Rumson-Fair Haven Regional High School

Course: *AP Computer Science A*
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Board Approval: August 2025

Section I: 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 a year-long course designed to help students master the basics of Java and equip them to successfully pass the College Board *AP Computer Science A* exam at the end of the school year. Students enrolled in this course are expected to take the *AP Computer Science A* exam in May to demonstrate their proficiency. All materials and resources teachers and students need for a successful year-long *AP Computer Science A* course can be found on the CSAwesome, CodeHS, and College Board's AP Classroom websites.

Section II: NJSLS: New Jersey Student Learning Standards/Learning Objectives:

1. **2020 New Jersey Student Learning Standards – *Computer Science and Design Thinking:***
    - "The 'Intent and Spirit of the Computer Science and Design Thinking Standards' is to focus on deep understanding of concepts that enable students to think critically and systematically about leveraging technology to solve local and global issues. Authentic learning experiences that enable students to apply content knowledge, integrate concepts across disciplines, develop computational thinking skills, acquire and incorporate varied perspectives, and communicate with diverse audiences about the use and effects of computing prepares New Jersey students for college and careers."
2. **2023 New Jersey Student Learning Standards - *English Language Arts:***
    - A New Jersey education in English Language Arts builds readers, writers, and communicators prepared to meet the demands of college and career and to engage as productive American citizens with global responsibilities. …Students will develop the necessary skills in reading, writing, speaking, and listening that are the foundations for creative and purposeful expression in language read rich, challenging texts that build their knowledge of the world, grow their confidence and identities as readers, and develop critical thinking skills and vocabulary necessary for long-term success[; e]ngage in regular, meaningful, writing authentic tasks, exploring valued topics, writing for impact and expression, and sharing their work with others (including authentic audiences) leverage complex texts and digital media to develop comprehension, active listening, and discussion skills ground daily writing and discussion in evidence, fostering an ability to read critically, build arguments, cite evidence, and communicate ideas to contribute meaningfully as productive citizens evaluate the reliability, credibility, and perspective of authors and speakers across all forms of media express ideas and knowledge through a variety of modalities and media, and serve as effective communicators who purposefully read, write, and speak across multiple disciplines [and l]earn to persist in reading complex texts, establishing lifelong habits to read voluntarily for pleasure, for further education, for information on public policy, and for advancement in the workplace.
3. ***Standard 8.1 (Computer Science) and 8.2 (Design Thinking)* of the *2020 NJSLS:***
    - "The 'Intent and Spirit of the Computer Science and Design Thinking Standards' is to focus on deep understanding of concepts that enable students to think critically and systematically about leveraging technology to solve local and global issues. Authentic learning experiences that enable students to apply content knowledge, integrate concepts across disciplines, develop computational thinking skills, acquire and incorporate varied perspectives, and communicate with diverse audiences about the use and effects of computing prepares New Jersey students for college and careers."
4. ***Standard 9.4 (Life Literacies and Key Skills)* of the *2020 NJSLS*:**
    - "This standard outlines key literacies and technical skills such as critical thinking, global and cultural awareness, and technology literacy that are critical for students to develop to live and work in an interconnected global economy."
      ***Climate Change:** The state of New Jersey has mandated instruction in, "Climate Change across all content areas, leveraging the passion students have shown for this critical issue and providing them opportunities to develop a deep understanding of the science behind the changes and to explore the solutions our world desperately needs."
5. ****Amistad Law: N.J.S.A. 18A 52:16A-88:***
    - The inclusion of lessons and resources/texts dealing with the African slave trade, slavery in America, the vestiges of slavery in this country and the contributions of African-Americans to our society will be implemented in English and Social Studies courses in accordance with state law: "Every board of education shall incorporate the information regarding the contributions of African-Americans to our country in an appropriate place in the curriculum of elementary and secondary school students."

6. ***Holocaust Law: N.J.S.A. 18A 35-28:***
    - The inclusion of lessons and resources/texts that enable pupils to identify and analyze applicable theories concerning human nature and behavior; to understand that genocide is a consequence of prejudice and discrimination; and to understand that issues of moral dilemma and conscience have a profound impact on life will be implemented in English and Social Studies courses in accordance with state law: "Every board of education shall include instruction on the Holocaust and genocides in an appropriate place in the curriculum of all elementary and secondary school pupils. The instruction shall further emphasize the personal responsibility that each citizen bears to fight racism and hatred whenever and wherever it happens."
7. ***LGBT and Disabilities Law: N.J.S.A. 18A:35-4.35:***
    - A transformative approach to the inclusion of lessons and resources/texts on the contributions and issues concerning the LGBTQ+ population and people with disabilities will be implemented across all core subjects in accordance with state law: "A board of education shall include instruction on the political, economic, and social contributions of persons with disabilities and lesbian, gay, bisexual, and transgender people, in an appropriate place in the curriculum of middle school and high school students as part of the district's implementation of the New Jersey Student Learning Standards (N.J.S.A.18A:35-4.36). A board of education shall have policies and procedures in place pertaining to the selection of instructional materials to implement the requirements of N.J.S.A. 18A:35-4.35."
8. ****Asian American and Pacific Islanders Legislation: N.J.S.A 4021/A6100:***
    - The inclusion of lessons and resources/texts on the history and contributions of Asian Americans and Pacific Islanders, will enable New Jersey's schools to provide a curriculum that reflects the diversity of our state. In accordance with state law: "A board of education shall include instruction on the history and contributions of Asian Americans and Pacific Islanders in an appropriate place in the curriculum of students in grades kindergarten through as part of the school district's implementation of the New Jersey Student Learning Standards in Social Studies."
9. Acquisition/development/refinement of the higher-order critical thinking skills aligned with the *Revised Bloom's Taxonomy of Cognitive Objectives*

