**Rumson-Fair Haven Regional High School**

**Course:** *AP Computer Science Principles*
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**Supervisor:** Jon Pennetti
**Board Approval:** August 2024
**Revision Approval:** November 2026

## Section I: Course Description

*AP Computer Science Principles* is a course in logic. It is a college-level introductory course in computer science. Students will showcase their ability to think critically, reason, and express their ideas and thoughts in writing. They will do this through an environment of collaboration where they are consistently working in pairs and groups with their peers. This course is recommended as a prerequisite to AP Computer Science A. *AP Computer Science Principles* introduces students to the foundational concepts of computer science and challenges them to explore how computing and technology can impact the world. The AP Program designed *AP Computer Science Principles* to create leaders in computer science fields and attract and engage those who are traditionally underrepresented with essential computing tools and multidisciplinary opportunities (code.org). The *AP Computer Science Principles* course will introduce you to the essential ideas of computer science and show how computing and technology can influence the world around you. Students will creatively address real-world issues and concerns while using the same processes and tools as artists, writers, computer scientists, and engineers to bring ideas to life (College Board). The overarching goal of this course will be to prepare students to take *The College Board's AP Computer Science Principles Exam.* While no specific math level or course is required to take this course, independent critical thinking, reasoning, and writing competencies are required. Please note that this course is NOT considered a Core Math course for college.

## 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 prepare 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. **2023 New Jersey Student Learning Standards – *Mathematics:***
   - "Successful teaching and learning of mathematics play an important role in ensuring that students have the right skills required to compete in a 21st century global economy. When properly implemented and coupled with opportunities for students to engage in mathematical investigation, communication and problem solving, rigorous mathematics standards hold the promise of elevating the mathematical knowledge and skill of every learner to levels competitive with the best in the world, of preparing our college entrants to undertake advanced work in the mathematical sciences, and of readying the next generation for the jobs their world will demand."
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 Principles* 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 Multi-Language Learners (MLL) 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 those outlined on the Modifications/Accommodations for Technology and Design Courses chart.

**Section IV: Preparation for Standardized Testing**

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

**Section V: Curriculum Pacing Guide**

| **Curriculum Pacing Guide** | |
|---|---|
| **Course Title:** *AP Computer Science Principles* | **Grade Level:** *10-12* |

| | |
|---|---|
| **Unit I:** Digital Information | Weeks 1-3 |
| **Unit II:** The Internet | Weeks 4-5 |
| **Unit III:** Introduction to App Design | Weeks 6-9 |
| **Unit IV:** Variables, Conditionals, and Functions | Weeks 10-13 |
| **Unit V:** Data | Weeks 14-16 |
| **Unit VI:** Lists, Loops, and Traversals | Weeks 17-20 |
| **Unit VII:** Parameters, Returns, and Libraries | Weeks 21-23 |
| **Unit VIII:** Cybersecurity and Global Impacts | Weeks 24-26 |
| **Unit IX:** Create PT Prep | Weeks 27-30 |
| **Unit X:** Algorithms | Weeks 31-32 |
| **Unit XI:** End of Course Project | Weeks 33-40 |

**Section VI: Primary Texts and Year-Long Instructional Resources**

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

- Google Classroom
- *Common Sense Education* (www.commonsense.org)
- AP Classroom (collegeboard.com)
- 5 Steps to a 5 AP Computer Science Principles
- Code.org (code.org)
- HourOfCode.org (hourofcode.org)

**Section VII: Grading Formula and Assessment Modes**

Marking period grades in *AP Computer Science Principles* 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 Principles* 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 Principles* 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 Principles* curriculum by the *AP Computer Science Principles* instructional team:

### Unit I: Digital Information

**Unit Summary**

Students will explore how computers store complex information like numbers, text, images, and sound, and they will debate the impacts of digitizing information (DAT). Alternating between lessons away from the computer ("unplugged") and lessons that use digital tools called "widgets," this unit encourages an exploratory and collaborative approach to learning about digital information. For example, in one activity, students will design a device using household items like pipe cleaners, cups, string, etc. that will allow them to communicate simple messages across a room. As students are challenged to send increasingly complex messages, they must improve their device collaboratively with their partner while confronting some of the challenges underlying the representation of digital information (CTP1). To close out the unit, students will debate the pros and cons of digitizing information and the impacts of digital information on society and culture at large (CTP5) (IOC).

