



monarch

Curriculum Catalog

Career and Technical Education Series

Principles of Coding

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Principles of Coding Course Overview

Principles of Coding is designed to introduce middle school students to the power of coding. Computer literacy has become just as important as reading and math literacy in the 21st Century. No matter what career students select, learning even the basics of coding and computers will benefit them. Additionally, every year there is a standing demand for 120,000 people who are trained in computer science. Jobs in this industry are growing at more than two times the national average of any other field ¹.

Throughout this course, students are not only introduced to the basics of coding, but delve deeply into the thought processes behind designing technology. Right from the start, students learn the Engineering Design Process and follow this process to create games, simulations, and even a mobile application. Students learn the connection between the core subjects of English Language Arts and Math to Computer Science. Students also examine the impact of technology from a global perspective. The content was written to be highly-engaging for the middle-school audience. Multimedia and interactive elements are built into every lesson to ensure a high-level of student engagement throughout.

Curriculum designed for this course was guided by the standards from the Computer Science Teacher's Association. These nationally recognized standards are designed to "provide the foundation for a complete computer science curriculum and its implementation at the K-12 level." These standards integrate computer science learning with core subjects.

More specifically student will learn the following.

Unit 1 – Computational Thinking. Students are introduced to the course by learning that problems are all around us and that programming can offer many solutions to these problems. Students learn the Engineering Design Process and Creative Problem Solving Process. Students are also introduced to *Scratch*. This visual coding program will be the basis for the coding work in the first part of the course. Students apply their understanding of algorithms and programming language to build an animated music video in *Scratch*. Students also begin to develop a game using *Scratch* by applying the computational thinking and practices of experimenting and iterating, testing, debugging, reusing and remixing, abstracting, and modularizing.

Unit 2 – Computer Practice and Programming. Students delve deeper into computers as machines. Students will differentiate computers with other kinds of machine systems. Students will also deepen their understanding of code and explain how it aids in analog-to-digital transformations. Students apply this understanding by designing a computing system. Students also analyze the positive and negative impacts of computing on human culture. Learners continue to build in *Scratch*, learning how to create interactive art and graphic effects.

Unit 3 – Data and Information. Students are introduced to computer modeling and simulations. They will begin to identify the kinds of problems that could be solved using modeling and simulations. Simulation games that model physics phenomena are examined to convey the concept that real-world phenomena can be simulated in a computer game or app. Learners will then explore issues related to the concepts of equity, access, and power of technology and the Internet in a global society. A discussion on cybersecurity and digital citizenship follow. Students will apply their learning by creating a game or interactive story by using variable and models within *Scratch*.

Unit 4 – Connecting Math and Computer Science. Math is the "fuel" that runs computers. In this unit, students will explore this idea more deeply. Students build on their understanding of modeling by looking more closely at the types and elements of models. Students are introduced to the important topic of Cyber Ethics, as well as robotics and artificial intelligence. Students will apply their learning by choosing a real-world problem and developing a simulation that attempts to solve the problem *using Scratch*. Students will also discover the basic building block of programming – logic. Mathematical topics of Boolean algebra, binary numbers, logic, sets, and functions are also taught. For the final project in this unit, students will use combinational logic to illustrate how the design of complex binary logic functions make up the components inside a digital device, such as the buzzer on a car, a blender, or a washing machine.

Unit 5 – Mobile Technology and Society. For the final instructional unit of the course, students will be introduced to mobile technology such as mobile computing tablets and smartphones. Learners will also explore the impact of technology on education, the workplace, and society. Students apply their skills by creating a mobile app using App Inventor.

STATISTICS FROM : [HTTPS://CODE.ORG](https://code.org) 2015

Unit 1: Computational Thinking	
Assignments	
Principles of Coding	1. Course Overview
	2. Introduction to Creative Computing
	3. Introduction to Scratch
	4. Exploring in Scratch
	5. Project: Debugging 101
	6. Quiz 1: Basic Algorithmic Problem Solving and Sequencing
	7. Alternate Quiz 1—Form A: Basic Algorithmic Problem Solving and Sequencing*
	8. Alternate Quiz 1—Form B: Basic Algorithmic Problem Solving and Sequencing*
	9. Project: Storytelling Through Dialogue
	10. Computational Concepts
	11. Animation Concepts
	12. Quiz 2: Parallelization, Multiple Paths, Search/Sort, and Sequences
	13. Alternate Quiz 2—Form A: Parallelization, Multiple Paths, Search/Sort, and Sequences*
	14. Alternate Quiz 2—Form B: Parallelization, Multiple Paths, Search/Sort, and Sequences*
	15. Project: Animated Music Video
	16. Broadcast Messages
	17. Project: Make a Game in Scratch
	18. Special Project*
	19. Unit Review
	20. Test
	21. Alternate Test—Form A*
	22. Alternate Test—Form B*
	23. Glossary and Credits