Section III: Curriculum Modifications

The *AP Computer Science A* curriculum is subject to case-by-case modifications to support/advance the needs of all students, including special education students, English language learners, gifted students, and those at risk of school failure. These modifications are based on Individualized Learning Programs (IEPs), recommendations made by the district's Multilingual Learners (ML) coordinator, feedback from members of the Intervention & Referral Services Team (*I&RS*) for at-risk students, and 504 Plans.

Coursework and assessments will be modified on an individual basis for students when necessary. Modifications may include, but are not limited to to those outlined on the Modifications/Accommodations for Technology and Design Courses chart.

Section IV: Preparation for Standardized Testing

Instruction in *AP Computer Science A* is aligned with the requirements of state and national standardized assessments, including the *NJGPA*, *NJSLA*, the *ACT*, the *PSAT,* and the *SAT*.

Section V: Curriculum Pacing Guide

Curriculum Pacing Guide	
Course Title: *AP Computer Science A*	**Grade Level:** 10-12
Unit I: Using Objects and Methods	Weeks 1-7
Unit II: Selection and Iteration	Weeks 8-14

Unit III: Class Creation	Weeks 15-18
Unit IV: Data Collections	Weeks 19-29
Unit V: AP Exam Review	Weeks 30-35
Unit VI: Computer Science Topics	Weeks 36-40

Section VI: Primary Texts and Year-Long Instructional Resources

The following texts and instructional resources are employed for all students in *AP Computer Science A*:

- Google Classroom (www.google.com)
- *Common Sense Education* (www.commonsense.org)
- 5 Steps to 5 AP Computer Science A
- CS Awesome {https://runestone.academy/ns/books/published/csawesome2/csawesome2.html)
- AP Classroom (collegeboard.com)
- CodeHS (https://www.codehs.com)

Section VII: Grading Formula and Assessment Modes

Marking period grades in *AP Computer Science A* are determined via a percentage weighting model. The specific grading categories and weightings of each will be determined before the start of each academic year and will be published in the posted/distributed course syllabi.

Assessments in *AP Computer Science A* vary greatly in format, scope/content/skills assessed, and alternative assessments; differentiation in assessments and choice will be incorporated as appropriate. Preliminary assessments of each format will be used as benchmarks, and summative assessments will be created/revised collaboratively each year and planned by members of the *AP Computer Science A* instructional team to inform future learning and to measure student growth.

Section VIII: Unit Templates

The following unit templates have been established for the *AP Computer Science A* curriculum by the *AP Computer Science A* instructional team:

Unit I: Using Objects and Methods	
Unit Summary	
This unit introduces students to the Java programming language and the use of variables and classes, providing students with an important foundation of concepts that will be leveraged and built upon in all future units. Students will learn about three built-in data types and how to create variables, store values, and interact with those variables using basic operations. The ability to write expressions is essential to representing the variability of the real world in a program. Several Math and String class methods are introduced, and students will learn the fundamentals of calling and using classes.	
Standards/Core Ideas/Performance Expectations/Progress Indicators	
The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in *AP Computer Science A:* ● *2020 New Jersey Student Learning Standards: Computer Science and Design Thinking* ○ 8.1.12.AP.1, 8.1.12.AP.2, 8.1.12.AP.3, 8.1.12.AP.5, 8.2.12.ED.1, 8.2.12.ETW.2 ● *2023 New Jersey Student Learning Standards English Language Arts:* ○ W.IW.9–10.2.A, W.IW.11–12.2.A ● *2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies, and Key Skills* ○ 9.3.IT-PRG.1, 9.3.IT-PRG.4, 9.3.IT-PRG.5, 9.3.IT-PRG.6, 9.3.IT-PRG.9	
Unit Essential Questions	**Unit Enduring Understandings**
● What are variables and data types? ● What are expressions and assignment statements?	● A variable can be thought of as a memory location that can hold values of a specific type. A data type is a classification of data that tells the compiler or interpreter how the

