

Level 3A: High School (Grades 9-10)

COMPUTING SYSTEMS 3A-CS

- 1 Explain how abstractions hide the underlying implementation details of computing systems embedded in everyday objects. 3A-CS-01
- 2 Compare levels of abstraction and interactions between application software, system software, and hardware layers. 3A-CS-02
- 3 Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors. 3A-CS-03

NETWORKS AND THE INTERNET 3A-NI

- 4 Evaluate the scalability and reliability of networks, by describing the relationship between routers, switches, servers, topology, and addressing. 3A-NI-04
- 5 Give examples to illustrate how sensitive data can be affected by malware and other attacks. 3A-NI-05
- 6 Recommend security measures to address various scenarios based on factors such as efficiency, feasibility, and ethical impacts. 3A-NI-06
- 7 Compare various security measures, considering tradeoffs between the usability and security of a computing system. 3A-NI-07
- 8 Explain tradeoffs when selecting and implementing cybersecurity recommendations. 3A-NI-08

DATA AND ANALYSIS 3A-DA

- 9 Translate between different bit representations of real-world phenomena, such as characters, numbers, and images. 3A-DA-09
- 10 Evaluate the tradeoffs in how data elements are organized and where data is stored. 3A-DA-10
- 11 Create interactive data visualizations using software tools to help others better understand real-world phenomena. 3A-DA-11
- 12 Create computational models that represent the relationships among different elements of data collected from a phenomenon or process. 3A-DA-12

**ALGORITHMS AND
PROGRAMMING** 3A-AP

- 13** Create prototypes that use algorithms to solve computational problems by leveraging prior student knowledge and personal interests. 3A-AP-13

- 14** Use lists to simplify solutions, generalizing computational problems instead of repeatedly using simple variables. 3A-AP-14

- 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. 3A-AP-15

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

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

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

- 19** Systematically design and develop programs for broad audiences by incorporating feedback from users. 3A-AP-19

- 20** Evaluate licenses that limit or restrict use of computational artifacts when using resources such as libraries. 3A-AP-20

- 21** Evaluate and refine computational artifacts to make them more usable and accessible. 3A-AP-21

- 22** Design and develop computational artifacts working in team roles using collaborative tools. 3A-AP-22

- 23** Document design decisions using text, graphics, presentations, and/or demonstrations in the development of complex programs. 3A-AP-23

**IMPACTS OF
COMPUTING** 3A-IC

- 24** Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices. 3A-IC-24

- 25** Test and refine computational artifacts to reduce bias and equity deficits. 3A-IC-25

- 26** Demonstrate ways a given algorithm applies to problems across disciplines. 3A-IC-26

- 27** Use tools and methods for collaboration on a project to increase connectivity of people in different cultures and career fields. 3A-IC-27

- 28** Explain the beneficial and harmful effects that intellectual property laws can have on innovation. 3A-IC-28

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- 29** Explain the privacy concerns related to the collection and generation of data through automated processes that may not be evident to users. 3A-IC-29
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- 30** Evaluate the social and economic implications of privacy in the context of safety, law, or ethics. 3A-IC-30