James Clemens High School
11306 County Line Road
Madison, AL 35756

Phone: 256-216-5313
Extension: 95222
Email: kgbrown@madisoncity.k12.al.us

Course Syllabus

AP CS A Spring 2024
Instructor: Kayla Brown

Dear Parent/Guardian,

Welcome to AP CS A!

My name is Kayla Brown and I will be your student's teacher this semester. I am looking forward to having a great year! I feel fortunate to have your son/daughter in my class this semester and hope that you will contact me should you have any concerns about the progress of your son/daughter or any aspect of the instruction. With your son/daughter, please read the attached policies, then sign and date this signature page and have them return this form. Please provide a current email address and phone number at which I can contact you should the need arise. Please turn in this page of the syllabus by Monday, January 8th.

Thank you,
Kayla Grantham Brown

My child and I have read and discussed the classroom syllabus.

Student Name (Print) _____ Date _____

Student Signature _____ Date _____

Parent/Guardian Name (Print) _____ Date _____

Parent/Guardian Signature _____ Date _____

Email Address(es) _____

Phone number(s) _____ (Cell) _____ (Home) _____ (Work)

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Course Description: The purpose of this class is to introduce the student to the fundamentals of object-oriented programming using the Java language. These elements are the foundation for many scientific and technical careers in addition to computer science. The course introduces students to computer science with fundamental topics that include problem solving, design strategies and methodologies, organization of data (data structures), approaches to processing data (algorithms), analysis of potential solutions, and the ethical and social implications of computing. The course emphasizes both object-oriented and imperative problem solving and design using the Java programming language. These techniques represent proven approaches for developing solutions that can scale up from small, simple problems to large, complex problems. Each student is expected to take the AP Computer Science A exam in May. Successful achievement on the AP exam will earn the student three hours of college credit.

Pre-Requisites:
Object Oriented Programming I

Credentialing (subject to change):
Students who earn a 3 or higher on the AP exam will receive 3 hours of college credit.

Grading and Assessment: Test grades will account for 70% of the 9-weeks grade, with the remaining 30% being determined by quiz/daily grades. The grading scale is as follows: A (90-100%), B (80-89), C (70-79), D (65-69), and F (below 65). Grades will be a reflection of mastery of the standards. Make sure all absences are excused as class work can be made up and graded for excused absences only. The final exam counts for 20% of the final grade.
Not all assignments will be graded, but students must complete all work. Students will take notes via guided notes, graphic organizers, and other methods in this course. If a student is absent, their missed printed materials will be located in their class folder. Students are responsible for checking this folder. My office hours will be every Tuesday and Thursday during the first half of refuel.

Late Work: Per JCHS Policy, all late work is to be made up within 3 days of excused absence(s). It is the student's responsibility to see what they have missed and to turn in by the third day. If they do not turn in the work within 3 days then it will become a zero. If you missed a test or quiz, you must communicate this with me ahead of time. Typically, all make-up tests/quizzes will be held during refuel on Wednesday or Friday. If there is a conflict, it is the student's responsibility to schedule another time together to make-up the test or quiz.

TSA (Technology Student Association) CTS Integration: Technology Student Association is a National Career Technical organization where students can use knowledge gained from computer science courses. JCHS's TSA team competes at Alabama TSA convention every year and students from this course can choose to register and attend.

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Embedded Numeracy, Literacy, & Science Anchor Assignments: Opportunities for numeracy, literacy, and science in the CTE class are critical and help support the goals of CTE in preparing students for college and/or career. There will be several Anchor assignments throughout the course that students will complete. Example anchor activities for mathematics and science include performing various computer science-related calculations and analyzing data collected when conducting research. Some examples but not limited to include interviewing a computer science engineer or other professional, investigating various STEM/Computer Science related fields and describing their responsibilities and the requirements to be successful in the field by writing a design brief, reflection paper, or other technical report on this field.

Accommodations: Requests for accommodations for this course or any school event are welcomed from students and parents.

Turnitin Notice: The majority of writing assignments in this course will be submitted to Turnitin via the Schoology learning platform. The primary focus of this software is to help students become better writers and scholars. Turnitin generates a report on the originality of student writing by comparing it with a database of periodicals, books, online content, student papers, and other published work. This program will help students discern when they are using sources fairly, citing properly, and paraphrasing effectively - skills essential to all academic work.

