AP Computer Science A

Course Syllabus

Jackson County High School

606-287-7155

Grade Level: 10-12 Course Length: 36 weeks

Instructor: LaDonna Woods School Year 2013-2014

Email: LaDonna.Woods@jackson.kyschools.us Planning: 5th Block 1:00-1:55

Description of Course

AP Computer Science is an introductory course in computer science that focuses on using computer programs and parts of programs to solve given problems. Java is the computer language of choice and object-oriented design is the primary paradigm. Students are introduced to the development and analysis of algorithms, fundamental data structures, and standard algorithms for searching, sorting, and operating upon data. They also become familiar with the basics of hardware and software components and the ethical responsibilities of both programmers and users. Throughout the course students plan and write code to solve a variety of different types of problems.

Pre-requisites of the Course

The necessary prerequisites for entering the AP Computer Science A course include knowledge of basic algebra and experience in problem solving. A student should be comfortable with functions and the concepts found in the uses of functional notation, such as f(x) - x + 2 and f(x) = g(h(x)). It is important that students understand that any significant computer science course upon a foundation of mathematical reasoning that should be acquired before attempting such a course.

Resources

Resources

- Textbook: John Lewis, William Loftus, and Cara Cocking. *Java Software Solutions for AP* Computer Science 3rd Edition*. Boston, Massachusetts: Addison-Wesley, 2011. Print.
- Cook, Charles. Blue Pelican Java. Virtualbokworm.com Publishing Inc., 2005. Print.
- Roselyn Teukolsky, M.S.. *Barron's Ap Computer Science A.* Hauppauge, New York: Barron's Educational Series, Inc., 2010. Print.
- Chris Nevison and Barbara Cloud Wells. *GridWorld Case Study* (2008 AP* CS Exam). The College Board, 2007. Print/Software.
- College Board AP Computer Science materials.

Software

• DrJava, Greenfoot, and Alice3

Grades & Assignments

All assignments will be uploaded using the student's blackboard account and all assignments will be available on their blackboard accounts. Each unit will consist of a reading assignment quiz, multiple choice and short answer assignments, students written java programs, and unit exam. Although it is not necessary to take notes as you read it is highly suggested to assist you. Many times the quiz may be open notes. Taking notes is always a good strategy especially for college courses as professors often do not give notes as a high school teacher would.

9 Weeks	Final Grade
60% Exams	20% 1 st Nine Weeks Grade
40% Formative Assessment	20% 2 nd Nine Weeks Grade
	20% 3 rd Nine Weeks Grade
	20% 4 th Nine Weeks Grade
	20% Final Exam

Grading Scale: A(100-92) B (91-81) C (80-70) D (69-60) F(59-below)

*** A student that does not take the AP Exam will be given a grade of "F". ***

The AP* Exam

The AP Computer Science A Exam is 3 hours long and seeks to determine how well students have mastered the concepts and techniques contained in the course outline. The exam consists of two sections: a multiple-choice section (40 questions in 1 hour and 15 minutes), which test proficiency in a wide variety of topics, and a free-response section (4 questions in 1 hour and 45 minutes), which requires the student to demonstrate the ability to solve problems involving more extended reasoning.

Students will be considered tardy if they are not in the classroom and prepared for class when the bell rings. Tardy discipline will follow the student handbook.

Class Expectation:

Students are expected to be prepared for class and do the best of their ability in class. Students should show respect to the teacher and their peers. Homework is assigned daily and will be checked in some fashion the following day. If there are any circumstances that may keep work from being turned in on time please discuss these with me. It is necessary if you are having trouble that you do not wait for a progress report or a test day before you come to ask for help. Seek help as soon as you have a misunderstanding. If you are absent you will be expected to get the make-up notes and work from me, a classmate, or from the blackboard. You will be required to turn in any missed assignments within one week of an absence.

All other policies covered in the school handbook will be enforced in this classroom.

Course Outline

Unit 1: Animation with Alice3 – 4 Weeks

Lesson 1: Telling a Story Visually

Lesson 2: Creating a Scene by Adding and Positioning Objects

Lesson 3: Using Procedures

Lesson 4: Declaring Procedures

Lesson 5: Using Control Statements and Functions

Lesson 6: Using the If and While Control Statements

Lesson 7: Using Expressions

Lesson 8: Using Variables and Keyboard Controls to Manipulate

Lesson 9: Correlating Java Variables, Data Types, and Expressions with Alice3 Tools

Lesson 10: Correlating Java Methods, Classes, and Other Structures with Alice3 Tools

Unit 2: Introduction to Java Programming with Greenfoot – 4 weeks

Lesson 1: Getting to know Greenfoot

Lesson 2: The First Program- Little Crab

Lesson3: Improving the Crab

Lesson 4: Finishing the Crab Game

Lesson 5: Making Music

Lesson 6: Interacting Objects

Lesson 7: Collision Detection: Asteroids

Unit 3: Objects and Primitive Data - 4 weeks

Students learn about data types, primitive and object. They write their first driver classes and learn about program syntax, input/output, methods, assignments, declarations, and constructing instances of String, Scanner, and other commonly used Java classes, along with invoking methods on those objects. Visibility modifiers are introduced along with classifying identifiers as instance fields, local variables, constants, etc. Arithmetic operators and precedence are discussed along with static methods from the Math class. Students also learn to hand-trace code and to choose appropriate data for testing their classes.