**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 Principles:*

- *2020 New Jersey Student Learning Standards: Computer Science and Design Thinking*
  - 8.1.12.CS.1-4, 8.1.12.IC.1-3, 8.1.12.DA.1-6, 8.2.12.ED.1-6, 8.2.12.ITH.1-3, 8.2.12.NT.1-2
- *2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies, and Key Skills*
  - 9.4.12.CI.1-3, 9.4.12.CT.1-2 & 4, 9.4.12.DC.1 & 3-4 & 8, 9.4.12.IML.3-4 & 7, 9.4.12.TL.1-4
- *2023 New Jersey Student Learning Standards: English Language Arts*
  - L.KL.11–12.2, L.VL.11–12.3, RI.CR.11–12.1, RI.MF.11–12.6, RI.CT.11–12.8, W.IW.11–12.2, W.WP.11–12.4-6, SL.PE.11–12.1, SL.UM.11–12.5
- *2023 New Jersey Student Learning Standards: Mathematics*
  - N.RN.A 2, N.Q.A.1-3, A.CED.A.1 & 3-4

| Unit Essential Questions | Unit Enduring Understandings |
|---|---|
| ● How do computers store complex information like numbers, text, images, and sound?<br>● What are the impacts of digitizing information through computing innovations? | ● The way a computer represents data internally is different from the way the data are interpreted and displayed for the user. Programs are used to translate data into a representation more easily understood by people.<br>● While computing innovations are typically designed to achieve a specific purpose, they may have unintended consequences. |

**Evidence of Learning**

| Formative & Alternative Assessments: | Benchmark & Summative Assessments: | Resources Needed: |
|---|---|---|
| ● Do-Nows<br>● Journaling<br>● Classroom Discussions and Debates<br>● AP Progress Checks<br>● Individual student check-ins with teacher<br>● Unit 1 CFUs (Check for Understanding Assignments) | ● Benchmark End of Unit Assessment<br>● Benchmark End of Unit Project- Digital Information Dilemmas | ● Laptop, Desktop, or Chromebook (many assignments will not be accessible on a phone or tablet)<br>● Code.org<br>● Worksheets<br>● Google Classroom<br>● Assortment of craft materials such as poster paper, tape, glue, construction paper, markers, string, cups, straws, plastic baggies, Post-it notes, etc. |

### Unit II: The Internet

**Unit Summary**

Students will learn how the Internet works and discuss its impacts on politics, culture, and the economy (CSN). Throughout this unit, students will use a digital tool called the Internet Simulator that simulates how different parts of the Internet work and forces students to grapple with and solve the problems each aspect of the Internet was designed to solve (CTP1). At the

conclusion of the unit, students will investigate an "Internet Dilemma," both from the standpoint of its technical background and its impacts on different groups of people (CTP5) (IOC).

**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 Principles:*

- *2020 New Jersey Student Learning Standards: Computer Science and Design Thinking*
  - 8.1.12.CS.1-4, 8.1.12.NI.1-4, 8.1.12.IC.1-3, 8.2.12.ED.1-6, 8.2.12.ITH.1-3, 8.2.12.NT.1-2
- *2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies, and Key Skills*
  - 9.4.12.CI.1-3, 9.4.12.CT.1-2 & 4, 9.4.12.DC.1 & 3-4 & 8, 9.4.12.IML.3-4 & 7, 9.4.12.TL.1-4
- *2023 New Jersey Student Learning Standards: English Language Arts*
  - L.KL.11–12.2, L.VL.11–12.3, RI.CR.11–12.1, RI.MF.11–12.6, RI.CT.11–12.8, W.IW.11–12.2, W.WP.11–12.4-6, SL.PE.11–12.1, SL.UM.11–12.5

| Unit Essential Questions | Unit Enduring Understandings |
|---|---|
| • How does information get shared between computers?<br>• What are the impacts of digitizing information through computing innovations? | • Computer systems and networks facilitate how data is transferred.<br>• While computing innovations are typically designed to achieve a specific purpose, they may have unintended consequences. |

**Evidence of Learning**

| Formative & Alternative Assessments: | Benchmark & Summative Assessments: | Resources Needed: |
|---|---|---|
| • Do-Nows<br>• Journaling<br>• Classroom Discussions and Debates<br>• AP Progress Checks<br>• Individual student check-ins with teacher<br>• Unit 2 CFUs (Check for Understanding Assignments)<br>• Internet Simulator Activity | • End of Unit Assessment<br>• End of Unit Project- Internet Dilemmas | • Laptop, Desktop, or Chromebook (many assignments will not be accessible on a phone or tablet)<br>• Code.org<br>• Worksheets<br>• Google Classroom<br>• Assortment of craft materials such as poster paper, tape, glue, construction paper, markers, string, cups, straws, plastic baggies, Post-it notes, etc. |

