# CSTA K-12 Computer Science Standards to ACM Code of Ethics Principles and Responsibilities Mapping

*ACM Committee on Professional Ethics (COPE)*

CSTA COPE Working Group

## Level 1A: Grades K-2 (Ages 5-7)

**Computing Systems**

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| CSTA | 1A-CS-01 | Select and operate appropriate software to perform a variety of tasks, and recognize that users have different needs and preferences for the technology they use. | Devices | 1.1 |
| ACM | 1.1 | Contribute to society and to human well-being, acknowledging that all people are stakeholders in computing. |  |  |
|  | 1.4 | Be fair and take action not to discriminate. |  |  |

Exemplar:

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| CSTA | 1A-CS-02 | Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). | Hardware & Software | 7.2 |
| ACM | 2.7 | Foster public awareness and understanding of computing, related technologies, and their consequences. |  |  |

Exemplar:

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| CSTA | 1A-CS-03 | Describe basic hardware and software problems using accurate terminology. | Troubleshooting | 6.2, 7.2 |
| ACM | 2.2 | Maintain high standards of professional competence, conduct, and ethical practice. // i.e. “skill in communication” |  |  |
|  | 2.7 | Foster public awareness and understanding of computing, related technologies, and their consequences. . // i.e. “communications with the public should be clear… |  |  |

Exemplar:

**Networks and the Internet**

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| CSTA | 1A-NI-04 | Explain what passwords are and why we use them, and use strong passwords to protect devices and information from unauthorized access. | Cybersecurity | 7.3 |
| ACM | 2.9 | Design and implement systems that are robustly and usably secure. |  |  |

Exemplar:

**Data and Analysis**

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| CSTA | 1A-DA-05 | Store, copy, search, retrieve, modify, and delete information using a computing device and define the information stored as data. | Storage | 4.2 |
| ACM |  |  |  |  |

Exemplar:

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| CSTA | 1A-DA-06 | Collect and present the same data in various visual formats. | Collection Visualization &  Transformation | 7.1, 4.4 |
| ACM |  |  |  |  |

Exemplar:

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| CSTA | 1A-DA-07 | Identify and describe patterns in data visualizations, such as charts or graphs, to make predictions. | Inference & Models | 4.1 |
| ACM |  |  |  |  |

Exemplar:

**Algorithms and Programming**

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| CSTA | 1A-AP-08 | Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks. | Algorithms | 4.4 |
| ACM |  |  |  |  |

Exemplar:

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| CSTA | 1A-AP-09 | Model the way programs store and manipulate data by using numbers or other symbols to represent information. | Variables | 4.4 |
| ACM |  |  |  |  |

Exemplar:

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| CSTA | 1A-AP-10 | Develop programs with sequences and simple loops, to express ideas or address a problem. | Control | 5.2 |
| ACM |  |  |  |  |

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| CSTA | 1A-AP-11 | Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. | Modularity | 3.2 |
| ACM |  |  |  |  |

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| CSTA | 1A-AP-12 | Develop plans that describe a program’s sequence of events, goals, and expected outcomes | Program Development | 5.1, 7.2 |
| ACM |  |  |  |  |

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| CSTA | 1A-AP-13 | Give attribution when using the ideas and creations of others while developing programs. | Program Development | 7.3 |
| ACM |  |  |  |  |

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| CSTA | 1A-AP-14 | Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops. | Program Development | 6.2 |
| ACM | 1.2 | Avoid harm |  |  |
|  | 2.1 | Strive to achieve high quality in both the processes and products of professional work. |  |  |
|  | 2.5 | Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks. |  |  |

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| CSTA | 1A-AP-15 | Using correct terminology, describe steps taken and choices made during the iterative process of program development. | Program Development | 7.2 |
| ACM | 2.7 | Foster public awareness and understanding of computing, related technologies, and their consequences. |  |  |

**Impacts of Computing**

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| CSTA | 1A-IC-16 | Compare how people live and work before and after the implementation or adoption of new computing technology. | Culture | 7 |
| ACM |  |  |  |  |

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| CSTA | 1A-IC-17 | Work respectfully and responsibly with others online. | Social Interactions | 2.1 |
| ACM |  |  |  |  |

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| CSTA | 1A-IC-18 | Keep login information private, and log off of devices appropriately. | Safety Law & Ethics | 7.3 |
| ACM | 1.6 | Respect privacy. |  |  |

