

# Computer Science Essentials

## Lesson 1.1

### The Computer Science Teachers Association Standards

#### 3A-A-7-3 Computer Science Teachers Association (CSTA)

Compare and contrast various software licensing schemes (e.g., open source, freeware, commercial).

#### 3A-A-5-4 Computer Science Teachers Association (CSTA)

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-5-6 Computer Science Teachers Association (CSTA)

Integrate grade-level appropriate mathematical techniques, concepts, and processes in the creation of computing artifacts.

#### 3A-A-4-7 Computer Science Teachers Association (CSTA)

Understand the notion of hierarchy and abstraction in high-level languages, translation, instruction sets, and logic circuits.

#### 3A-A-4-8 Computer Science Teachers Association (CSTA)

Deconstruct a complex problem into simpler parts using predefined constructs (e.g., functions and parameters and/or classes).

#### 3A-A-3-10 Computer Science Teachers Association (CSTA)

Design algorithms using sequence, selection, and iteration.

#### 3A-A-6-12 Computer Science Teachers Association (CSTA)

Use a systematic approach and debugging tools to independently debug a program (e.g., setting breakpoints, inspecting variables with a debugger).

#### 3A-C-5-14 Computer Science Teachers Association (CSTA)

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-D-4-18 Computer Science Teachers Association (CSTA)

Convert between binary, decimal, and hexadecimal representations of data (e.g., convert hexadecimal color codes to decimal percentages, ASCII/Unicode representation).

**3A-I-1-27 Computer Science Teachers Association (CSTA)**

**Demonstrate how computing enables new forms of experience, expression, communication, and collaborating.**

**3A-I-1-28 Computer Science Teachers Association (CSTA)**

**Explain the impact of the digital divide (i.e., uneven access to computing, computing education, and interfaces) on access to critical information.**

# Computer Science Essentials

## Lesson 1.2

### The Computer Science Teachers Association Standards

#### 3A-A-2-1 Computer Science Teachers Association (CSTA)

Design and develop a software artifact working in a team.

#### 3A-A-2-2 Computer Science Teachers Association (CSTA)

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-5-4 Computer Science Teachers Association (CSTA)

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-5-6 Computer Science Teachers Association (CSTA)

Integrate grade-level appropriate mathematical techniques, concepts, and processes in the creation of computing artifacts.

#### 3A-A-4-8 Computer Science Teachers Association (CSTA)

Deconstruct a complex problem into simpler parts using predefined constructs (e.g., functions and parameters and/or classes).

#### 3A-A-4-9 Computer Science Teachers Association (CSTA)

Demonstrate the value of abstraction for managing problem complexity (e.g., using a list instead of discrete variables).

#### 3A-A-3-10 Computer Science Teachers Association (CSTA)

Design algorithms using sequence, selection, and iteration.

#### 3A-A-6-12 Computer Science Teachers Association (CSTA)

Use a systematic approach and debugging tools to independently debug a program (e.g., setting breakpoints, inspecting variables with a debugger).

#### 3A-I-7-25 Computer Science Teachers Association (CSTA)

Describe how computation shares features with art and music by translating human intention into an artifact.

**3A-I-1-27 Computer Science Teachers Association (CSTA)**

**Demonstrate how computing enables new forms of experience, expression, communication, and collaborating.**

**3A-I-1-28 Computer Science Teachers Association (CSTA)**

**Explain the impact of the digital divide (i.e., uneven access to computing, computing education, and interfaces) on access to critical information.**

# Computer Science Essentials

## Lesson 1.3

### The Computer Science Teachers Association Standards

#### 3A-A-2-1 Computer Science Teachers Association (CSTA)

Design and develop a software artifact working in a team.

#### 3A-A-2-2 Computer Science Teachers Association (CSTA)

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-5-4 Computer Science Teachers Association (CSTA)

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-5-5 Computer Science Teachers Association (CSTA)

Use user-centered research and design techniques (e.g., surveys, interviews) to create software solutions.

#### 3A-A-5-6 Computer Science Teachers Association (CSTA)

Integrate grade-level appropriate mathematical techniques, concepts, and processes in the creation of computing artifacts.

#### 3A-A-4-8 Computer Science Teachers Association (CSTA)

Deconstruct a complex problem into simpler parts using predefined constructs (e.g., functions and parameters and/or classes).

#### 3A-A-3-10 Computer Science Teachers Association (CSTA)

Design algorithms using sequence, selection, and iteration.

