Computer Science Standards Scope & Sequence

Integrating the K5 Computer Science Standards Across the Curriculum @ L L Beazley
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VDOE Computer Science Page	All K – 12th CS Standards PDF	CS SOL Curriculum Framework Draft PDF

Algorithms and Programming

K.1 The student will construct sets of step-by-step instructions (**algorithms**) either independently or collaboratively including **sequencing**, emphasizing the beginning, middle, and end. [Related SOL: Math K.13]	1.1 The student will construct sets of step-by-step instructions (**algorithms**) either independently or collaboratively, including a) **sequencing** (including ordinal numbers) and; b) simple **loops** (**patterns** and **repetition**).	2.1 The student will construct sets of step-by-step instructions (**algorithms**) both independently and collaboratively a) using **sequencing**; b) using **loops** (a wide variety of **patterns** such as **repeating patterns** or **growing patterns**); and c) identifying **events**.	3.1 The student will construct sets of step-by-step instructions (**algorithms**), both independently and collaboratively a) using **sequencing**; b) using **loops** (a wide variety of **patterns** such as **repeating patterns** or **growing patterns**); and [Related SOL: Math 3.16] c) using **events**.	4.1 The student will construct sets of step-by-step instructions (**algorithms**) both independently and collaboratively a) using **sequencing**; b) using **loops**; c) using **variables** to store and **process data**; and d) performing number **calculations on variables** (e.g., addition, subtraction, multiplication and division). [Related SOL: Math 4.4, 4.5, 4.6]	5.1 The student will construct sets of step-by-step instructions (**algorithms**) both independently and collaboratively, a) using **sequencing**; b) using **loops**; [Related SOL: Math 5.18] c) using **variables** to **store** and **process data**; [Related SOL: Math 5.19] d) performing number **calculations on variables** (addition, subtraction, multiplication and division); and [Related SOL: Math 5.5, 5.7] e) e) using **conditionals** (if-statements). [Related SOL: M 5.2, 5.3]
K.2 The student will **construct programs** to accomplish tasks as a means of creative expression using a **block based programming** language or **unplugged activities**, either independently or collaboratively, including *sequencing*, emphasizing the *beginning, middle, and end*.	1.2 The student will **construct programs** to accomplish tasks as a means of creative expression using **a block based programming** language or **unplugged activities**, either independently or collaboratively including a) *sequencing*, *ordinal numbers*; and b) **simple loops** (patterns and repetition).	2.2 The student will **construct programs** to accomplish tasks as a means of creative expression using a **block based programming** language or **unplugged activities**, both independently and collaboratively a) using **sequencing**; b) using **loops** (a wide variety of patterns, such as repeating patterns or growing patterns); and c) identifying **events**.	3.2 The student will **construct programs** to accomplish tasks as a means of creative expression using a **block or text based programming** language, both independently and collaboratively a) using **sequencing**; b) using **loops** (a wide variety of patterns such as repeating patterns or growing patterns); and c) identifying **events**.	4.2 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 a) using **sequencing**; b) using **loops**; c) using **variables**; and d) performing number **calculations** (e.g., addition, subtraction, multiplication and division) on **variables**. [Related SOL: Math 4.4, 4.5, 4.6]	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 a) using **sequencing**; b) using **loops**; c) using **variables**; d) using mathematical **operations** (addition, subtraction, multiplication and division) **variable** to manipulate a variable; and [Related SOL: Math 5.19]

