

## CSTA K-12 Computer Science Standards: Mapped to Common Core State Standards

Standard	Description	Common Core State Standards						
		College and Career Readiness Anchor Standards: Reading	Reading Standards for Literacy in Science/ Technical Subjects	College and Career Readiness Anchor Standards: Writing	Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 6-12	College and Career Readiness Anchor Standards: Speaking and Listening	College and Career Readiness Anchor Standards: Language	Standards for Mathematical Practice
	<b>CT: Computational Thinking</b>							
CT.L2-01	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, evaluation).							✓
CT.L2-02	Describe the process of parallelization as it relates to problem solving.				✓			
CT.L2-03	Define an algorithm as a sequence of instructions that can be processed by a computer.						✓	
CT.L2-04	Evaluate ways that different algorithms may be used to solve the same problem.							✓
CT.L2-05	Act out searching and sorting algorithms.		✓					
CT.L2-06	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).	✓						
CT.L2-07	Represent data in a variety of ways including text, sounds, pictures, and numbers.			✓	✓			✓
CT.L2-08	Use visual representations of problem states, structures, and data (e.g., graphs, charts, network diagrams, flowcharts).			✓	✓			✓
CT.L2-09	Interact with content-specific models and simulations (e.g., ecosystems, epidemics, molecular dynamics) to support learning and research.							✓
CT.L2-10	Evaluate what kinds of problems can be solved using modeling and simulation.							✓
CT.L2-11	Analyze the degree to which a computer model accurately represents the real world.							✓
CT.L2-12	Use abstraction to decompose a problem into sub problems.							✓
CT.L2-13	Understand the notion of hierarchy and abstraction in computing, including high level languages, translation, instruction set, and logic circuits.							
CT.L2-14	Examine connections between elements of mathematics and computer science including binary numbers, logic, sets and functions.							✓
CT.L2-15	Provide examples of interdisciplinary applications of computational thinking.							
CT.L3A-01	Use predefined functions and parameters, classes and methods to divide a complex problem into simpler parts.							✓
CT.L3A-02	Describe a software development process used to solve software problems (e.g., design, coding, testing, verification).			✓	✓		✓	
CT.L3A-03	Explain how sequence, selection, iteration, and recursion are building blocks of algorithms.			✓	✓		✓	✓
CT.L3A-04	Compare techniques for analyzing massive data collections.			✓	✓			✓
CT.L3A-05	Describe the relationship between binary and hexadecimal representations.			✓	✓			✓
CT.L3A-06	Analyze the representation and trade-offs among various forms of digital information.			✓	✓			
CT.L3A-07	Describe how various types of data are stored in a computer system.			✓	✓			✓
CT.L3A-08	Use modeling and simulation to represent and understand natural phenomena.					✓		✓
CT.L3A-09	Discuss the value of abstraction to manage problem complexity.			✓	✓			✓
CT.L3A-10	Describe the concept of parallel processing as a strategy to solve large problems.			✓	✓			

