Standard: Technology Literacy (2009)

8.1: Education Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge.

8.2: Technology Education, Engineering, and Design: All students will develop an understanding of the nature and impact of technology, engineering, technology design, and the designed world, as they relate to the individual, global, and the environment.

9.1: 21st Century Life and Career Skills: All students will demonstrate the creativity, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

Strand:

8.1.A: Technology Operations and Concepts
8.1.F: Critical Thinking, Problem Solving, and Decision Making

8.2.B: Design: Critical Thinking, Problem Solving, and Decision Making
8.2.F: Resources for a Technological World
8.2.G: The Designed World

9.1.A: Critical Thinking and Problem Solving
9.2.E: Communication and Media Fluency
9.2.F: Accountability, Productivity, and Ethics

Curriculum aligned with: 2009 New Jersey Core Curriculum Content Standards for 21st Century Skills (9.1 A-F)

21st Century Theme: *Global Awareness ☐,Financial, economic, business and entrepreneurial literacy ☐ Civic literacy ☐,Health literacy ☐Environmental Literacy X*

AP Computer Science Principles Unit 1 | 25 – 35 Days
Established 14-15
Revised 20-21
Revised August 2023

21st Century Skills: *Critical Thinking & Problem Solving ☐,Creativity and Innovation ☐,Collaboration, Teamwork and Leadership ☐,Cross-Cultural Understanding and Interpersonal Communications X Communication and Media Fluency ☐, Accountability, Productivity and Ethics ☐*		
Interdisciplinary Connection: Math=MA, English=ELA, Science=SCI, Social Studies=SS, Physical Education=PE, Art=ART, Music=MU, Technology=TECH, World Language=WL Business = BU		
Essential Questions	**Enduring Understandings**	**Activities, Investigation, and Student Experiences**
• What are the impact of technology? • How to send Binary Messages? • How to send more complex messages? • What are Bit Sending Widgets? • How to send bits in the real world? • What is the "Number System"? • What are Binary Numbers? • How to send Binary Numbers? • How to Encode Numbers in the Real World?	*Students will understand….* • The impact of innovation. • to send messages with 'A' and 'B' • to send complex messages. • what widgets are. • Sending bits in the real world. • Math is part of technology • Text messages • Text compression • Black and white images • Color images • RGB • Difference between compression files and normal files	• Lab 1: Research the many impacts of technology • Lab 2: Label the parts of a computer • Lab 3: Label the different types of sizes. • Lab 4: Label the different types of files. • Lab 5: Write a program where it will convert from base 10 to base 2. • Lab 6: Mini Project - Personal Favicon assignment This is the small project that comes out of lesson 15. Students use the pixelation widget to encode the bits for 16x16 image that represents them somehow. **Spot Light On:** *Seek multiple perspectives and different answers to questions.*

<table>
<tr><td>

- How to encode and send text “text”?
- How to send formatted text?
- What are the different types of file sizes?
- How to compress Text?
- How to Encode Black and White images?
- How to Encode Color images?
- What are Lossy Compression and File Formats?

</td><td></td><td rowspan="2">

Unit Project:

SS

- Lab 7:

Encode a complex piece of information Students must consider a complex type of information that has not been considered in class and invent a way to encode it in binary. Students must present their file encoding protocol and respond to reflection prompts in writing.

Modifications and/or Accommodations:

- **Special Education:** Utilize a multi-sensory (VAKT) approach during instruction, provide alternate presentations of skills by varying the method (repetition, simple explanations, additional examples, modeling, etc.), modify test content and/or format, allow students to retake test for additional credit, provide additional times and preferential seating as needed, review, restate and repeat directions, provide study guides, and/or break assignments into segments of shorter tasks.
- **English Language Learners:** Extend time requirements, preferred seating, positive reinforcement, check often for understanding/review, oral/visual directions/prompts when necessary, supplemental materials including use of online bilingual dictionary, and modified assessment and/or rubric.
- **Students at Risk of School Failure:** Deliver instruction utilizing varied learning styles including audio, visual, and tactile/kinesthetic, provide individual instruction as needed, modify assessments and/or rubrics, repeat instructions as needed.

