

# Computer Science 3-5 Standards



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The CSTA K–12 Computer Science Standards are created and maintained by members of the Computer Science Teachers Association (CSTA).



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The [K–12 Computer Science Framework](#), led by the [Association for Computing Machinery](#), [Code.org](#), [Computer Science Teachers Association](#), [Cyber Innovation Center](#), and [National Math and Science Initiative](#) in partnership with states and districts, informed the development of this work.

The CSTA Standards Revision Task Force crafted standards by combining concept statements and practices from the Framework. The Task Force also used descriptive material from the Framework when writing examples and clarifying statements to accompany the standards. The glossary referenced in the navigation header links directly to the Framework's glossary.

For more information about the Framework, please visit [k12cs.org](http://k12cs.org).

## Legend for Identifiers

### Unique Numbering System for the Washington Computer Science K–12 Learning Standards

To help organize and track each individual standard, a unique identifier was developed. An example appears below:

Level	Framework Concept	Number	Computer Science K–12 Learning Standard
Grades 6-8	Algorithms and Programming	17	Systematically test and refine programs using a range of test cases.
<b>2</b>	<b>AP</b>	<b>17</b>	<b>Identifier: 2-AP-17</b>

Use the following legend to interpret the unique identifier for each Computer Science K–12 Learning Standard:

The identifier code corresponds to: Level – Concept – Number		
Identifier Code		Key
Levels	1A	Grades K–2
	1B	Grades 3–5
	2	Grades 6–8
	3A	Grades 9–10
	3B	Grades 11–12
Concepts	CS	Computing Systems
	NI	Networks and the Internet
	DA	Data and Analysis
	AP	Algorithms and Programming
	IC	Impacts of Computing

Integrated into classroom activities through practices:

Practices	1	Fostering an Inclusive Computing Culture
	2	Collaborating
	3	Recognizing and Defining Computational Problems
	4	Developing and Using Abstractions
	5	Creating Computational Artifacts
	6	Testing and Refining
	7	Communicating about Computing

Figure 1: Standards Identifier Code –  
Computer Science Teachers Association K–12 Computer Science Standards (2017)  
Retrieved from <http://www.csteachers.org>



## Standards

Identifier	Level 1B: 3–5
1B-CS-01	Describe how internal and external parts of computing devices function to form a system. (P. 7.2)
1B-CS-02	Model how computer hardware and software work together as a system to accomplish tasks. (P. 4.4)
1B-CS-03	Determine potential solutions to solve simple hardware and software problems using common troubleshooting strategies. (P. 6.2)
1B-NI-04	Model how information is broken down into smaller pieces, transmitted as packets through multiple devices over networks and the Internet, and reassembled at the destination. (P. 4.4)
1B-NI-05	Discuss real-world cybersecurity problems and how personal information can be protected. (P. 3.1)
1B-DA-06	Organize and present collected data visually to highlight relationships and support a claim. (P. 7.1)
1B-DA-07	Use data to highlight or propose cause-and-effect relationships, predict outcomes, or communicate an idea. (P. 7.1)
1B-AP-08	Compare and refine multiple algorithms for the same task and determine which is the most appropriate. (P. 6.3, P. 3.3)
1B-AP-09	Create programs that use variables to store and modify data. Variables are used to store and modify data. (P. 5.2)
1B-AP-10	Create programs that include sequences, events, loops, and conditionals. (P. 5.2)
1B-AP-11	Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process. (P. 3.2)
1B-AP-12	Modify, remix, or incorporate portions of an existing program into one's own work, to develop something new or add more advanced features. (P. 5.3)
1B-AP-13	Use an iterative process to plan the development of a program by including others' perspectives and considering user preferences. (P. 1.1, P. 5.1)
1B-AP-14	Observe intellectual property rights and give appropriate attribution when creating or remixing programs. (P. 5.2, P. 7.3)
1B-AP-15	Test and debug (identify and fix errors) a program or algorithm to ensure it runs as intended. (P. 6.1, P. 6.2)
1B-AP-16	Take on varying roles, with teacher guidance, when collaborating with peers during the design, implementation, and review stages of program development. (P. 2.2)
1B-AP-17	Describe choices made during program development using code comments, presentations, and demonstrations. (P. 7.2)
1B-IC-18	Discuss computing technologies that have changed the world, and express how those technologies influence, and are influenced by, cultural practices. (P. 3.1)
1B-IC-19	Brainstorm ways to improve the accessibility and usability of technology products for the diverse needs and wants of users. (P. 1.2)
1B-IC-20	Seek diverse perspectives for the purpose of improving computational artifacts. (P. 1.1)
1B-IC-21	Use public domain or creative commons media, and refrain from copying or using material created by others without permission. (P. 7.3)