Students will have the opportunity to review their Turnitin originality report and will have the opportunity to make revisions before submitting their work for grading. Once their work is submitted, teachers have the opportunity to view the student's originality report and grade accordingly.

Supplies:

3 Ring Binder	Pencils
Loose Leaf Paper	Calculator (Optional)

Procedures & Rules:
Rules and Procedures will be discussed on the first day of class, but the main rules are as follows.

1. BE RESPONSIBLE FOR YOUR OWN LEARNING.
2. BE ON TIME and BE PREPARED.
3. ALWAYS TREAT OTHERS WITH RESPECT. WE DO NOT MAKE OFFENSIVE JOKES IN CLASS.
4. DO NOT THROW THINGS ACROSS THE ROOM.
5. DO NOT SPEAK OVER ME WHEN I AM TEACHING.
6. DO NOT LEAVE MATERIALS OR YOUR THINGS ON MY TABLES WHEN YOU LEAVE.
7. CHECK BACK OF THE ROOM BOARD FOR WEEKLY ASSIGNMENTS/QUIZZES/TESTS.
8. ONE PERSON OUT OF THE CLASSROOM FOR BATHROOM AT A TIME.

Technology in the Classroom:

- WE WILL USE ASSIGNED LAPTOP EVERY DAY. THESE LAPTOPS MUST STAY IN MRS. BROWN'S ROOM
- You should know when it is appropriate to use your phone and when it is not.
- No phones out during presentations, but you can use them for quick googling.

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Computer/Internet Appropriate Use Policies: Student laptops should not be hard-wired to the network or have print capabilities. 2. Use of discs, flash drives, jump drives, or other USB devices will not be allowed on Madison City computers. 3. Neither the teacher, nor the school is responsible for broken, stolen, or lost laptops. 4. Laptops and other electronic devices will be used at the individual discretion of the teacher.

Instructional Delivery Plan

18 - WEEK PLAN*	
WEEK 1	**Introduction to Computer Science / Primitive Types**
WEEK 2	**Java Basics, Using Object, Boolean Expressions, If/Else Statements, Loops/Iteration**
WEEK 3	**Java Basics, Using Object, Boolean Expressions, If/Else Statements, Loops/Iteration**
WEEK 4	**Java Basics, Using Object, Boolean Expressions, If/Else Statements, Loops/Iteration**
WEEK 5	**Java Basics, Using Object, Boolean Expressions, If/Else Statements, Loops/Iteration**
WEEK 6	**Java Basics, Using Object, Boolean Expressions, If/Else Statements, Loops/Iteration**
WEEK 7	**Introduction to Classes**
WEEK 8	**Introduction to Classes**
WEEK 9	**In depth study of Arrays and ArrayLists, 2D Arrays**
WEEK 10	**In depth study of Arrays and ArrayLists, 2D Arrays**
WEEK 11	**In depth study of Arrays and ArrayLists, 2D Arrays**
WEEK 12	**Insertion / Selection Sort, Linear / Binary Search, MergeSort**
WEEK 13	**Recursion**
WEEK 14	**Inheritance and Polymorphism, Interfaces**
WEEK 15	**Inheritance and Polymorphism, Interfaces**
WEEK 16	**Overall Review for AP EXAM**
WEEK 17	**Overall Review for AP EXAM & Final Project**
WEEK 18	**Overall Semester Review**

*** This syllabus serves as a guide for both the teacher and student; however, during the term it may become necessary to make additions, deletions or substitutions.**