#### 3A-A-6-12 Computer Science Teachers Association (CSTA)

Use a systematic approach and debugging tools to independently debug a program (e.g., setting breakpoints, inspecting variables with a debugger).

#### 3A-I-2-22 Computer Science Teachers Association (CSTA)

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-1-27 Computer Science Teachers Association (CSTA)**

**Demonstrate how computing enables new forms of experience, expression, communication, and collaborating.**

**3A-I-1-28 Computer Science Teachers Association (CSTA)**

**Explain the impact of the digital divide (i.e., uneven access to computing, computing education, and interfaces) on access to critical information.**

**3A-I-6-29 Computer Science Teachers Association (CSTA)**

**Redesign user interfaces (e.g., web pages, mobile applications, animations) to be more inclusive, accessible, and minimizing the impact of the designer's inherent bias.**

# Computer Science Essentials

## Lesson 2.1

### The Computer Science Teachers Association Standards

#### 3A-A-7-3 Computer Science Teachers Association (CSTA)

Compare and contrast various software licensing schemes (e.g., open source, freeware, commercial).

#### 3A-A-5-4 Computer Science Teachers Association (CSTA)

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-5-6 Computer Science Teachers Association (CSTA)

Integrate grade-level appropriate mathematical techniques, concepts, and processes in the creation of computing artifacts.

#### 3A-A-4-7 Computer Science Teachers Association (CSTA)

Understand the notion of hierarchy and abstraction in high-level languages, translation, instruction sets, and logic circuits.

#### 3A-A-4-8 Computer Science Teachers Association (CSTA)

Deconstruct a complex problem into simpler parts using predefined constructs (e.g., functions and parameters and/or classes).

#### 3A-A-4-9 Computer Science Teachers Association (CSTA)

Demonstrate the value of abstraction for managing problem complexity (e.g., using a list instead of discrete variables).

#### 3A-A-3-10 Computer Science Teachers Association (CSTA)

Design algorithms using sequence, selection, and iteration.

#### 3A-A-6-12 Computer Science Teachers Association (CSTA)

Use a systematic approach and debugging tools to independently debug a program (e.g., setting breakpoints, inspecting variables with a debugger).

#### 3A-C-5-14 Computer Science Teachers Association (CSTA)

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-4-15 Computer Science Teachers Association (CSTA)**

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-D-4-19 Computer Science Teachers Association (CSTA)**

Analyze the representation trade-offs among various forms of digital information (e.g., lossy versus lossless compression, encrypted vs. unencrypted, various image representations).

**3A-D-3-21 Computer Science Teachers Association (CSTA)**

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-I-2-22 Computer Science Teachers Association (CSTA)**

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-1-26 Computer Science Teachers Association (CSTA)**

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-1-27 Computer Science Teachers Association (CSTA)**

Demonstrate how computing enables new forms of experience, expression, communication, and collaborating.



# Computer Science Essentials

## Lesson 2.2

### The Computer Science Teachers Association Standards

#### 3A-A-2-1 Computer Science Teachers Association (CSTA)

Design and develop a software artifact working in a team.

#### 3A-A-2-2 Computer Science Teachers Association (CSTA)

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-7-3 Computer Science Teachers Association (CSTA)

Compare and contrast various software licensing schemes (e.g., open source, freeware, commercial).

#### 3A-A-5-4 Computer Science Teachers Association (CSTA)

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-5-6 Computer Science Teachers Association (CSTA)

Integrate grade-level appropriate mathematical techniques, concepts, and processes in the creation of computing artifacts.

#### 3A-A-4-8 Computer Science Teachers Association (CSTA)

Deconstruct a complex problem into simpler parts using predefined constructs (e.g., functions and parameters and/or classes).

#### 3A-A-4-9 Computer Science Teachers Association (CSTA)

Demonstrate the value of abstraction for managing problem complexity (e.g., using a list instead of discrete variables).

#### 3A-A-3-10 Computer Science Teachers Association (CSTA)

Design algorithms using sequence, selection, and iteration.

#### 3A-A-6-12 Computer Science Teachers Association (CSTA)

Use a systematic approach and debugging tools to independently debug a program (e.g., setting breakpoints, inspecting variables with a debugger).

**3A-C-5-14 Computer Science Teachers Association (CSTA)**

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-4-15 Computer Science Teachers Association (CSTA)**

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-D-3-21 Computer Science Teachers Association (CSTA)**

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-I-1-26 Computer Science Teachers Association (CSTA)**

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-1-27 Computer Science Teachers Association (CSTA)**

Demonstrate how computing enables new forms of experience, expression, communication, and collaborating.

