

# Virginia CS Standards Alignment with CodeX Curriculum

	Unit 1	Unit 2	Unit 3
<b>Algorithms and Programming</b>			
5.1 The student will construct sets of step-by-step instructions (algorithms) both independently and collaboratively.	[1]		
5.2 The student will construct programs to accomplish a task as a means of creative expression using a block or text-based programming language, both independently and collaboratively.	[2]		
5.3 The student will analyze, correct, and improve (debug) an algorithm that includes sequencing, events, loops, conditionals, and variables.	[3]		
5.4 The student will create a plan as part of the iterative design process, both independently and collaboratively using different strategies (e.g., pair programming, storyboard, flowchart, pseudocode, story map).	[4]		
5.5 The student will break down (decompose) a larger problem into smaller subproblems, both independently and collaboratively.			
5.6 The student will give credit to sources when borrowing or changing ideas (e.g., using information, pictures created by others, using music created by others, remixing programming projects).			
<b>Computing Systems</b>			
5.7 The student will model how a computing system works including input and output, processors, sensors, and storage.			
5.8 The student will identify, using accurate terminology, simple hardware and software problems that may occur during use and apply strategies for solving problems (e.g., rebooting the device, checking for power, checking network availability, closing and reopening an app.).			
<b>Cybersecurity</b>			
5.9 The student will evaluate and solve problems that relate to inappropriate use of computing devices and networks.			
5.10 The student will determine whether passwords are strong, explain why strong passwords should be used, and demonstrate proper use and protection of personal passwords.			
<b>Data and Analysis</b>			
5.11 The student will use a computer to observe, analyze, and manipulate data in order to draw conclusions and make predictions.			
5.12 The student will create an artifact using computing systems to model the attributes and behaviors associated with a concept (e.g., plate tectonics).			
5.13 The student will use numeric values to represent non-numeric ideas in the computer (e.g., binary, ASCII, pixel attributes such as RGB).			
<b>Impacts of Computing</b>			
5.14 The student will give examples and explain how computer science has changed the world and express how computing technologies influence, and are influenced by, cultural practices.			
5.15 The student will evaluate and describe 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, wearable computing).			
5.16 The student will explain social and ethical issues that relate to computing devices and networks.			
<b>Networking and the Internet</b>			
5.17 The student will compare and contrast the difference between a local network and a worldwide network.			

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	Unit 1	Unit 2	Unit 3
<b>Algorithms and Programming</b>			
6.1 The student will construct programs to accomplish a task as a means of creative expression or scientific exploration using a block based or text-based programming language, both independently and collaboratively,	[5]		
6.2 The student will trace programs to predict outcomes and debug (correct and improve) for correctness.	[6]		
6.3 The student will seek and incorporate feedback from team members and users to refine a program that meets user needs.			
6.4 The student will incorporate existing code, media, and libraries into original programs, and give attribution.	[7]		
<b>Computing Systems</b>			
6.5 The student will design projects that combine hardware and software components to collect and exchange data.			
<b>Cybersecurity</b>			
6.6 The student will identify physical and digital security measures used to protect electronic information.			
<b>Data and Analysis</b>			
6.7 The student will explain how binary sequences are used to represent digital data.			
6.8 The student will collect data using computational tools then clean and organize to make it more useful and reliable.			
6.9 The student will explain the insight and knowledge gained from digitally processed data by using appropriate visualizations.			
6.10 The student will use models and simulations to formulate, refine, and test hypotheses.			
<b>Impacts of Computing</b>			
6.11 The student will explain how computing has impacted innovations in other fields.			
6.12 The student will explore careers related to data.			
<b>Networking and the Internet</b>			
6.13 The student will explain why the speed of data transmission across the Internet can vary depending on the type of data being transmitted.			