• What are compound assignment operators?
• What is casting and ranges of variables in Java?
• How can programs be used to solve problems?
• How are mathematical concepts used in Java programming?
• How is object-oriented programming used in Java?
• What are objects in Java?
• How are objects and classes created in Java?
• What is a method?
• What is a void method?
• What is a non-void method?
• How are string methods used in Java?
• What is the Math Class in Java, and how is it utilized?
	programmer intends to use the data. Most programming languages support various types of data, including integer, real, character or string, and Boolean.
	• An assignment statement always has a single variable on the left-hand side of the = sign. The value of the expression on the right-hand side of the = sign (which can contain math operators and other variables) is copied into the memory location of the variable on the left-hand side.
	• Compound assignment operators are shortcuts that do a math operation and assignment in one step. For example, x += 1 adds 1 to x and assigns the sum to x. It is the same as x = x + 1. This pattern is possible with any operator put in front of the = sign, as seen below + shortcuts.
	• Type casting is used to convert variables from one data type to another. If an expression evaluates to an int value outside of the allowed range, an integer overflow occurs. This could result in an incorrect value within the allowed range.
	• Programs are used to solve problems through abstraction. Abstraction is a fundamental Object-Oriented Programming (OOP) concept that focuses on hiding the complex implementation details and showing only the essential features of an object.
	• Programs use mathematical concepts, such as variables and control structures, to solve complex problems through decomposition, breaking down programs into smaller parts.
	• The main ideas behind Java's Object-Oriented Programming (OOP) concepts include abstraction, encapsulation, inheritance, and polymorphism. Basically, Java OOP concepts let users create working methods and variables, then reuse all or part of them without compromising security.
	• An object in Java is a basic unit of Object-Oriented Programming and represents real-life entities. Objects are the instances of a class that are created to use the attributes and methods of a class. A typical Java program creates many objects and interacts by invoking methods.
	• A class provides the blueprint for objects; you create an object from a class. Each of the following example statements creates an object and assigns it to a variable:
	  ○ Point originOne = new Point(23, 94);
	  ○ Rectangle rectOne = new Rectangle(originOne, 100, 200);
	  ○ Rectangle rectTwo = new Rectangle(50, 100);
	• A method in Java is a block of code that, when called, performs specific actions mentioned in it. For instance, if there are written instructions to draw a circle in the method, it will do that task. Values or parameters can be inserted into methods, and they will only be executed when called.
	• The `void` keyword in Java is a reserved type used to specify that a method does not return any data type.
	• Non-void methods return a value that is the same type as the return type in the signature. To use the return value when calling a non-void method, it must be stored in a variable or used as part of an expression.
	• The String class has a set of built-in methods that students can use on strings. Different string methods can be used to modify text.
	• The class Math contains methods for performing basic numeric operations such as the elementary exponential, logarithm, square root, and trigonometric functions.

Evidence of Learning	

Formative & Alternative Assessments:	Benchmark & Summative Assessments:	Resources Needed:
● Do-Nows - Question of the Day ● Classwork assignments ● AP Classroom Quizzes ○ 1.1: Introduction to Algorithms, Programming, and Compilers Quiz ○ 1.2: Variables and Data Types Quiz ○ 1.3: Expressions and Output Quiz ○ 1.4: Assignment Statements and Input Quiz ○ 1.5: Casting and Ranges of Variables Quiz ○ 1.6: Compound Assignment Operators Quiz ○ 1.7: Application Program Interface (API) and Libraries Quiz ○ 1.8: Documentation with Comments Quiz ○ 1.9: Method Signatures Quiz ○ 1.10: Classing Class Methods Quiz ○ 1.11: Math Class Quiz ○ 1.12: Objects: Instances of Classes Quiz ○ 1.13: Object Creation and Storage (Instantiation) Quiz ○ 1.14: Calling Instance Methods Quiz ○ 1.15: String Manipulation Quiz ● Classroom Discussions ● CS Awesome Homework ● Individual student check-ins with teacher	● Coding Assignments ● AP Classroom Unit 1: MCQ Part A and B Progress Checks ● Unit 1.1-1.9 Test (Benchmark) ● AP Classroom Unit 1: MCQ Part C and FRQ Part C ● Unit 1.10-1.15 Test	● AP Classroom (collegeboard.com) ● CS Awesome (https://runestone.academy/ns/books/published/csawesome2/csawesome2.html) ● CodeHS (https://www.codehs.com) ● Computer ● Internet Access

Unit II: Selection and Iteration

Unit Summary

Algorithms are composed of three building blocks: sequencing, selection, and iteration. While Unit I introduced sequencing, this unit focuses on selection and iteration. Selection is important to a computer program because it gives the programmer the ability to make a decision and respond to that decision using conditional statements. These allow programmers to incorporate choice into their programs: to create games that react to user interactions, to develop simulations that are more real-world by allowing for variability, or to discover new knowledge in a sea of information by filtering out irrelevant data. Iteration is a form of repetition and changes the flow of control by repeating a segment of code. It is represented by while loops and for loops. In addition, students will build on the introduction of Boolean variables in Unit I by writing Boolean expressions with relational and logical operators. This unit also introduces several standard algorithms that use iteration. Knowledge of standard algorithms makes solving similar problems easier, as algorithms can be modified or combined to suit new situations.