**3A-I-1-28 Computer Science Teachers Association (CSTA)**

Explain the impact of the digital divide (i.e., uneven access to computing, computing education, and interfaces) on access to critical information.

**3A-N-4-31 Computer Science Teachers Association (CSTA)**

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-1-32 Computer Science Teachers Association (CSTA)**

Compare and contrast multiple viewpoints on cybersecurity (e.g., from the perspective of security experts, privacy advocates, the government).

**3A-N-3-33 Computer Science Teachers Association (CSTA)**

Explain the principles of information security (confidentiality, integrity, availability) and authentication techniques.

**3A-N-6-35 Computer Science Teachers Association (CSTA)**

Identify digital and physical strategies to secure networks and discuss the trade-offs between ease of access and need for security.

# Computer Science Essentials

## Lesson 2.3

### The Computer Science Teachers Association Standards

#### 3A-A-2-1 Computer Science Teachers Association (CSTA)

Design and develop a software artifact working in a team.

#### 3A-A-2-2 Computer Science Teachers Association (CSTA)

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-5-4 Computer Science Teachers Association (CSTA)

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-5-6 Computer Science Teachers Association (CSTA)

Integrate grade-level appropriate mathematical techniques, concepts, and processes in the creation of computing artifacts.

#### 3A-A-4-8 Computer Science Teachers Association (CSTA)

Deconstruct a complex problem into simpler parts using predefined constructs (e.g., functions and parameters and/or classes).

#### 3A-A-4-9 Computer Science Teachers Association (CSTA)

Demonstrate the value of abstraction for managing problem complexity (e.g., using a list instead of discrete variables).

#### 3A-A-3-10 Computer Science Teachers Association (CSTA)

Design algorithms using sequence, selection, and iteration.

#### 3A-A-6-12 Computer Science Teachers Association (CSTA)

Use a systematic approach and debugging tools to independently debug a program (e.g., setting breakpoints, inspecting variables with a debugger).

#### 3A-D-3-21 Computer Science Teachers Association (CSTA)

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-I-2-22 Computer Science Teachers Association (CSTA)**

**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-1-27 Computer Science Teachers Association (CSTA)**

**Demonstrate how computing enables new forms of experience, expression, communication, and collaborating.**

**3A-I-1-28 Computer Science Teachers Association (CSTA)**

**Explain the impact of the digital divide (i.e., uneven access to computing, computing education, and interfaces) on access to critical information.**

# Computer Science Essentials

## Lesson 3.1

### The Computer Science Teachers Association Standards

#### 3A-A-7-3 Computer Science Teachers Association (CSTA)

Compare and contrast various software licensing schemes (e.g., open source, freeware, commercial).

#### 3A-A-5-4 Computer Science Teachers Association (CSTA)

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-4-7 Computer Science Teachers Association (CSTA)

Understand the notion of hierarchy and abstraction in high-level languages, translation, instruction sets, and logic circuits.

#### 3A-A-4-8 Computer Science Teachers Association (CSTA)

Deconstruct a complex problem into simpler parts using predefined constructs (e.g., functions and parameters and/or classes).

#### 3A-A-4-9 Computer Science Teachers Association (CSTA)

Demonstrate the value of abstraction for managing problem complexity (e.g., using a list instead of discrete variables).

#### 3A-A-6-12 Computer Science Teachers Association (CSTA)

Use a systematic approach and debugging tools to independently debug a program (e.g., setting breakpoints, inspecting variables with a debugger).

#### 3A-C-5-14 Computer Science Teachers Association (CSTA)

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-D-4-19 Computer Science Teachers Association (CSTA)

Analyze the representation tradeoffs among various forms of digital information (e.g., lossy versus lossless compression, encrypted vs. unencrypted, various image representations).

#### 3A-D-3-20 Computer Science Teachers Association (CSTA)

Discuss techniques used to store, process, and retrieve different amounts of information (e.g., files, databases, data warehouses).

**3A-D-3-21 Computer Science Teachers Association (CSTA)**

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-I-2-22 Computer Science Teachers Association (CSTA)**

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-1-27 Computer Science Teachers Association (CSTA)**

Demonstrate how computing enables new forms of experience, expression, communication, and collaborating.

**3A-I-1-28 Computer Science Teachers Association (CSTA)**

Explain the impact of the digital divide (i.e., uneven access to computing, computing education, and interfaces) on access to critical information.

**3A-I-6-29 Computer Science Teachers Association (CSTA)**

Redesign user interfaces (e.g., web pages, mobile applications, animations) to be more inclusive, accessible, and minimizing the impact of the designer's inherent bias.