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	Unit 1	Unit 2	Unit 3
<b>Algorithms and Programming</b>			
7.1 The student will construct programs to accomplish a task as a means of creative expression or scientific exploration using a block based or text based programming language, both independently and collaboratively.	[8]		
7.2 The student will document programs to make them easier to follow, test, and debug.	[9]		
7.3 The student will distribute tasks and maintain a project timeline when collaboratively developing computational artifacts.			
7.4 The student will decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.			
<b>Computing Systems</b>			
7.5 The student will describe how the Internet connects devices and networks all over the world.			
<b>Cybersecurity</b>			
7.6 The student will describe how physical and digital security measures protect electronic information.			
7.7 The student will identify existing cybersecurity concerns associated with Internet use and Internet-based systems and potential options to address these issues.			
<b>Data and Analysis</b>			
7.8 The student will discuss the correctness of a model representing a system by comparing the model's generated results with data that were observed in the system being modeled.			
7.9 The student will refine computational models based on the data they have generated.			
<b>Impacts of Computing</b>			
7.10 The student will explain how advances in technology have contributed to Virginia's prosperity and role in the global economy.			
7.11 The student will describe the development of new technologies in communication, entertainment, and business and their impact on American life.			
7.12 The student will explore careers related to the Internet.			
<b>Networking and the Internet</b>			
7.13 The student will outline the advantages and disadvantages of transmitting information over the Internet, including speed, reliability, cost, and security.			
7.14 The student will explain why protocols are necessary in data transmission. Model the role of protocols in transmitting data across networks and the Internet.			
7.15 The student will 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.			

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	Unit 1	Unit 2	Unit 3
<b>Algorithms and Programming</b>			
8.1 The student will construct programs to accomplish a task as a means of creative expression or scientific exploration using a block based or text based programming language, both independently and collaboratively.	[10]		
8.2 The student will systematically test and refine programs using a range of test cases.			
8.3 The student will explain how effective communication between participants is required for successful collaboration when developing programs.			
8.4 The student will use flowcharts and/or pseudocode to address complex problems as algorithms.	[11]		
<b>Computing Systems</b>			
8.5 The student will, using the elements of computing devices such as primary memory, secondary storage, processor, input and output devices, and network connectivity, analyze the advantages and limitations of a given computing system.			
<b>Cybersecurity</b>			
8.6 The student will evaluate physical and digital security measures used to protect electronic information.			
8.7 The student will identify impacts of hacking, ransomware, scams, fake vulnerability scans, and the ethical and legal concerns involved.			
<b>Data and Analysis</b>			
8.8 The student will a) explain the difference between a model and a simulation; and b) create computational models to conduct simulations.			
<b>Impacts of Computing</b>			
8.9 The student will describe tradeoffs between allowing information to be public and keeping information private.			
8.10 The student will evaluate online and print sources for appropriateness and credibility.			
8.11 The student will discuss the social impacts and ethical considerations associated with the field of cybersecurity.			
8.12 The student will explore careers related to the field of cybersecurity.			
<b>Networking and the Internet</b>			
8.13 The student will identify existing cybersecurity concerns associated with Internet use and Internet-based systems and potential options to address these issues.			