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Course Goals/ Objectives

Curricular Requirements • Access to a college-level computer science textbook in print or electronic format • Opportunities to develop student understanding of the required content outlined in each of the units described in the AP Course and Exam Description (CED). • Opportunities to develop student understanding of the big ideas. • Opportunities for students to develop skills related to Computational Thinking Practice 1: Program Design and Algorithm Development • Opportunities for students to develop skills related to Computational Thinking Practice 2: Code Logic • Opportunities for students to develop skills related to Computational Thinking Practice 3: Code Implementation • Opportunities for students to develop skills related to Computational Thinking Practice 4: Code Testing • Opportunities for students to develop skills related to Computational Thinking Practice 5: Documentation • Hands-on lab experiences to practice programming through designing and implementing computer-based solutions to problems. **Lab Component** • Students will complete a minimum of 20 hours of hands-on lab experiences. • Students will complete a minimum of 20 hours of hands-on lab experiences. **Professional Skills** • Team collaboration • Project management • Problem-solving • Communication skills • Presentation skills • Technical writing	**Course Objectives** • Understand and apply the main principles of object-oriented software design and programming: classes and objects, constructors, methods, instance and static variables, inheritance, class hierarchies, and polymorphism. • Learn to code fluently in Java in a well-structured fashion and in good style; learn to pay attention to code clarity and documentation • Learn to use Java library packages and classes within the scope of the AP Java subset • Understand the concept of an algorithm; implement algorithms in Java using conditional and iterative control structures and recursion • Learn to select appropriate algorithms and data structures to solve a given problem • Learn common searching and sorting algorithms: Sequential Search and Binary Search; Selection Sort, Insertion Sort, and MergeSort • Understand one and two dimensional arrays and the ArrayList class, and use them appropriately in programming projects • Discuss ethical and social issues related to the use of computers • Prepare for the AP Computer Science A exam; meet all of the curricular requirements defined by the College Board for this course. **Compilation and Debugging** • Troubleshoot syntax errors, logic errors, and runtime errors. • Utilize debugging tools to suspend program execution and to examine, step through, and reset execution of code. • Utilize common error recovery strategies to detect errors and write a strategy to implement and handle the error. **Technical Knowledge** • Describe the differences between structured programming and object-oriented programming (OOP).

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Unit 1: Primitive Types		
Topic	**Suggested Skills**	**Highlighted Assignments & Labs**
1.1 Why Programming? Why Java?	2.B, 4.B	
1.2 Variables and Data Types	1.A, 1.B	
1.3 Expressions and Assignment Statements	1.B, 2.A	
1.4 Compound Assignment Operators	2.B, 5.A	Assignment: Dollars and Cents Assignment: Paper to IDE
1.5 Casting and Ranges of Variables	2.B, 5.B	
Complete Personal Progress Checks for Unit 1		Personal Progress Check MCQ Part A Personal Progress Check MCQ Part B
Unit 1 Review		
Unit 1 Test		

Unit 2: Using Objects		
Topic	**Suggested Skills**	**Highlighted Assignments & Labs**
2.1 Objects–Instances of Classes	5.A	
2.2 Creating and Storing Objects (Instantiation)	1.C, 3.A	
2.3 Calling a Void Method	1.C, 3.A	
2.4 Calling a Void Method with Parameters	2.C, 3.A	
2.5 Calling a Non-void Method	1.C, 3.A	
2.6 `String` Objects: Concatenation, Literals, and More	2.A	
2.7 `String` Methods	2.C, 3.A	Lab 1: Splitting Strings
2.8 Wrapper Classes: `Integer` and `Double`	2.C	
2.9 Using the `Math` Class	1.B, 3.A	
Complete Personal Progress Checks for Unit 2		Personal Progress Check MCQ Part A Personal Progress Check MCQ Part B Personal Progress Check FRQ
Unit 2 Review		
Unit 2 Test		

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Unit 3: Boolean Expressions and `if` Statements		
Topic	**Suggested Skills**	**Highlighted Assignments & Labs**
3.1 Boolean Expressions	2.A	Assignment: *Output or Trick
3.2 `if` Statements and Control Flow	2.B, 3.C	
3.3 `if-else` Statements	3.C, 4.A	
3.4 `else if` Statements	3.C, 4.C	
3.5 Compound Boolean Expressions	2.B, 3.C	
3.6 Equivalent Boolean Expressions	4.C	
3.7 Comparing Objects	2.C, 3.A	
Complete Personal Progress Checks for Unit 3		Personal Progress Check MCQ Personal Progress Check FRQ
Unit 3 Review		
Unit 3 Test		