## Unit III: Introduction to App Design

**Unit Summary**

Students will design their first app while learning both fundamental programming concepts and collaborative software development processes (CRD, AAP). Students will work with partners to develop this simple app that teaches classmates about a topic of personal interest (CTP1, CTP4, CTP6). Throughout the unit, students will learn how to use App Lab to design user interfaces and write simple event-driven programs. Along the way, students will learn practices like debugging, pair programming, and collecting and responding to feedback, which they will be able to use throughout the course as they build ever more complex projects. The unit concludes with students sharing the apps they develop with their classmates.

**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 Principles:*

- *2020 New Jersey Student Learning Standards: Computer Science and Design Thinking*
  - 8.1.12.CS.1-4, 8.1.12.DA.1, 8.1.12.AP.1-9, 8.2.12.ED.1-6, 8.2.12.ITH.1, 8.2.12.EC.1-6
- *2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies, and Key Skills*
  - 9.4.12.CI.1-3, 9.4.12.CT.1-2 & 4, 9.4.12.DC.1 & 3-4 & 8, 9.4.12.IML.3 & 4 & 7, 9.4.12.TL.1-4
- *2023 New Jersey Student Learning Standards: English Language Arts*
  - L.KL.11–12.2, L.VL.11–12.3, RI.CR.11–12.1, RI.MF.11–12.6, RI.CT.11–12.8, W.IW.11–12.2, W.WP.11–12.4-6, SL.PE.11–12.1, SL.UM.11–12.5

| Unit Essential Questions | Unit Enduring Understandings |
|---|---|
| • How can computing innovations be improved?<br>• How can developers collect additional feedback to improve computing innovations?<br>• What is the importance of writing clear instructions, especially in | • Incorporating multiple perspectives through collaboration improves computing innovations as they are developed.<br>• Developers create and innovate using an iterative design process that is user-focused, incorporates implementation/feedback cycles, and leaves ample room for experimentation and risk-taking.<br>• The way statements are sequenced and combined in a program determines the computed result. Programs incorporate iteration and |

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|---|---|
| programming?<br>● How can code be simplified or reused to improve programs? | selection constructs to represent repetition and make decisions to handle varied input values.<br>● Programmers break down problems into smaller and more manageable pieces. By creating procedures and leveraging parameters, programmers generalize processes that can be reused. Procedures allow programmers to draw upon existing code that has already been tested, allowing them to write programs more quickly and with more confidence. |

| Evidence of Learning | | |
|---|---|---|
| **Formative & Alternative Assessments:**<br>● Do-Nows<br>● Journaling<br>● Classroom Discussions and Debates<br>● AP Progress Checks<br>● Individual student check-ins with teacher<br>● Unit 3 CFUs (Check for Understanding Assignments)<br>● App-Lab practice activities | **Benchmark & Summative Assessments:**<br>● End of Unit Assessment<br>● End of Unit Project- Designing an App | **Resources Needed:**<br>● Laptop, Desktop, or Chromebook (many assignments will not be accessible on a phone or tablet)<br>● Code.org<br>● Worksheets<br>● Google Classroom |

## Unit IV: Variables, Conditionals, and Functions

### Unit Summary

Students will expand the types of apps they can create by adding the ability to store information (variables), make decisions (conditionals), and better organize code (functions) (AAP). Students will be introduced to these concepts through guided hands-on activities that feature approachable manipulatives like sticky notes and plastic bags. They will then be provided opportunities to explore working examples of programs that use each concept (CTP4) before setting out on a series of increasingly challenging practice activities. The exploration of each of these three concepts concludes with a lesson in which students must write the code for a simple app that uses each concept without starter code. The entire unit concludes with an open-ended project in which students must build an app that helps their classmates make a decision based on user input (CTP1, CTP3, CTP4, CTP6).