Virginia CS Standards Alignment with CodeX Curriculum			
	Unit 1	Unit 2	Unit 3
<b>6-week Core Module</b>			
<b>Algorithms and Programming</b>			
MSCSE.1 The student will design and iteratively develop programs that combine control structures, including loops and conditionals.	[12]		
MSCSE.2 The student will investigate variables and data types, including simple operations on strings.	[13]		
MSCSE.3 The student will implement a program that accepts input values, stores them in appropriately named variables, and produces output.	[14]		
MSCSE.4 The student will document programs in order to make them easier to trace, test, and debug.	[15]		
<b>Additional Content for 9-week Module</b>			
<b>Impacts of Computing</b>			
MSCSE.5 The student will discuss issues of bias and accessibility in the design of existing technologies.			
MSCSE.6 The student will describe and explain the history of computer science, including naming significant historical figures and describing their impact on the field.			
<b>Additional Content for 18-week Module</b>			
<b>Algorithms and Programming</b>			
MSCSE.7 The student will use flowcharts and/or pseudocode to address complex problems as algorithms.	[16]		
MSCSE.8 The student will incorporate existing code, media, and libraries into original programs, and give attribution.	[17]		
MSCSE.9 The student will systematically test and refine programs using a range of test cases.			
<b>Networks and the Internet</b>			
MSCSE.10 The student will model the role of protocols in transmitting data across networks and the Internet.			
<b>Cybersecurity</b>			
MSCSE.11 The student will apply multiple methods of encryption to model the secure transmission of information.			
MSCSE.12 The student will explain how physical and digital security measures protect electronic information.			
<b>Data and Analysis</b>			
MSCSE.13 The student will collect data using computational tools and transform the data to make it more useful and reliable.			
MSCSE.14 The student will refine computational models based on the data they have generated.			
MSCSE.15 The student will represent data using multiple encoding schemes.			
<b>Impacts of Computing</b>			
MSCSE.16 The student will compare tradeoffs associated with computing technologies that affect people's everyday activities and career options.			
MSCSE.17 The student will collaborate with many contributors through strategies such as crowdsourcing or surveys when creating a computational artifact or visualization			
MSCSE.18 The student will describe tradeoffs between allowing information to be public and keeping information private and secure.			
<b>Computing Systems</b>			
MSCSE.19 The student will systematically identify and correct problems with computing devices and their components.	[18]		
MSCSE.20 The student will explore the relationship between hardware and software using the Internet of Things.			
<b>36-week Module</b>			
<b>Algorithms and Programming</b>			
MSCSE.21 The student will a) work in a team to distribute tasks; b) maintain a timeline; and c) use iterative design to solve problems, including peer review and feedback.			
MSCSE.22 The student will decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.			
MSCSE.23 The student will create procedures with parameters to organize code and make it easier to reuse.	[19]		
<b>Computing Systems</b>			
MSCSE.24 The student will recommend improvements to the design of computing devices, based on an analysis of how users interact with the devices.			
MSCSE.25 The student will design projects that combine hardware and software components to collect and exchange data.			

Virginia CS Standards Alignment with CodeX Curriculum			
Computer Science Foundations	Unit 1	Unit 2	Unit 3
<b>Computing Systems</b>			
CSF.1 The student will a) compare the structures, functions, and interactions between application software, system software, and hardware; and b) explore the relationship between hardware and software using the Internet of Things.			
<b>Networks and the Internet</b>			
CSF.2 The student will 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.			
CSF.3 The student will explain the role of protocols in transmitting data across networks and the Internet.			
CSF.4 The student will evaluate the scalability and reliability of networks, by describing the relationship between routers, switches, servers, topology, and addressing.			
<b>Cybersecurity</b>			
CSF.5 The student will identify and explain ways that sensitive data (assets) can be threatened by malware and other computer attacks, using appropriate terminology.			
CSF.6 The student will give examples of ways to protect sensitive data (assets) from malware and other computer attacks and evaluate them according to multiple criteria.			
CSF.7 The student will explain typical tradeoffs between usability and security and recommend security measures in a given scenario based on these (or other) tradeoffs.			
CSF.8 The student will write or adapt a program to validate its input and to avoid certain kinds of vulnerabilities.			
<b>Data and Analysis</b>			
CSF.9 The student will evaluate the tradeoffs in how data elements are organized and where data is stored.			
CSF.10 The student will create interactive data visualizations using software tools to help others better understand real-world phenomena.			
CSF.11 The student will use data analysis tools and techniques to identify patterns in data representing complex systems.			
<b>Algorithms and Programming</b>			
CSF.12 The student will develop a program working individually and in teams using a text-based language.	[20]		
CSF.13 The student will identify the expected output of a program given a problem and some input.			
CSF.14 The student will design and iteratively develop programs for practical intent or personal expression, incorporating feedback from users.			
CSF.15 The student will design and implement algorithms using a) sequencing of instructions; b) conditional execution; and c) iteration.	[21]		
CSF.16 The student will implement a program that accepts input values, stores them in appropriately named variables, and produces output.	[22]		
CSF.17 The student will trace the execution of an algorithm, illustrating output and changes in values of named variables.	[23]		
CSF.18 The student will apply the basic operations used with numeric and non-numeric data types in developing programs.	[24]		
CSF.19 The student will use predefined functions to simplify the solution of a complex problem.			
CSF.20 The student will apply simple algorithms to a collection of data.			[25]
CSF.21 The student will create programs a) demonstrating an understanding that program development is an ongoing process that requires adjusting and debugging along the way; and b) using version control to create and refine programs.	[26]		
<b>Impacts of Computing</b>			
CSF.22 The student will use tools and methods for collaboration on a project to increase connectivity of people in different cultures and career fields.			
CSF.23 The student will evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.			
CSF.24 The student will explain the beneficial and harmful effects that intellectual property laws can have on innovation, including the impact of open source software.			
CSF.25 The student will explain the privacy concerns related to the collection and generation of data through automated processes that are not always evident to users.			

