



Ohio's Learning Standards

Computer Science Grades 9-12

ADOPTED DECEMBER 2018

Grades 9 - 12—Foundational Level

COMPUTING SYSTEMS

Devices

CS.D.9-12.F.a Identify different multifunctional computing devices and connection technologies, both virtual and physical, to describe their purpose.

CS.D.9-12.F.b Develop and apply criteria to evaluate computing systems for a given purpose.

CS.D.9-12.F.c Create an artifact to demonstrate the roles and interactions of computing systems embedded in everyday objects.

Hardware and Software

CS.HS.9-12.F.a Compare and contrast interactions between application software, system software and hardware.

Troubleshooting

CS.T.9-12.F.a Apply a systemic process to identify problems and take steps to correct them within an integrated computing system.

CS.T.9-12.F.b Analyze an IT device to determine either what repairs are needed or how to build it.

NETWORKS AND THE INTERNET

Networking

NI.N.9-12.F.a Evaluate and select networking devices to establish scalable communications.

NI.N.9-12.F.b Evaluate and select networking protocols to establish network communication.

NI.N.9-12.F.c Understand scalability and reliability of networks to describe the relationships and effects of how the different types of networks work together.

Cybersecurity

NI.C.9-12.F.a Examine and employ principles of cybersecurity.

NI.C.9-12.F.b Identify physical, social and digital security risks to address possible attacks.

DATA AND ANALYSIS

Data Collection and Storage

DA.DCS.9-12.F.a Analyze patterns in a real-world data store through hypothesis, testing and use of data tools to gain insight and knowledge.

DA.DCS.9-12.F.b Investigate data storage systems to compare and contrast how data is stored and accessed.

Visualization and Communication

DA.VC.9-12.F.a Analyze the benefits and limitations of data visualization or multisensory artifacts and tools to communicate which is most appropriate to solve a real-world problem.

Inference and Modeling

DA.IM.9-12.F.a Evaluate a model by creating a hypothesis, testing it and refining it to discover connections and trends in the data.

ALGORITHMIC THINKING AND PROGRAMMING

Algorithms

ATP.A.9-12.F.a Define and use appropriate problem solving strategies and visual artifacts to create and refine a solution to a real-world problem.

ATP.A.9-12.F.b Define and implement an algorithm by decomposing problem requirements from a problem statement to solve a problem.

Variables and Data Representation

ATP.VDR.9-12.F.a Identify types of variables and data and utilize them to create a computer program that stores data in appropriate ways.

Control Structures

ATP.CS.9-12.F.a Define control structures and Boolean logic and use them to solve real-world scenarios.

ATP.CS.9-12.F.b Use appropriate syntax to create and use a method.

ATP.CS.9-12.F.c Use data scoping to isolate data.

Modularity

ATP.M.9-12.F.a Break down a solution into procedures using systematic analysis and design.

Equivalent to: ATP.A.9-12.F.b Define and implement an algorithm by decomposing problem requirements from a problem statement to solve a problem.

ATP.M.9-12.F.b Create computational artifacts by systematically organizing, manipulating and/or processing data.

Addressed in:

ATP.VDR.9-12.A.a Utilize different data storage structures to store larger and more complex data than variables can contain.

ATP.VDR.9-12.A.b Identify the appropriate data structures or variables to use to design a solution to a complex problem.

Program Development

ATP.PD.9-12.F.a Investigate software development methodologies to select the appropriate one for a project to complete as a team.

ATP.PD.9-12.F.b Compare test methodologies to evaluate why each is used and to determine their benefits and costs.

ATP.PD.9-12.F.c Correctly use consistent naming conventions, version control and comments to demonstrate why these are important for future use, maintenance and reuse of code.

IMPACTS OF COMPUTING

Culture

IC.Cu.9-12.F.a Analyze new technology to predict realistic impacts on society.

IC.Cu.9-12.F.b Explore other professions to understand how computing has and will impact them positively and negatively.

Social Interactions

IC.SI.9-12.F.a Evaluate tools to increase connectivity of people in different cultures and career fields.

IC.SI.9-12.F.b Analyze the collection and generation of data through automated processes to explain the privacy concerns that are not always evident to users.

Safety, Law and Ethics

IC.SLE.9-12.F.a Interpret and analyze breaches in privacy and security to investigate the legal and ethical impact.

IC.SLE.9-12.F.b Analyze the concepts of usability and security to explain typical tradeoffs between them.