K	1	2	3	4	5
					e) using conditionals (if-statements).
K.3 The student will *create a design **document** to illustrate thoughts, ideas, and stories in a* **sequential** *(step-by-step) manner (e.g., story map, storyboard, and sequential graphic organizer).*	1.3 The student will *analyze, correct, and improve (**debug**) an* **algorithm** *that includes* **sequencing**.	2.3 The student will *analyze, correct, and improve (**debug**) an* **algorithm** *that includes* **sequencing** *and simple* **loops**, *with or without a computing device.*	3.3 The student will *analyze, correct, and improve (**debug**) an* **algorithm** *that includes* **sequencing**, **events**, *and* **loops**. [Related SOL areas – Math: Problem Solving, English: Editing]	4.3 The student will *analyze, correct, and improve (**debug**) an* **algorithm** *that includes* **sequencing**, **events**, **loops** *and* **variables**. [Related SOL areas – Math: Problem Solving, English: Editing]	5.3 The student will *analyze, correct, and improve (**debug**) an* **algorithm** *that includes* **sequencing**, **events**, **loops**, **conditionals**, *and* **variables**. [Related SOL areas - Math: Problem Solving, English: Editing]
K.4 The student will **categorize** *a group of items based* **on one attribute** *or the action of each item,* **with or without a computing device**. [Related SOL: Math K.12, Science K.1d]	1.4 The student will *plan and create a* **design document** *to illustrate thoughts, ideas, and stories in a* **sequential (step-by-step) manner** *(e.g., story map, storyboard, sequential graphic organizer).*	2.4 The student will *plan and create a* **design document** *to illustrate thoughts, ideas, and stories in a* **sequential (step-by-step) manner** *(e.g., story map, storyboard, sequential graphic organizer).*	3.4 The student will *create a plan as part of the* **iterative design process**, *independently and/or collaboratively using strategies such as* **pair programming** *(e.g., storyboard, flowchart, pseudo-code, story map.* [Related SOL: English 3.8c]	4.4 The student will *create a plan as part of the* **iterative design process**, *both independently and collaboratively using strategies such as* **pair programming** *(e.g., storyboard, flowchart, pseudo-code, story map).* [Related SOL: English: 4.7d, f]	5.4 The student will *create a plan as part of the* **iterative design process**, *both independently and collaboratively using strategies such as* **pair programming** *(e.g., storyboard, flowchart, pseudo-code, story map).* [Related SOL: English 5.7 c, d, e]
	1.5 The student will **categorize** *a group of items based on one or* **two attributes** *or the actions of each item, with or* **without a computing device**. [Related SOL: Science 1.1c, Math 1.13]	2.5 The student will **compare and contrast** *a group of items based on the* **attributes or actions** *of each item,* **with or without a computing device**. [Related SOL: Science.2.1d, Math 2.13]	3.5 The student will **compare and contrast** *a group of items based on* **attributes or actions classified into at least two sets and two subsets**. [Related SOL: Science 3.1c]	4.5 The student will **classify** *and* **arrange** *a group of items based on the* **attributes or actions**. [Related SOL: Science 4.1.b]	5.5 The student will *break down (**decompose**) a larger problem into smaller sub-problems,* **both** *independently and collaboratively.* [Related SOL: Math 5.4]
	1.6 The student will **acknowledge** *that materials are created by others (e.g., author, illustrator).*	2.6 The student will **acknowledge** *that materials are created by others (e.g., author, illustrator, and website).*	3.6 The student will *break down (**decompose**) a larger problem into smaller sub-problems, independently or collaboratively.* [Related SOL: Math 3.3b]	4.6 The student will *break down (**decompose**) a larger problem into smaller sub-problems, both independently and collaboratively.* [Related SOL: Math 4.4d]	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).* [Related SOL: English 5.9d, e]
			3.7 The student will *give* **credit to sources** *when borrowing or changing ideas (e.g., using information and pictures created by others, using music created by others, remixing programming projects).* [Related SOL: English 3.10e]	4.7 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).* [Related SOL: English 4.9d, e]	

Computing Systems

K.5 The student will *identify* **components** of **computing systems** (e.g., *keyboard, mouse, desktop computer, laptop computer, tablet, and printer*).	1.7 The student will *identify* **components of computing systems** *that are common among* **different types of computing devices** *including* **desktop and laptop computers, tablets,** *and* **mobile phones**.	2.7 The student will *describe the* **characteristics** of **computing systems** *to include* **hardware, software, input, and output**.	3.8 The student will **model** *how a* **computing system** *works including* **input** *and* **output**. [Related SOL: Math 3.16]	4.8 The student will **model** *how a* **computing system** *works including* **input** *and* **output, processors** *and* **sensors**.	5.7 The student will **model** *how a* **computing system** *works including* **input** *and* **output, processors, sensors** *and* **storage**.
K.6 The student will *identify, using accurate* **terminology**, **simple** *hardware and software* **problems** *that may occur during use (e.g., app or program is not working as expected, no sound is coming from a device, device will not turn on).*	1.8 The student will *identify, using accurate* **terminology**, *simple hardware and software* **problems** *that may occur during use (e.g., app or program is not working as expected, no sound is coming from the device, the device won't turn on).*	2.8 The student will *identify, using accurate* **terminology**, *simple hardware and software* **problems** *that may occur during use (e.g., app or program not working as expected, no sound, device won't turn on).*	3.9 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).*	4.9 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 for network availability, closing and reopening an app).*	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).*

Cybersecurity

K.7 The student will *identify* what *is allowed and what is not allowed* at school *when using technology*.	1.9 The student will *describe* what is *allowed and what is not allowed* at school associated with the *use of technology*.	2.9 The student will *explain* what is *allowed and what is not allowed* at school associated with the *use of technology* (e.g., class rules).	3.10 The student will *identify problems* that relate to *inappropriate use of computing devices and networks*.	4.10 The student will *identify* and *explain problems* that relate to *inappropriate use of computing devices and networks*.	5.9 The student will *evaluate* and *solve problems* that relate to *inappropriate use of computing devices and networks*
K.8 The student will *identify* personal information *(e.g., address, telephone number, and name) and the importance of protecting personal information online.*	1.10 The student will *identify* and *use strong passwords, explain* why strong passwords should be used (e.g., protect name, address, and telephone number).	2.10 The student will *identify* and *create strong passwords, explain* why strong passwords should be used. (e.g., protect name, address, and telephone number).	3.11 The student will *create* examples of *strong* passwords, *explain* why strong passwords should be used, and *demonstrate* proper use and protection of personal passwords.	4.11 The student will *create* examples of *strong* passwords, *explain* why strong passwords should be used, and *demonstrate* proper use and protection of personal passwords.	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.