## Level 1B: Grades 3-5 (Ages 8-11)

**Computing Systems**

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| CSTA | 1B-CS-01 | Describe how internal and external parts of computing devices function to form a system. | Devices | 7.2 |
| ACM | 2.7 | Foster public awareness and understanding of computing, related technologies, and their consequences. |  |  |

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| CSTA | 1B-CS-02 | Model how computer hardware and software work together as a system to accomplish tasks. | Hardware & Software | 4.4 |
| ACM |  |  |  |  |

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| CSTA | 1B-CS-03 | Determine potential solutions to solve simple hardware and software problems using common troubleshooting strategies. | Troubleshooting | 6.2 |
| ACM |  |  |  |  |

**Networks and the Internet**

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| CSTA | 1B-NI-04 | Model how information is broken down into smaller pieces, transmitted as packets through multiple devices over networks and the Internet, and reassembled at the destination. | Network Communication & Organization | 4.4 |
| ACM |  |  |  |  |

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| CSTA | 1B-NI-05 | Discuss real-world cybersecurity problems and how personal information can be protected. | Cybersecurity | 3.1 |
| ACM | 1.7 | Honor confidentiality |  |  |
|  | 2.9 | Design and implement systems that are robustly and usably secure. |  |  |

**Data and Analysis**

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| CSTA | 1B-DA-06 | Organize and present collected data visually to highlight relationships and support a claim | Collection Visualization & Transformation | 7.1 |
| ACM |  |  |  |  |

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| CSTA | 1B-DA-07 | Use data to highlight or propose cause-and-effect relationships, predict outcomes, or communicate an idea. | Inference & Models | 7.1 |
| ACM |  |  |  |  |

**Algorithms and Programming**

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| CSTA | 1B-AP-08 | Compare and refine multiple algorithms for the same task and determine which is the most appropriate. | Algorithms | 6.3, 3.3 |
| ACM |  |  |  |  |

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| CSTA | 1B-AP-09 | Create programs that use variables to store and modify data | Variables | 5.2 |
| ACM |  |  |  |  |

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| CSTA | 1B-AP-10 | Create programs that include sequences, events, loops, and conditionals. | Control | 5.2 |
| ACM |  |  |  |  |

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| CSTA | 1B-AP-11 | Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process. | Modularity | 3.2 |
| ACM |  |  |  |  |

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| CSTA | 1B-AP-12 | Modify, remix, or incorporate portions of an existing program into one's own work, to develop something new or add more advanced features. | Modularity | 5.3 |
| ACM |  |  |  |  |

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| CSTA | 1B-APS-13 | Use an iterative process to plan the development of a program by including others' perspectives and considering user preferences | Program Development | 1.1, 5.1 |
| ACM |  |  |  |  |

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| CSTA | 1B-AP-14 | Observe intellectual property rights and give appropriate attribution when creating or remixing programs. | Program Development | 5.2, 7.3 |
| ACM | 1.5 | Respect the work required to produce new ideas, inventions, creative works, and computing artifacts. |  |  |

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| CSTA | 1B-AP-15 | Test and debug (identify and fix errors) a program or algorithm to ensure it runs as intended. | Program Development | 6.1, 6.2 |
| ACM | 1.2 | Avoid harm |  |  |
|  | 2.1 | Strive to achieve high quality in both the processes and products of professional work. |  |  |
|  | 2.5 | Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks. |  |  |

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| CSTA | 1B-AP-16 | Take on varying roles, with teacher guidance, when collaborating with peers during the design, implementation, and review stages of program development. | Program Development | 2.2 |
| ACM |  |  |  |  |

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| CSTA | 1B-AP-17 | Describe choices made during program development using code comments, presentations, and demonstrations. | Program Development | 7.2 |
| ACM | 1.3 | Be honest and trustworthy. // i.e. transparency |  |  |
|  | 2.7 | Foster public awareness and understanding of computing, related technologies, and their consequences. // i.e. “communications with the public should be clear…” |  |  |

**Impacts of Computing**

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| CSTA | 1B-IC-18 | Discuss computing technologies that have changed the world, and express how those technologies influence, and are influenced by, cultural practices. | Culture | 3.1 |
| ACM |  |  |  |  |