### 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 Principles:*

- *2020 New Jersey Student Learning Standards: Computer Science and Design Thinking*
  - 8.1.12.CS.1-4, 8.1.12.IC.1-3, 8.1.12.DA.1, 8.1.12.AP.1-9, 8.2.12.ED.1-6, 8.2.12.ITH.1-3, 8.2.12.NT.1-2, 8.2.12.EC.1-6
- *2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies, and Key Skills*
  - 9.4.12.CI.1-3, 9.4.12.CT.1-2 & 4, 9.4.12.DC.1 & 3-4 & 8, 9.4.12.IML.3-4 & 7, 9.4.12.TL.1-4
- *2023 New Jersey Student Learning Standards: English Language Arts*
  - L.KL.11–12.2, L.VL.11–12.3, RI.CR.11–12.1, RI.MF.11–12.6, RI.CT.11–12.8, W.IW.11–12.2, W.WP.11–12.4-6, SL.PE.11–12.1, SL.UM.11–12.5
- *2023 New Jersey Student Learning Standards: Mathematics*
  - N.RN.A 2, N.Q.A.1-3, A.CED.A.1 & 3-4, F.IF.A 2

| Unit Essential Questions | Unit Enduring Understandings |
|---|---|
| ● How can developers collect additional feedback to improve computing innovations?<br>● How can we store data in a program to solve problems?<br>● What is the importance of writing clear instructions, especially in programming?<br>● How can code be simplified or reused to improve programs? | ● Developers create and innovate using an iterative design process that is user-focused, that incorporates implementation/feedback cycles, and that leaves ample room for experimentation and risk-taking.<br>● To find specific solutions to generalizable problems, programmers represent and organize data in multiple ways.<br>● The way statements are sequenced and combined in a program determines the computed result. Programs incorporate iteration and selection constructs to represent repetition and make decisions to handle varied input values.<br>● Programmers break down problems into smaller and more manageable pieces. By creating procedures and leveraging parameters, programmers generalize processes that can be reused. Procedures allow programmers |

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|---|---|
| | to draw upon existing code that has already been tested, allowing them to write programs more quickly and with more confidence. |

**Evidence of Learning**

| Formative & Alternative Assessments: | Benchmark & Summative Assessments: | Resources Needed: |
|---|---|---|
| ● Do-Nows<br>● Journaling<br>● Classroom Discussions and Debates<br>● AP Progress Checks<br>● Individual student check-ins with teacher<br>● Unit 4 CFUs (Check for Understanding Assignments)<br>● Unit 4 EIPM (Explore, Investigate, Practice Make) Activities | ● End of Unit Assessment<br>● End of Unit Project- Decision Maker App | ● Laptop, Desktop, or Chromebook (many assignments will not be accessible on a phone or tablet)<br>● Code.org<br>● Worksheets<br>● Google Classroom<br>● Assortment of craft materials such as poster paper, tape, glue, construction paper, markers, string, cups, straws, plastic baggies, Post-it notes, etc. |

## Unit V: Data

**Unit Summary**

Students will explore and visualize datasets from a wide variety of topics as they hunt for patterns and try to learn more about the world around them (DAT). Students will work with datasets in App Lab and will be asked to make use of a data visualizer tool that assists students in finding data patterns. Students will learn how different types of visualizations can be used to better understand the patterns contained in data sets and investigate hypotheses. At the conclusion of the unit, students will learn about the impacts of data analysis on the world around them, before completing a final project in which they must uncover and present a data investigation they've completed independently (CTP5).

**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 Principles:*

- *2020 New Jersey Student Learning Standards: Computer Science and Design Thinking*
  - 8.1.12.CS.1-4, 8.1.12.IC.1-3, 8.1.12.DA.1-6, 8.2.12.ED.1-6, 8.2.12.ITH.1-3, 8.2.12.NT.1-2, 8.2.12.ETW.1-3, 8.2.12.EC.1-6
- *2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies, and Key Skills*
  - 9.4.12.CI.1-3, 9.4.12.CT.1-2 & 4, 9.4.12.DC.1 & 3-4 & 8, 9.4.12.IML.3-4 & 7, 9.4.12.TL.1-4
- *2023 New Jersey Student Learning Standards: English Language Arts*
  - L.KL.11–12.2, L.VL.11–12.3, RI.CR.11–12.1, RI.MF.11–12.6, RI.CT.11–12.8, W.IW.11–12.2, W.WP.11–12.4-6, SL.PE.11–12.1, SL.UM.11–12.5
- *2023 New Jersey Student Learning Standards: Mathematics*
  - N.RN.A 2, N.Q.A.1-3, A.CED.A.1 & 3-4, S.ID.A.1, S.ID.B.5-6

| Unit Essential Questions | Unit Enduring Understandings |
|---|---|
| ● How can computers help process data?<br>● What are the impacts of digitizing information through computing innovations? | ● Programs can be used to process data, which allows users to discover information and create new knowledge.<br>● While computing innovations are typically designed to achieve a specific purpose, they may have unintended consequences. |