**3A-N-7-30 Computer Science Teachers Association (CSTA)**

Describe key protocols and underlying processes of Internet-based services (e.g., http/https and SMTP/IMAP, routing protocols).

**3A-N-1-32 Computer Science Teachers Association (CSTA)**

Compare and contrast multiple viewpoints on cybersecurity (e.g., from the perspective of security experts, privacy advocates, the government).

**3A-N-3-33 Computer Science Teachers Association (CSTA)**

Explain the principles of information security (confidentiality, integrity, availability) and authentication techniques.

**3A-N-6-35 Computer Science Teachers Association (CSTA)**

Identify digital and physical strategies to secure networks and discuss the trade-offs between ease of access and need for security.

# Computer Science Essentials

## Lesson 3.2

### The Computer Science Teachers Association Standards

#### 3A-A-2-1 Computer Science Teachers Association (CSTA)

Design and develop a software artifact working in a team.

#### 3A-A-2-2 Computer Science Teachers Association (CSTA)

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-7-3 Computer Science Teachers Association (CSTA)

Compare and contrast various software licensing schemes (e.g., open source, freeware, commercial).

#### 3A-A-5-4 Computer Science Teachers Association (CSTA)

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-5-6 Computer Science Teachers Association (CSTA)

Integrate grade-level appropriate mathematical techniques, concepts, and processes in the creation of computing artifacts.

#### 3A-A-4-8 Computer Science Teachers Association (CSTA)

Deconstruct a complex problem into simpler parts using predefined constructs (e.g., functions and parameters and/or classes).

#### 3A-A-4-9 Computer Science Teachers Association (CSTA)

Demonstrate the value of abstraction for managing problem complexity (e.g., using a list instead of discrete variables).

#### 3A-A-3-10 Computer Science Teachers Association (CSTA)

Design algorithms using sequence, selection, and iteration.

#### 3A-A-6-12 Computer Science Teachers Association (CSTA)

Use a systematic approach and debugging tools to independently debug a program (e.g., setting breakpoints, inspecting variables with a debugger).

**3A-C-5-14 Computer Science Teachers Association (CSTA)**

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-D-4-18 Computer Science Teachers Association (CSTA)**

Convert between binary, decimal, and hexadecimal representations of data (e.g., convert hexadecimal color codes to decimal percentages, ASCII/Unicode representation).

**3A-D-4-19 Computer Science Teachers Association (CSTA)**

Analyze the representation trade-offs among various forms of digital information (e.g., lossy versus lossless compression, encrypted vs. unencrypted, various image representations).

**3A-D-3-20 Computer Science Teachers Association (CSTA)**

Discuss techniques used to store, process, and retrieve different amounts of information (e.g., files, databases, data warehouses)

**3A-D-3-21 Computer Science Teachers Association (CSTA)**

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-I-7-24 Computer Science Teachers Association (CSTA)**

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-1-27 Computer Science Teachers Association (CSTA)**

Demonstrate how computing enables new forms of experience, expression, communication, and collaborating.

**3A-I-1-28 Computer Science Teachers Association (CSTA)**

Explain the impact of the digital divide (i.e., uneven access to computing, computing education, and interfaces) on access to critical information.

**3A-N-7-30 Computer Science Teachers Association (CSTA)**

Describe key protocols and underlying processes of Internet-based services (e.g., http/https and SMTP/IMAP, routing protocols).

**3A-N-1-32 Computer Science Teachers Association (CSTA)**

Compare and contrast multiple viewpoints on cybersecurity (e.g., from the perspective of security experts, privacy advocates, the government).

**3A-N-3-33 Computer Science Teachers Association (CSTA)**

Explain the principles of information security (confidentiality, integrity, availability) and authentication techniques.



**3A-N-3-34 Computer Science Teachers Association (CSTA)**

**Use simple encryption and decryption algorithms to transmit/receive an encrypted message.**

# Computer Science Essentials

## Lesson 3.3

### The Computer Science Teachers Association Standards

#### 3A-A-2-1 Computer Science Teachers Association (CSTA)

Design and develop a software artifact working in a team.

#### 3A-A-2-2 Computer Science Teachers Association (CSTA)

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-5-4 Computer Science Teachers Association (CSTA)

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-5-5 Computer Science Teachers Association (CSTA)

Use user-centered research and design techniques (e.g., surveys, interviews) to create software solutions.

#### 3A-A-4-8 Computer Science Teachers Association (CSTA)

Deconstruct a complex problem into simpler parts using predefined constructs (e.g., functions and parameters and/or classes).

