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Course Description

AP Computer Science A introduces students to computer science through programming. Fundamental topics in this course include the design of solutions to problems, the use of data structures to organize large sets of data, the development and implementation of algorithms to process data and discover new information, the analysis of potential solutions, and the ethical and social implications of computing systems. The course emphasizes object-oriented programming and design using the Java programming language.

AP Computer Science A is equivalent to a first-semester, college-level course in computer science.

The AP Computer Science A course includes a minimum of 20 hours of hands-on structured lab experiences to engage students in individual or group problem solving.

Policy on Academic Dishonesty and Plagiarism

Failing to acknowledge the source or author of any and all information or evidence taken from the work of someone else will receive a score of 0 on that particular assignment.

Plagiarism in the computer science classroom includes the following:

- Turning in the work of another student and representing it as your own work.
- Knowingly permitting another student to turn in your work.
- Copying code from the work of another student.
- Transforming copied code in order to disguise its origin.
- Collaborating on a project assigned as individual work.
- Including content from other sources and in your work or projects without proper attribution

The following are allowed and do not constitute academic dishonesty or plagiarism:

- Collaborating on a project with permission, and listing all collaborators.
- Sharing knowledge about syntax errors or other language-specific information that makes programming easier.
- General discussion of the requirements for an assignment, or general implementation strategies.
- When students copy code and cite its source on assignments for which the instructor allows inclusion of code other than the student's own.

Texts and Supplementary Materials

The College Board's *Consumer Review, Celebrity, Data and Steganography Labs Student Guides*. <https://bit.ly/3299PB1>

Horstmann, Cay S. *Big Java: Early Objects 6th*. Wiley, 2015.
<https://www.wiley.com/go/bjeo6examples>

Problems for Introductory Programming. <http://www.problems.org/about/topics/index.html>

Programming Environment:

Eclipse IDE for Java Developers <https://www.eclipse.org/downloads/>
Installing Eclipse at home: <https://www.eclipse.org/downloads/packages/installer>

Grading

- All assignments are given equal weight.
- In-class programming projects and labs will make up about 50% of a student's grade.
- Unit tests will make up about 25% of a student's grade.
- The remaining 25% of a student's grade will be based on quizzes, homework and notebook checks. At the end of each week there will be a 5 question multiple choice quiz based on the learning objectives from that week.

Schedule at a glance:

Introduction to Java Programming with Eclipse

Students will be able to describe how information is represented in a computer's memory. Students will be able to use an API, debug and test programs, and use the new command to instantiate an object.

Resources: *Big Java: Early Objects* Chapter 1, [Eclipse IDE](#).

Unit 1

Primitive Types

Students will be able to write programs using variables, primitive data types, casting and mathematical operators. 10 class periods.

Resources: *Big Java: Early Objects* Chapter 4, [Problems: Arithmetic Expressions in Java](#), AP Personal Progress Check 1.

Unit 2

Using Objects

Students will be able to implement classes with instance variables and constructor methods, use methods of the String class and Math class, and describe the behavior of given code segments. 12 class periods.

Resources: [CodingBat Java String-1](#), 2018 AP Computer Science A Exam Free-Response Question #1 (Frog Simulation), *Big Java: Early Objects* Chapter 2, AP Personal Progress Check 2.

Unit 3

Boolean Expressions and if Statements

Students will be able to implement decisions using if statements, compare variables, and write statements using the Boolean data type. 11 class periods.

Resources: *Big Java: Early Objects* Chapter 5, <https://codingbat.com/java>, Personal Progress Check 3.

Unit 4

Iteration

Students will be able to write and interpret programs using iterative control structures such as while loops and for loops, including nested loops. Students will recognize and use common algorithms using iteration for manipulating strings. 14 class periods.

Resources: [AP Computer Science A Consumer Review Lab](#), 2017 AP Computer Science A Exam Free-Response Question #3, Part B (Phrase) , *Big Java: Early Objects* Chapter 6, Personal Progress Check 4.

Unit 5

Writing Classes

Students will be able to design classes based on the attributes and behaviors of real-world entities, implement subclasses, and designate access and visibility constraints to classes, data, constructors, and methods. 12 class periods

Resources: *GridWorld Case Study*, *Big Java: Early Objects* Chapters 3 & 8, Personal Progress Check 5.

Unit 6

Array

Students will be able to use and implement arrays to represent collections of related data, use iteration to examine and manipulate data in an array, traverse elements in an array using an enhanced for loop, and use common array algorithms such as determining a maximum value, computing a sum and comparing values. 6 class periods.

Resources: *Big Java: Early Objects* Chapter 7, [CodingBat Java Array 1](#), [CodingBat Java Array 2](#), [CodingBat Java Array 3](#), [Practice-It!: BJP4 Chapter 7: Arrays](#), Personal Progress Check 6.