**Evidence of Learning**

| Formative & Alternative Assessments: | Benchmark & Summative Assessments: | Resources Needed: |
|---|---|---|
| ● Do-Nows<br>● Journaling<br>● Classroom Discussions and Debates<br>● AP Progress Checks<br>● Individual student check-ins with teacher<br>● Unit 5 CFUs (Check for Understanding Assignments) | ● End of Unit Assessment<br>● End of Unit Project- Tell a Data Story (Summative) | ● Laptop, Desktop, or Chromebook (many assignments will not be accessible on a phone or tablet)<br>● Code.org<br>● Worksheets<br>● Google Classroom<br>● Assortment of craft materials such as poster paper, tape, glue, construction paper, markers, string, cups, straws, plastic baggies, Post-it notes, etc. |

## Unit VI: Lists, Loops, and Traversals

### Unit Summary

Students will learn to build apps that use and process lists of information (AAP). Like the Variables, Conditionals, and Functions unit, students will explore the core concepts of lists, loops, and traversals through a variety of lesson types, ranging from hands-on unplugged activities to reading and modifying working code, to collaboratively work through programming challenges (CTP4). Late in the unit, students will be introduced to tools that allow them to import tables of real-world data to help further power the types of apps they can make. At the conclusion of the unit, students will complete a week-long project in which they must design an app around a goal of their choosing that uses one of these data sets (CTP1, CTP4, CTP6).

### 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 Principles:*

- *2020 New Jersey Student Learning Standards: Computer Science and Design Thinking*
  - 8.1.12.CS.1-4, 8.1.12.IC.1-3, 8.1.12.DA.1-6, 8.1.12.AP.1-9, 8.2.12.ED.1-6, 8.2.12.ITH.1-3, 8.2.12.NT.1-2, 8.2.12.ETW.1-3, 8.2.12.EC.1-6
- *2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies, and Key Skills*
  - 9.4.12.CI.1-3, 9.4.12.CT.1-2 & 4, 9.4.12.DC.1 & 3-4 & 8, 9.4.12.IML.3-4 & 7, 9.4.12.TL.1-4
- *2023 New Jersey Student Learning Standards: English Language Arts*
  - L.KL.11–12.2, L.VL.11–12.3, RI.CR.11–12.1, RI.MF.11–12.6, RI.CT.11–12.8, W.IW.11–12.2, W.WP.11–12.4-6, SL.PE.11–12.1, SL.UM.11–12.5

| Unit Essential Questions | Unit Enduring Understandings |
|---|---|
| • How can developers collect additional feedback to improve computing innovations?<br>• How can we store data in a program to solve problems?<br>• What is the importance of writing clear instructions, especially in programming?<br>• How can code be simplified or reused to improve programs? | • Developers create and innovate using an iterative design process that is user-focused, incorporating implementation/feedback cycles, which leaves ample room for experimentation and risk-taking.<br>• To find specific solutions to generalizable problems, programmers represent and organize data in multiple ways.<br>• The way statements are sequenced and combined in a program determines the computed result. Programs incorporate iteration and selection constructs to represent repetition and make decisions to handle varied input values.<br>• Programmers break down problems into smaller and more manageable pieces. By creating procedures and leveraging parameters, programmers generalize processes that they can reuse. Procedures allow programmers to draw upon existing code that has already been tested, allowing them to write programs more quickly and more confidently. |

### Evidence of Learning

| Formative & Alternative Assessments: | Benchmark & Summative Assessments: | Resources Needed: |
|---|---|---|
| • Do-Nows<br>• Journaling<br>• Classroom Discussions and Debates<br>• AP Progress Checks<br>• Individual student check-ins with teacher<br>• Unit 6 CFUs (Check for Understanding Assignments)<br>• Unit 6 EIPM (Explore, Investigate, Practice Make) Activities | • End of Unit Assessment<br>• End of Unit Project- Hackathon | • Laptop, Desktop, or Chromebook (many assignments will not be accessible on a phone or tablet)<br>• Code.org<br>• Worksheets<br>• Google Classroom<br>• Assortment of craft materials such as poster paper, tape, glue, construction paper, markers, string, cups, straws, plastic baggies, Post-it notes, etc. |

## Unit VII: Parameters, Returns, and Libraries

### Unit Summary

Students will learn how to design clean and reusable code that can be shared with a single classmate or the entire world (AAP). At the beginning of the unit, students will be introduced to the concepts of parameters and return, which allow students to design code that encapsulates algorithms (CTP3). In the second half of the unit, students will learn how to design

libraries of functions that can be used in a variety of situations. The unit concludes with students designing a small library of functions that can be used by a classmate (CTP1, CTP2, CTP3, CTP4).

