

# Grades 9, 10

Adopted 2016

## Algorithms and Programming

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- 3A-A-2-1.** Design and develop a software artifact working in a team. [3A-A-2-1](#)
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- 3A-A-2-2.** Demonstrate how diverse collaborating impacts the design and development of software products (e.g., discussing real-world examples of products that have been improved through having a diverse design team or reflecting on their own team's development experience). [3A-A-2-2](#)
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- 3A-A-7-3.** Compare and contrast various software licensing schemes (e.g., open source, freeware, commercial). [3A-A-7-3](#)
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- 3A-A-5-4.** Design, develop, and implement a computing artifact that responds to an event (e.g., robot that responds to a sensor, mobile app that responds to a text message, sprite that responds to a broadcast). [3A-A-5-4](#)
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- 3A-A-5-5.** Use user-centered research and design techniques (e.g., surveys, interviews) to create software solutions [3A-A-5-5](#)
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- 3A-A-5-6.** Integrate grade-level appropriate mathematical techniques, concepts, and processes in the creation of computing artifacts. [3A-A-5-6](#)
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- 3A-A-4-7.** Understand the notion of hierarchy and abstraction in high-level languages, translation, instruction sets, and logic circuits. [3A-A-4-7](#)
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- 3A-A-4-8.** Deconstruct a complex problem into simpler parts using predefined constructs (e.g., functions and parameters and/or classes). [3A-A-4-8](#)
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- 3A-A-4-9.** Demonstrate the value of abstraction for managing problem complexity (e.g., using a list instead of discrete variables). [3A-A-4-9](#)
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- 3A-A-3-10.** Design algorithms using sequence, selection, and iteration. [3A-A-3-10](#)
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- 3A-A-3-11.** Explain and demonstrate how modeling and simulation can be used to explore natural phenomena (e.g., flocking behaviors, queueing, life cycles). [3A-A-3-11](#)
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- 3A-A-6-12.** Use a systematic approach and debugging tools to independently debug a program (e.g., setting breakpoints, inspecting variables with a debugger). [3A-A-6-12](#)
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## Computing Systems

**3A-C-7-13.** Develop and apply criteria (e.g., power consumption, processing speed, storage space, battery life, cost, operating system) for evaluating a computer system for a given purpose (e.g., system specification needed to run a game, web browsing, graphic design or video editing). [3A-C-7-13](#)

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**3A-C-5-14.** Create, extend, or modify existing programs to add new features and behaviors using different forms of inputs and outputs (e.g., inputs such as sensors, mouse clicks, data sets; outputs such as text, graphics, sounds). [3A-C-5-14](#)

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**3A-C-4-15.** Demonstrate the role and interaction of a computer embedded within a physical system, such as a consumer electronic, biological system, or vehicle, by creating a diagram, model, simulation, or prototype. [3A-C-4-15](#)

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**3A-C-4-16.** Describe the steps necessary for a computer to execute high compilation to machine language, interpretation, fetch-decode-execute [3A-C-4-16](#)

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## Data and Analysis

**3A-D-5-17.** Create computational models that simulate real-world systems (e.g., ecosystems, epidemics, spread of ideas). [3A-D-5-17](#)

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**3A-D-4-18.** Convert between binary, decimal, and hexadecimal representations of data (e.g., convert hexadecimal color codes to decimal percentages, ASCII/Unicode representation). [3A-D-4-18](#)

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**3A-D-4-19.** Analyze the representation tradeoffs among various forms of digital information (e.g., lossy versus lossless compression, encrypted vs. unencrypted, various image representations). [3A-D-4-19](#)

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**3A-D-3-20.** Discuss techniques used to store, process, and retrieve different amounts of information (e.g., files, databases, data warehouses). [3A-D-3-20](#)

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**3A-D-3-21.** Apply basic techniques for locating and collecting small- and large-scale data sets (e.g., creating and distributing user surveys, accessing real-world data sets). [3A-D-3-21](#)

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## Impacts of Computing

**3A-I-2-22.** Debate the social and economic implications associated with ethical and unethical computing practices (e.g., intellectual property rights, hacktivism, software piracy, diesel emissions testing scandal, new computers shipped with malware). [3A-I-2-22](#)

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**3A-I-7-23.** Compare and contrast information access and distribution rights. [3A-I-7-23](#)

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**3A-I-7-24.** Discuss implications of the collection and large-scale analysis of information about individuals (e.g., how businesses, social media, and government collect and use personal data). [3A-I-7-24](#)

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**3A-I-7-25.** Describe how computation shares features with art and music by translating human intention into an artifact. [3A-I-7-25](#)

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**3A-I-1-26.** Compare and debate the positive and negative impacts of computing on behavior and culture (e.g., evolution from hitchhiking to ridesharing apps, online accommodation rental services). [3A-I-1-26](#)

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**3A-I-1-27.** Demonstrate how computing enables new forms of experience, expression, communication, and collaborating. [3A-I-1-27](#)

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**3A-I-1-28.** Explain the impact of the digital divide (i.e., uneven access to computing, computing education, and interfaces) on access to critical information. [3A-I-1-28](#)

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**3A-I-6-29.** Redesign user interfaces (e.g., webpages, mobile applications, animations) to be more inclusive, accessible, and minimizing the impact of the designer's inherent bias. [3A-I-6-29](#)

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## Networks and the Internet

**3A-N-7-30.** Describe key protocols and underlying processes of Internet-based services (e.g., http/https and SMTP/IMAP, routing protocols). [3A-N-7-30](#)

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**3A-N-4-31.** Illustrate the basic components of computer networks (e.g., draw logical and topological diagrams of networks including routers, switches, servers, and end user devices; create model with string and paper). [3A-N-4-31](#)

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**3A-N-1-32.** Compare and contrast multiple viewpoints on cybersecurity (e.g., from the perspective of security experts, privacy advocates, the government). [3A-N-1-32](#)

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**3A-N-3-33.** Explain the principles of information security (confidentiality, integrity, availability) and authentication techniques. [3A-N-3-33](#)

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**3A-N-3-34.** Use simple encryption and decryption algorithms to transmit/receive an encrypted message. [3A-N-3-34](#)

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**3A-N-6-35.** Identify digital and physical strategies to secure networks and discuss the tradeoffs between ease of access and need for security. [3A-N-6-35](#)

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