## Computer Science Glossary

*The following glossary includes definitions of terms used in the statements in the Washington Computer Science K–12 Learning Standards. These terms are intended to increase teacher understanding and decrease biased language.*

**abstraction (process):** The process of reducing complexity by focusing on the main idea. By hiding details irrelevant to the question at hand and bringing together related and useful details, abstraction reduces complexity and allows one to focus on the problem. In elementary classrooms, abstraction is hiding unnecessary details to make it easier to think about a problem.

**abstraction (product):** A new representation of a thing, a system, or a problem that helpfully reframes a problem by hiding details irrelevant to the question at hand. [MA-DLCS]

**abstraction** (Code.org K–5) Pulling out specific differences to make one solution work for multiple problems.

**algorithm:** A step-by-step process to complete a task.

A list of steps to finish a task. A set of instructions that can be performed with or without a computer. For example, the collection of steps to make a peanut butter and jelly sandwich is an algorithm. (Code.org K–5)

**artifact:** Anything created by a human. *See “computational artifact” for the computer science-specific definition.*

**automation:** To link disparate systems and software in such a way that they become self-acting or self-regulating.

**Block-based programming language:** (Code.org K–5) Any programming language that lets users create programs by manipulating “blocks” or graphical programming elements, rather than writing code using text. Examples include Code Studio, Scratch, and Swift. (Sometimes called visual coding, drag and drop programming, or graphical programming blocks)

**bug:** An error in a software program. It may cause a program to unexpectedly quit or behave in an unintended manner. [TechTerms] The process of removing errors (bugs) is called debugging.

An error in a program that prevents the program from running as expected. (Code.org K–5)

**code:** Any set of instructions expressed in a programming language. [MA-DLCS] One or more commands or algorithm(s) designed to be carried out by a computer. (Code.org K–5) See also: program

**command:** An instruction for the computer. Many commands put together make up algorithms and computer programs. (Code.org K–5)

**computational artifact:** Anything created by a human using a computational thinking process and a computing device. A computational artifact can be, but is not limited to, a program, image, audio, video, presentation, or web page file.

**computational thinking:** Mental processes and strategies that include: decomposition, pattern matching, abstraction, algorithms (decomposing problems into smaller, more manageable problems, finding repeating patterns, abstracting specific differences to make one solution work for multiple problems, and creating step-by-step algorithms). (Code.org K–5)

**computer science:** Using the power of computers to solve problems. (Code.org K–5)

**conditionals:** Statements that only run under certain conditions or situations. (Code.org K–5)

**data:** Information. Often, quantities, characters, or symbols that are the inputs and outputs of computer programs. (Code.org K–5)

**debugging:** Finding and fixing errors in programs. (Code.org K–5)

**decompose:** Break a problem down into smaller pieces. (Code.org K–5)

**decryption:** The process of taking encoded or encrypted text or other data and converting it back into text that you or the computer can read and understand.