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| CSTA | 1B-IC-19 | Brainstorm ways to improve the accessibility and usability of technology products for the diverse needs and wants of users. | Culture | 1.2 |
| ACM | 1.2 | Contribute to society and to human well-being, acknowledging that all people are stakeholders in computing. |  |  |
|  | 1.4 | Be fair and take action not to discriminate |  |  |

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| CSTA | 1B-IC-20 | Seek diverse perspectives for the purpose of improving computational artifacts. | Social Interactions | 1.1 |
| ACM | 1.2 | Contribute to society and to human well-being, acknowledging that all people are stakeholders in computing. |  |  |

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| CSTA | 1B-IC-21 | Use public domain or creative commons media, and refrain from copying or using material created by others without permission. | Safety Law & Ethics | 7.3 |
| ACM | 1.5 | Respect the work required to produce new ideas, inventions, creative works, and computing artifacts. |  |  |

## Level 2: Grades 6-8 (Ages 11-14)

**Computing Systems**

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| CSTA | 2-CS-01 | Recommend improvements to the design of computing devices, based on an analysis of how users interact with the devices. | Devices | 3.3 |
| ACM |  |  |  |  |

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| CSTA | 2-CS-02 | Design projects that combine hardware and software components to collect and exchange data. | Hardware & Software | 5.1 |
| ACM |  |  |  |  |

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| CSTA | 2-CS-03 | Systematically identify and fix problems with computing devices and their components. | Troubleshooting | 6.2 |
| ACM |  |  |  |  |

**Networks and the Internet**

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| CSTA | 2-NI-04 | Model the role of protocols in transmitting data across networks and the Internet. | Network Communication & Organization | 4.4 |
| ACM |  |  |  |  |

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| CSTA | 2-NI-05 | Explain how physical and digital security measures protect electronic information. | Cybersecurity | 7.2 |
| ACM | 2.9 | Design and implement systems that are robustly and usably secure. |  |  |

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| CSTA | 2-NI-06 | Apply multiple methods of encryption to model the secure transmission of information. | Cybersecurity | 4.4 |
| ACM | 2.9 | Design and implement systems that are robustly and usably secure. |  |  |

**Data and Analysis**

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| CSTA | 2-DA-07 | Represent data using multiple encoding schemes. | Storage | 4 |
| ACM |  |  |  |  |

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| CSTA | 2-DA-08 | Collect data using computational tools and transform the data to make it more useful and reliable. | Collection Visualization & Transformation | 6.3 |
| ACM | 1.6 | Respect privacy // i.e. allow individuals to understand what data is being collected and how it is being used |  |  |

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| CSTA | 2-DA-09 | Refine computational models based on the data they have generated. | Inference & Models | 5.3, 4.4 |
| ACM |  |  |  |  |

**Algorithms and Programming**

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| CSTA | 2-AP-10 | Use flowcharts and/or pseudocode to address complex problems as algorithms. | Algorithms | 4.4, 4.1 |
| ACM |  |  |  |  |

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| CSTA | 2-AP-11 | Create clearly named variables that represent different data types and perform operations on their values. | Variables | 5.1, 5.2 |
| ACM |  |  |  |  |

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| CSTA | 2-AP-12 | Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals. | Control | 5.1, 5.2 |
| ACM |  |  |  |  |

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| CSTA | 2-AP-13 | Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs. | Modularity | 3.2 |
| ACM |  |  |  |  |

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| CSTA | 2-AP-14 | Create procedures with parameters to organize code and make it easier to reuse. | Modularity | 4.1, 4.3 |
| ACM |  |  |  |  |

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| CSTA | 2-AP-15 | Seek and incorporate feedback from team members and users to refine a solution that meets user needs. | Program Development | 2.3, 1.1 |
| ACM |  |  |  |  |

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| CSTA | 2-AP-16 | Incorporate existing code, media, and libraries into original programs, and give attribution. | Program Development | 4.2, 5.2  7.3 |
| ACM |  |  |  |  |

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| CSTA | 2-AP-17 | Systematically test and refine programs using a range of test cases. | Program Development | 6.1 |
| ACM |  |  |  |  |

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| CSTA | 2-AP-18 | Distribute tasks and maintain a project timeline when collaboratively developing computational artifacts. | Program Development | 2.2 |
| ACM |  |  |  |  |

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| CSTA | 2-AP-19 | Document programs in order to make them easier to follow, test, and debug. |  | 7.2 |
| ACM |  |  |  |  |