**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 Principles:*

- *2020 New Jersey Student Learning Standards: Computer Science and Design Thinking*
  - 8.1.12.CS.1-4, 8.1.12.IC.1-3, 8.1.12.AP.1-9, 8.2.12.ED.1-6, 8.2.12.ITH.1-3, 8.2.12.NT.1-2, 8.2.12.EC.1-6
- *2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies, and Key Skills*
  - 9.4.12.CI.1-3, 9.4.12.CT.1-2 & 4, 9.4.12.DC.1 & 3-4 & 8, 9.4.12.IML.3-4 & 7, 9.4.12.TL.1-4
- *2023 New Jersey Student Learning Standards: English Language Arts*
  - L.KL.11–12.2, L.VL.11–12.3, RI.CR.11–12.1, RI.MF.11–12.6, RI.CT.11–12.8, W.IW.11–12.2, W.WP.11–12.4-6, SL.PE.11–12.1, SL.UM.11–12.5
- *2023 New Jersey Student Learning Standards: Mathematics*
  - N.RN.A.2, N.Q.A.1-3, A.CED.A.1 & 3-4

| Unit Essential Questions | Unit Enduring Understandings |
|---|---|
| • How can developers collect additional feedback to improve computing innovations?<br>• What is the importance of writing clear instructions, especially in programming?<br>• How can code be simplified or reused to improve programs? | • Developers create and innovate using an iterative design process that is user-focused, that incorporates implementation/feedback cycles, and that leaves ample room for experimentation and risk-taking.<br>• The way statements are sequenced and combined in a program determines the computed result. Programs incorporate iteration and selection constructs to represent repetition and make decisions to handle varied input values.<br>• Programmers break down problems into smaller and more manageable pieces. By creating procedures and leveraging parameters, programmers generalize processes that can be reused. Procedures allow programmers to draw upon existing code that has already been tested, allowing them to write programs more quickly and with more confidence. |

**Evidence of Learning**

| Formative & Alternative Assessments: | Benchmark & Summative Assessments: | Resources Needed: |
|---|---|---|
| • Do-Nows<br>• Journaling<br>• Classroom Discussions and Debates<br>• AP Progress Checks<br>• Individual student check-ins with teacher<br>• Unit 7 CFUs (Check for Understanding Assignments)<br>• Unit 7 EIPM (Explore, Investigate, Practice Make) Activities | • End of Unit Assessment<br>• End of Unit Project- Make a Library | • Laptop, Desktop, or Chromebook (many assignments will not be accessible on a phone or tablet)<br>• Code.org<br>• Worksheets<br>• Google Classroom<br>• Assortment of craft materials such as poster paper, tape, glue, construction paper, markers, string, cups, straws, plastic baggies, Post-it notes, etc. |

## Unit VIII: Cybersecurity and Global Impacts

**Unit Summary**

Students will research and debate current events at the intersection of data, public policy, law, ethics, and societal impact (IOC). This unit is built around a simulated "future school" conference in which students must take on the persona of a stakeholder in a school setting and propose and debate technological innovations that could improve schools. Throughout the unit, students will learn about the privacy and security risks of many computing innovations and learn about the ways some of these risks can be mitigated. Students will complete their Explore Curricular Requirement as part of this project as they investigate at least three computing innovations, then discuss and debate many other innovations with their classmates (CTP5, CTP6). At the conclusion of the unit, the class will hold a conference in which teams present their overall vision for a school of the future and the computing innovations that would power it.