Standards/Core Ideas/Performance Expectations/Progress Indicators

The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in *AP Computer Science A:*

- *2020 New Jersey Student Learning Standards: Computer Science and Design Thinking*
  - 8.1.12.AP.1, 8.1.12.AP.2, 8.1.12.AP.3
- *2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies, and Key Skills*
  - 9.3.IT-PRG.1, 9.3.IT-PRG.4, 9.3.IT-PRG.5
- *2023 New Jersey Student Learning Standards English Language Arts:*
  - W.IW.9–10.2.A, W.IW.11–12.2.A

Unit Essential Questions	Unit Enduring Understandings
● How do relational operators work? ● How are Boolean expressions used to control the flow of a program? ● How are Boolean expressions verified?	● Relational operators may compare both variables and numerical values. Variables can be compared using == and !=. Numerical values can be compared using <, >, <=, and >=. ● 'If statements' can be used to execute or not execute code segments depending on a Boolean value or expression. 'If/else

• How are the values of two objects compared? • What are loops and how are they used? • How are loops used to repeat code statements? • When is it good to use a for loop? • When is it good to use a while loop? • What is an off-by-one error?	statements' can be used to run a specific code segment depending on the value of a Boolean expression. 'If statements' can be placed inside other 'if statements', creating a 'nested if statement.' • Boolean expressions can be created or verified by using Truth tables. • Objects are compared using the equals() method, and variables can be compared using the == operator. • Loops are a programming construct that repeats a block of code until a certain condition is met and are used to control how many times code is executed. • Both types of loops constrain a Boolean expression, and the loop is executed as long as the Boolean expression evaluates to true. A return statement inside a loop will end the iteration. • A coder will use a for loop when they know the amount of times a loop needs to iterate. • A coder will use a while loop while a condition is true. • An "off-by-one error" in Java, or programming in general, is a common logical error where a calculation, loop, or array index is off by a single unit, either one too many or one too few. This will cause significant issues with the code.

Evidence of Learning

Formative & Alternative Assessments:	Benchmark & Summative Assessments:	Resources Needed:

• Do-Nows - Question of the Day
• Classwork assignments
• AP Classroom Quizzes
  ○ 2.1 Algorithms with Selection and Repetition Quiz
  ○ 2.2: Boolean Expressions Quiz
  ○ 2.3: If Statements Quiz
  ○ 2.4: Nested if Statements Quiz
  ○ 2.5: Compound Boolean Expressions Quiz
  ○ 2.6: Comparing Boolean Expressions Quiz
  ○ 2.7: while Loops Quiz
  ○ 2.8: for Loops Quiz
  ○ 2.9: Implementing Selection and Iteration Algorithms Quiz
  ○ 2.10: Implementing String Algorithms Quiz
  ○ 2.11: Nested Iteration Quiz
  ○ 2.12: Informal Run-Time Analysis Quiz
• Classroom Discussions
• CS Awesome Homework
• Individual student check-ins with teacher
	• Coding Assignments
	• AP Classroom Unit 2 MCQ Part A and FRQ Part A Progress Checks
	• Unit 2.1-2.6 Test
	• AP Classroom Unit 2 MCQ Part B and FRQ Part B Progress Checks
	• Unit 2.7-2.12 Test
	• Unit 1 and 2 Summative Assessment
		• AP Classroom (collegeboard.com)
		• CS Awesome (https://runestone.academy/ns/books/published/csawesome2/csawesome2.html)
		• CodeHS (https://www.codehs.com)
		• Computer
		• Internet Access

Unit III: Class Creation

Unit Summary

This unit will pull together information from the previous two units to create new, user-defined reference data types in the form of classes. The ability to accurately model real-world entities in a computer program is a large part of what makes computer science so powerful. By being able to design their classes, programmers are not limited to the existing classes provided within the Java libraries and can therefore represent their ideas through classes. This unit focuses on identifying appropriate behaviors and attributes of real-world entities and organizing these into classes and their corresponding methods. The creation of computer programs can have an extensive impact on societies, economies, and cultures. The legal and ethical concerns that come with programs and the responsibilities of programmers are also addressed in this unit.

Standards/Core Ideas/Performance Expectations/Progress Indicators

The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in *AP Computer Science A:*

- *2020 New Jersey Student Learning Standards: Computer Science and Design Thinking*
  - 8.1.12.AP.1, 8.1.12.AP.3, 8.1.12.AP.5, 8.2.12.ETW.2
- *2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies, and Key Skills*
  - 9.3.IT-PRG.1, 9.3.IT-PRG.4, 9.3.IT-PRG.9
- *2023 New Jersey Student Learning Standards English Language Arts:*
  - W.IW.9–10.2.A, W.IW.11–12.2.A

Unit Essential Questions	Unit Enduring Understandings
• What is the difference between a class and an object? • What is a method in Java? • What is an accessor method? • What is a mutator method? • What are static variables and methods? • How are scope and access used in Java?	• A class is a blueprint of an object. Classes are used to create objects. Objects have methods and properties. Multiple objects can be created by the same class. • A method in Java is a block of code that, when called, performs specific actions mentioned in it. For instance, if you have written instructions to draw a circle in the method, it will do that task. You can insert values or parameters into methods, and they will only be executed when called. • An accessor method will allow you to display information from an object. • A mutator method allows you to modify information in an object. • Static variables and methods belong to the class, not the object. No matter how many instances of objects are of the same type, each static variable will only be created once. • The scope of a variable is defined as where a variable is accessible or can be used. The scope is determined by where you declare the variable when you write your programs.

