Flocking). (Grades 9-10)	PROGRAMS & ALGORITHMS	DESIGNING & REPRESENTING COMPUTATIONAL PROBLEMS
9-10	Describe the concept of parallel processing as a strategy to solve large problems. (Grades 9-10)	PROGRAMS & ALGORITHMS	DESIGNING & REPRESENTING COMPUTATIONAL PROBLEMS
9-10	Compare and evaluate software development processes used to solve problems. (Grades 9-10)	PROGRAMS & ALGORITHMS	DESIGNING & REPRESENTING COMPUTATIONAL PROBLEMS
9-10	Rearrange a complex problem into simpler parts using predefined functions and parameters, classes, and methods. (Grades 9-10)	PROGRAMS & ALGORITHMS	DEVELOPING ABSTRACTIONS
9-10	Demonstrate the value of abstraction to manage problem complexity (e.g., Use App Inventor to create a golf scoring game that presents a simple screen to user but with more complex details suppressed from users' view). (Grades 9-10)	PROGRAMS & ALGORITHMS	DEVELOPING ABSTRACTIONS
9-10	Evaluate and ensure program correctness using various debugging and testing methods. (Grades 9-10)	PROGRAMS & ALGORITHMS	TESTING & ITERATIVE REFINEMENT

## DRAFT 2016 CSTA K-12 CS Standards: Level 3B (Grades 11-12)

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Grade(s)	Draft CSTA 2016 K-12 CS Standard	K-12.org Framework Concept	K-12.org Framework Practice
11-12	Identify and describe hardware (e.g., physical layers, logic gates, chips, components). (Grades 11-12)	COMPUTING DEVICES & SYSTEMS	COMMUNICATING ABOUT & WITH COMPUTING
11-12	Use data analysis to enhance understanding and gain knowledge of complex systems (e.g., take existing data sets and make sense of them). (Grades 11-12)	DATA & INFORMATION	CONNECTING COMPUTING TO CONTEXTS & CULTURES
11-12	Use various data collection techniques for different types of problems (e.g., mobile device GPS, user surveys, embedded system sensors). (Grades 11-12)	DATA & INFORMATION	CONNECTING COMPUTING TO CONTEXTS & CULTURES
11-12	Explore security policies by implementing and comparing encryption and authentication strategies (Secure Coding in C++ and Java Materials: <a href="http://cis1.towson.edu/~cssecinj/">http://cis1.towson.edu/~cssecinj/</a> Most modules have an associated answers page, the password for that page (instructors only) contact for info). (Grades 11-12)	DATA & INFORMATION	DESIGNING & REPRESENTING COMPUTATIONAL PROBLEMS
11-12	Discuss the interpretation of binary sequences in a variety of forms (e.g., instructions, numbers, text, sound, image). (Grades 11-12)	DATA & INFORMATION	DEVELOPING ABSTRACTIONS
11-12	Use models and simulations to help formulate, refine, and test scientific hypotheses. (Grades 11-12)	DATA & INFORMATION	DEVELOPING ABSTRACTIONS
11-12	Analyze data and identify patterns through modeling and simulation. (Grades 11-12)	DATA & INFORMATION	DEVELOPING ABSTRACTIONS

## DRAFT 2016 CSTA K-12 CS Standards: Level 3B (Grades 11-12)

The 2011 CSTA K-12 CS Standards were categorized into five conceptual strands (Computational Thinking, Collaboration, Computing Practice & Programming, Computer & Communication Devices; and Community, Global & Ethical Impacts). The DRAFT 2016 CSTA K-12 CS Standards are categorized into five concepts of the K-12 CS Framework, which is currently under development (Computing Devices & Systems, Networks & Communication, Programs & Algorithms, Data & Information, and Impacts of Computing). There is some overlap between strands and concepts, but they are not identical.