**Digital divide:** the gulf between those who have ready access to computers and the Internet, and those who do not.

**event:** An action that causes something to happen. (Code.org K–5)

**execution:** The process of executing an instruction or instruction set.

**for loop:** A loop with a predetermined beginning, end, and increment (step interval) (Code.org K–5)

**function:** A type of procedure or routine. Some programming languages make a distinction between a function, which returns a value, and a procedure, which performs some operation, but does not return a value. [MA-DLCS] *Note: This definition differs from that used in math. A piece of code that you can easily call over and over again. Functions are sometimes called ‘procedures.’* (Code.org K–5)

**hacking:** Appropriately applying ingenuity (from “The Meaning of Hack”), cleverly solving a programming problem (the New Hacker’s Dictionary), and using a computer to gain unauthorized access to data within a system. [MA-DLCS]

**hardware:** The physical components that make up a computing system, computer, or computing device. [MA-DLCS]

**HTTP:** (Hypertext Transfer Protocol) is the set of rules for transferring files (text, graphic images, sound, video, and other multimedia files) on the World Wide Web.

**HTTPS:** encrypts and decrypts user page requests as well as the pages that are returned by the Web server. The use of HTTPS protects against eavesdropping and man-in-the-middle attacks.

**input:** The signals or instructions sent to a computer. [Techopedia]

**Internet:** The global collection of computer networks and their connections, all using shared protocols to communicate [CAS-Prim] A group of computers and servers that are connected to each other. (Code.org K–5)

**iterative:** Involving the repeating of a process with the aim of approaching a desired goal, target, or result. [MA-DLCS]

**logic (Boolean):** Boolean logic deals with the basic operations of truth values: AND, OR, NOT and combinations thereof. [FOLDOC]

**loop:** A programming structure that repeats a sequence of instructions as long as a specific condition is true. [TechTerms]

**looping:** Repetition, using a loop. The action of doing something over and over again. (Code.org K–5)

**memory:** Temporary storage used by computing devices. [MA-DLCS]

**model:** A representation of (some part of) a problem or a system. (Modeling (v): the act of creating a model) [MA-DLCS] *Note: This definition differs from that used in science.*

**network:** A group of computing devices (personal computers, phones, servers, switches, routers, and so on) connected by cables or wireless media for the exchange of information and resources.

**nested loop:** A loop within a loop, an inner loop within the body of an outer one.

**operating system:** Software that communicates with the hardware and allows other programs to run. An operating system (or “OS”) is comprised of system software, or the fundamental files a computer needs to boot up and function. Every desktop computer, tablet, and smartphone includes an operating system that provides basic functionality for the device. [TechTerms]

**operation:** An action, resulting from a single instruction, that changes the state of data. [Dictionary.com]

**packets:** Small chunks of information that have been carefully formed from larger chunks of information.

**pair programming:** A technique in which two developers (or students) team together and work on one computer. [TechTarget] The terms “driver” and “navigator” are often used for the two roles. In a classroom setting, teachers often specify that students switch roles frequently (or within a specific period of time).

**parallelism:** The simultaneous execution on multiple processors of different parts of a program.

**pattern matching:** Finding similarities between things. (Code.org K–5)

**persistence:** Trying again and again, even when something is very hard. (Code.org K–5)

**piracy:** The illegal copying, distribution, or use of software. [TechTarget]

**procedure:** An independent code module that fulfills some concrete task and is referenced within a larger body of source code. This kind of code item can also be called a function or a subroutine. The

fundamental role of a procedure is to offer a single point of reference for some small goal or task that the developer or programmer can trigger by invoking the procedure itself. A procedure may also be referred to as a function, subroutine, routine, method or subprogram. [Techopedia]

**processor:** The hardware within a computer or device that executes a program. The CPU (central processing unit) is often referred to as the brain of a computer.