**Impacts of Computing**

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| CSTA | 2-IC-20 | Compare tradeoffs associated with computing technologies that affect people's everyday activities and career options. | Culture | 7.2 |
| ACM |  |  |  |  |

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| CSTA | 2-IC-21 | Discuss issues of bias and accessibility in the design of existing technologies. | Culture | 1.2 |
| ACM |  |  |  |  |

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| CSTA | 2-IC-22 | Collaborate with many contributors through strategies such as crowdsourcing or surveys when creating a computational artifact. | Social Interactions | 1.2 |
| ACM |  |  |  |  |

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| CSTA | 2-IC-23 | Describe tradeoffs between allowing information to be public and keeping information private and secure. | Safety Law & Ethics | 7.2 |
| ACM | 1.5 | Respect the work required to produce new ideas, inventions, creative works, and computing artifacts. |  |  |
|  | 1.6 | Respect privacy |  |  |
|  | 1.7 | Honor confidentiality |  |  |

## Level 3A: Grades 9-10 (Ages 14-16)

**Computing Systems**

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| CSTA | 3A-CS-01 | Explain how abstractions hide the underlying implementation details of computing systems embedded in everyday objects. | Devices | 4.1 |
| ACM |  |  |  |  |

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| CSTA | 3A-CS-02 | Compare levels of abstraction and interactions between application software, system software, and hardware layers. | Hardware & Software | 4.1 |
| ACM |  |  |  |  |

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| CSTA | 3A-CS-03 | Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors. | Troubleshooting | 6.2 |
| ACM |  |  |  |  |

**Networks and the Internet**

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| CSTA | 3A-NI-04 | Evaluate the scalability and reliability of networks, by describing the relationship between routers, switches, servers, topology, and addressing. | Network Communication & Organization | 4.1 |
| ACM |  |  |  |  |

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| CSTA | 3A-NI-05 | Give examples to illustrate how sensitive data can be affected by malware and other attacks. | Network Communication & Organization | 7.2 |
| ACM | 2.5 | Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks. |  |  |

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| CSTA | 3A-NI-06 | Recommend security measures to address various scenarios based on factors such as efficiency, feasibility, and ethical impacts. | Cybersecurity | 3.3 |
| ACM | 1.1 | Contribute to society and to human well-being, acknowledging that all people are stakeholders in computing. |  |  |
|  | 2.5 | Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks. |  |  |

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| CSTA | 3A-NI-07 | Compare various security measures, considering tradeoffs between the usability and security of a computing system. | Network Communication & Organization | 6.3 |
| ACM |  |  |  |  |

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| CSTA | 3A-NI-08 | Explain tradeoffs when selecting and implementing cybersecurity recommendations. | Cybersecuirty | 7.2 |
| ACM | 2.5 | Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks. |  |  |

**Data Analysis**

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| CSTA | 3A-DA-09 | Translate between different bit representations of real-world phenomena, such as characters, numbers, and images. | Storage | 4.1 |
| ACM |  |  |  |  |

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| CSTA | 3A-DA-10 | Evaluate the tradeoffs in how data elements are organized and where data is stored. | Storage | 3.3 |
| ACM |  |  |  |  |

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| CSTA | 3A-DA-11 | Create interactive data visualizations using software tools to help others better understand real-world phenomena. | Collection Visualization & Transformation | 4.4 |
| ACM |  |  |  |  |

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| CSTA | 3A-DA-12 | Create computational models that represent the relationships among different elements of data collected from a phenomenon or process. | Inference & Models | 4.4 |
| ACM | 1.6 | Respect privacy // i.e. allow individuals to understand what data is being collected and how it is being used |  |  |

**Algorithms and Programming**

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| CSTA | 3A-AP-13 | Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests. | Algorithms | 5.2 |
| ACM |  |  |  |  |

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| CSTA | 3A-AP-14 | Use lists to simplify solutions, generalizing computational problems instead of repeatedly using simple variables. | Variables | 4.1 |
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| CSTA | 3A-AP-15 | Justify the selection of specific control structures when tradeoffs involve implementation, readability, and program performance, and explain the benefits and drawbacks of choices made. | Control | 5.2 |
| ACM |  |  |  |  |

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| CSTA | 3A-AP-16 | Design and iteratively develop computational artifacts for practical intent, personal expression, or to address a societal issue by using events to initiate instructions. | Control | 5.2 |
| ACM |  |  |  |  |

