

## BINARY BRACELETS

Do you enjoy playing computer games? Would you like to learn more about computers, what they do, and how you can communicate with them? In order to learn about computers, you must understand how they work, “think”, and communicate.

When you talk to other people, you have to speak the same language in order to understand each other. We can take information that we know and **translate**, or change it, into another language. Humans speak many different languages. Computers also have a language of their own. We communicate with them through **code**, language that **programmers** (people who write code) create and use to tell computers what to do.

**Coding**, or programming, gives instructions in a language the machine understands. A list of detailed, step-by-step instructions needed to complete a task is called an **algorithm**. An algorithm that can be run by a machine is called a **program**. Programs are used to make computer graphics, documents, music, and much more.



**These are the names of just a few of many computer languages.**

When programmers write and **execute** (run) code, that code is translated into **binary** instructions for the computer. Binary describes anything with only two options to represent information (yes/no, off/on, true/false, 0/1). In the case of computers, we can translate instructions into a simple series of ones and zeroes. All information has a value of either 1 or 0.

Each number in a binary number is called a **bit** (short for “binary digit”). When 8 bits are put together, that binary line of code is called a **byte**. Each individual letter, number, and symbol is represented by its own unique byte. For example, the letter “A” is represented by the byte “0100 0001”. This code is based on a system called **ASCII** (American Standard Code for Information Interchange), which was created in the 1960s as a way for computers to communicate. Each character on a computer keyboard has its own special, unique ASCII byte.

### **ACTIVITY: Make your own binary bracelet**

#### **Materials**

- Plastic or wooden beads, in two different colors of your choice
- Plastic lacing cord, pipe cleaner, yarn or string



- Scissors
- Binary Decoder Key (in ASCII format):

A	■□■□ ■□■□	N	■□■□ □□□■
B	■□■□ ■□□■	O	■□■□ □□□□
C	■□■□ ■□□□	P	■□□□ ■□■□
D	■□■□ ■□■□	Q	■□□□ ■□■□
E	■□■□ ■□□□	R	■□□□ ■□□■
F	■□■□ ■□□■	S	■□□□ ■□□□
G	■□■□ ■□□□	T	■□□□ ■□■□
H	■□■□ □□■□	U	■□□□ ■□□□
I	■□■□ □□■□	V	■□□□ ■□□■
J	■□■□ □□□■	W	■□□□ ■□□□
K	■□■□ □□□□	X	■□□□ □□■□
L	■□■□ □□■□	Y	■□□□ □□■□
M	■□■□ □□□□	Z	■□□□ □□■□

**Binary Decoder Key** (from Code.org - This [curriculum](#) is available under a Creative Commons License (CC BY-NC-SA 4.0))

1. Decide which color bead will be used for which square symbol in the Binary Decoder Key above, using one color for the white squares (to represent the "0" bit) and another color for the black squares (to represent the "1" bit). We chose black and red beads.
2. Cut a piece of plastic lacing cord so that it is long enough to fit around your wrist, plus a couple of extra inches for tying knots at each end.
3. Pick the first or last initial of your name or something else (a word, a place, a person, etc.) that is meaningful to you. We selected the letter "N" for "Nevada".



**Step 1**

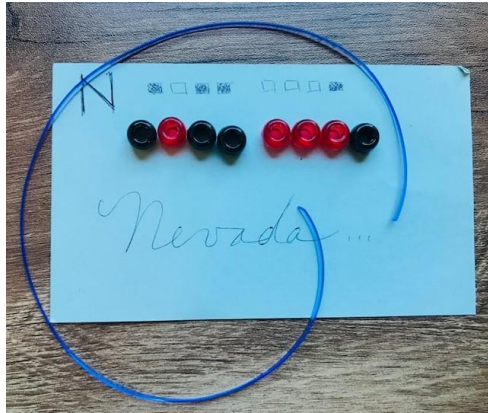


**Steps 2 and 3**

4. Find the letter that you've selected on the Binary Decoder Key.



- Count out the eight beads needed for that letter, using one color for the white squares (representing the "0" bit) and another color for the black squares (representing the "1" bit). Arrange them to match the pattern for your letter as shown on the Binary Decoder Key.
- Tie a knot in the end of the cord so that the beads won't slip off as you are adding them to the cord.



**Steps 4 and 5**

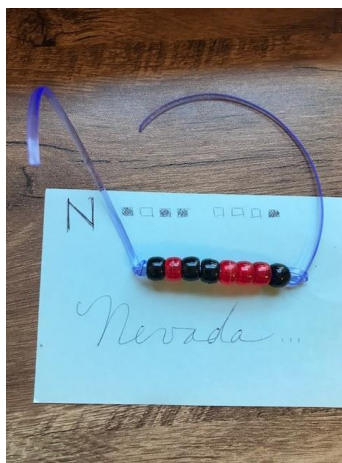


**Step 6**

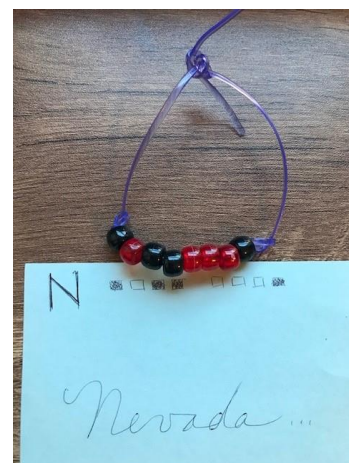
- Slide the beads onto the cord in the correct order as shown on the Binary Decoder Key.
- When you're done, tie a knot in the other end of the cord. Your binary bracelet is ready to wear!



**Step 7**



**Step 7**



**Step 8**

You can always make more bracelets and spell out names and words. Just make sure that you have enough beads on hand to do so because each letter requires 8 beads to represent it.

## **ADDITIONAL RESOURCES**

### **Books from the Washoe County Library System:**

[\*Coding from Scratch\*](#) by Rachel Ziter

[\*G is for Googol: A Math Alphabet Book\*](#) by David M. Schwartz



[Girls Who Code: Learn to Code and Change the World](#) by Reshma Saujani

[Grace Hopper: Queen of Computer Code](#) by Laurie Wallmark

[How to Code a Rollercoaster](#) by Josh Funk

[How to Talk to Your Computer](#) by Seymour Simon

[Kids Can Code!: Fun Ways to Learn Computer Programming](#) by Ian Garland

### **Videos:**

BrainPOP, "Computer Programming" <https://youtu.be/pKBw98uHOyk>

Code.org, "How Computers Work: Binary & Data" <https://youtu.be/USCBCmwMCDA>

Codecademy, "What do programmers do?" <https://youtu.be/kEjCfsrotAM>

### **Websites:**

BBC, Bitesize, GCSE: Introducing Binary <https://www.bbc.co.uk/bitesize/guides/zwsbwmn/revision/1>

DK findout!, Computer Coding <https://www.dkfindout.com/us/computer-coding/>

Massachusetts Institute of Technology, Scratch <https://scratch.mit.edu/>

University of California, Berkeley and Education Development Center, Snap! <https://snap.berkeley.edu/>