Unit 7

ArrayList

Students will be able to write program code to create, traverse, and manipulate elements in ArrayList objects. Students will be able to write algorithms to implement insertion sort, merge sort and selection sort and implement each sort in Java.

Resources: Visualgo.net <https://visualgo.net/en/sorting>, 10 class periods.

Resources: [AP Computer Science A Data Lab](#), *Big Java: Early Objects* Chapters 7 and 14, 2017 AP CS A Exam Free-Response Question 31 Part B (Digits), [Practice-It!: BJP4 Chapter 10: ArrayLists](#), Personal Progress Check 7.

Unit 8

2-Dimensional Array

Students will be able to use nested loops to create, traverse and manipulate data in 2-dimensional arrays. Students will be able to identify and modify standard algorithms that require the use of 2-dimensional array traversals. 10 class periods.

Resources: [AP Computer Science A Picture Lab and Steganography Lab](#), *Big Java: Early Objects* Chapter 7, [Practice-It!: BJP4 Chapter 7: Arrays](#), Personal Progress Check 8.

Unit 9

Inheritance

Students will be able to write program code to define a new type by creating a class, create objects of a class, call methods and implement subclasses that inherit and override superclass methods. 14 class periods.

Resources: [Gradebook Project](#), [AP Computer Science A Celebrity Lab](#), *Big Java: Early Objects* Chapter 7, Personal Progress Check 9.

Unit 10

Recursion

Students will be able to determine the results of executing recursive methods, apply recursive search algorithms and recursive sort algorithms. Students will be able to implement a binary search. Writing recursive program code is outside the scope of the course. 4 class periods

Resources: *Big Java: Early Objects* Chapter 13, Visualizing Data Structures and Algorithms through Animation at <https://visualgo.net/en/sorting>, [Khan Academy Towers of Hanoi](#). Personal Progress Check 10.

After the AP Exam: Impact of computing.

A study of contemporary topics in computer science to include the societal impact of computing, artificial intelligence, and basic data structures.

Late Assignments Policy

In AP CSA, students will sharpen the organizational and time management skills. Because of the emphasis on developing these skills, there is a strict late work policy.

1. **Homework** must be complete and turned in by the due date, **prior to the beginning of class**. Late or incomplete homework is not accepted.
2. Late classwork will be marked down 10%. You can submit late classwork not more than two weeks past the due date, without extenuating circumstances.

Missed Classwork and Excused Absences

All missed classwork should be made up within 1 week of returning to school after an excused absence. Assignments are posted in MCPS Classroom. It is the student's responsibility to clarify any questions regarding assignments missed due to absence.

What to do when you finish class work early

If you have successfully completed your class work, check it over. After you have finished your work and checked it, you have two options:

1. CodeCheck[®] Java Problems: <http://horstmann.com/codecheck/problems.html>
2. CodingBat: <http://codingbat.com/java>

Computer Science Notebook

Each student is responsible for keeping a notebook which includes 3 sections:

1. Chapter Notes
2. Warmup Questions
3. Homework Assignments

Notebook checks will be done randomly each month.

AP COMPUTER SCIENCE A EXAM: 3 HOURS Assessment Overview

All code on the AP Computer Science A Exam is consistent with the AP Java subset that can be found in [Appendix A of the Course Description](#). All questions involving code should be answered in Java. Students are not tested on minor points of syntax.

Format of Assessment

Section I: Multiple Choice | 40 Questions | 1 Hour, 30 Minutes | 50% of Exam Score

- Discrete Question topics will include: programming fundamentals, data structures, logic, algorithms/problem solving, object-oriented programming, recursion, and software engineering.

Section II: Free Response | 4 Questions | 1 Hour, 30 Minutes | 50% of Exam Score

- Question 1: Methods and Control Structures—Students will be asked to write program code to create objects of a class and call methods, and satisfy method specifications using expressions, conditional statements, and iterative statements.
- Question 2: Classes—Students will be asked to write program code to define a new type by creating a class and satisfy method specifications using expressions, conditional statements, and iterative statements.
- Question 3: Array/ArrayList - Students will be asked to write program code to satisfy method specifications using expressions, conditional statements, and iterative statements and create, traverse, and manipulate elements in 1D array or ArrayList objects.
- Question 4: 2D Array—Students will be asked to write program code to satisfy method specifications using expressions, conditional statements, and iterative statements and create, traverse, and manipulate elements in 2D array objects.

Student Acknowledgment Form

I, _____, have received, read, and

(print student name)

accept the expectations, procedures, and policies for Mrs. Bailey's class.

Student signature: _____

Parent/Guardian Acknowledgement Form

I, _____, have received, read, and

(print parent/guardian name)

accept the expectations, procedures, and policies for Mrs. Bailey's class

with my child _____.

(print student's name here)

Parent/Guardian Signature: _____