Kentucky Academic Standards (KAS) for **Computer Science**

Progression Chart

Concept	Subconcept	Grades K-5 By the end of Grade 5, students will be able to...	Grades 6-8 By the end of Grade 8, students will be able to...	Grades 9-12 By the end of Grade 12, students will be able to...
Networks & The Internet	Network Communication & Organization	**E-NI-01:** Understand the basic components of how networks operate to protect physical and digital information.	**M-NI-01:** Model how different sets of rules (protocols) are used to transmit different types of data across networks and the Internet.	**H-NI-01:** Evaluate the scalability and reliability of networks, by describing the relationship between routers, switches, end devices, topology, and addressing.
		function moveForward() { var standard }	function moveForward() { var standard }	**H-NI-04:** Describe the issues that impact network functionality (e.g., bandwidth, load, delay, topology). *
	Cybersecurity	**E-NI-02:** Model how information is broken down into smaller pieces (data packets), transmitted over various paths (physical and/or wireless), and reassembled at the destination	**M-NI-02:** Model how information is disguised using different methods of encryption to secure it during transmission from one point to another.	**H-NI-02:** Give examples to illustrate how sensitive data can be affected by viruses, malware and other attacks.
		function moveForward() { var standard }	**M-NI-03:** Explain how physical and digital security practices and measures proactively address the threat of breaches to personal and private data.	**H-NI-03:** Recommend security measures to address various scenarios based on factors such as usuability, efficiency, feasibility, and ethical impacts.
		function moveForward() { var standard }	function moveForward() { var standard }	**H-NI-05:** Compare ways software developers protect devices and information from unauthorized access. *
Data & Analysis	Storage	**E-DA-01:** Appropriately store and modify digital files.	**M-DA-01:** Store data using multiple encoding methods.	**H-DA-01:** Evaluate the trade offs in how data elements are organized and where data is stored.*
	Collection, Visualization & Transformation	**E-DA-02:** Collect and visually display data using appropriate applications.	**M-DA-02:** Collect data using computational tools and transform the data to make it more useful and reliable.	**H-DA-02:** Collect data using appropriate data collection tools and techniques to support a claim or to communicate information.
		function moveForward() { var standard }	function moveForward() { var standard }	**H-DA-03:** Understand and design database structures to optimize search and retrieval.*
		function moveForward() { var standard }	function moveForward() { var standard }	**H-DA-04:** Explain the privacy concerns related to the collection and generation of data.
		function moveForward() { var standard }	function moveForward() { var standard }	**H-DA-05:** Use data analysis tools (e.g. formulas and other software data / statistical tools) to process and transform the data to make it more useful and reliable.
		function moveForward() { var standard }	function moveForward() { var standard }	**H-DA-08:** Create interactive data visualizations using software tools to help others better understand real-world phenomena.

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	Inference & Models	**E-DA-03:** Analyze data for trends and relationships	**M-DA-03:** Refine computational models based on the data they have generated.	**H-DA-06:** Use data analysis tools and techniques to identify patterns and analyze data represented in complex systems.
		function moveForward() { var standard }	function moveForward() { var standard }	**H-DA-07:** Create computational models that represent the relationships among different elements of data.
		function moveForward() { var standard }	function moveForward() { var standard }	**H-DA-09:** Evaluate the ability of models and simulations to test and support the refinement of hypotheses.*
Algorithms & Programming	Algorithms	**E-AP-01:** Create, follow, compare and refine algorithms for a task.	**M-AP-04:** Create flowcharts and/or pseudocode to address complex problems as algorithms.	**H-AP-07:** Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests.
		function moveForward() { var standard }	function moveForward() { var standard }	**H-AP-13:** Use and adapt classic algorithms to solve computational problems.*
		function moveForward() { var standard }	function moveForward() { var standard }	**H-AP-14:** Evaluate algorithms in terms of their efficiency, correctness, and clarity.*
		function moveForward() { var standard }	function moveForward() { var standard }	**H-AP-16:** Illustrate the flow of execution of a recursive algorithm.*
	Variables	**E-AP-02:** Explore and use variables in a program.	**M-AP-05:** Create clearly named variables that represent different data types and perform operations on their values.	**H-AP-03:** Use functions, data structures or objects to simplify solutions, generalizing computational problems instead of repeated use of simple variables.
	Control	**E-AP-03:** Routinely create programs using a variety of tools to express ideas, address a problem or create an artifact, individually and collaboratively.	**M-AP-07:** Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals.	**H-AP-06:** Justify the selection of specific control structures when trade offs involve implementation, readability, and program performance and explain the benefits and drawbacks of choices made.
		function moveForward() { var standard }	function moveForward() { var standard }	**H-AP-15:** Compare and contrast fundamental data structures and their uses.*
		function moveForward() { var standard }	function moveForward() { var standard }	**H-AP-21:** Use version control systems, integrated development environments (IDEs), and collaborative tools and practices (code documentation) in a group software project.*
	Modularity	**E-AP-04:** Decompose precise steps needed to solve a problem.	**M-AP-02:** Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.	**H-AP-05:** Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.
	Subconcept	Grades K-5	Grades 6-8	Grades 9-12

