

# Computer Science: Grades 9-12

## Algorithms and Programming

- 1 Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests.** 9-12.AP.A.1

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- 2 Demonstrate the use of both linked lists and arrays to simplify solutions, generalizing computational problems instead of repeatedly using simple variables.** 9-12.AP.V.1

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- 3 Justify the selection of specific control structures when tradeoffs involve implementation, readability, and program performance, and explain the benefits and drawbacks of choices made.** 9-12.AP.C.1

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- 4 Design and iteratively develop computational artifacts for practical intent, personal expression, or to address a societal issue by using events to initiate instructions.** 9-12.AP.C.2

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- 5 Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.** 9-12.AP.M.1

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- 6 Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs.** 9-12.AP.M.2

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- 7 Systematically design and develop programs for broad audiences by incorporating feedback from users.** 9-12.AP.PD.1

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- 8 Evaluate licenses that limit or restrict use of computational artifacts when using resources such as libraries.** 9-12.AP.PD.2

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- 9 Evaluate and refine computational artifacts to make them more usable by all and accessible to people with disabilities.** 9-12.AP.PD.3

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- 10 Design and develop computational artifacts working in team roles using collaborative tools.** 9-12.AP.PD.4

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- 11 Document design decisions using text, graphics, presentations, and/or demonstrations in the development of complex programs.** 9-12.AP.PD.5

## Computing Systems

- 1 Explain how abstractions hide the underlying implementation details of computing systems embedded in everyday objects.** 9-12.CS.D.1

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**2 Compare levels of abstraction and interactions between application software, system software, and hardware layers.** 9-12.CS.HS.1

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**3 Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.** 9-12.CS.T.1

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## Data and Analysis

**1 Translate between different bit representations of real-world phenomena, such as characters, numbers, and images (e.g., convert hexadecimal colors to decimal percentages, ASCII/Unicode representation).** 9-12.DA.S.1

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**2 Evaluate the tradeoffs in how data elements are organized and where data is stored.** 9-12.DA.S.2

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**3 Create interactive data visualizations or alternative representations using software tools to help others better understand real-world phenomena.** 9-12.DA.CVT.1

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**4 Create computational models that represent the relationships among different elements of data collected from a phenomenon, process, or model.** 9-12.DA.IM.1

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## Impacts of Computing

**1 Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.** 9-12.IC.C.1

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**2 Test and refine computational artifacts to reduce bias and equity deficits.** 9-12.IC.C.2

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**3 Demonstrate ways a given algorithm applies to problems across disciplines.** 9-12.IC.C.3

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**4 Explain the potential impacts of artificial intelligence on society.** 9-12.IC.C.4

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**5 Use tools and methods for collaboration on a project to increase connectivity of people in different cultures and career fields.** 9-12.IC.SI.1

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**6 Explain the beneficial and harmful effects that intellectual property laws can have on innovation.** 9-12.IC.SLE.1

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**7 Explain the privacy concerns related to the collection and generation of data through automated processes that may not be evident to users.** 9-12.IC.SLE.2

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**8 Evaluate the social and economic implications of privacy in the context of safety, law, or ethics.** 9-12.IC.SLE.3

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## Networks and the Internet

**1 Evaluate the scalability and reliability of networks, by describing the relationship between routers, switches, servers, topology, and addressing.** 9-12.NI.NCO.1

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**2 Give examples to illustrate how sensitive data can be affected by malware and other attacks.** 9-12.NI.C.1

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- 3 Recommend security measures to address various scenarios based on factors such as efficiency, feasibility, and ethical impacts.** 9-12.NI.C.2
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- 4 Compare various security measures, considering tradeoffs between the usability and security of a computing system.** 9-12.NI.C.3
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- 5 Explain tradeoffs when selecting and implementing cybersecurity recommendations.** 9-12.NI.C.4