

Essential Skills for Grade 5

Concept	Sub-concept	Standard	Essential Skills
Computing Systems	Devices	5. CS.D.01 Describe and model how internal and external parts of computing devices function to form a system. Describe how some components rely on others for correct functionality	Create a model of a computing system that shows how components interact to function correctly.
Computing Systems	Hardware & Software	5. CS.HS.01 Model and explain how information flows through hardware and software to accomplish a task.	Create a model that shows the path of an input through a computing device and its conversion to an output.
Computing Systems	Troubleshooting	5. CS.T.01 Identify, using appropriate technical terminology, simple hardware and software problems that may occur during everyday use, discuss problems with peers and adults, apply a variety of strategies for solving these problems, and provide evidence why these strategies did or did not work.	Recognize and explain, using appropriate technical language, common problems that occur with computing devices. Analyze the reasons for success or failure of attempted solutions to problems with computing devices.
Networks and the Internet	Network Communication & Organization	5. NI.NCO.01 Model how information is deconstructed into packets (smaller pieces), transmitted through multiple devices over the internet and networks, and reassembled at the final destination.	Illustrate (in words, pictures, dramatization and/or animation) how the transmission of packets occurs through multiple devices over the Internet.
Networks and the Internet	Cybersecurity	5. NI.C.01 Define personal identifiable information (e.g., digital footprint) and why it should be protected as related to real-world cyber security problems.	Compare and contrast personal identifiable information and digital footprint and provide examples of each. Identify cybersecurity issues that can result from not protecting personally identifiable information.
Networks and the Internet	Cybersecurity	5. NI.C.02 Discuss real-world cybersecurity problems and explain how personal information can be protected (e.g., antivirus software, backing up data, strong passwords).	Describe examples of cybersecurity issues. Outline ways personal identifiable information can be protected.

Data Analysis	Storage	5. DA.S.01 Convert different types of information into various formats to be used across multiple software/hardware.	Identify the file format that various software and hardware are capable of storing and opening (for example a spreadsheet stored on a laptop can be opened by Excel or Google Sheets). Convert a file from a format appropriate for one device to a format appropriate for another device based on the intended software and/or hardware.
Data Analysis	Collection, Visualization & Transformation	5.DA.CVT.01 Interpret and communicate data in a variety of visual formats to highlight the relationships among the data to support a claim	Interpret data to make a claim. Justify the choice of a visual representation or format of the data to support a claim most effectively or communicate an interpretation.
Data Analysis	Inference & Models	5. DA.IM.01 Refer to data sets to highlight or propose cause-and-effect relationships, predict outcomes, or communicate ideas.	Use data to justify how you answer a question, detect a pattern, or infer causation, correlation or draw a conclusion.
Algorithms and Programming	Algorithms	5. AP.A.01 Develop, compare, and refine multiple algorithms for the same task and determine which algorithm is the most appropriate.	Evaluate two or more algorithms that complete the same task to determine which algorithm is best suited for the task at hand. Justify the choice of which algorithm is most appropriate to complete a task.
Algorithms and Programming	Variables	5. AP.V.01 Create programs that use variables to store and modify grade-appropriate data.	Create a computer program in which the value of a variable changes, resulting in a change in the output of the program. Use variables for more than one type of data (e.g., text and numbers) in a computer program.
Algorithms and Programming	Control	5.AP.C.01 Create programs using a programming language that includes sequences, loops, conditionals, event handlers, and variables that utilize mathematics operations to manipulate values in order to solve a problem or express an idea.	Incorporate one or more events that cause a set of instructions or occurrences to be executed in a computer program. Model (verbally, using a flowchart, etc.) when and how events in a computer program trigger a set of instructions (event handlers).
Algorithms and Programming	Modularity	5. AP.M.01 Decompose a large problem into smaller, manageable sub-problems and then further into sets of sequenced instructions to facilitate the program development process.	Devise algorithms to solve identified sub-problems Demonstrate how combinations to the solutions of sub-problems can simplify writing programs to solve complex problems.

Algorithms and Programming	Modularity	5. AP.M.02 Modify, remix, or incorporate portions of an existing program into one's own work, to develop or add more advanced features (grade-level appropriate).	Increase the complexity of an original computer program by incorporating portions of existing programs and making modifications, as necessary.
Algorithms and Programming	Program Development	5. AP.PD.01 Use an iterative process to plan the development of a program by including others' perspectives and considering user preferences while solving problems.	Review and revise the plan for a computer program by repeatedly incorporating the perspective of users and others.
Algorithms and Programming	Program Development	5.AP.PD.02 Observe intellectual property rights and give appropriate attribution when creating or remixing programs	Reflect on work produced and assess the desired restrictions to the ability of others to remix or reuse that work. Identify ways creators can restrict how others reuse and remix their work and the reasons they may do so.
Algorithms and Programming	Program Development	5. AP.PD.03 Create, test, and debug a program that includes sequencing, repetition, and variables in a programming language to ensure its runs as intended.	Evaluate a computer program you have created (containing sequences, loops and variables) with respect to its intended outcome. Examine a computer program you have created (containing sequences, loops and variables) to determine where errors exist and make revisions in order to achieve the intended outcome.
Algorithms and Programming	Program Development	5. AP.PD.04 Communicate and explain program development to peers and adults using comments, presentations, and demonstrations.	Summarize how choices made during program development , including debugging and checking inputs and outputs , contributed to program development and the outcome achieved.
Impacts of Computing	Culture and Diversity	5. IC.C.01 Evaluate how different technologies created by people from diverse backgrounds have contributed to computing and helped to change the world.	Identify the variety of backgrounds and experiences of individuals involved in the creation or improvement of a technology. Assess how changes in computing have changed people's lives and our world.

Impacts of Computing	Culture and Diversity	5. IC.C.02 Develop, test, and refine computational artifacts to improve accessibility and usability for all users.	<p>Create an artifact that improves accessibility and/or usability of a computing device or a computer program.</p> <p>Evaluate the extent to which an artifact is effective at improving accessibility and/or usability and revise accordingly.</p>
Impacts of Computing	Social Interactions	5. IC.SI.01 Develop a code of conduct, explain, and practice grade-level appropriate behavior and responsibilities while participating online.	Model multiple ways to respond to and report issues that may occur online including inappropriate behavior.
Impacts of Computing	Social Interactions	5. IC.SI.02 Discuss ways existing computing devices or computational products can be improved by collaborating with outside resources (other grade-levels, businesses) to gain their diverse perspectives.	<p>Collaborate with people of different ages, roles and situations to imagine ways of changing computing devices and programs so they can be improved.</p> <p>Discuss the unique perspectives of others and reflect on one's own perspectives when designing and developing computing devices and programs.</p>
Impacts of Computing	Safety, Law & Ethics	5. IC.SLE.01 Discuss personal consequences and social impact of violating intellectual property rights or failing to provide appropriate attribution.	<p>Explain why it is important to give credit (attribution) to the original creator.</p> <p>Articulate the personal and social consequences of using intellectual property.</p>

Skills for Grade 4

These annotations are a collaboration between [Maryland Center for Computing Education](#) and the [Maryland State Department of Education](#).