		By the end of Grade 5, students will be able to...	By the end of Grade 8, students will be able to...	By the end of Grade 12, students will be able to...
		E-AP-05: Use a process when creating programs or computational artifacts.	**M-AP-06:** Create procedures with parameters to organize code and make it easier to reuse.	**H-AP-18:** Analyze a large-scale computational problem and identify generalizable patterns that can be applied to a solution.*
	Program Development	**E-AP-06:** Modify, remix or reuse part of an existing program to create a new program, giving attribution to others.	**M-AP-01:** Distribute tasks and maintain a project timeline when collaboratively developing computational artifacts.	**H-AP-01:** Evaluate licenses that limit or restrict use of computational artifacts when using resources such as libraries.
		E-AP-07: Document, share and reflect when creating programs using correct terminology.	**M-AP-12:** Develop a process creating a computational artifact that leads to a minimum viable product followed by reflection, analysis, and iteration.	**H-AP-02:** Use a development process in creating a computational artifact that leads to a minimum viable product followed by reflection, analysis, and iteration.
		E-AP-08: Identify and correct errors in an algorithm.	**M-AP-03:** Seek and incorporate feedback from team members and users to refine a solution that meets user needs.	**H-AP-04:** Design and iteratively develop event-driven computational artifacts for practical intent, personal expression, or to address a societal issue.
		`function moveForward() { var standard }`	**M-AP-08:** Incorporate existing code, media, and libraries into original programs, and give attribution.	**H-AP-08:** Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.
		`function moveForward() { var standard }`	**M-AP-09:** Systematically test and refine programs using a range of test cases.	**H-AP-09:** Evaluate and refine computational artifacts to make them more usable and accessible using systematic testing and debugging.
		`function moveForward() { var standard }`	**M-AP-10:** Document programs in order to make them easier to follow, test, and debug.	**H-AP-10:** Systematically design and develop programs for broad audiences by incorporating feedback from users.
		`function moveForward() { var standard }`	**M-AP-11:** Evaluate licenses that limit or restrict use of computational artifacts when using resources such as libraries.	**H-AP-11:** Design and develop computational artifacts working in team roles using collaborative tools.*
		`function moveForward() { var standard }`	`function moveForward() { var standard }`	**H-AP-12:** Describe how artificial intelligence drives many software and physical systems.*
		`function moveForward() { var standard }`	`function moveForward() { var standard }`	**H-AP-17:** Construct solutions to problems using student-created components, such as procedures, modules and/or objects.*
		`function moveForward() { var standard }`	`function moveForward() { var standard }`	**H-AP-19:** Select and employ an appropriate component or library to facilitate programming solutions.*
		`function moveForward() { var standard }`	`function moveForward() { var standard }`	**H-AP-20:** Develop programs for multiple computing platforms.*
		`function moveForward() { var standard }`	`function moveForward() { var standard }`	**H-AP-22:** Modify an existing program to add additional functionality and discuss intended and unintended implications (e.g., introducing errors).*

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	Program Development	function moveForward() { var standard }	function moveForward() { var standard }	**H-AP-23:** Evaluate key qualities (including correctness, usability, readability, and efficiency) of a program.*
		function moveForward() { var standard }	function moveForward() { var standard }	**H-AP-24:** Compare multiple programming languages and discuss how their features make them suitable for solving different types of problems.*
Impacts of Computing	Culture	**E-IC-01:** Discuss how computing has impacted society.	**M-IC-01:** Discuss issues of bias and accessibility in existing technologies.	**H-IC-01:** Reduce bias and equity deficits through the design of accessible computational artifacts.
		function moveForward() { var standard }	**M-IC-02:** Compare the positive & negative effects of computing technologies on society.	**H-IC-03:** Research how computational innovations that have revolutionized aspects of our culture might have evolved from a need to solve a problem.
		function moveForward() { var standard }	function moveForward() { var standard }	**H-IC-06:** Evaluate the impact of the digital divide (i.e. inequity of computing access, education and influence) on the development of local communities and society.
		function moveForward() { var standard }	function moveForward() { var standard }	**H-IC-07:** Demonstrate ways computational design (i.e. algorithms, abstractions and analysis) can apply to problems across disciplines.*
	Social Interactions	**E-IC-02:** Discover how computing devices have affected the way people communicate.	**M-IC-03:** Collaborate with others using appropriate tools at the local, national, and/or international levels.	**H-IC-02:** Evaluate and assess how computing impacts personal, ethical, social, economic, and cultural practices.
	Safety, Law & Ethics	**E-IC-03:** Evaluate the relevance and appropriateness of electronic information sources and digital media.	function moveForward() { var standard }	**H-IC-04:** Explain the beneficial and harmful effects that laws governing data (intellectual property, privacy etc.) can have on innovation.
		E-IC-04: Understand the importance of proper use of data and information in a computing society.	function moveForward() { var standard }	**H-IC-05:** Evaluate and design computational artifacts to maximize their benefit to society.*
		function moveForward() { var standard }	**M-IC-04:** Discuss the benefits and consequences of making information either public or private.	**H-IC-08:** Debate laws and regulations that impact the development and use of software and the protection of privacy.

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Computing Systems	Devices	**E-CS-01:** Select and operate appropriate software and hardware to perform a variety of tasks and recognize that users have different needs and preferences for the technology they use.	**M-CS-01:** Recommend improvements to the design of computing devices based on an analysis of how users interact with the devices.	**H-CS-01:** Explain how abstractions hide the underlying implementation details of computing systems embedded in everyday objects.
	Hardware & Software	**E-CS-02:** Identify and describe the function of common physical components of computing systems (hardware) using appropriate terminology.	**M-CS-02:** Design projects that combine hardware and software components to collect and exchange data.	**H-CS-02:** Compare levels of abstraction and interactions between application software, system software and hardware layers.
		`function moveForward() { var standard }`	`function moveForward() { var standard }`	**H-CS-04:** Categorize the roles of operating system software.
		`function moveForward() { var standard }`	`function moveForward() { var standard }`	**H-CS-05:** Illustrate ways computing systems implement logic, input, and output through hardware components.*
	Troubleshooting	**E-CS-03:** Describe basic hardware and software problems using accurate terminology.	**M-CS-03:** Identify and fix problems with computing devices and their components systematically.	**H-CS-03:** Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.