
Computer Science

Curriculum Guide

Scranton School District

Scranton, PA



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Curriculum Guide**

Computer Science

Prerequisite: Algebra II/Trig, Honors Geometry

Intended Audience: This course is designed for the student who has a strong math background and an interest in computer science.

A computer program is a set of instructions that tell a computer how to accomplish a given task. Computer programming is the art and science of planning and writing computer programs. This course is designed to introduce students to the process of computer programming. Students will learn fundamental concepts of computer programming using the programming language JAVA. During the year, students will learn to write JAVA programs to solve a variety of interesting and useful problems, some of which may include the use of graphics and game playing. By the end of the course, students will have acquired enough knowledge and skill to plan and develop programs for their own use. This course also provides the foundation for further study in computer programming. Students who do well in mathematics and have a possible interest in pursuing careers in any math or science related area should consider taking this course.

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Year-at-a-glance

Subject: Computer Science	Grade Level: 10 th – 12 th	Date Completed: 3-17-15
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1st Quarter

Topic	Resources	AP Standard
Introduction	Text Book: Big Java, Chapter 1, Computer	
Using Objects	Text Book: Big Java, Chapter 2, Computer	
Implementing Classes	Text Book: Big Java, Chapter 3, Computer	

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2nd Quarter

Topic	Resources	AP Standard
Fundamental Data Types	Text Book: Big Java, Chapter 4, Computer	
Decisions	Text Book: Big Java, Chapter 5, Computer	
Loops	Text Book: Big Java, Chapter 6, Computer	

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3rd Quarter

Topic	Resources	AP Standard
Arrays and Array Lists	Text Book: Big Java, Chapter 7, Computer	
Designing Classes	Text Book: Big Java, Chapter 8, Computer	
Inheritance	Text Book: Big Java, Chapter 9, Computer	

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4th Quarter

Topic	Resources	AP Standard
Interfaces	Text Book: Big Java, Chapter 10, Computer	
Robocode (optional)	IBM developerWorks Robocode, Computer	

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Curricular Standards

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|------|---|
| CR1 | The course teaches students to design and implement computer-based solutions to problems. |
| CR2a | The course teaches students to use and implement commonly used algorithms. |
| CR2b | The course teaches students to use commonly used data structures. |
| CR3 | The course teaches students to select appropriate algorithms and data structures to solve problems. |
| CR4 | The course teaches students to code fluently in an object-oriented paradigm using the programming language Java. |
| CR5 | The course teaches students to use elements of the standard Java library from the AP Java subset in Appendix A of the AP Computer Science A Course Description. |
| CR6 | The course includes a structured lab component of a minimum of 20 hours of hands-on lab experiences. |
| CR7 | The course teaches students to recognize the ethical and social implications of computer use. |

Since the content of Computer Science course is beyond the scope of Common Core, the College Board Computer Science Curriculum Standards was used for this course.

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General Topic	Academic Standard(s)	Essential Knowledge, Skills & Vocabulary	Resources & Activities	Assessments	Suggested Time
Computer Programs The Anatomy of a Computer The Java Programming Language Becoming Familiar with Your Programming Environment Analyzing Your First Program Errors Problem Solving: Algorithm Design	CR1 CR2a CR7	- Describe the relationship between hardware and software. - Define various types of software and how they are used. - Identify basic computer hardware - Explain how the hardware components execute programs and manage data. - Describe how computers are connected together into networks to share information. - Introduce the Java Programming Language. - Describe the steps involved in program compilation and execution. - Identify the different types of compiler errors - Introduce Algorithms: sequence of steps that is unambiguous, executable, and terminating. - Law and Ethics Acceptable User's Policy	Text Book: <i>BIG JAVA</i> Computer (Bullets below match previous column) 1.1 1.1 1.2 1.2 1.3 1.4 1.5 1.6 1.7 1.7	Teacher prepared tests, quizzes, etc. Daily Class Work Quizzes	8
Test – Introduction				Multiple Choice Test	1

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Objects and Classes Variables Calling Methods Constructing Objects Accessor and Mutator Methods The API Documentation Implementing a Test Program Object References Graphical Applications	CR1 CR2a CR3 CR4	• Define the difference between primitive data and objects. • Declare and use variables. • Perform mathematical computations. • Create objects and use them. • Create graphical programs that draw shapes. • Understand the concepts of classes and objects. • Be able to call methods. • Learn about arguments and return values. • Write programs that display simple shapes. • Understand how to search and use the API documentation.	Text Book: <i>BIG JAVA Computer</i> • 2.1 • 2.2 • 2.4 • 2.9 • 2.5 • 2.5 • 2.3 • 2.4 • 2.9, 2.10 • 2.6	Daily Class Work Quizzes	14
Test - Using Objects				Multiple Choice Test & Hands on Programming Project	2

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Instance Variables and Encapsulation Specifying the Public Interface of a Class Providing the Class Implementation Problem Solving: Tracing Objects Local Variables The this reference Shape Classes	CR1 CR2a CR3 CR4	• Become familiar with the process of implementing classes • Be able to implement and test simple methods • Understand the purpose and use of constructors • Understand how to access instance variables and local variables • Be able to write javadoc comments • Implement classes for drawing graphical shapes	Text Book: <i>BIG JAVA Computer</i> • 3.1, 3.2, 3.3 • 3.3 • 3.4 • 3.6 • 3.7 • 3.8	Daily Class Work Quizzes	15
Test – Implementing Classes				Multiple Choice Test & Hands on Programming Project	2