# Virginia CS Standards Alignment with CodeX Curriculum

Computer Science Principles	Unit 1	Unit 2	Unit 3
<b>Computing Systems</b>			
CSP.1 The student will develop and apply criteria for evaluating a computer system for a given purpose			
CSP.2 The student will illustrate ways computing systems implement logic, input, and output through hardware components.			
<b>Networks and the Internet</b>			
CSP.3 The student will explain abstractions enabling a) one computer to communicate with another over an Internet connection; and b) different layers of Internet technology to build on one another.			
CSP.4 The student will explain design principles enabling large-scale operation of the Internet to connect devices and networks all over the world.			
<b>Cybersecurity</b>			
CSP.5 The student will explain symmetric and asymmetric encryption as they pertain to messages being sent on a network.			
<b>Data and Analysis</b>			
CSP.6 The student will discuss the methods and tradeoffs of collecting and analyzing data elements on a large scale.			
CSP.7 The student will select data collection tools and techniques to generate data sets that support a claim or communicate information. Implement a relational database to work with data.			
CSP.8 The student will discuss how data representations can be interpreted in a variety of forms, convert between data representations, and analyze the representation tradeoffs among various forms of digital information.			
<b>Algorithms and Programming</b>			
CSP.9 The student will design and implement algorithms with a) compound conditional execution; and b) a variety of loop control structures.	[27]		
CSP.10 The student will solve a complex problem by decomposing it into subtasks consisting of predefined functions and user-defined functions.			
CSP.11 The student will store, process, and manipulate data contained in a data structure.			
CSP.12 The student will systematically debug a program using an appropriate set of data.	[28]		
<b>Impacts of Computing</b>			
CSP.13 The student will explain how computing has impacted innovations in other fields positively and negatively, and enables collaboration between a variety of people.			
CSP.14 The student will evaluate the impact of equity, access, and influence on the distribution of computing resources in a global society, including the impacts of cloud computing.			
CSP.15 The student will explain how intellectual property concerns affect the tools for and products of computing, including combining existing content to create new artifacts and the impact of open source and free software.			
CSP.16 The student will evaluate the social and economic implications of privacy in the context of safety, law, or ethics.			