Readings and Multiple Choice / Short Answer Review Questions
Java Software Solutions - Chapters 2 Objects and Primitive Data

- Using Objects
- String Literals
- Variables and Assignments
- o Primitive Data Types
- Arithmetic Expressions
- Enumerated Types
- Creating Objects
- Class Libraries and Packages

- o Interactive Programs
- Introduction to Applets
- o Drawing Shapes

Lab Assignments & Programs

Blue Pelican Lessons

Lesson 1 Hello World Simple use of println, rems, remarks, comments, block rems.

Project... From Me to You

Lesson 2 Variable Types- String, int, double, legal names, illegal names, declaring, initializing Lesson 3 Simple String Operations- Concatenation, length, substring, toLowerCase, toUpperCase, escape sequences, backslash

Project... Name That Celebrity

Lesson 4 Using Numeric variables- Assignment, ++, --, modulus, +=, -=, /=, *=, PEMDAS, increment, decrement, multiple declarations, remainder, compound operator, roundoff.

Project...Cheating on Your Arithmetic Assignment

Lesson 5 Mixed Data Types, Casting, and Constants -final, mixed arithmetic, casting.

Project... Mixed Results

Lesson 6 Math Class Methods- abs, pow, sqrt, ceil, floor, log, min, max, round, PI, sin, cos, tan, asin, acos, atan, toDegrees, toRadians.

Project... Compute This

Lesson 7 Input from the Keyboard - Scanner class, nextInt, nextDouble, next, nextLine,

Projects... Going in Circles ... What's My Name?

Unit 4: Program Statements- 4 weeks

Students learn the basics of logic along with relational and logical operators. They learn to evaluate Boolean expressions using truth tables. Boolean methods and variables are discussed and written, and their connection to the binary number system becomes obvious. The IF/ELSE control structure is examined and students learn to create interactive menus and handle input errors. Other types of error recognition and handling are also presented along with general documentation needs including preconditions and post conditions. The two types of loops, for loops and while loops, are examined in various situations. Students learn to choose the best loop for a particular situation. Sentinels, nesting, break and continue statements are discussed. Traversing a String object, printing a pattern, creating a Round-Robin, and other common uses for looping are experienced.

Readings and Multiple Choice / Short Answer Review Questions
Java Software Solutions - Chapter 3 Program Statements

- o Program Development
- o Control flow
- o The if Statement
- o Boolean Expressions
- o More Operators
- o The While Statement
- o The For Statement
- o Drawing Using Conditionals and Loops

Lab Assignments & Programs

Blue Pelican

Lesson 8 boolean Type and Operators - AND, OR, NOT, precedence Lesson 9 "if" statement- equals, equalsIgnoreCase.

Project...Even or Odd?

Lesson 10 The "switch" Statement and char - switch, default, break, char.

Project... Weight on Other Planets

Lesson11 The "for" Loop - Initializing, control, and step expressions. break, infinite loops, scope,

for-loop project

Project...Name Reversal

Lesson12 while and do-while loops - Testing at top and bottom of loop, break, continue Lesson 32 Boolean Algebra and DeMorgan's Theorem - OR, AND, truth table

GridWorld Case Study

Part 1: Provides experiments to observe the attributes and behaviors of the actors.

Part 2: Defines Bug Variations

Unit 5: Classes – 3 weeks

The writing class chapter is a gentle introduction to object oriented design for students. This chapter explores some of the concepts of how to break code into usable pieces as well as some of the important features of designing abstract data types and data storage classes. A solid understanding of this material is crucial if the student is to move into more advanced concepts. Constructors, accessor methods, mutator methods, instance fields, static methods and fields, visibility modifiers, encapsulation, and scope are emphasized. The concepts of data abstraction and encapsulation are also presented.

Readings and Multiple Choice / Short Answer Review Questions
Java Software Solutions - Chapter 4 & Chapter 5 Classes

- Objects
- Anatomy of a Class
- o Anatomy of a Method
- Method Overloading
- Method Decomposition
- Object Relationships
- Applet Methods
- Graphical Objects
- References Revisited
- The Static Modifier

Lab Assignments & Programs

Blue Pelican

Lesson 20 Static Methods and State Variables -Class methods and variables, static constants static imports.

Project... How Far To The Line?

Lesson 21 Wrapper Classes - Converting primitives to objects and vice versa

Lesson 22 More on Wrapper Classes - parseInt, parseDouble, toHexString, toOctalString, toBinaryString, toString, valueOf

Lesson 30 Random Numbers - nextDouble, nextInt, Monte Carlo, simulations,

Project... Monte Carlo Technique

Unit 6: Arrays & ArrayLists - 3 weeks

Students work with 1-dimensional and 2-dimensional arrays, using loops to traverse. The abbreviated for loop is introduced. Students also work with ArrayLists and learn the advantages and disadvantages of arrays versus ArrayLists.