Evidence of Learning

Formative & Alternative Assessments:	Benchmark & Summative Assessments:	Resources Needed:

• Do-Nows - Question of the Day
• Classwork assignments
• AP Classroom Quizzes
  ○ 3.1: Abstraction and Program Design Quiz
  ○ 3.2: Impact of Program Design Quiz
  ○ 3.3: Anatomy of a Class Quiz
  ○ 3.4: Constructors Quiz
  ○ 3.5: Methods: How to Write Them Quiz
  ○ 3.6: Methods: Passing and Returning References of an Object Quiz
  ○ 3.7: Class Variables and Methods Quiz
  ○ 3.8: Scope and Access Quiz
  ○ 3.9: this Keyword Quiz
• Classroom Discussions
• CS Awesome Homework
• Individual student check-ins with teacher
	• Coding Assignments
	• AP Classroom Unit 3 MCQ Part A and Part B and FRQ Part A Progress Checks
	• Unit 3 Test
		• AP Classroom (collegeboard.com)
		• CS Awesome (https://runestone.academy/ns/books/published/csawesome2/csawesome2.html)
		• CodeHS (https://www.codehs.com)
		• Computer
		• Internet Access

Unit IV: Data Collections

Unit Summary

This unit introduces the data structures array, ArrayList, and 2D array, which are used to represent collections of related data using a single variable rather than multiple variables. Arrays have a static size, which causes limitations related to the number of elements stored, and it can be challenging to reorder elements stored in arrays. An ArrayList object has a dynamic size, and the class contains methods for insertion and deletion of elements, making reordering and shifting items easier. Deciding which data structure to select becomes increasingly important as the size of the dataset grows, such as

when using a large real-world dataset. A 2D array is most suitable to represent a table. Unlike 1D arrays, 2D arrays require nested iterative statements to traverse and access all elements. The easiest way to accomplish this is in row-major order, but it is important to discuss additional traversal patterns, such as column-major or back and forth. Just as there are useful standard algorithms when dealing with primitive data, there are standard algorithms to use with data structures. Additional algorithms, such as two common searching and three common sorting algorithms, are also covered. Sometimes a problem can be solved by solving smaller or simpler versions of the same problem rather than attempting an iterative solution. This is called recursion, and it is a powerful math and computer science concept. In this unit, students will learn how to write simple recursive methods and determine the purpose or output of a recursive method by tracing. Students will revisit how control is passed when methods are called, which is necessary knowledge when working with recursion. Tracing skills are also helpful. Also in this unit, students will learn about privacy concerns related to storing large amounts of personal data and about what can happen if such information is compromised. They will also examine the potential for bias in collecting and using data.

Standards/Core Ideas/Performance Expectations/Progress Indicators

The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in *AP Computer Science A:*

- *2020 New Jersey Student Learning Standards: Computer Science and Design Thinking*
  - 8.1.12.AP.1, 8.1.12.AP.2, 8.1.12.AP.3, 8.1.12.AP.5
- *2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies, and Key Skills*
  - 9.3.IT-PRG.1, 9.3.IT-PRG.4, 9.3.IT-PRG.5
- *2023 New Jersey Student Learning Standards English Language Arts:*
  - W.IW.9–10.2.A, W.IW.11–12.2.A

