

# Grades 9-12

## COMPUTING SYSTEMS

- 1 Identify and describe hardware components.** 9-12.CS.1.1

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- 2 Identify and evaluate what computing system resources are required for a specific software program.** 9-12.CS.1.2

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- 3 Identify the use of embedded computers in various applications.** 9-12.CS.1.3

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- 4 Create or modify a program that uses different forms of input and output.** 9-12.CS.1.4

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- 5 Identify how a high level programming language abstracts machine language in a computer program.** 9-12.CS.1.5

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- 6 Create a model of how embedded systems sense, process, and interact in a given environment.** 9-12.CS.1.6

## DATA AND ANALYSIS

- 1 Use applicable data collection techniques for various scenarios.** 9-12.CS.2.1

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- 2 Apply basic techniques for locating, collecting, and understanding the quality of data sets.** 9-12.CS.2.2

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- 3 Analyze data and identify patterns through modeling and simulation.** 9-12.CS.2.3

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- 4 Use data analysis to show the transformation from data to information to knowledge.** 9-12.CS.2.4

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- 5 Use models and simulations to help formulate, refine, and test scientific hypotheses.** 9-12.CS.2.5

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- 6 Compare and contrast the viewpoints on cybersecurity from the perspective of security experts, privacy advocates, and the government.** 9-12.CS.2.6

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- 7 Analyze the strengths and weaknesses of security policies based on their usage of encryption and authentication strategies.** 9-12.CS.2.7

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- 8 Convert between binary, decimal, octal, and hexadecimal representations of data.** 9-12.CS.2.8

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- 9 Describe how real-world phenomena such as numbers, Strings, or images are represented as binary in a computer.** 9-12.CS.2.9

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**10 Analyze the trade-offs among various compression algorithms.** 9-12.CS.2.10

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**IMPACTS OF  
COMPUTING**

**1 Demonstrate responsible digital citizenship (legal and ethical behaviors) in the use of technology systems and software.** 9-12.CS.3.1

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**2 Explain the social and economic implications associated with unethical computing practices.** 9-12.CS.3.2

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**3 Discuss trade-offs such as privacy, safety, and convenience associated with the collection and large-scale analysis of personal information.** 9-12.CS.3.3

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**4 Identify and evaluate the beneficial and harmful effects of computing innovations on behavior and culture.** 9-12.CS.3.4

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**5 Debate how the issues of equity, data access, and distribution of computing resources create a digital divide in a global society.** 9-12.CS.3.5

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**6 Debate laws and regulations that impact the development, security and use of software.** 9-12.CS.3.6

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**7 Understand and define artificial intelligence.** 9-12.CS.3.7

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**8 Research and explain the social, moral, ethical, and legal impacts of artificial intelligence systems and respective usage.** 9-12.CS.3.8

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**9 Explain how computer automation continues to transform society and the global economy (e.g. financial markets, transactions, predictions).** 9-12.CS.3.9

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**10 Research, analyze, and present how computational thinking has enabled computing to revolutionize business, manufacturing, commerce and society.** 9-12.CS.3.10

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**11 Evaluate the accessibility of a computational artifact.** 9-12.CS.3.11

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**12 Describe how computer science shares features with creating and designing an artifact such as in music and art.** 9-12.CS.3.12

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**13 Understand the ecosystem of open- source software development and its impact on global collaboration.** 9-12.CS.3.13

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**14 Explain how computer science fosters innovation and enhances other career and disciplines.** 9-12.CS.3.14

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**NETWORKS AND THE  
INTERNET**

**1 Illustrate the basic components of computer networks and protocols.** 9-12.CS.4.1

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**2 Analyze the issues that impact network functionality.** 9-12.CS.4.2

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**3 Describe the data flow that occurs when using Internet-based services.** 9-12.CS.4.3

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**4 Examine how encryption is essential to ensuring privacy and security over the internet.** 9-12.CS.4.4

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**ALGORITHMS AND PROGRAMMING**

**1 Diagram the flow of execution and output of a given program.** 9-12.CS.5.1

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**2 Design algorithms using sequence, selection, iteration and recursion.** 9-12.CS.5.2

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**3 Use variable scope and encapsulation to design programs with cohesive and modular components.** 9-12.CS.5.3

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**4 Decompose a complex problem using abstraction through methods and/or classes.** 9-12.CS.5.4

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**5 Demonstrate the value of abstraction to manage problem complexity.** 9-12.CS.5.5

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**6 Demonstrate code reuse by creating programming solutions using APIs and libraries.** 9-12.CS.5.6

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**7 Evaluate the qualities of a program such as correctness, usability, readability, efficiency, portability and scalability through processes such as debugging and code review.** 9-12.CS.5.7

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**8 Compare and contrast simple data structures and their uses.** 9-12.CS.5.8

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**9 Compare software development processes.** 9-12.CS.5.9

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**10 Demonstrate an understanding of the software life cycle process.** 9-12.CS.5.10

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**11 Design and develop a software artifact by leading, initiating, and participating in a team.** 9-12.CS.5.11

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**12 Create collaborative software projects using Integrated Development Environments, or other collaborative tools.** 9-12.CS.5.12

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**13 Understand the positive and negative implications that arise when you add functionality to an existing program.** 9-12.CS.5.13

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**14 Demonstrate how diverse team collaboration improves the design and development of software products.** 9-12.CS.5.14

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**15 Compare a variety of programming languages available to solve problems and develop systems.** 9-12.CS.5.15

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**16 Analyze security issues that might lead to compromised computer programs.** 9-12.CS.5.16

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**17 Classify and define the different types of software licenses in order to understand how to apply each one to a specific software example.** 9-12.CS.5.17

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- 18** Analyze the notion of intelligent behavior through the programs that learn and adapt, play games, do image recognition, perform text analysis, and control the behavior of robots. 9-12.CS.5.18
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- 19** Illustrate how mathematical and statistical functions, sets, and logic are used in computation. 9-12.CS.5.19
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- 20** Describe the concept of parallel processing. 9-12.CS.5.20
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- 21** Explore issues surrounding mobile computing. 9-12.CS.5.21
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- 22** Explain the value of heuristic algorithms to approximate solutions for interactable problems. 9-12.CS.5.22
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- 23** Critically examine algorithms and design an original algorithm (e.g. adapt, remix, improve). 9-12.CS.5.23
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- 24** Classify problems as tractable, interactable, or computationally unsolvable. 9-12.CS.5.24