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| CSTA | 3A-AP-17 | Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects. | Control | 3.2 |
| ACM |  |  |  |  |

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| CSTA | 3A-AP-18 | Create artifacts by using procedures within a program, combinations of data and procedures, or independent but interrelated programs. | Modularity | 5.3 |
| ACM |  |  |  |  |

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| CSTA | 3A-AP-19 | Systematically design and develop programs for broad audiences by incorporating feedback from user | Modularity | 5.1 |
| ACM |  |  |  |  |

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| CSTA | 3A-AP-20 | Evaluate licenses that limit or restrict use of computational artifacts when using resources such as libraries. | Program Development | 7.3 |
| ACM |  |  |  |  |

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| CSTA | 3A-AP-21 | Evaluate and refine computational artifacts to make them more usable and accessible. | Program Development | 6.3 |
| ACM |  |  |  |  |

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| CSTA | 3A-AP-22 | Design and develop computational artifacts working in team roles using collaborative tools. | Program Development | 2.4 |
| ACM |  |  |  |  |

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| CSTA | 3A-AP-23 | Document design decisions using text, graphics, presentations, and/or demonstrations in the development of complex programs. | Program Development | 7.2 |
| ACM |  |  |  |  |

**Impacts of Computing**

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| CSTA | 3A-IC-24 | Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices. | Culture | 1.2 |
| ACM | 1.1 | Contribute to society and to human well-being, acknowledging that all people are stakeholders in computing. |  |  |
|  | 1.2 | Avoid harm |  |  |
|  | 1.4 | Be fair and take action not to discriminate. |  |  |

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| CSTA | 3A-IC-25 | Test and refine computational artifacts to reduce bias and equity deficits. | Culture | 1.2 |
| ACM | 1.1 | Contribute to society and to human well-being, acknowledging that all people are stakeholders in computing. |  |  |
|  | 1.2 | Avoid harm |  |  |
|  | 1.4 | Be fair and take action not to discriminate. |  |  |

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| CSTA | 3A-IC-26 | Demonstrate ways a given algorithm applies to problems across disciplines. | Culture | 3.1 |
| ACM |  |  |  |  |

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| CSTA | 3A-IC-27 | Use tools and methods for collaboration on a project to increase connectivity of people in different cultures and career fields. | Social Interactions | 2.4 |
| ACM |  |  |  |  |

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| CSTA | 3A-IC-28 | Explain the beneficial and harmful effects that intellectual property laws can have on innovation. | Safety Law & Ethics | 7.3 |
| ACM | 1.5 | Respect the work required to produce new ideas, inventions, creative works, and computing artifacts. | Safety Law & Ethics |  |

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| CSTA | 3A-IC-29 | Explain the privacy concerns related to the collection and generation of data through automated processes that may not be evident to users. | Safety Law & Ethics | 7.2 |
| ACM | 1.6 | Respect privacy |  |  |

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| CSTA | 3A-IC-30 | Evaluate the social and economic implications of privacy in the context of safety, law, or ethics. | Safety Law & Ethics | 7.3 |
| ACM | 1.5 | Respect the work required to produce new ideas, inventions, creative works, and computing artifacts. |  |  |

## Level 3B: Grades 11-12 (Ages 16-18)

**Computing Systems**

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| CSTA | 3B-CS-01 | Categorize the roles of operating system software. | Hardware &  Software | 7.2 |
| ACM | 2.7 | Foster public awareness and understanding of computing, related technologies, and their consequences. |  |  |

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| CSTA | 3B-CS-02 | Illustrate ways computing systems implement logic, input, and output through hardware components. | Troubleshooting | 7.2 |
| ACM | 2.7 | Foster public awareness and understanding of computing, related technologies, and their consequences. |  |  |

**Networks and the Internet**

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| CSTA | 3B-NI-03 | Describe the issues that impact network functionality (e.g., bandwidth, load, delay, topology). | Network Communication & Organization | 7.2 |
| ACM |  |  |  |  |

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| CSTA | 3B-NI-04 | Compare ways software developers protect devices and information from unauthorized access. | Cybersecurity | 7.2 |
| ACM | 2.9 | Design and implement systems that are robustly and usably secure. |  |  |

**Data and Analysis**

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| CSTA | 3B-DA-05 | Use data analysis tools and techniques to identify patterns in data representing complex systems. | Collection Visualization & Transformation | 4.1 |
| ACM |  |  |  |  |