Unit Essential Questions	Unit Enduring Understandings
• What are the ethical and social issues around data collection? • How do you use arrays in programs? • What is iterating over an array? • What does it mean to traverse an array? • How do you develop an algorithm using arrays? • What are enhanced for loops? • How do you use text files in Java programming? • What is an ArrayList? • What is the difference between an Array and an ArrayList? • How are ArrayLists written using parameters? • How can users efficiently search through and sort data saved in data structures? • What are the different Array and ArrayList searches and sorts? • What is a 2D Array? • How do you access elements in a 2D Array? • How do you traverse a 2D Array? • What are some real-life applications for 2D Arrays? • What is recursion? • What are the advantages of recursion? • How can a process be written recursively? • How can users prevent StackOverflow Errors? • What is MergeSort? • How is binary searching used with recursion?	• Ethical and social issues surrounding data collection include privacy concerns, informed consent, data security, bias and fairness, transparency, and accountability. These concerns arise from the vast amounts of personal information that can be collected and analyzed, and the potential for misuse or harm to individuals and society. • An array is a data structure that stores a fixed number of elements, all of the same type, one after another, like a list. This allows a user to select multiple properties and values in objects. • Iterating over an array means accessing each element of an array one by one. There may be many ways of iterating over an array in Java; below is a simple way. Method 1: Using for loop: This is the simplest of all where a loop where a counter variable accesses each element one by one. • To traverse an array means to access each element (item) stored in the array so that the data can be checked or used as part of a process. • To develop an algorithm, first determine the minimum or maximum value in an array. Compute a sum, average, or mode of array elements. Search for a particular element in the array. Determine if at least one element has a particular property. Determine if all elements have a particular property. • The enhanced for loop, otherwise known as a foreach loop, offers a simplified way to iterate over collections and arrays. • Java provides several classes for reading and writing text files, primarily found in the java.io package. You can choose the approach that best suits your needs, considering factors like performance, ease of use, and whether you need to process the file line by line or character by character. • An ArrayList is a Java class that is like an Array with extra powers. It can automatically resize and comes with other helpful methods. • An ArrayList size can be modified as well as the values in the list, while the array can not. • To efficiently search through and sort data saved in data structures, the type of ArrayList is set using a type parameter, ex, ArrayList = new ArrayList(); ArrayLists can be constructed without a type parameter, but it is safer to use the parameter

	because it can help catch errors while compiling instead of while running. ● Traversing ArrayLists can be done with for and for-each loops, but the size of an ArrayList cannot be modified with a for-each or a ConcurrentModificationException will be thrown. Algorithms for Arrays will work with ArrayLists, but users can create more efficient algorithms with ArrayLists if adding or removing elements. ● There are different types of search algorithms used with Arrays and ArrayLists. Sequential and binary searches are executed with Arrays and ArrayLists. Insertion and Selection Sorts are also executed with Arrays and ArrayLists. ● A two-dimensional array, also known as a 2D array, is a collection of data elements arranged in a grid-like structure with rows and columns. Each element in the array is referred to as a cell and can be accessed by its row and column indices/indexes. ● To access an element of a two-dimensional array, you must specify the index number of both the row and column. This statement accesses the value of the element in the first row (0) and third column (2) of the matrix array. ● There are two ways for you to traverse over a 2D list (a list of lists). The first is the usage of a nested for-each loop. For this, users must first retrieve the 2D list that they would like to iterate. After this, you can effectively traverse through the entries of the list using two for-each loops. ● Some real-life applications of 2D Arrays are a seating plan for a room (organized by rows and columns), a monthly budget (organized by category and month), and a grade book where rows might correspond to individual students and columns to student scores. ● Recursion is defined as a process that calls itself directly or indirectly, and the corresponding function is called a recursive function. ● Recursion can make your code easier to write, replacing complex logic with one function. It can make your code more concise and efficient. It can reduce the amount of time it takes for your solution to run. Recursion is efficient at traversing tree data structures. ● Creating a recursive method in Java involves defining a method that calls itself with modified arguments, moving closer to a base condition that terminates the recursion. ● A way to prevent stack overflow is to limit the depth of the recursion, which is the number of recursive calls that can be made before returning a value. You can do this by using a parameter or a global variable that keeps track of the current depth and stops the recursion when it reaches a certain threshold. ● MergeSort is a process to sort values in a data structure where the values are recursively split into two sections, sorted, then merged together in order. This process is shorter to write recursively than it is to write iteratively. ● Binary Searching can be written recursively, although the code is very similar to writing it as a loop.

Evidence of Learning		
Formative & Alternative Assessments: ● Classwork ● Do-Nows - Question of the Day ● AP Classroom Quizzes ○ 4.1 Ethical and Social Issues Around Data Collection Quiz	**Benchmark & Summative Assessments:** ● Coding Assignments ● AP Classroom Unit 4 MCQ Part A and FRQ Part A Progress Checks ● Unit 4.1-4.5 Test	**Resources Needed:** ● AP Classroom (collegeboard.com) ● CS Awesome (https://runestone.academy/

○ 4.2: Introduction to Using Data Sets Quiz ○ 4.3: Array Creation and Access Quiz ○ 4.4: Array Traversals Quiz ○ 4.5: Implementing Array Algorithms Quiz ○ 4.6: Using Text Files Quiz ○ 4.7: Wrapper Classes Quiz ○ 4.8: ArrayList Methods Quiz ○ 4.9: ArrayList Traversals Quiz ○ 4.10: Implementing ArrayList Algorithms Quiz ○ 4.11: 2D Array Creation and Access Quiz ○ 4.12: 2D Array Traversals Quiz ○ 4.13: Implementing 2D Array Algorithms Quiz ○ 4.14: Searching Algorithms Quiz ○ 4.15: Sorting Algorithms Quiz ○ 4.16: Recursion Quiz ○ 4.17: Recursive Searching and Sorting Quiz ● Classroom Discussions ● CS Awesome Homework ● Individual student check-ins with teacher	● AP Classroom Unit 4 MCQ Part B and FRQ Part B Progress Checks ● Unit 4.6-4.10 Test ● AP Classroom Unit 4 MCQ Part C and FRQ Part C Progress Checks ● Unit 4.11-4.15 Test ● AP Classroom Unit 4 MCQ Part D and FRQ Part D Progress Checks ● Unit 4.16-4.17 Test ● Unit 3 and 4 Summative Assessment	ns/books/published/csawesome2/csawesome2.html) ● CodeHS (https://www.codehs.com) ● Computer ● Internet Access