Readings and Multiple Choice / Short Answer Review Questions
Java Software Solutions - Chapter 6 Arrays

- o Arrays
- Arrays of Objects
- Searching

- Two-Dimensional Arrays
- o The ArrayList Class
- o Polygons and Polylines
- o Button Components

Lab Assignments & Programs

Blue Pelican

Lesson 18 Arrays - Declaring and initializing, length, parallel arrays, Out-of-bounds exception, passing an array to a method, automatic initialization, split, reg expr.

Project... Array of Hope

Lesson 19 Advanced Array Concepts - Arrays of objects, comparison of array values, null pointer exception, different reference to same array, arraycopy, toCharArray, logical vs physical size, Arrays class, sort, binarySearch, equals, fill, importing, command line arguments, enhanced forloop.

Project... Sorting a String Array. ... Two Orders for the Price of One

Lesson33 Selection Operator - ?: syntax

Lesson 34 Passing by Value and by Reference - Arrays, primitives, objects, references.

Project...Pass the Gravy, Please

Lesson 35 Two-Dimensional Arrays - Subscripted variables, matrix, initializing, Arrays class.

Project... Matrix Multiplication, ... Matrix Multiplication with File Input

Lesson 43 ArrayList - advantages, disadvantages,

Project... Big Bucks in the Bank

GridWorld

Part 3: Explores the code that is needed to understand and create actors.

Part 4: Defines classes that extend the Critter class.

Unit 7: Interfaces, Inheritance, and Polymorphism - 4 weeks

Interfaces and abstract classes are introduced along with abstract methods and the requirements for designing a subclass. Specific examples are provided that help clarify "is-a" and "has-a" relationships. The Object class and Comparable interface are discussed along with invocation and overriding of the equals, toString, and compareTo methods. Students learn about polymorphism and method calls in terms of compile-time and run-time.

Readings and Multiple Choice / Short Answer Review Questions

Java Software Solutions - Chapters 7 Inheritance

- Creating Subclasses
- Overriding Methods
- Class Hierarchies
- Indirect Use of Class Members
- Designing for Inheritance
- o Polymorphism
- Interfaces
- Designing for Polymorphism
- Inheritance and GUIs
- o Mouse Events

Lab Assignments & Programs

Blue Pelican

Lesson 36 Inheritance - Superclass, subclass, base class, derived class, abstract, final, overriding, shadowing, cosmic superclass, instanceof, Object, this, super

Lesson 37 Exceptions - Checked, unchecked, try, catch, finally, throw, throws

Project... Keep Trying

Lesson 38 Interfaces - Implementation perspective, objective perspective, instanceof, polymorphism, realizes, implements.

Project... Linear Function

Lesson 39 Complexity Analysis (Big O) - sequential search, binary search Lesson 42 List Interface - ArrayList, LinkedList, Vector

Lesson 44 Iterator/ListIterator - stepping through a list

Project... Big Bucks Revisited

Unit 8: Recursion -2 week

Students are introduced to the concept of recursion in a very general sense, and then more specifically, as an alternative to looping. They practice writing and tracing simple recursive math formulas, and they write and trace recursive methods. Advantages and disadvantages of recursive methods are discussed along with stacks and program execution order.

Readings and Multiple Choice or Short Answer Review Questions Java Software Solutions - Chapter 8 Recursion

- Recursive Thinking
- o Recursive Programming
- Using Recursion
- o Recursion in Sorting
- Recursion in Graphics

Lab Assignments & Programs
Barron's Recursion chapter

Blue Pelican Lesson

Lesson 40 Recursion - Factorial, Fibonacci series **Project... Fibonacci**

Unit 9: Searching and Sorting Algorithms - 2 weeks

Students learn about different searching algorithms, including sequential and binary searching. Sorting is discussed along with algorithms for the selection, insertion, and merge sorts. Analysis of algorithms and big-Oh notation are introduced, and students learn to compare speed and space requirements based on design choice. They also look at the effect of the size of the data set.

Lab Assignments & Programs

Blue Pelican Lesson

Lesson 41 Sorting Routines - selection, insertion, quick, & merge sorts, partition, Big O chart,

Project... Multiple Key Sorting

Barron's chapter on Searching & Sorting

Unit 10: Exam Review and Practice - 3weeks

Students will go through the AP Computer Science A Topic Outline item by item to make sure they understand all of the material to be tested. The Barron's review book will be used for summarizing all topics and practicing multiple choice and free response type questions.

Lab Assignments & Programs
Barron's practice tests
2004 AP Computer Science A released exam
2009 AP Computer Science A released exam

Note to Parents
Students may get extra help by scheduling a time before or after school with me. Parents will be responsible for picking the students up at the specified time.
If your child has done something wonderful, made improvements or is having problems in class, I would like to contact you. Please provide the following information.
Student Name:
Contact Name:
Daytime Phone:
Evening Phone:
If you would like to be put on the distribution list for this class, please give your email address. I will send notifications of upcoming events.
Email:
I will use email as the basic form of communication with you.
Thank you,
LaDonna Woods