# Virginia CS Standards Alignment with CodeX Curriculum

Computer Science Programming	Unit 1	Unit 2	Unit 3
<b>Cybersecurity</b>			
PRG.1 The student will describe and use best practices of program development that make some common flaws less likely and explain how this improves computer security.			
<b>Data and Analysis</b>			
PRG.2 The student will create programs that model the relationships among different elements in collections of real-world data.			
PRG.3 The student will translate numbers between machine representations and human-accessible representations.			
<b>Algorithms and Programming</b>			
PRG.4 The student will design and implement a program working individually and in teams using a text-based language.	[29]		
PRG.5 The student will explain the software life cycle and how it applies to iterative development processes.			
PRG.6 The student will design and implement an algorithm a) with compound conditional execution, and analyze and evaluate complex Boolean conditions; and b) using complex iteration, including nested loops.	[30]		
PRG.7 The student will implement programs that accept input from a variety of sources and produce output based on that input.			
PRG.8 The student will trace the execution of iterative and recursive algorithms, illustrating output and changes in values of named variables.	[31]		
PRG.9 The student will perform complex computations a) on numbers, including modular division and random number generation; and b) on strings, including substring manipulation and processing individual characters.			
PRG.10 The student will demonstrate an understanding of different data types by using appropriate constructs to convert between them when appropriate.	[32]		
PRG.11 The student will analyze a large-scale computational problem, identify generalizable patterns, and implement a solution.			
PRG.12 The student will implement an algorithm that uses existing functions and accesses existing libraries or APIs to satisfy its requirements.	[33]		
PRG.13 The student will write functions, both with and without parameters, and both with and without return values, that represent abstractions useful to the solution of a larger problem.	[34]		
PRG.14 The student will create programs demonstrating an understanding of the interactions between classes in object-oriented design, and by implementing classes with instance data and methods to satisfy a design specification.			
PRG.15 The student will use code written by others by reading the documentation and incorporating it into their programs using proper citation of the reused code.			
PRG.16 The student will read and store data in 1D and 2D collections, and design and implement algorithms to process and manipulate those collections.			
PRG.17 The student will adapt classic algorithms for use in a particular context and analyze them for effectiveness and efficiency.			
PRG.18 The student will develop and use a series of test cases to verify that a program performs according to its design specifications, including edge cases and all branches.			
PRG.19 The student will, through the process of code review, evaluate a program's correctness, readability, usability, and other factors.	[35]		
PRG.20 The student will use a systematic approach and debugging tools to independently debug a program.	[36]		
<b>Impacts of Computing</b>			
PRG.21 The student will identify some of the practical, business, and ethical impacts of open source and free software and the widespread access they provide.			



- [1] pseudocodes are introduced in the teachers' manual
- [2] These are the remixes that begin in Mission 4
- [3] This begins in Mission 4  
3.5 introduces the debugger
- [4] Flowcharts and pseudocodes are introduced in the teachers' manual
- [5] These are the remixes that begin in Mission 4
- [6] 3.5 introduces the debugger  
Code Tracing Charts are in the teachers' manual
- [7] Libraries are used in all missions and every time a new one is introduced it is explained
- [8] These are the remixes that begin in Mission 4
- [9] 5.5 introduces the use of comments
- [10] These are the remixes that begin in Mission 4
- [11] Flowcharts are introduced in the teachers' manual
- [12] These begin in Mission 4
- [13] 3.8 introduces variables  
4.2 introduces different data types and strings
- [14] This is introduced in Mission 4
- [15] 5.5 introduces the use of comments
- [16] These are introduced in the teachers' manual
- [17] All missions use libraries and every time a new one is introduced it is explained
- [18] Mission 2 and the teachers' manual discusses troubleshooting
- [19] Code Reuse begins with Mission 6  
7.6 discusses readability and maintenance for reuse

- [20] These are the remixes that begin in Mission 4
- [21] This begins with Mission 4
- [22] This begins in Mission 4
- [23] Mission 3 shows the use of the debugger to step into the program one line at a time
- [24] Mission 4 begins the use of numeric and non numeric data types
- [25] This is done in Mission 10
- [26] These are the remixes that begin in Mission 4
- [27] These begin in Mission 4
- [28] 3.5 introduces the debugger
- [29] These are the remixes that begin in Mission 4
- [30] Mission 6 introduces but does not discuss nested loops  
Mission 9 introduces compound conditionals
- [31] Code Tracing Charts are introduced in the teachers' manual  
The debugger is explained in 3.5 and shows how you can trace the variable changes
- [32] Mission 4 introduces different data types
- [33] All missions use libraries and every time a new one is introduced it is explained
- [34] Function use begins in Mission 4  
Function creation begins in Mission 9
- [35] Code Tracing Charts are introduced in the teachers' manual
- [36] 3.5 introduces the debugger