Unit 4: Iteration		
Topic	**Suggested Skills**	**Highlighted Assignments & Labs**
4.1 `while` Loops	1.B, 2.B, 3.C	Lab 2: *Rolling Dice
4.2 `for` Loops	3.C, 4.C, 5.C	Assignment: Matching Positions Assignment: For-loop Patterns
4.3 Developing Algorithms Using Strings	2.C, 3.C	
4.4 Nested Iteration	1.B, 3.C, 5.C	Lab 3: Processing from a File
4.5 Informal Code Analysis	2.D	
Complete Personal Progress Checks for Unit 4		Personal Progress Check MCQ Personal Progress Check FRQ
Unit 4 Review		
Unit 4 Test		

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Unit 5: Writing Classes		
Topic	**Suggested Skills**	**Highlighted Assignments & Labs**
5.1 Anatomy of a Class	1.A, 1.B	Lab 4: Investments and Investors
5.2 Constructors	1.C, 3.B	
5.3 Documentation with Comments	5.D	Assignment: *Documenting Classes with Javadoc
5.4 Accessor Methods	3.B, 5.B	
5.5 Mutator Methods	3.B, 4.B	
5.6 Writing Methods	1.B, 3.B	
5.7 Static Variables and Methods	3.B, 5.A	Lab 5: *Parity Functions
5.8 Scope and Access	3.B, 5.B	Lab 6: *Set Ops Lab 7: Three-Method Breakdown
5.9 `this` Keyword	2.C	
5.10 Ethical and Social Implications of Computing Systems		
Complete Personal Progress Checks for Unit 5		Personal Progress Check MCQ Part A Personal Progress Check MCQ Part B Personal Progress Check FRQ
Unit 5 Review		
Unit 5 Test		

Unit 6: Array		
Topic	**Suggested Skills**	**Highlighted Assignments & Labs**
6.1 Array Creation and Access	1.C, 3.D	
6.2 Traversing Arrays	2.B, 3.D, 4.B	
6.3 Enhanced `for` Loop for Arrays	3.D, 4.C	
6.4 Developing Algorithms Using Arrays	1.B, 3.D, 5.D	Assignment: *Test Cases
Complete Personal Progress Checks for Unit 6		Personal Progress Check MCQ Personal Progress Check FRQ
Unit 6 Review		
Unit 6 Test		

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Unit 7: `ArrayList`		
Topic	**Suggested Skills**	**Highlighted Assignments & Labs**
7.1 Introduction to `ArrayList`	1.B, 3.D	Assignment: Why Don't We Always Use This?
7.2 `ArrayList` Methods	2.C, 3.D	
7.3 Traversing ArrayLists	2.C, 3.D	
7.4 Developing Algorithms Using ArrayLists	3.D, 4.A	
7.5 Searching	3.D, 5.C	
7.6 Sorting	2.D	Assignment: *Practical Big-O Assignment: Insertion Sort Assignment: Selection Sort
7.7 Ethical Issues Around Data Collection		Assignment: *Computing Ethics
Complete Personal Progress Checks for Unit 7		Personal Progress Check MCQ Personal Progress Check FRQ
Unit 7 Review		
Unit 7 Test		

Unit 8: 2D Array		
Topic	**Suggested Skills**	**Highlighted Assignments & Labs**
8.1 2D Arrays	1.B, 1.C, 3.E	Lab 8: 2D Array Shifter
8.2 Traversing 2D Arrays	2.B, 2.D, 3.E, 4.A	Lab 9: Taxman Assignment: Star Trek Revisited
Complete Personal Progress Checks for Unit 8		Personal Progress Check MCQ Personal Progress Check FRQ
Unit 8 Review		
Unit 8 Test		

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Unit 9: Inheritance		
Topic	**Suggested Skills**	**Highlighted Assignments & Labs**
9.1 Creating Superclasses and Subclasses	1.A, 3.B	Lab 10: Taxable and Non-taxable Lab 11: Foreign Investment
9.2 Writing Constructors for Subclasses	3.B, 5.A	
9.3 Overriding Methods	3.B, 5.D	
9.4 `super` Keyword	1.C, 3.B	
9.5 Creating References Using Inheritance Hierarchies	3.A, 5.B	
9.6 Polymorphism	3.A, 5.B	Assignment: `ArrayList` of Investments
9.7 `Object` Superclass	1.C, 3.B	Assignment: Auto-Test
Complete Personal Progress Checks for Unit 9		Personal Progress Check MCQ Personal Progress Check FRQ
Unit 9 Review		
Unit 9 Test		