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<b>CT: Computational Thinking (continued)</b>								
CT.L3A-11	Describe how computation shares features with art and music by translating human intention into an artifact.			✓	✓			
CT.L3B-01	Classify problems as tractable, intractable, or computationally unsolvable.						✓	✓
CT.L3B-02	Explain the value of heuristic algorithms to approximate solutions for intractable problems.			✓	✓			✓
CT.L3B-03	Critically examine classical algorithms and implement an original algorithm.		✓					✓
CT.L3B-04	Evaluate algorithms by their efficiency, correctness, and clarity.		✓					✓
CT.L3B-05	Use data analysis to enhance understanding of complex natural and human systems.		✓					✓
CT.L3B-06	Compare and contrast simple data structures and their uses (e.g., arrays and lists).			✓	✓			
CT.L3B-07	Discuss the interpretation of binary sequences in a variety of forms (e.g., instructions, numbers, text, sound, image).			✓	✓			✓
CT.L3B-08	Use models and simulations to help formulate, refine, and test scientific hypotheses.	✓	✓					✓
CT.L3B-09	Analyze data and identify patterns through modeling and simulation.		✓					✓
CT.L3B-10	Decompose a problem by defining new functions and classes.							✓
CT.L3B-11	Demonstrate concurrency by separating processes into threads and dividing data into parallel streams.							
<b>CL: Collaboration</b>								
CL.L2-01	Apply productivity/ multimedia tools and peripherals to group collaboration and support learning throughout the curriculum.							
CL.L2-02	Collaboratively design, develop, publish, and present products (e.g., videos, podcasts, websites) using technology resources that demonstrate and communicate curriculum concepts.			✓	✓			
CL.L2-03	Collaborate with peers, experts, and others using collaborative practices such as pair programming, working in project teams, and participating in group active learning activities.					✓		
CL.L2-04	Exhibit dispositions necessary for collaboration: providing useful feedback, integrating feedback, understanding and accepting multiple perspectives, socialization.			✓		✓		
CL.L3A-01	Work in a team to design and develop a software artifact.							
CL.L3A-02	Use collaborative tools to communicate with project team members (e.g., discussion threads, wikis, blogs, version control, etc.).			✓	✓			
CL.L3A-03	Describe how computing enhances traditional forms and enables new forms of experience, expression, communication, and collaboration.			✓	✓			
CL.L3A-04	Identify how collaboration influences the design and development of software products.			✓	✓			
CL.L3B-01	Use project collaboration tools, version control systems, and Integrated Development Environments (IDEs) while working on a collaborative software project.			✓	✓			
CL.L3B-02	Demonstrate the software life cycle process by participating on a software project team.							
CL.L3B-03	Evaluate programs written by others for readability and usability.		✓					✓

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<b>CPP: Computing Practice and Programming</b>								
CPP.L2-01	Select appropriate tools and technology resources to accomplish a variety of tasks and solve problems.			✓	✓			✓
CPP.L2-02	Use a variety of multimedia tools and peripherals to support personal productivity and learning throughout the curriculum.			✓	✓	✓		✓
CPP.L2-03	Design, develop, publish, and present products (e.g., webpages, mobile applications, animations) using technology resources that demonstrate and communicate curriculum concepts.			✓	✓			
CPP.L2-04	Demonstrate an understanding of algorithms and their practical application.							✓
CPP.L2-05	Implement problem solutions using a programming language, including: looping behavior, conditional statements, logic, expressions, variables, and functions.							✓
CPP.L2-06	Demonstrate good practices in personal information security, using passwords, encryption, and secure transactions.							
CPP.L2-07	Identify interdisciplinary careers that are enhanced by computer science.							
CPP.L2-08	Demonstrate dispositions amenable to open-ended problem solving and programming (e.g., comfort with complexity, persistence, brainstorming, adaptability, patience, propensity to tinker, creativity, accepting challenge).							✓
CPP.L2-09	Collect and analyze data that is output from multiple runs of a computer program.		✓					✓
CPP.L3A-01	Create and organize web pages through the use of a variety of web programming design tools.			✓	✓			
CPP.L3A-02	Use mobile devices/ emulators to design, develop, and implement mobile computing applications.							
CPP.L3A-03	Use various debugging and testing methods to ensure program correctness (e.g., test cases, unit testing, white box, black box, integration testing)							✓
CPP.L3A-04	Apply analysis, design, and implementation techniques to solve problems (e.g., use one or more software lifecycle models).							✓
CPP.L3A-05	Use Application Program Interfaces (APIs) and libraries to facilitate programming solutions.							✓
CPP.L3A-06	Select appropriate file formats for various types and uses of data.							
CPP.L3A-07	Describe a variety of programming languages available to solve problems and develop systems.							
CPP.L3A-08	Explain the program execution process.			✓	✓			
CPP.L3A-09	Explain the principles of security by examining encryption, cryptography, and authentication techniques.			✓	✓		✓	
CPP.L3A-10	Explore a variety of careers to which computing is central.							
CPP.L3A-11	Describe techniques for locating and collecting small and large-scale data sets.		✓	✓	✓			
CPP.L3A-12	Describe how mathematical and statistical functions, sets, and logic are used in computation.			✓	✓			✓
CPP.L3B-01	Use advanced tools to create digital artifacts (e.g., web design, animation, video, multimedia).			✓	✓			
CPP.L3B-02	Use tools of abstraction to decompose a large-scale computational problem (e.g., procedural abstraction, object-oriented design, functional design).							✓