IC.SLE.9-12.F.c Analyze the collection and generation of data through automated processes to explain the legal concerns that are not always evident to users.

IC.SLE.9-12.F.d Explain the beneficial and harmful effects of intellectual property laws to determine the impacts on innovation.

Grades 9 - 12—Advanced Level

COMPUTING SYSTEMS

Devices

CS.D.9-12.A.a Evaluate the function of various devices to formulate a human interaction solution.

CS.D.9-12.A.b Integrate multifunctional computing devices to solve a problem.

CS.D.9-12.A.c Identify the functionality of various categories of hardware components and the communication between them, and use that information to build a system virtually or physically for a specific task.

Hardware and Software

CS.HS.9-12.A.a Categorize types of operating systems and how they will be used.

Troubleshooting

CS.T.9-12.A.a Evaluate and revise a systematic process to identify the source of a problem and the steps to correct it within individual and connected devices.

NETWORKS AND THE INTERNET

Networking

NI.N.9-12.A.a Construct a networking devices map solution for a real-world scenario to establish communication between distant devices.

NI.N.9-12.A.b Develop a solution to a real-world scenario using networking protocols to establish network communication.

NI.N.9-12.A.c Improve scalability and reliability of networks to describe the relationships and effects of how the different types of networks work together.

Cybersecurity

NI.C.9-12.A.a Identify cybersecurity ethics and law.

NI.C.9-12.A.b Implement a devised solution to counter a security threat.

DATA AND ANALYSIS

Data Collection and Storage

DA.DCS.9-12.A.a Create multidimensional data collections that can be utilized through various methods to solve complex data problems.

DA.DCS.9-12.A.b Investigate data storage and collection tools to analyze tradeoffs and limitations.

Visualization and Communication

DA.VC.9-12.A.a Create visualization or multisensory artifacts to communicate insights and knowledge gained from complex data analysis that answers real-world questions.

Inference and Modeling

DA.IM.9-12.A.a Create a model that simulates a complex system and uses extracted data to hypothesize, test and refine the model to discover connections or trends.

ALGORITHMIC THINKING AND PROGRAMMING

Algorithms

ATP.A.9-12.A.a Define and explain recursive algorithms to understand how and when to apply them.

ATP.A.9-12.A.b Use recursion to effectively solve problems.

ATP.A.9-12.A.c Define and explain sorting and searching algorithms to understand how and when to apply them.

ATP.A.9-12.A.d Use sorting and searching to analyze and organize data.

Variables and Data Representation

ATP.VDR.9-12.A.a Utilize different data storage structures to store larger and more complex data than variables can contain.

ATP.VDR.9-12.A.b Identify the appropriate data structures or variables to use to design a solution to a complex problem.

Control Structures

ATP.CS.9-12.A.a Write programs that use library methods and control structures and methods to solve a problem.

ATP.CS.9-12.A.b Refactor a program to be smaller and more efficient.

Modularity

ATP.M.9-12.A.a Construct solutions to problems using student-created components (e.g., procedures, modules, objects).

Equivalent to: ATP.CS.9-12.F.b Use appropriate syntax to create and use a method.

ATP.M.9-12.A.b Design or redesign a solution to a large-scale computational problem by identifying generalizable patterns.

Equivalent to: ATP.PD.9-12.A.a Fully implement the most appropriate software methodology to complete a team programming project.

ATP.M.9-12.A.c Create programming solutions by reusing existing code (e.g., libraries, Application Programming Interface (APIs), code repositories).

Equivalent to: ATP.CS.9-12.A.a Write programs that use library functions, methods and control structures to solve a problem.

Program Development

ATP.PD.9-12.A.a Fully implement the most appropriate software methodology to complete a team programming project.

IMPACTS OF COMPUTING

Culture

IC.Cu.9-12.A.a Evaluate an alternative solution where a current tool does not exist due to limited resources.

IC.Cu.9-12.A.b Analyze the equity, access and influence of the distribution of computing resources to see their global impact.

IC.Cu.9-12.A.c Design a study to predict how computers will revolutionize an aspect of our culture.

Safety, Law and Ethics

IC.SLE.9-12.A.a Create a scenario to demonstrate typical tradeoffs between usability and security and recommend security measures based on these or other tradeoffs.

IC.SLE.9-12.A.b Investigate intellectual property laws, including copyright, trademarks and patents, to identify some of the practical, business and ethical impacts.