Unit 2: Computer Practice and Programming	
Assignments	
Principles of Coding	1. What is a Computer?
	2. Computers Are Everywhere
	3. Project: Design a Computing Device
	4. Quiz 1: Computing Devices
	5. Alternate Quiz 1—Form A: Computing Devices*
	6. Alternate Quiz 1—Form B: Computing Devices*
	7. Career Connections
	8. Computing: A Double-Edged Sword
	9. Interactive Art and Graphic Effects
	10. Graphic Design in Scratch
	11. Quiz 2: Career Connections and Graphic Solutions
	12. Alternate Quiz 2—Form A: Career Connections and Graphic Solutions*
	13. Alternate Quiz 2—Form B: Career Connections and Graphic Solutions*
	14. Project: Customized Design Project
	15. Special Project*
	16. Unit Review
	17. Test
	18. Alternate Test—Form A*
	19. Alternate Test—Form B*
	20. Glossary and Credits

Unit 3: Data and Information		
Assignments		
Principles of Coding	1. Introduction to Computer Modeling and Simulation	12. Alternate Quiz 2—Form A: Value, Security, Responsibility, and Citizenship*
	2. Simulation Game Examples	13. Alternate Quiz 2—Form B: Value, Security, Responsibility, and Citizenship*
	3. Exploration of Simulation Modeling Games	14. Variable Types, Classes, and Models
	4. Quiz 1: Modeling, Simulation, Games	15. Game or Interactive Story Using Variables and Models
	5. Alternate Quiz 1—Form A: Modeling, Simulation, Games*	16. Project: Group Evaluation / Peer Evaluation
	6. Alternate Quiz 1—Form B: Modeling, Simulation, Games*	17. Special Project*
	7. Project: Evaluation of Simulation Modeling Problems	18. Unit Review
	8. Global Citizenship	19. Test
	9. Project: Value and Security	20. Alternate Test—Form A*
	10. Project: Responsible Citizens	21. Alternate Test—Form B *
	11. Quiz 2: Value, Security, Responsibility, and Citizenship	22. Glossary and Credits

Unit 4: Connecting Math and Computer Science		
Assignments		
Principles of Coding	1. Computer Model Analysis	15. Alternate Quiz 2—Form B: Historical Perspectives, Ethics, Human/Machine Differentiation, Abstraction, Interdisciplinary Applications, and Run Analysis*
	2. Evaluate Industry Models	16. Introduction of the Full Network Stack
	3. Limitations of Modeling and Simulations	17. Introduction to Digital Logic Elements
	4. Select Computer Model of Real-World Simulation	18. Boolean Algebra
	5. Project: Evaluating Models	19. Project: Digital Design Project
	6. Quiz 1: Representational Accuracy	20. Quiz 3: Hierarchy and Abstraction, Math/Science Connections, Interdisciplinary Thinking
	7. Alternate Quiz 1—Form A: Representational Accuracy*	21. Alternate Quiz 3—Form A: Hierarchy and Abstraction, Math/Science Connections, Interdisciplinary Thinking*
	8. Alternate Quiz 1—Form B: Representational Accuracy*	22. Alternate Quiz 3—Form B: Hierarchy and Abstraction, Math/Science Connections, Interdisciplinary Thinking*
	9. Cyber Ethics	23. Special Project*
	10. The Interconnected Human Race	24. Unit Review
	11. Introduction to Digital Media - Graphics Software - Robotics - Artificial Intelligence	25. Test
	12. Project: Scratch Simulation Project	26. Alternate Test—Form A*
	13. Quiz 2: Historical Perspectives, Ethics, Human/Machine Differentiation, Abstraction, Interdisciplinary Applications, and Run Analysis	27. Alternate Test—Form B*
	14. Alternate Quiz 2—Form A: Historical Perspectives, Ethics, Human/Machine Differentiation, Abstraction, Interdisciplinary Applications, and Run Analysis*	28. Glossary and Credits

Unit 5: Mobile Technology and Society			
Assignments			
Principles of Coding	1. Hardware Design and Function	12. Quiz 2: Elements of Designing, Developing, Publishing, and Presenting Products	
	2. Corrective Troubleshooting	13. Alternate Quiz 2—Form A: Elements of Designing, Developing, Publishing, and Presenting Products*	
	3. Mobile Devices and Applications	14. Alternate Quiz 2—Form B: Elements of Designing, Developing, Publishing, and Presenting Products*	
	4. Mobile Applications in Society	15. Bouncing Ball App Inventor	
	5. Technology as a Tool	16. Finger Painting Without the Mess	
	6. Quiz 1: Hardware vs Software, Systems, Networks, Tools, and Problem Diagnostics	17. Special Project*	
	7. Alternate Quiz 1—Form A: Hardware vs Software, Systems, Networks, Tools, and Problem Diagnostics*	18. Unit Review	
	8. Alternate Quiz 1—Form B: Hardware vs Software, Systems, Networks, Tools, and Problem Diagnostics*	19. Test	
	9. Project: Open Design	20. Alternate Test—Form A*	
	10. Introduction to App Inventor	21. Alternate Test—Form B*	
	11. Talk to Me App	22. Glossary and Credits	
	Unit 6: Review and Exam		
	Assignments		
	PC	1. Course Review	3. Alternate Final Exam - Form A*
		2. Final Exam	4. Alternate Final Exam - Form B*

(*) Indicates alternative assignment