Grade(s)	Draft CSTA 2016 K-12 CS Standard	K-12.org Framework Concept	K-12.org Framework Practice
11-12	Explore global collaboration through selecting, observing and potentially contributing to an open-source software project (e.g., <a href="https://developers.google.com/open-source/gci/">https://developers.google.com/open-source/gci/</a> ). (Grades 11-12)	IMPACTS OF COMPUTING	COLLABORATION WITH COMPUTING
11-12	Debate laws and regulations that impact the development and use of software. (Grades 11-12)	IMPACTS OF COMPUTING	COMMUNICATING ABOUT & WITH COMPUTING
11-12	Summarize how financial markets, transactions, and predictions have been transformed by automation. (Grades 11-12)	IMPACTS OF COMPUTING	COMMUNICATING ABOUT & WITH COMPUTING
11-12	Design a study that evaluates how computation has revolutionized an aspect of our culture (e.g., financial markets, communication, work, healthcare, etc). (Grades 11-12)	IMPACTS OF COMPUTING	CONNECTING COMPUTING TO CONTEXTS & CULTURES
11-12	Analyze the role and impact of government regulation on privacy and security. (Grades 11-12)	IMPACTS OF COMPUTING	CONNECTING COMPUTING TO CONTEXTS & CULTURES
11-12	Debate issues of equity, access, and power to the distribution of computing resources in a global society. (Grades 11-12)	IMPACTS OF COMPUTING	CONNECTING COMPUTING TO CONTEXTS & CULTURES
11-12	Develop criteria to evaluate the beneficial and harmful effects of computing innovations. (Grades 11-12)	IMPACTS OF COMPUTING	DEVELOPING ABSTRACTIONS



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Grade(s)	Draft CSTA 2016 K-12 CS Standard	K-12.org Framework Concept	K-12.org Framework Practice
11-12	Analyze the notion of intelligent behavior through computer modeling and robotics. (Grades 11-12)	NETWORKS & COMMUNICATION	COMMUNICATING ABOUT & WITH COMPUTING
11-12	Simulate and discuss the issues that impact network functionality (Use ns3 <a href="https://www.nsnam.org">https://www.nsnam.org</a> , check for other free network simulators). (Grades 11-12)	NETWORKS & COMMUNICATION	DEVELOPING ABSTRACTIONS

11-12	Evaluate programs written by others for readability and usability. (Grades 11-12)	PROGRAMS & ALGORITHMS	COLLABORATION WITH COMPUTING
11-12	Create collaborative software projects using version control systems, Integrated Development Environments (IDEs), and collaborative tools. (Grades 11-12)	PROGRAMS & ALGORITHMS	COLLABORATION WITH COMPUTING
11-12	Demonstrate the software life cycle process by participating on a software project team. (Grades 11-12)	PROGRAMS & ALGORITHMS	COLLABORATION WITH COMPUTING
11-12	Discuss the impact of modifications on the functionality of application programs. (Grades 11-12)	PROGRAMS & ALGORITHMS	COMMUNICATING ABOUT & WITH COMPUTING
11-12	Decompose a problem by creating new functions and classes. (Grades 11-12)	PROGRAMS & ALGORITHMS	CREATING COMPUTATIONAL ARTIFACTS
11-12	Classify problems as tractable, intractable, or computationally unsolvable. (Grades 11-12)	PROGRAMS & ALGORITHMS	DESIGNING & REPRESENTING COMPUTATIONAL PROBLEMS

## DRAFT 2016 CSTA K-12 CS Standards: Level 3B (Grades 11-12)

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Grade(s)	Draft CSTA 2016 K-12 CS Standard	K-12.org Framework Concept	K-12.org Framework Practice
11-12	Explain the value of heuristic algorithms to approximate solutions for intractable problems. (Grades 11-12)	PROGRAMS & ALGORITHMS	DESIGNING & REPRESENTING COMPUTATIONAL PROBLEMS
11-12	Decompose a large-scale computational problem through data abstraction and modularity. (Grades 11-12)	PROGRAMS & ALGORITHMS	DESIGNING & REPRESENTING COMPUTATIONAL PROBLEMS
11-12	Critically examine classical algorithms and design an original algorithm (e.g., adapt, remix, improve). (Grades 11-12)	PROGRAMS & ALGORITHMS	DEVELOPING ABSTRACTIONS
11-12	Evaluate algorithms by their efficiency, correctness, and clarity. (Grades 11-12)	PROGRAMS & ALGORITHMS	DEVELOPING ABSTRACTIONS
11-12	Compare and contrast simple data structures and their uses (e.g., arrays and lists, stacks and queues, or trees and graphs). (Grades 11-12)	PROGRAMS & ALGORITHMS	DEVELOPING ABSTRACTIONS
11-12	Demonstrate concurrency (e.g., separate processes into threads and divide data into parallel streams; teacher with multiple students raising their hands). (Grades 11-12)	PROGRAMS & ALGORITHMS	DEVELOPING ABSTRACTIONS
11-12	Evaluate the qualities of a program such as correctness, usability, readability, efficiency, portability and scalability through a process such as a code review. (Grades 11-12)	PROGRAMS & ALGORITHMS	TESTING & ITERATIVE REFINEMENT
11-12	Evaluate the qualities of a program such as correctness, usability, readability, efficiency, portability and scalability through a process such as a code review. (Grades 11-12)	PROGRAMS & ALGORITHMS	TESTING & ITERATIVE REFINEMENT