**program; programming** (*n*): A set of instructions that the computer executes in order to achieve a particular objective. [MA-DLCS] **program** (*v*): To produce a program by programming. An algorithm that has been coded into something that can be run by a machine. (Code.org K–5)

**programming:** The craft of analyzing problems and designing, writing, testing, and maintaining programs to solve them. [MA-DLCS] The art of creating a program. (Code.org K–5)

**protocol:** The special set of rules that end points in a telecommunication connection use when they communicate. Protocols specify interactions between the communicating entities. [TechTarget]

**prototype; prototype:** An early approximation of a final product or information system, often built for demonstration purposes. [TechTarget, Techopedia]

**pseudocode:** A detailed yet readable description of what a computer program or algorithm must do, expressed in a formally-styled natural language rather than in a programming language. [TechTarget]

**routing; router; routing:** Establishing the path that data packets traverse from source to destination. A device or software that determines the routing for a data packet. [TechTarget]

**run program:** Cause the computer to execute the commands you've written in your program. (Code.org K–5)

**security:** The protection against access to, or alteration of, computing resources, through the use of technology, processes, and training. [TechTarget]

**servers:** Computers that exist only to provide things to others. (Code.org K–5)

**software:** Programs that run on a computer system, computer, or other computing device.

**storage:** A place (usually a device) into which data can be entered, in which it can be held, and from which it can be retrieved at a later time. [FOLDOC] A process through which digital data is saved within a data storage device by means of computing technology. Storage is a mechanism that enables a computer to retain data, either temporarily or permanently. [Techopedia]

**string:** A sequence of letters, numbers, and/or other symbols. A string might represent a name, address, or song title. Some functions commonly associated with strings are length, concatenation, and substring. [TechTarget]

**structure:** A general term used in the framework to discuss the concept of encapsulation without specifying a particular paradigm.

**subroutine:** A callable unit of code, a type of procedure.



**switch:** A high-speed device that receives incoming data packets and redirects them to their destination on a local area network (LAN). [Techopedia]

**system:** A collection of elements or components that work together for a common purpose. [TechTarget] A collection of computing hardware and software integrated for the purpose of accomplishing shared tasks.

**troubleshooting:** A systematic approach to problem solving that is often used to find and resolve a problem, error, or fault within software or a computer system. [Techopedia, TechTarget]

**user:** A person for whom a hardware or software product is designed (as distinguished from the developers). [TechTarget]

**variable:** A symbolic name that is used to keep track of a value that can change while a program is running. Variables are not just used for numbers. They can also hold text, including whole sentences (“strings”), or the logical values “true” or “false.” A variable has a data type and is associated with a data storage location; its value is normally changed during the course of program execution. [CAS-Prim, Techopedia] A placeholder for a piece of information that can change (Code.org K–5) **Note:** *This definition differs from that used in math.*

**wearable computing:** Miniature electronic devices that are worn under, with or on top of clothing.

### **Key to sources of multiple definitions in this glossary:**

CAS-Prim: Computing at School. Computing in the national curriculum: A guide for primary teachers (<http://www.computingatschool.org.uk/data/uploads/CASPrimaryComputing.pdf>)

Code.org: Creative Commons License (CC BY-NC-SA 4.0) (<https://code.org/curriculum/docs/k-5/glossary>)

Computer Science Teachers Association: CSTA K–12 Computer Science Standards (2011) <https://csta.acm.org/Curriculum/sub/K12Standards.html>

FOLDOC: Free On-Line Dictionary of Computing. (<http://foldoc.org/>)

MA-DLCS: Massachusetts Digital Literacy and Computer Science Standards, Glossary (Draft, December 2015)

NIST/DADS: National Institute of Science and Technology Dictionary of Algorithms and Data Structures. (<https://xlinux.nist.gov/dads/>)

Techopedia: Techopedia. (<https://www.techopedia.com/dictionary>)

TechTarget: TechTarget Network. (<http://www.techtarget.com/network>)

TechTerms: Tech Terms Computer Dictionary. (<http://www.techterms.com>)

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