West Virginia Technology and Computer Science

Computer Science & Mathematics: Grades 9, 10, 11, 12

Adopted 2017

Computational Thinking

1. Analyze the various mathematical bases (e.g., binary, decimal, hexadecimal) and convert between them. TCS.M.1
2. Describe the relationship between binary and hexadecimal representations. TCS.M.2
3. Convert information between various encoding formats (e.g., ASCII, Unicode, hexadecimal, binary). TCS.M.3
4. Compare techniques (e.g., sorting, statistics, searching) for analyzing massive data collections. TCS.M.4
5. Describe how mathematical and statistical functions, sets, and logic are used in computation. TCS.M.5
6. Utilize predefined mathematical functions and parameters to divide a complex problem into simpler parts, including parallel processing. TCS.M.6
7. Interpret truth tables from basic statements using Boolean operators (AND, OR, XOR, and NOT). TCS.M.7
8. Explain ways in which sequence, selection, iteration, and recursion are building blocks of algorithms. TCS.M.8
9. Create systems of equations based on real-world situations. TCS.M.9
10. Analyze decisions and strategies using probability and statistical concepts. TCS.M.10
11. Utilize modeling and simulation techniques to represent and understand natural phenomena. TCS.M.11
12. Examine classical algorithms (e.g., searching, sorting, shortest path). TCS.M.12

13. **Manipulate formulas and equations and apply them to algorithm development.** TCS.M.13

14. **Apply algorithm analysis and design techniques to solve problems.** TCS.M.14

15. **Write algorithms to solve mathematical problems using formulas, equations, and functions.** TCS.M.15

16. **Implement conditional statements that include if/then, if/then/else, case statements, and Boolean logic, in the design of algorithms.** TCS.M.16

17. **Represent algorithms using flowcharts and pseudocode.** TCS.M.17

18. **Combine standard function types using arithmetic operations.** TCS.M.18

19. **Analyze algorithms for correctness, clarity, and efficiency.** TCS.M.19

Computing Practice and Programming

20. **Compare and contrast computer programming languages and paradigms (e.g., compiled and interpreted languages, procedural and object-oriented paradigms).** TCS.M.20

21. **Diagram the program execution process.** TCS.M.21

22. **Determine the output of a given sample program without the use of a computer.** TCS.M.22

23. **Implement computing applications using the following software development tools and techniques
branching (if, if-else) declare, define, and reference variables
lists/arrays looping (for, while, do/while) recursion
sequencing
** TCS.M.23

24. **Use various debugging and testing methods to ensure program correctness.** TCS.M.24

25. **Cite evidence to support or refute the correctness of software solutions.** TCS.M.25

Computers and Communication Devices

26. **Recognize that computers are devices that execute programs.** TCS.M.26

27. **Identify a variety of electronic devices (e.g., cell phones, desktops, laptops, vehicles, programmable thermostats, programmable kitchen appliances) that contain computational processors.** TCS.M.27

28. **Describe unique features of computers embedded in mobile devices and vehicles.** TCS.M.28

29. **Investigate the history of computers, identifying contributors and major milestones (e.g., Alan Turing, Charles Babbage, Ada Lovelace, Grace Hopper, analytical machine, ENIAC, IBM PC).** TCS.M.29

30. **Demonstrate an understanding of the relationship between hardware and software.** TCS.M.30

31. **Develop criteria for purchasing or upgrading computer system hardware.** TCS.M.31

32. **Describe primary components of computer systems (e.g., input, output, processing, storage).** TCS.M.32

33. **Explain multiple levels of hardware and software that support program execution (e.g., compilers, interpreters, operating systems, networks).** TCS.M.33

34. **Apply strategies for identifying and solving routine hardware problems that occur during everyday computer use.** TCS.M.34

35. **Describe how the Internet facilitates global communication.** TCS.M.35

36. **Describe issues that impact network functionality (e.g., latency, bandwidth, firewalls, server capability).** TCS.M.36

Social and Ethical Impacts of Computing

37. **Summarize appropriate and inappropriate technological behaviors, including issues of privacy, copyright, security, legalities, and politics.** TCS.M.37

38. **Explore the ramifications of inappropriate uses of technology.** TCS.M.38

39. **Investigate the national and global economic impact of cybercrime.** TCS.M.39

40. **Discuss accessibility issues (e.g., adaptive technology for special needs individuals, censorship, geographical locations, economically-disadvantaged populations).** TCS.M.40

41. **Compare the reliability of various online sources.** TCS.M.41

42. **Investigate information ownership topics
access
distribution rights
hacking
licensure
open source
public domain
software piracy
** TCS.M.42

43. **Describe security and privacy issues that relate to computer networks.** TCS.M.43

44. **Explain principles of network security and techniques that protect stored and transmitted data (e.g., encryption, cryptography, authentication).** TCS.M.44