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<b>CPP: Computing Practice and Programming (continued)</b>								
CPP.L3B-03	Classify programming languages based on their level and application domain.							
CPP.L3B-04	Explore principles of system design in scaling, efficiency, and security.							
CPP.L3B-05	Deploy principles of security by implementing encryption and authentication strategies.							
CPP.L3B-06	Anticipate future careers and the technologies that will exist.							
CPP.L3B-07	Use data analysis to enhance understanding of complex natural and human systems.		✓					✓
CPP.L3B-08	Deploy various data collection techniques for different types of problems.							✓
<b>CD: Computers and Communication Devices</b>								
CD.L2-01	Recognize that computers are devices that execute programs.							
CD.L2-02	Identify a variety of electronic devices that contain computational processors.							
CD.L2-03	Demonstrate an understanding of the relationship between hardware and software.							
CD.L2-04	Use developmentally appropriate, accurate terminology when communicating about technology.			✓	✓		✓	
CD.L2-05	Apply strategies for identifying and solving routine hardware problems that occur during everyday computer use.							
CD.L2-06	Describe the major components and functions of computer systems and networks.			✓	✓		✓	
CD.L2-07	Describe what distinguishes humans from machines, focusing on human intelligence versus machine intelligence and ways we can communicate.			✓	✓			
CD.L2-08	Describe ways in which computers use models of intelligent behavior (e.g., robot motion, speech and language understanding, and computer vision).			✓	✓			
CD.L3A-01	Describe the unique features of computers embedded in mobile devices and vehicles (e.g., cell phones, automobiles, airplanes).			✓	✓			
CD.L3A-02	Develop criteria for purchasing or upgrading computer system hardware.							
CD.L3A-03	Describe the principal components of computer organization (e.g., input, output, processing, and storage).			✓	✓		✓	
CD.L3A-04	Compare various forms of input and output.			✓	✓			
CD.L3A-05	Explain the multiple levels of hardware and software that support program execution (e.g., compilers, interpreters, operating systems, networks).			✓	✓		✓	
CD.L3A-06	Apply strategies for identifying and solving routine hardware and software problems that occur in everyday life.							
CD.L3A-07	Compare and contrast client-server and peer-to-peer network strategies.			✓	✓			
CD.L3A-08	Explain the basic components of computer networks (e.g., servers, file protection, routing, spoolers and queues, shared resources, and fault-tolerance).			✓	✓			
CD.L3A-09	Describe how the Internet facilitates global communication.			✓	✓			
CD.L3A-10	Describe the major applications of artificial intelligence and robotics.			✓	✓			
CD.L3B-01	Discuss the impact of modifications on the functionality of application programs.			✓	✓			
CD.L3B-02	Identify and describe hardware (e.g., physical layers, logic gates, chips, components).			✓	✓		✓	
CD.L3B-03	Identify and select the most appropriate file format based on trade-offs (e.g., accuracy, speed, ease of manipulation).							

