

Grades 9-12

Computing Systems

Devices

- 1 Describe ways in which abstractions hide the underlying implementation details of computing systems to simplify user experiences. [9-12.CS.1](#)
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Hardware & Software

- 2 Compare levels of abstraction and interactions between application software, system software, and hardware. [9-12.CS.2](#)
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Troubleshooting

- 3 Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors. [9-12.CS.3](#)
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Networks & the Internet

Network Communication & Organization

- 4 Describe issues that impact network functionality. [9-12.NI.4](#)
 - 5 Describe the design characteristics of the internet. [9-12.NI.5](#)
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Cybersecurity

- 6 Compare and contrast security measures to address various security threats. [9-12.NI.6](#)
 - 7 Compare and contrast cryptographic techniques to model the secure transmission of information. [9-12.NI.7](#)
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Data & Analysis

Storage

- 8 Translate between different representations of data abstractions of real-world phenomena, such as characters, numbers, and images. [9-12.DA.8](#)
 - 9 Describe tradeoffs associated with how data elements are organized and stored. [9-12.DA.9](#)
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Collection Visualization & Transformation

- 10 Create data visualizations to help others better understand real-world phenomena. [9-12.DA.10](#)
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Inference & Models

- 11 Refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process. [9-12.DA.11](#)
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Algorithms & Programming

Algorithms

- 12 Design algorithms to solve computational problems using a combination of original and existing algorithms. [9-12.AP.12](#)
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Variables

- 13 Create more generalized computational solutions using collections instead of repeatedly using simple variables. [9-12.AP.13](#)
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Control

- 14 Justify the selection of specific control structures by identifying tradeoffs associated with implementation, readability, and performance. [9-12.AP.14](#)
 - 15 Iteratively design and develop computational artifacts for practical intent, personal expression, or to address a societal issue by using events to initiate instructions. [9-12.AP.15](#)
 - 16 Decompose problems into smaller subproblems through systematic analysis, using constructs such as procedures, modules, and/or classes. [9-12.AP.16](#)
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Modularity

- 17 Create computational artifacts using modular design. [9-12.AP.17](#)
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Program Development

- 18 Systematically design programs for broad audiences by incorporating feedback from users. [9-12.AP.18](#)
 - 19 Explain the limitations of licenses that restrict use of computational artifacts when using resources such as libraries. [9-12.AP.19](#)
 - 20 Iteratively evaluate and refine a computational artifact to enhance its performance, reliability, usability, and accessibility. [9-12.AP.20](#)
 - 21 Design and develop computational artifacts working in team roles using collaborative tools. [9-12.AP.21](#)
 - 22 Document decisions made during the design process using text, graphics, presentations, and/or demonstrations in the development of complex programs. [9-12.AP.22](#)
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Impacts of Computing

Culture

- 23 Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices. [9-12.IC.23](#)
 - 24 Identify impacts of bias and equity deficit on design and implementation of computational artifacts and apply appropriate processes for evaluating issues of bias. [9-12.IC.24](#)
 - 25 Demonstrate ways a given algorithm applies to problems across disciplines. [9-12.IC.25](#)
 - 26 Study, discuss, and think critically about the potential impacts and implications of emerging technologies on larger social, economic, and political structures, with evidence from credible sources. [9-12.IC.26](#)
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Social Interactions

- 27 Use collaboration tools and methods to increase connectivity with people of different cultures and careers. [9-12.IC.27](#)
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Safety Law & Ethics

- 28 Explain the beneficial and harmful effects that intellectual property laws can have on innovation. [9-12.IC.28](#)
- 29 Explain the privacy concerns related to the collection and generation of data through automated processes. [9-12.IC.29](#)
- 30 Evaluate the social and economic implications of privacy in the context of safety, law, or ethics. [9-12.IC.30](#)