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Numbers Arithmetic Input and Output Problem Solving: First Do it by Hand Strings	CR1 CR2a CR2b CR3 CR4 CR5 CR6	• Understand integer and floating-point numbers • Recognize the limitations of the numeric types • Become aware of causes for overflow and roundoff errors • Understand the proper use of constants • Write arithmetic expressions in Java • Use the String type to manipulate character strings • Write programs that read input and produce formatted output	Text Book: <i>BIG JAVA Computer</i> • 4.1 • 4.2 • 4.2 • 4.1, 4.2 • 4.2 • 4.4, 4.5 • 4.3	Daily Class Work Quizzes	14
Test - Fundamental Data Types				Multiple Choice Test & Hands on Programming Project	2

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The if Statement Comparing Values Multiple Alternatives Nested Branches Problem Solving: Flowcharts Problem Solving: Selecting Test Cases Boolean Variables and Operators Application: Input Validation	CR1 CR2a CR3 CR4 CR6	• Implement decisions using if statements • Compare integers, floating-point numbers, and strings • Write statements using the Boolean data type • Develop strategies for testing your programs • Validate user input	Text Book: <i>BIG JAVA Computer</i> • 5.1 • 5.2, 5.3 • 5.7 • 5.5, 5.6 • 5.8	Daily Class Work Quizzes	14
Test - Decisions				Multiple Choice Test & Hands on Programming Project	2

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The while Loop Problem Solving: Hand-Tracing The for Loop The do Loop Application: Processing Sentinel Values Problem Solving: Storyboards Common Loop Algorithms Nested Loops Application: Random Numbers and Simulations Using a Debugger	CR1 CR2a CR2b CR3 CR4 CR6	• Implement while, for, and do loops • Hand-trace the execution of a program • Learn to use common loop algorithms • Understand nested loops • Implement programs that read and process data sets • Use a computer for simulations • Learn about the debugger	Text Book: <i>BIG JAVA Computer</i> • 6.1 • 6.2 • 6.3, 6.4, 6.5 • 6.6, 6.7 • 6.8 • 6.9 • 6.10	Daily Class Work Quizzes	22
Test - Loops				Multiple Choice Test & Hands on Programming Project	2

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Arrays The Enhanced for Loop Common Array Algorithms Adapting Algorithms Discovering Algorithms by Manipulating Physical Objects Two-Dimensional Arrays	CR1 CR2a CR3 CR4 CR6	• Collect elements using arrays and array lists • Use the enhanced for loop for traversing arrays and array lists • Learn common algorithms for processing arrays and array lists • Work with two-dimensional arrays • Understand the concept of regression testing	Text Book: <i>BIG JAVA Computer</i> • 7.1 • 7.2 • 7.3 • 7.6 • 7.7 • 7.8	Daily Class Work Quizzes	17
Test - Arrays				Multiple Choice Test & Hands on Programming Project	2

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Discovering Classes Designing Good Methods Patterns for Object Data Static Variables and Methods Packages	CR1 CR2a CR2b CR3 CR4 CR6	• Learn how to choose appropriate classes for a given problem • Understand the concept of cohesion • Minimize dependencies and side effects • Learn how to find a data representation for a class • Understand static methods and variables • Learn about packages • Learn about unit testing frameworks	Text Book: <i>BIG JAVA</i> Computer • 8.1 • 8.1 • 8.2 • 8.3 • 8.4 • 8.5 • 8.6	Daily Class Work Quizzes	14
Test - Classes				Multiple Choice Test & Hands on Programming Project	2

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Inheritance Hierarchies Implementing Subclasses Overriding Methods Polymorphism Object: The Cosmic Superclass	CR1 CR2a CR2b CR4 CR6	• Learn about inheritance • Implement subclasses that inherit and override superclass methods • Understand the concept of polymorphism • Be familiar with the common superclass Object and its methods	Text Book: <i>BIG JAVA Computer</i> • 9.1 • 9.2, 9.3 • 9.4 • 9.5	Daily Class Work Quizzes	14
Test – Inheritance				Multiple Choice Test & Hands on Programming Project	2

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Using Interfaces for Algorithm Reuse Working with Interface Variables The Comparable Interface Using Interfaces for Callbacks Inner Classes Mock Objects Event Handling Building Applications with Buttons Processing Timer Events Mouse Events	CR1 CR2a CR2b CR3 CR4 CR6	• Be able to declare and use interface types • Appreciate how interfaces can be used to decouple classes • Learn how to implement helper classes as inner classes • Implement event listeners in graphical applications	Text Book: <i>BIG JAVA Computer</i> • 10.1, 10.2 • 10.3, 10.4 • 10.5, 10.6, 10.7 • 10.8, 10.9, 10.10	Daily Class Work Quizzes	14
Test - Interfaces				Multiple Choice Test & Hands on Programming Project	2

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Robocode (optional)		Robocode is a programming game where the goal is to code a robot battle tank to compete against other robots in a battle arena. So the name Robocode is short for "Robot code". The player is the programmer of the robot, who will have no direct influence on the game. Instead, the player must write the AI of the robot telling it how to behave and react to events occurring in the battle arena. Battles are running in real-time and on-screen.	IBM Robocode, Computer	Daily Class Work Quizzes	15
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