#### 3A-A-4-9 Computer Science Teachers Association (CSTA)

Demonstrate the value of abstraction for managing problem complexity (e.g., using a list instead of discrete variables).

#### 3A-A-3-10 Computer Science Teachers Association (CSTA)

Design algorithms using sequence, selection, and iteration.

#### 3A-A-6-12 Computer Science Teachers Association (CSTA)

Use a systematic approach and debugging tools to independently debug a program (e.g., setting breakpoints, inspecting variables with a debugger).

#### 3A-D-4-19 Computer Science Teachers Association (CSTA)

Analyze the representation trade-offs among various forms of digital information (e.g., lossy versus lossless compression, encrypted vs. unencrypted, various image representations).

**3A-D-3-20 Computer Science Teachers Association (CSTA)**

Discuss techniques used to store, process, and retrieve different amounts of information (e.g., files, databases, data warehouses).

**3A-D-3-21 Computer Science Teachers Association (CSTA)**

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-I-2-22 Computer Science Teachers Association (CSTA)**

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-1-27 Computer Science Teachers Association (CSTA)**

Demonstrate how computing enables new forms of experience, expression, communication, and collaborating.

**3A-I-1-28 Computer Science Teachers Association (CSTA)**

Explain the impact of the digital divide (i.e., uneven access to computing, computing education, and interfaces) on access to critical information.

**3A-I-6-29 Computer Science Teachers Association (CSTA)**

Redesign user interfaces (e.g., web pages, mobile applications, animations) to be more inclusive, accessible, and minimizing the impact of the designer's inherent bias.

**3A-N-7-30 Computer Science Teachers Association (CSTA)**

Describe key protocols and underlying processes of Internet-based services (e.g., http/https and SMTP/IMAP, routing protocols).

**3A-N-1-32 Computer Science Teachers Association (CSTA)**

Compare and contrast multiple viewpoints on cybersecurity (e.g., from the perspective of security experts, privacy advocates, the government).

**3A-N-3-33 Computer Science Teachers Association (CSTA)**

Explain the principles of information security (confidentiality, integrity, availability) and authentication techniques.

**3A-N-3-34 Computer Science Teachers Association (CSTA)**

Use simple encryption and decryption algorithms to transmit/receive an encrypted message.

# Computer Science Essentials

## Lesson 4.1

### The Computer Science Teachers Association Standards

#### 3A-A-2-1 Computer Science Teachers Association (CSTA)

Design and develop a software artifact working in a team.

#### 3A-A-2-2 Computer Science Teachers Association (CSTA)

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-7-3 Computer Science Teachers Association (CSTA)

Compare and contrast various software licensing schemes (e.g., open source, freeware, commercial).

#### 3A-A-5-4 Computer Science Teachers Association (CSTA)

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-5-5 Computer Science Teachers Association (CSTA)

Use user-centered research and design techniques (e.g., surveys, interviews) to create software solutions.

#### 3A-A-5-6 Computer Science Teachers Association (CSTA)

Integrate grade-level appropriate mathematical techniques, concepts, and processes in the creation of computing artifacts.

#### 3A-A-4-7 Computer Science Teachers Association (CSTA)

Understand the notion of hierarchy and abstraction in high-level languages, translation, instruction sets, and logic circuits.

#### 3A-A-4-8 Computer Science Teachers Association (CSTA)

Deconstruct a complex problem into simpler parts using predefined constructs (e.g., functions and parameters and/or classes).

#### 3A-A-6-12 Computer Science Teachers Association (CSTA)

Use a systematic approach and debugging tools to independently debug a program (e.g., setting breakpoints, inspecting variables with a debugger).

**3A-I-2-22 Computer Science Teachers Association (CSTA)**

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-7-24 Computer Science Teachers Association (CSTA)**

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-7-25 Computer Science Teachers Association (CSTA)**

Describe how computation shares features with art and music by translating human intention into an artifact.

**3A-I-1-27 Computer Science Teachers Association (CSTA)**

Demonstrate how computing enables new forms of experience, expression, communication, and collaborating.

**3A-I-1-28 Computer Science Teachers Association (CSTA)**

Explain the impact of the digital divide (i.e., uneven access to computing, computing education, and interfaces) on access to critical information.

**3A-I-6-29 Computer Science Teachers Association (CSTA)**

Redesign user interfaces (e.g., webpages, mobile applications, animations) to be more inclusive, accessible, and minimizing the impact of the designer's inherent bias.