

CSTA K-12 Computer Science Standards: Mapped to Partnership for the 21st Century Essential Skills

Standard	Description	Partnership for 21st Century Skills: Essential Skills for Success									
		Creativity & Innovation	Critical Thinking & Problem-Solving	Communication & Collaboration	Information Literacy	Media Literacy	Information Communication Technology Literacy	Flexibility & Adaptability	Initiative & Self-Direction	Social & Cross-Cultural Skills	Productivity & Accountability
CT: Computational Thinking											
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.	✓									

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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.		✓	✓										
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.		✓											
	CL: Collaboration													
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.	✓		✓									✓	

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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.		✓	✓								
CPP: Computing Practice and Programming												
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.			✓								

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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).		✓									
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.		✓	✓								
CD: Computers and Communication Devices												
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.		✓									

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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).		✓											
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.			✓										
	CI: Community, Global, and Ethical Impacts													
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.			✓	✓									

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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.		✓	✓			✓							
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.			✓			✓					✓		✓

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