Gifted Students: Create an enhanced set of introductory activities, integrate active teaching/learning opportunities, incorporate authentic components, propose interest-based extension activities, and connect student to related talent development opportunities.

</td></tr>
<tr><td>

Content Statements

</td><td>

Cumulative Progress Indicators

</td></tr>
</table>

Students will know… ● Connecting Computing: Describe connections between people and computing. ● Communicating: Describe computation and the impact of technology and computation. ● Collaborating: Foster a constructive, collaborative climate by facilitating the contributions of a team member; exchange knowledge and feedback with a partner or team member. ● Information travelling on the internet is all represented in	● Tests ● Quizzes ● Practice problems for homework ● Projects ● Worksheets ● In-class programs ● Labs	

bits, encoded either as voltage in a copper wire, beams of light in a fiber-optic cable, or frequencies of radio waves moving through the air. ● The symbols of the decimal number system (0, 1, …, 9) are so familiar that it can be challenging to mentally separate the written symbols from the abstract values they represent. ● The basic principle behind compression is to develop a method or protocol for using fewer bits to represent the original information, even		

if it requires us to do a little more work in encoding and decoding the data. ● Early computers stored and ran 8-bit instructions. Much of the early computing world relied on representing and exchanging messages encoded in ASCII text, and so an 8-bit chunk, or "byte," became a very common chunk-size or unit of data for representing information.		
Desired Results		
● Communicate with classmates about computing innovations in their lives. ● Describe positive and negative effects of computing innovations. ● Create a device for sending a single bit of information over a distance.		

● Analyze the possibilities and limitations that arise when sending binary messages. ● Experiment to create a binary message system to send messages with more than two states. ● Connect the number of messages they need to send with the number of bits required to do so (e.g. 16 messages requires 4 bits). ● Validate the success of the system with a demonstration. ● Reason about the need for communication protocols. ● Differentiate between three common methods for transmitting bits across the Internet. ● Identify how household items use these technologies to send, receive, or store information. ● Calculate the range of values that can be represented using binary numbers of a given size in bits. ● Invent their own communication protocol for sending a list of numbers that represent coordinates on a cartesian grid. ● Use the Internet Simulator to send the list of points that make up the drawing to a friend. ● Collaborate with a peer to find a solution to a text compression problem using the Text Compression Widget (lossless compression scheme). ● Explain the factors that make compression challenging. ● Explain why the “best” compression is impossible or “hard” to identify. ● Develop a strategy (heuristic algorithm) for compressing text.	

● Explain the color encoding scheme for digital images. ● Use the Pixelation Tool to encode small color images with varying bits-per-pixel settings. ● Use the Pixelation Tool to encode an image of the student's design. ● Explain the benefits of using hexadecimal numbers for representing long streams of bits.	
Standards for Mathematical Practices	Teacher Resources
1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	https://learnzillion.com https://www.khanacademy.org/ https://www.desmos.com/

LGBT and Disabilities Law: *N.J.S.A. 18A:35-4.35*

- Alan Turning: English mathematician, computer scientist, logician, cryptanalyst, philosopher, and theoretical biologist. Turning was highly influential in the development of theoretical computer science.

The mission is to ensure that every student is able to see themselves in our rich and diverse history.

Social and Emotional Learning: ***Competencies***	**Social and Emotional Learning:** ***Sub-Competencies***
Self-Awareness Social Awareness Self-Management Relationship Skills Responsible Decision-Making	• Recognizing the importance of self-confidence in handling daily tasks and challenges. • Demonstrate an awareness of the expectations for social interactions in a variety of ways. • Demonstrate an understanding of the need for mutual respect when viewpoints differ. • Recognize the skills needed to establish and achieve personal and educational goals. • Utilize positive communication and social skills to interact effectively with others. • Develop, implement, and model effective problem solving and critical thinking skills.

New Jersey Legislative Statutes and Administrative Code (place an "X" before each law/statute if/when present within the curriculum map)								
	Amistad Law: *N.J.S.A. 18A 52:16A-88*		Holocaust Law: *N.J.S.A. 18A:35-28*	x	LGBT and Disabilities Law: *N.J.S.A. 18A:35-4.35*	x	Diversity & Inclusion: *N.J.S.A. 18A:35-4.36a*		Standards in Action: *Climate Change*