

Pirate Binary

Overview:

Participants will learn about Binary code and how it can be used to code letters and pictures to transmit data.

Goals:

- Use Binary to code secret messages and pictures.

Time Required: 1 hour

Materials:

- pencils

Vocab: Binary Code, Byte, Pixel

Procedures:

1. Start by thinking about all the ways we use technology today. Have students brainstorm ways computers help us.
2. Ask students, “What did we use before we had computers?” and “How did we send messages?”
3. Connect to pirates and history:
“Because written communication could be easily intercepted, complex codes were developed so the messages were only able to be read by someone who had the key. When the telegraph was invented, Samuel Morse worked to develop a code based on a series of dots and dashes to transmit messages along the telegraph wires...this code is known as Morse Code – are any of you familiar with this code? What are some other codes you know about?”
4. Introduce the activity:
“Computers are complicated machines capable of complex tasks and storing large amounts of data. Computers assign 0s and 1s to letters, numbers, and symbols to transmit information. This is called Binary Code. In this activity, we will look at some different ways Binary Code is used to transmit data.”
5. For our first activity, we will use the ASCII Binary code for capital letters A to Z.
6. Instructions: “In the ASCII Code, each “Byte” (set of eight 1’s and 0’s) codes for 1 letter, number, or symbol. Use the ASCII Binary Code to decode the answer to the joke: What’s a pirate’s favorite kind of fish?”
7. Some fun facts about ASCII:
 - a. ASCII code is based on Morse code used by telegraph systems. ASCII was developed in the 1960’s.
 - b. Remember the Block Code we use with our Sphero Robots? This, like other computer languages you may have heard of (Java, C+, Python, etc) makes writing computer code easier. The software for these languages breaks the commands into the 1’s and 0’s of Binary Code that the computer uses to follow those commands.



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- c. Each 1 or 0 is referred to as a Binary Digit or “Bit” of data. Eight “Bits” make up a “Byte”. A group of four bits is called a Nibble!
8. *If you have time, you may choose to do the Binary Bracelets optional activity here!*
9. Second activity: “Binary code can also be used to send pictures. Photos of distant objects, like Pluto, taken by robotic spacecraft are transmitted back to earth via radio waves using binary code. Pixels are the individual squares that make up a digital image (think minecraft). Have you ever zoomed way in on a digital image and seen all those little squares – those are pixels. For our black and white images, each pixel (square) is represented by a Bit of data - either a 0 or a 1. 0’s are left white, and 1’s should be colored in black. Use the lines of data to decode the picture.

Extensions:

1. Use beads and cord or pipe cleaners to make a Binary Code Bracelet. Use the ASCII code to turn your first and last initial to Binary Code. Use one color of bead for 1’s and another color for 0’s. A third color can be used as a spacer. See *the Binary Bracelets optional resource for complete instructions.*
2. Use ASCII to write secret messages to a friend.
3. Create and code your own secret picture.
4. Learn about Morse Code and try to send messages using a flashlight.
5. Research and try out other secret codes.

Reflection:

1. What other things could you code using ASCII?
2. Why do you think binary code uses only 1’s and 0’s?
3. What other skills do coders need for their jobs?
4. How could you encode a color picture?
5. What are 2 things you learned about Binary Code today?

Adapted from the following lessons:

National 4-H Council. “Code Your Communication.” *Clover by 4-H*, 19 Dec. 2023, 4-h.org/clover/activities/code-your-communication/.

Additional Resources:

Code.org. “Binary Bracelets - Lesson 15.” *Code.Org*, 2022, studio.code.org/s/coursec-2022/lessons/15.

Thinkersmith. “Binary Baubles.” *TM Traveling Circuits - Code.Org*, 2013, code.org/files/CSEDbinary.pdf.