Unit V: AP Exam Review	
Unit Summary	
Students will have roughly 4-5 weeks to prepare for the AP Exam. Students will take two practice exams and view the College Board Review Sessions on YouTube. There will also be classroom discussions of the major topics covered over the course of the year and review strategies that should be deployed to study for the exam.	
Standards/Core Ideas/Performance Expectations/Progress Indicators	
The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in *AP Computer Science A:* ● *2020 New Jersey Student Learning Standards: Computer Science and Design Thinking* ○ 8.1.12.AP.1, 8.1.12.AP.2, 8.1.12.AP.3, 8.1.12.AP.5, 8.2.12.ED.1, 8.2.12.ETW.2 ● *2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies, and Key Skills* ○ 9.3.IT-PRG.1, 9.3.IT-PRG.4, 9.3.IT-PRG.5, 9.3.IT-PRG.6, 9.3.IT-PRG.9 ● *2023 New Jersey Student Learning Standards English Language Arts:* ○ W.IW.9–10.2.A, W.IW.11–12.2.A	
Unit Essential Questions	**Unit Enduring Understandings**
● What were the important concepts covered this year? ● What do students need to review before they take the AP Exam?	● The important concepts include topics from each of the four units. The units are as follows: ○ Unit 1: Using Objects and Methods (15–25% Exam Weight) ○ Unit 2: Selection and Iteration (25–35% Exam Weight) ○ Unit 3: Class Creation (10-18% Exam Weight) ○ Unit 4: Data Collections (30-40% Exam Weight) ● The class will watch the AP Exam Review Week videos in April after all of the curriculum material is taught. The class will then take two practice exams and will be assigned review activities in the *5 Steps to a 5* book. Assignments from CS Awesome will also be utilized during the review period.
Evidence of Learning	
Formative & Alternative Assessments: ● Classwork ● Do-Nows - Question of the Day ● Coding Homework	**Benchmark & Summative Assessments:** ● Two Practice Exams
Resources Needed: ● AP Classroom (collegeboard.com) ● CS Awesome (https://runestone.academy/ns/books/published/csawesome2/csawesome2.html) ● CodeHS (https://www.codehs.com)	

• Individual student check-ins with teacher		• Computer • Internet Access • 5 Steps to a 5: AP Computer Science A Textbook

Unit VI: Computer Science Topics	
Unit Summary	
In this unit, students will research various Computer Science topics and present their findings to the class. We cover the history of computing and personal laptops and Microsoft, Apple Computer, and Facebook. Students will research these topics as well.	
Standards/Core Ideas/Performance Expectations/Progress Indicators	

The state standards outlined below, and established by the New Jersey Department of Education, will guide instruction throughout this unit in *AP Computer Science A:*
• *2020 New Jersey Student Learning Standards: Computer Science and Design Thinking*
  ○ 8.1.12.AP.1, 8.1.12.AP.2
• *2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies, and Key Skills*
  ○ 9.3.IT-PRG.1, 9.3.IT-PRG.4
• *2023 New Jersey Student Learning Standards English Language Arts*
  ○ W.IW.9–10.2.A, W.IW.11–12.2.A	

Unit Essential Questions	**Unit Enduring Understandings**
• What Cybersecurity topic would I like to research? • What is the history of Apple Computers? • How were technology and science used for the stranded astronaut to return home from Mars? • What Computer Science topic would I like to research for my Final Computer Science Project?	• Students will choose a Cybersecurity topic to research that interests them and will get their topics approved. Each student will have a different topic and present their research to the class. • Apple Computer Company was founded on April 1, 1976, by Steve Jobs, Steve Wozniak, and Ronald Wayne as a partnership. The company's first product is the Apple I, a computer designed and hand-built entirely by Wozniak. The Apple II was the first mass-produced computer, and then there was the LISA Computer. The Macintosh computer was then developed, which is the predecessor to today's iMac. Apple has grown into a worldwide multi-trillion-dollar company. • NASA and the astronauts were able to solve multiple problems and create solutions using Computer Science and Engineering. They broke down the problem into smaller problems and solved them one at a time, to then solve the larger problem overall. This is called Decomposition. Decomposition in computational thinking is the process of breaking down a complex problem into smaller, more manageable sub-problems. • Students will choose a teacher-approved Computer Science topic to research that interests them. Each student will have a different topic and present their research to the class.
Evidence of Learning	
Formative & Alternative Assessments: • Classwork • Do-Nows - Question of the Day • AP Classroom Quizzes • Classroom Discussions	**Benchmark & Summative Assessments:** • Cybersecurity Research Presentation • Essay on Steve Jobs and Apple Computers • Essay on The Martian Video • Final Computer Science Presentation Summative
Resources Needed: • *Jobs* Video (https://www.imdb.com/title/tt2357129/) • *The Martian* Video (https://www.imdb.com/title/tt3659388/?ref_=fn_all_ttl_1) • Computer • Internet Access	