**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 Principles:*

- *2020 New Jersey Student Learning Standards: Computer Science and Design Thinking*

- 8.1.12.CS.1-4, 8.1.12.NI.1-4, 8.1.12.IC.1-3, 8.2.12.ED.1-6, 8.2.12.ITH.1-3, 8.2.12.NT.1-2, 8.2.12.ETW.1-3, 8.2.12.EC.1-6
- *2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies, and Key Skills*
  - 9.4.12.CI.1-3, 9.4.12.CT.1-2 & 4, 9.4.12.DC.1 & 3-4 & 8, 9.4.12.IML.3-4 & 7, 9.4.12.TL.1-4
- *2023 New Jersey Student Learning Standards: English Language Arts*
  - L.KL.11–12.2, L.VL.11–12.3, RI.CR.11–12.1, RI.MF.11–12.6, RI.CT.11–12.8, W.IW.11–12.2, W.WP.11–12.4-6, SL.PE.11–12.1, SL.UM.11–12.5

| Unit Essential Questions | Unit Enduring Understandings |
|---|---|
| • What are the impacts of digitizing information through computing innovations?<br>• Are there risks involved when using computing innovations? | • While computing innovations are typically designed to achieve a specific purpose, they may have unintended consequences.<br>• The use of computing innovations may involve risks to your personal safety and identity. |

**Evidence of Learning**

| Formative & Alternative Assessments: | Benchmark & Summative Assessments: | Resources Needed: |
|---|---|---|
| • Do-Nows<br>• Journaling<br>• Classroom Discussions and Debates<br>• AP Progress Checks<br>• Individual student check-ins with teacher<br>• Unit 8 CFUs (Check for Understanding Assignments)<br>• Cybersecurity research | • End of Unit Assessment<br>• End of Unit Project-Innovation Simulation (Summative) | • Laptop, Desktop, or Chromebook (many assignments will not be accessible on a phone or tablet)<br>• Code.org<br>• Worksheets<br>• Google Classroom<br>• Assortment of craft materials such as poster paper, tape, glue, construction paper, markers, string, cups, straws, plastic baggies, Post-it notes, etc. |

## Unit IX: Create PT Prep

**Unit Summary**

Students will practice and complete the Create Performance Task (PT). The unit begins with a series of activities that ensure students understand the requirements of the Create PT, which they have practiced throughout the year. Subsequently, students will be given at least 9 class hours in which to complete the Create PT.

**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 Principles:*

- *2020 New Jersey Student Learning Standards: Computer Science and Design Thinking*
  - 8.1.12.CS.1-4, 8.1.12.NI.1-4, 8.1.12.IC.1-3, 8.1.12.DA.1-6, 8.1.12.AP.1-9, 8.2.12.ED.1-6, 8.2.12.ITH.1-3, 8.2.12.NT.1-2, 8.2.12.ETW.1-3, 8.2.12.EC.1-6
- *2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies, and Key Skills*
  - 9.4.12.CI.1-3, 9.4.12.CT.1-2 & 4, 9.4.12.DC.1 & 3-4 & 8, 9.4.12.IML.3-4 & 7, 9.4.12.TL.1-4
- *2023 New Jersey Student Learning Standards: English Language Arts*
  - L.KL.11–12.2, L.VL.11–12.3, RI.CR.11–12.1, RI.MF.11–12.6, RI.CT.11–12.8, W.IW.11–12.2, W.WP.11–12.4-6, SL.PE.11–12.1, SL.UM.11–12.5
- *2023 New Jersey Student Learning Standards: Mathematics*
  - N.RN.A.2, N.Q.A.1-3, A.CED.A.1 & 3-4, F.IF.A.2, S.ID.A.1, S.ID.B.5-6

| Unit Essential Questions | Unit Enduring Understandings |
|---|---|
| • What is computer science, and how can it be used to solve problems? | • Computer science is interdisciplinary, collaborative, innovative, and can benefit society. |

**Evidence of Learning**

| Formative & Alternative Assessments: | Benchmark & Summative Assessments: | Resources Needed: |
|---|---|---|
| • Journaling<br>• Self-assessment<br>• Unit 9 CFUs (Check for Understanding Assignments)<br>• Individual student check ins with teacher | • Create Performance Task for AP Test | • Laptop, Desktop, or Chromebook (many assignments will not be accessible on a phone or tablet)<br>• Code.org<br>• Worksheets<br>• Google Classroom<br>• AP Classroom Digital Portfolio |

## Unit X: Algorithms

### Unit Summary

Students will learn to design and analyze algorithms to understand how they work and why some algorithms are considered more efficient than others (AAP). This short unit will be entirely unplugged and features hands-on activities that help students get an intuitive sense of the differences between how quickly different algorithms run and the pros and cons of different algorithms (CTP2). Later in the unit, students will explore concepts like undecidable problems and parallel and distributed computing (CSN).