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<b>CD: Computers and Communication Devices (continued)</b>								
CD.L3B-04	Describe the issues that impact network functionality (e.g., latency, bandwidth, firewalls, server capability).			✓	✓			✓
CD.L3B-05	Explain the notion of intelligent behavior through computer modeling and robotics.			✓	✓			✓
<b>CI: Community, Global, and Ethical Impacts</b>								
CI.L2-01	Exhibit legal and ethical behaviors when using information and technology and discuss the consequences of misuse.							
CI.L2-02	Demonstrate knowledge of changes in information technologies over time and the effects those changes have on education, the workplace, and society.							
CI.L2-03	Analyze the positive and negative impacts of computing on human culture.			✓	✓			
CI.L2-04	Evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources concerning real-world problems.	✓	✓					✓
CI.L2-05	Describe ethical issues that relate to computers and networks (e.g., security, privacy, ownership, and information sharing).			✓	✓			
CI.L2-06	Discuss how the unequal distribution of computing resources in a global economy raises issues of equity, access, and power.			✓	✓			
CI.L3A-01	Compare appropriate and inappropriate social networking behaviors.			✓	✓			
CI.L3A-02	Discuss the impact of computing technology on business and commerce (e.g., automated tracking of goods, automated financial transactions, e-commerce, cloud computing).			✓	✓			
CI.L3A-03	Describe the role that adaptive technology can play in the lives of people with special needs.			✓	✓			
CI.L3A-04	Compare the positive and negative impacts of technology on culture (e.g., social networking, delivery of news and other public media, and intercultural communication).			✓	✓			
CI.L3A-05	Describe strategies for determining the reliability of information found on the Internet.	✓	✓	✓	✓	✓		✓
CI.L3A-06	Differentiate between information access and information distribution rights.			✓	✓			✓
CI.L3A-07	Describe how different kinds of software licenses can be used to share and protect intellectual property.			✓	✓			✓
CI.L3A-08	Discuss the social and economic implications associated with hacking and software piracy.			✓	✓			
CI.L3A-09	Describe different ways in which software is created and shared and their benefits and drawbacks (commercial software, public domain software, open source development).			✓	✓			✓
CI.L3A-10	Describe security and privacy issues that relate to computer networks.			✓	✓			
CI.L3A-11	Explain the impact of the digital divide on access to critical information.			✓	✓			
CI.L3B-01	Demonstrate ethical use of modern communication media and devices.			✓	✓			
CI.L3B-02	Analyze the beneficial and harmful effects of computing innovations.			✓	✓			
CI.L3B-03	Summarize how financial markets, transactions, and predictions have been transformed by automation.			✓	✓			

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<b>CI: Community, Global, and Ethical Impacts (continued)</b>								
CI.L3B-04	Summarize how computation has revolutionized the way people build real and virtual organizations and infrastructures.			✓	✓			
CI.L3B-05	Identify laws and regulations that impact the development and use of software.			✓	✓			
CI.L3B-06	Analyze the impact of government regulation on privacy and security.			✓	✓			
CI.L3B-07	Differentiate among open source, freeware, and proprietary software licenses and their applicability to different types of software.			✓	✓		✓	
CI.L3B-08	Relate issues of equity, access, and power to the distribution of computing resources in a global society.			✓	✓			

## Common Core State Standards

The **Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects** (CCSSI\_ELA Standards.pdf) are divided into two major groupings:

**College and Career Readiness Anchor Standards** ("general cross-disciplinary literacy expectations"):

- Reading (general: p. 35; for Informational Text: p. 39-40)
- Writing (p. 41-47)
- Speaking and Listening (p. 48-50)
- Language (p. 52-55)

Each grouping has grade-level sub-groups; we have looked for matches in Grades 6-8, 9-10, and Grades 11-12.

Note on Speaking and Listening standards: If interpreted literally, "speaking" and "listening" would seem to apply only to oral / aural, synchronous communications. However, CSTA standards do not specify a particular type of communication, and many new technologies facilitate synchronous communications that are not oral / aural (such as text-based "chat"), allowing synchronous communications between people who are not in the same geographical location and/or have limitations of speech and/or hearing. Therefore, we have broadened our interpretation of the CCSS Speaking and Learning standards to apply to any method of synchronous communications (which invite immediate responses), and we have mapped accordingly.

This interpretation still excludes asynchronous communications, such as those made through blogs or wikis, those that involve providing feedback through document markup / commenting, and other modes that allow people in different time zones or with different schedules to conduct "conversations." Those modes of communication are a step above single-direction communication (reading a published work or writing a "finished" product for an assignment or publication), so they have some elements of speaking or listening, but they don't have the immediacy of synchronous communications, so we judged them not to be applicable to the Speaking and Listening standards.

**Standards for Literacy in History/Social Studies, Science, and Technical Subjects** have more detailed standards for Reading and Writing in their respective subject areas. We have mapped to standards in these areas:

- Reading Standards for Literacy in Science and Technical Subjects 6-12 (p. 62)
- Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 6-12 (p. 64-66)

The **Common Core State Standards for Mathematics** (CCSSI\_Math Standards.pdf) are also divided into two groupings:

**Mathematical Practice:** 3 pages of narrative comments in 8 areas such as (1) Make sense of problems and persevere in solving them and (2) Reason abstractly and quantitatively.

**Mathematical Content:** 27 pages of high school standards, divided into 6 areas, like (1) Numbers and Quantity and (2) Algebra.

We have mapped to the "Mathematical Practice" grouping.