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| CSTA | 3B-DA-06 | Select data collection tools and techniques to generate data sets that support a claim or communicate information. | Collection Visualization & Transformation | 7.2 |
| ACM | 1.6 | Respect privacy // i.e. allow individuals to understand what data is being collected and how it is being used |  | 2.7 |

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| CSTA | 3B-DA-07 | Evaluate the ability of models and simulations to test and support the refinement of hypotheses. | Inference & Models | 4.4 |
| ACM |  |  |  |  |

**Algorithms and Programming**

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| CSTA | 3B-AP-08 | Describe how artificial intelligence drives many software and physical systems. | Algorithms | 7.2 |
| ACM |  |  |  |  |

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| CSTA | 3B-AP-09 | Implement an artificial intelligence algorithm to play a game against a human opponent or solve a problem. | Algorithms | 5.3 |
| ACM |  |  |  |  |

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| CSTA | 3B-AP-10 | Use and adapt classic algorithms to solve computational problems. | Algorithms | 4.2 |
| ACM |  |  |  |  |

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| CSTA | 3B-AP-11 | Evaluate algorithms in terms of their efficiency, correctness, and clarity. | Algorithms | 4.2 |
| ACM |  |  |  |  |

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| CSTA | 3B-AP-12 | Compare and contrast fundamental data structures and their uses. | Variables | 4.2 |
| ACM |  |  |  |  |

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| CSTA | 3B-AP-13 | Illustrate the flow of execution of a recursive algorithm | Control | 3.2 |
| ACM |  |  |  |  |

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| CSTA | 3B-AP-14 | Construct solutions to problems using student-created components, such as procedures, modules and/or objects. | Modularity | 5.2 |
| ACM |  |  |  |  |

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| CSTA | 3B-AP-15 | Analyze a large-scale computational problem and identify generalizable patterns that can be applied to a solution |  |  |
| ACM |  |  |  |  |

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| CSTA | 3B-AP-16 | Demonstrate code reuse by creating programming solutions using libraries and APIs |  |  |
| ACM |  |  |  |  |

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| CSTA | 3B-AP-17 | Plan and develop programs for broad audiences using a software life cycle process. | Program Development | 5.1 |
| ACM |  |  |  |  |

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| CSTA | 3B-AP-18 | Explain security issues that might lead to compromised computer programs | Program Development | 7.2 |
| ACM | 2.5 | Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks. |  |  |

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| CSTA | 3B-AP-19 | Develop programs for multiple computing platforms | Program Development | 5.2 |
| ACM |  |  |  |  |

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| CSTA | 3B-AP-20 | Use version control systems, integrated development environments (IDEs), and collaborative tools and practices (code documentation) in a group software project. | Program Development | 2.4 |
| ACM |  |  |  |  |

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| CSTA | 3B-AP-21 | Develop and use a series of test cases to verify that a program performs according to its design specifications. | Program Development | 6.1 |
| ACM |  |  |  |  |

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| CSTA | 3B-AP-22 | Modify an existing program to add additional functionality and discuss intended and unintended implications (e.g., breaking other functionality). | Program Development | 5.3 |
| ACM | 2.5 | Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks. |  |  |

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| CSTA | 3B-AP-23 | Evaluate key qualities of a program through a process such as a code review. | Program Development | 6.3 |
| ACM | 2.4 | Accept and provide appropriate professional review. |  |  |

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| CSTA | 3B-AP-24 | Compare multiple programming languages and discuss how their features make them suitable for solving different types of problems. | Program Development | 7.2 |
| ACM |  |  |  |  |

**Impacts of Computing**

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| CSTA | 3B-IC-25 | Evaluate computational artifacts to maximize their beneficial effects and minimize harmful effects on society. | Culture | 6.1, 1.2 |
| ACM | 1.1 | Contribute to society and to human well-being, acknowledging that all people are stakeholders in computing. |  |  |
|  | 1.2 | Avoid harm |  |  |
|  | 1.4 | Be fair and take action not to discriminate. |  |  |

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| CSTA | 3B-IC-26 | Evaluate the impact of equity, access, and influence on the distribution of computing resources in a global society. | Culture | 1.2 |
| ACM | 1.1 | Contribute to society and to human well-being, acknowledging that all people are stakeholders in computing. |  |  |
|  | 1.4 | Be fair and take action not to discriminate. |  |  |