### 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 Principles:*

- *2020 New Jersey Student Learning Standards: Computer Science and Design Thinking*
  - 8.1.12.IC.1-3, 8.1.12.AP.1-2 & 5 & 7-9, 8.2.12.ED.5-6
- *2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies, and Key Skills*
  - 9.4.12.CI.1-3, 9.4.12.CT.1-2 & 4, 9.4.12.DC.1 & 3-4 & 8, 9.4.12.IML.3-4 & 7, 9.4.12.TL.1-4
- *2023 New Jersey Student Learning Standards: English Language Arts*
  - L.KL.11–12.2, L.VL.11–12.3, RI.CR.11–12.1, RI.MF.11–12.6, RI.CT.11–12.8, W.IW.11–12.2, W.WP.11–12.4-6, SL.PE.11–12.1, SL.UM.11–12.5

### Unit Essential Questions

- What is the importance of writing clear instructions, especially in programming?
- Are there problems that computers cannot solve?
- What are the benefits of dividing tasks among many members of a group or of a computing system?

### Unit Enduring Understandings

- The way statements are sequenced and combined in a program determines the computed result. Programs incorporate iteration and selection constructs to represent repetition and make decisions to handle varied input values.
- Problems exist that computers cannot solve, and even when a computer can solve a problem, it may not be able to do so in a reasonable amount of time.
- Parallel and distributed computing leverage multiple computers to more quickly solve complex problems or process large data sets.

### Evidence of Learning

**Formative & Alternative Assessments:**

- Do-Nows
- Journaling
- Classroom Discussions and Debates
- AP Progress Checks
- Individual student check-ins with teacher
- Unit 10 CFUs (Check for Understanding Assignments)

**Benchmark & Summative Assessments:**

- End of Unit Assessment

**Resources Needed:**

- Laptop, Desktop, or Chromebook (many assignments will not be accessible on a phone or tablet)
- Code.org
- Worksheets
- Google Classroom
- Assortment of craft materials such as poster paper, tape, glue, construction paper, markers, string, cups, straws, plastic baggies, Post-it notes, etc.

## Unit XI: End of Course Project

### Unit Summary

Collaboration allows computer scientists to improve their products. During this unit, students will be encouraged to collaborate with many different students, especially those who have different perspectives than their own. Collaborating with people who have a different perspective helps to reveal blind spots they might have due to their own backgrounds and experiences.

### 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 Principles:*

- *2020 New Jersey Student Learning Standards: Computer Science and Design Thinking*
  - 8.1.12.CS.1-4, 8.1.12.NI.1-4, 8.1.12.IC.1-3, 8.1.12.DA.1-6, 8.1.12.AP.1-9, 8.2.12.ED.1-6, 8.2.12.ITH.1-3, 8.2.12.NT.1-2, 8.2.12.ETW.1-3, 8.2.12.EC.1-6
- *2020 New Jersey Student Learning Standards: Career Readiness, Life Literacies, and Key Skills*
  - 9.4.12.CI.1-3, 9.4.12.CT.1-2 & 4, 9.4.12.DC.1 & 3-4 & 8, 9.4.12.IML.3-4 & 7, 9.4.12.TL.1-4
- *2023 New Jersey Student Learning Standards: English Language Arts*
  - L.KL.11–12.2, L.VL.11–12.3, RI.CR.11–12.1, RI.MF.11–12.6, RI.CT.11–12.8, W.IW.11–12.2, W.WP.11–12.4-6, SL.PE.11–12.1, SL.UM.11–12.5

| Unit Essential Questions | Unit Enduring Understandings |
|---|---|
| ● What is computer science, and how can it be used to solve problems? | ● Computer science is interdisciplinary, collaborative, innovative, and can benefit society. |

| Evidence of Learning | | |
|---|---|---|
| **Formative & Alternative Assessments:**<br>● Journaling<br>● Self-assessment<br>● Peer feedback<br>● Individual student check-ins with teacher | **Benchmark & Summative Assessments:**<br>● End of Unit Project (Summative) | **Resources Needed:**<br>● Laptop, Desktop, or Chromebook (many assignments will not be accessible on a phone or tablet)<br>● Code.org<br>● Worksheets<br>● Google Classroom<br>● Assortment of craft materials such as poster paper, tape, glue, construction paper, markers, string, cups, straws, plastic baggies, Post-it notes, etc. |

**Section IX: Unit Reflection**

The *AP Computer Science Principles* instructional team must confer upon the completion of each instructional unit in the *AP Computer Science Principles* curriculum and rate the degrees 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 complementary list of suggested modifications to the *AP Computer Science Principles* curriculum.

| Unit Reflection Form: *AP Computer Science Principles* | | | |
|---|---|---|---|
| **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 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)