Unit 10: Recursion		
Topic	**Suggested Skills**	**Highlighted Assignments & Labs**
10.1 Recursion	1.B, 5.A	Lab 12: Almost the Largest Assignment: It Might As Well Be Recursion Assignment: Now It's Recursion
10.2 Recursive Searching and Sorting	2.C, 2.D	Lab 13: Recursion-a-palooza Assignment: Recursive Mergesort Assignment: Mergesort
Complete Personal Progress Checks for Unit 10		Personal Progress Check MCQ Personal Progress Check FRQ
Unit 10 Review		
Unit Test		

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Select Assignment Descriptions

[CTP1] [CTP3] Lab 2—Rolling Dice: CR9 In this assignment, we want to write a program that inputs a specially formatted string that indicates how many times to roll dice with different numbers of sides, and uses random numbers to simulate a roll. For example, `1d8 + 2d6 + 3` means to simulate rolling an eight-sided die once, a six-sided die twice, then add all results together plus 3. **(Skills 3.A, 3.C)** CR6 Instead of attacking this dead-on though, we'll brainstorm ways to reduce this problem to simpler versions we can tackle first. **(Skill 1.A)** We'll make lists of each individual task in this assignment and see what additional Java library methods we'll need to investigate. **(Skill 1.C)** CR4

[CTP2] Practical Big-O: Students will be given a series a code examples and asked to determine the Big-O running time based on the input size. Examples will include single loops, nested loops, single and nested loops in series, and disguised nesting that occurs when code inside a loop calls other methods, including library methods. **(Skill 2.D)** CR5

[CTP2] Output or Trick: Throughout the year, students will be given code examples and asked to determine the output. In some cases, the answer is straightforward, e.g., a series of `if` statements with output that only requires understanding boolean expressions. In other cases, there's a trick. For example, a loop that looks like it adds ten Integer objects to an `ArrayList` but actually adds ten references to the same `Integer` object. **(Skills 2.B, 2.C)**

[CON] [CTP3] Lab 5—Parity Functions: CR9 Write a program with two static methods called `evenParity` and `oddParity`. These functions each take a `String` and return a `boolean`. The `evenParity` method should return `true` if the `String` represents a binary number with evenparity, and `false` otherwise. For example. `evenParity("1100101")` would return `true` but `evenParity("11001")` would return `false`. The `oddParity` method does the same, but of course for odd parity. **(Skills 3.A, 3.C)** CR3

For the sake of robustness, if the `String` contains anything other than `'0'` or `'1'` characters, it should return `false`. For example, `oddParity("2374")` would return false.

[VAR and MOD] [CTP3] Lab 6—Set Ops: CR9 Create your own `Set` class for storing and manipulating sets of `String` objects. The class should include methods to add a `String` to the set and to determine if a `String` is in the `Set`. The class should also include methods to find the intersection, union (with no duplicates), and difference of two sets. For example, `S1.intersect(S2);` should set `S1` to the intersection of `S1` and `S2`. **(Skills 3.A–3.C)** CR3 CR6

[CTP 4] Test Cases: After another programming assignment has been provisionally completed, students will be asked to design a series of test cases for testing another student's unseen implementation. **(Skill 4.A)** CR7

[IOC] Computing Ethics: CR3 Choose one question to argue for or against in a short essay, documenting all sources. We'll choose in class to make sure all questions are covered.

1. The Morality of Theft

Choose one of the following to answer in a brief essay (several paragraphs). Support your answer with sound reasoning.

A. Is it morally permissible to inflict a DDoS attack on a target you think is itself immoral?
B. Is digital theft "better" than physical theft?
C. Is it permissible to steal something you want if you could not otherwise afford it?

2. The Duty of Developers

Choose one of the following to answer in a brief essay (several paragraphs). Support your answer with sound reasoning.

A. Do programmers have a responsibility to develop code that is as reliable as possible?
B. Do programmers have a responsibility to develop code that is as readable as possible?
C. Should programmers be held legally responsible for code failures in the way that doctors are held legally responsible for medical failures?

[CTP5] Documenting Classes with Javadoc: Each student is given a method to investigate. Students must explain the purpose of the method using Java documentation. **(Skill 5.A)** From there we will construct, as a class, our own method header documentation requirements for future programming assignments. CR8