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| CSTA | 3B-IC-27 | Predict how computational innovations that have revolutionized aspects of our culture might evolve. | Culture | 7.2 |
| ACM | 2.7 | Foster public awareness and understanding of computing, related technologies, and their consequences. |  |  |

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| CSTA | 3B-IC-28 | Debate laws and regulations that impact the development and use of software. | Safety Law & Ethics | 3.3, 7.3 |
| ACM | 1.5 | Respect the work required to produce new ideas, inventions, creative works, and computing artifacts. |  |  |
|  | 1.7 | Honor confidentiality |  |  |

CSTA Practices

1. Fostering an Inclusive Computing Culture
   1. Include the unique perspectives of others and reflect on one’s own perspectives when designing and developing computational products.

ACM 1.1 – Contribute to society and to human well-being, acknowledging that all people are stakeholders in computing.

ACM 1.4 – Be fair and take action not to discriminate.

* 1. Address the needs of diverse end users during the design process to produce artifacts with broad accessibility and usability.

ACM 1.1 – Contribute to society and to human well-being, acknowledging that all people are stakeholders in computing.

ACM 1.4 – Be fair and take action not to discriminate.

* 1. Employ self- and peer-advocacy to address bias in interactions, product design, and development methods

ACM 1.1 – Contribute to society and to human well-being, acknowledging that all people are stakeholders in computing.

ACM 2.4 – Be fair and take action not to discriminate.

1. Collaborating Around Computing
   1. Cultivate working relationships with individuals possessing diverse perspectives, skills, and personalities.

ACM 1.1 – Contribute to society and to human well-being, acknowledging that all people are stakeholders in computing.

ACM 1.4 – Be fair and take action not to discriminate.

* 1. Create team norms, expectations, and equitable workloads to increase efficiency and effectiveness.
  2. Solicit and incorporate feedback from, and provide constructive feedback to, team members and other stakeholders.
  3. Evaluate and select technological tools that can be used to collaborate on a project.

1. Recognizing and Defining Computational Problems
   1. Identify complex, interdisciplinary, real-world problems that can be solved computationally
   2. Decompose complex real-world problems into manageable subproblems that could integrate existing solutions or procedures.
   3. Evaluate whether it is appropriate and feasible to solve a problem computationally
2. Developing and Using Abstractions
   1. Extract common features from a set of interrelated processes or complex phenomena.
   2. Evaluate existing technological functionalities and incorporate them into new designs.
   3. Create modules and develop points of interaction that can apply to multiple situations and reduce complexity.
   4. Model phenomena and processes and simulate systems to understand and evaluate potential outcomes
3. Creating Computational Artifacts
   1. Plan the development of a computational artifact using an iterative process that includes reflection on and modification of the plan, taking into account key features, time and resource constraints, and user expectations
   2. Create a computational artifact for practical intent, personal expression, or to address a societal issue
   3. Modify an existing artifact to improve or customize it
4. Testing and Refining Computational Artifacts
   1. Systematically test computational artifacts by considering all scenarios and using test cases

ACM 1.2 – Avoid harm

ACM 2.1 – Strive to achieve high quality in both the processes and products of professional work.

ACM 2.5 – Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks.

* 1. Identify and fix errors using a systematic process

ACM 1.2 – Avoid harm

ACM 2.1 – Strive to achieve high quality in both the processes and products of professional work.

ACM 2.5 – Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks.

* 1. Evaluate and refine a computational artifact multiple times to enhance its performance, reliability, usability, and accessibility.

1. Communicating About Computing
   1. Select, organize, and interpret large data sets from multiple sources to support a claim.
   2. Descript, justify, and documentcomputational processes and solutions using appropriate terminology consistent with the intended audience and purpose.

ACM 2.2 – Maintain high standards of professional competence, conduct, and ethical practice. // i.e. “skill in communication”

ACM 2.7 – Foster public awareness and understanding of computing, related technologies, and their consequences. // i.e. “communications with the public should be clear…”

* 1. Articulate ideas responsiblyby observing intellectual property rights and giving appropriate attribution.

*Primary*

ACM 1.5 – Respect the work required to produce new ideas, inventions, creative works, and computing artifacts.

*Secondary*

ACM 1.6 – Respect privacy.

ACM 1.7 – Honor confidentiality

References

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