Section IX: Unit Reflection

The *AP Computer Science A* instructional team must confer upon the completion of each instructional unit in the *AP Computer Science A* curriculum and rate the degree to which the instructional units meet performance criteria established by the New Jersey Department of Education using the Unit Reflection Form. Completed unit reflection forms must be submitted to the Department Supervisor for approval upon completion of curriculum implementation with a complementing list of suggested modifications to the *AP Computer Science A* curriculum.

Unit Reflection Form: *AP Computer Science A*			
Lesson Activities:	**Strongly**	**Moderately**	**Weakly**

Foster student use of technology as a tool to develop critical thinking, creativity, and innovation skills;			
Are challenging and require higher-order thinking and problem-solving skills;			
Allow for student choice;			
Provide scaffolding for acquiring targeted knowledge/skills;			
Integrate modern, global perspectives, especially those regarding diversity, genocide, global issues, and historical ones regarding racial relations;			
Integrate 21st century skills;			
Provide opportunities for interdisciplinary connection and transfer of knowledge and skills;			
Are varied to address different student learning styles and preferences;			
Are differentiated based on student needs;			
Are student-centered, with the teacher acting as a facilitator and co-learner during the teaching and learning process;			
Provide means for students to demonstrate knowledge and skills and progress in meeting learning goals and objectives;			
Provide opportunities for student reflection and self-assessment;			
Provide data to inform and adjust instruction to better meet the varying needs of learners.			

Appendix
Writing Instruction and the RFH Community

Writing instruction should happen across the RFH Community. Writing across the curriculum is a philosophy that advances the belief that writing is a method of learning. Since all departments are committed to helping students learn, writing must be used as a methodology to advance student learning.

Each academic discipline has its own unique conventions, formats and structures. It is the responsibility of each department to agree upon domain-specific writing praxes, model them for students, and require them to utilize them on a consistent basis. Students must understand that acceptable writing in one domain may not be acceptable writing in another area. The development of domain-specific writing skills supports the overall development of the student writer because all writing is grounded in the writing situation: audience, context, purpose, subject, and writer. Representatives from the academic disciplines must share their domain-specific writing praxes with each other, identify intersections, and determine how to address perceived gaps that limit student learning.

Students must experience writing situations that help them learn how to think creatively and critically and communicate effectively in the academic disciplines. Writing instruction, regardless of the academic discipline, must always reinforce student understanding of the writing situation. When students experience writing situations, they must study examples of domain-specific writing in order to understand how writers communicate in discipline-related contexts. This does not mean

information embedded in textbooks. Domain-specific writing is writing that is used to inform and influence readers as it draws them into an established circle of discourse. Students must use these non-fiction texts to develop the close reading skills that will shape their own writing. Focused engagement with domain-specific writing should not be limited to basic reading comprehension and topical understanding. It must also include the analysis of the writing situation that is represented in the text: audience, context, purpose, subject, and writer. The close reading of well-written texts—regardless of the domain—will show students the importance of writing mechanics, diction, and syntax. The development of close reading skills will also help the students grow in terms of their ability to construct and advance independent and original claims that are well-supported by evidence. Domain-specific writing is grounded in positioning of claims and the effective use of evidence.

The final written product is important; nevertheless, the learning that results in this production must not be devalued. The writing process is not limited to the basic steps of planning, drafting, revising, and editing/proofreading. It is a complex sequence of critical and creative thinking and writing that leads to the production of a text that provides evidence of learning and understanding. Students must ultimately develop the ability to self-assess the effectiveness of their writing as a representation of the writing situation. Without the use of models that evidence learning and understanding, students will not develop the ability to self-assess their own work—the true outcome of the writing process.

What types of writing situations should RFH students engage in?

RFH students should engage in writing situations across the curriculum that require them to:

- write to improve mechanical proficiency, diction usage, and syntactical sophistication
- write to narrate, describe, and reflect
- write to summarize and report
- write to classify and define
- write to explain how process leads to an outcome
- write to compare, contrast and evaluate
- write to speculate on cause and effect
- write to propose solutions and solve problems
- write to analyze

These writing situations should be positioned in a coordinated, developmental sequence that extends across the academic disciplines.

Upon Completion of Grade 12, RFH students must be ready to transition to the following writing situations:

- write to analyze
- write to persuade (argument)

The core foci of first-year college writing courses are analysis and argument. These courses orient the students to the demands and expectations of writing for the academic culture of college. At colleges/universities with carefully coordinated writing programs, students must demonstrate proficiency in analysis and argument before they transition to upper level courses that require them to engage in the following writing situation:

- write to investigate (research)