Data and Analysis

K.9 The student will **gather** and **display data** and **organize** it in a chart or graph in order to **answer questions about the data, with or without a computing device.** [Related SOL: HSS K.1c]	1.11 The student will **identify** and **interpret data** and **organize** it in a chart or graph in order to make a **prediction**, **with or without a computing device**. [Related SOL: HSS 1.1c]	2.11 The student will **construct** and **analyze data** and **organize** it in a chart or graph in order to make a **prediction**, **with or without a computing device.** [Related SOL: HSS 2.1c]	3.12 The student will **answer questions** by **using a computer to observe data** in order for the student to **draw conclusions** and make **predictions**. [Related SOL: Math 3.15, HSS 3.1d]	4.12 The student will **answer questions** by **using a computer to manipulate data** in order for the student to **draw conclusions** and **make predictions**. [Related SOL: Math 4.14]	5.11 The student will **answer a question** by **using a computer to manipulate data** in order for the student to **draw conclusions** and make **predictions**. [Related SOL: Math 5.16, 5.17, VS.1c and j]
		2.12 The student will **create a model** of a physical object or process in order to show relationships **with or without a computing device** (e.g., water cycle, butterfly life cycle, seasonal weather patterns).	3.13 The student will **create an artifact using computing systems** to **model** the attributes and behaviors associated with a concept (e.g., day and night, animal life cycles, plant life cycles). [Related SOL areas – Math: Models, Science: Moon Phases]	4.13 The student will **create an artifact using computing systems** to **model** the attributes and behaviors associated with a concept (e.g., solar system). [Related SOL area – Math: Models]	5.12 The student will **create an artifact using computing systems to model** the attributes and behaviors associated with a concept (e.g., rocks). [Related SOL area - Math Models, VS.1c and j]
				4.14 The student will use **numeric values** to represent **non-numeric ideas in the computer** (**binary**, ASCII, pixel attributes such as RGB). [Related SOL: Math 5.19a]	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). [Related SOL: Math 5.19a]

Impacts of Computing					
K.10 The student will **identify responsible behaviors** associated with using information and technology. [Related SOL: HSS K.10]	1.12 The student will **identify** and **explain responsible behaviors** associated with using information and technology. [Related SOL: HSS 1.10]	2.13 The student will **compare and contrast** examples of how **computing technology** has **changed and improved the way people live, work, and interact.** [Related SOL: HSS 2.11]	3.14 The student will **identify computing technologies** that have changed the world and **express how those technologies influence, and are influenced by, cultural practices**.	4.15 The student will give **examples of computing technologies that have changed the world** and **express how those technologies influence, and are influenced by, cultural practices**.	5.14 The student **will give examples** and **explain how computer science had changed the world** and **express how computing technologies influence, and are influenced by, cultural practices**.
		2.14 The student will **identify** and **model responsible behaviors** when using information and technology. [Related SOL: HSS 2.11]	3.15 The student will **identify** 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).	4.16 The student will **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).	5.15 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).
			3.16 The student will **identify social and ethical issues** that relate to computing devices and networks. [Related SOL: C/T: 6-8.3, HSS 3.11]	4.17 The student will **describe social and ethical issues** that relate to computing devices and networks. [Related SOL: C/T: 6-8.3]	5.16 The student will **explain social and ethical issues** that relate to computing devices and networks. [Related SOL: C/T: 6-8.3]

Networking and the Internet

K.11 The student will *discuss, in a whole class setting, how information can be communicated electronically* (e.g., email, social media)	1.13 The student will, *in a whole class* environment, discuss *how information can be communicated electronically* (e.g., email, social media).	2.15 The students will *discuss in partners and as a class how information can be communicated electronically* (e.g., email, social media, video conferencing, blogging).	3.17 The students will *discuss in partners and as a class that information can be transmitted using computing devices via a network* (e.g., email, blogging, video messaging).	4.18 The student will *identify and explain how information can be transmitted using computing devices via a network* (e.g., email, images, and videos).	5.17 The student will *compare and contrast the difference between a local network and a worldwide network.*