Binary Bracelets

When looking at a computer screen, you see letters, numbers and pictures. You can type up documents, watch videos, edit images, play games and create spreadsheets. How do computers do all this? With data made up of different combinations of 0s and 1s. This two-option system is called binary coding, and it's extremely important to the computer world.

One way to help picture a binary system is to imagine the 1s and 0s are black or white squares. The white squares are like a light being on in one room and represent the 1, and the black squares are the 0, or zero light so a total blackout. Visualizing binary coding, and understanding how it can be used as language, is easier when you have colored pieces to represent the 1s and 0s, which is exactly what this non-computer-based bracelet activity does!

What You'll Need

- String or yarn
- Scissors
- Two different colors of beads

If you don't have beads, you can use two different types of pasta that both have a hole in the middle, but this makes the bracelet more fragile.

You can make paper beads by cutting elongated triangles out of magazine pages, tightly rolling the paper starting at the large end and gluing the tip to hold the bead together. **Bigbeadlittlebead.com** has a helpful guide about making paper beads.

If you would like, you can add a third colored bead as a spacer between the two sequences.

What You'll Do

- Using the decoder key provided, write your first and last initial in binary. You can do it either way: use the white/black color system or use 1s and 0s.
- Make a bracelet!
- Assign one color bead to the black 0s and one color to the white 1s.
- Cut a length of string that can fit the number of beads needed, and add a few extra inches.
- Make a knot to start the bracelet. One by one, string the first and last initial bead sequence on the string toward the knotted end.
- Carefully knot the open end of the string, and then tie the two ends together, making sure there is enough room to slide the bracelet off and on your hand.
- Slip it on your wrist and wear your coded-message binary bracelet proudly!

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What to Think About

- If the alphabet has a binary code key, do you think there is a key for numbers? If each letter has a combination of eight 1s and 0s, how many digits do you think represent one number?
- If you can convert letters into binary, can you do it the opposite way and convert binary into letters?
- Can you think of any other hardware that stores information in binary?
- How else could you represent binary instead of squares that are filled in with black or not filled?
- How do you think pictures and sounds could be represented in binary?
- Can you think of any other languages that have a code to represent letters?
- How could you expand your binary message past just your initials? Could you make a necklace the same way by spelling out your full first name? Could you write an entire note in binary for a family member to decode?

What to Remember

- Computers don't use human languages like Spanish or English to transmit and store information. Instead, the information is coded, or transformed into a representation of that information.
- To **encode** something means to convert information from one system of communication into another.
- A **binary code** represents computer instructions that use a two-symbol ("bi" means two) system to encode information. The two symbols most may be familiar with are 0 and 1, but data can be encoded in other ways, too, like high and low, positive and negative or reflective and non-reflective.
- In a binary number, each digit's location is known as a **bit** (short for binary digit). A string of 8 bits is known as a **byte**. Strung together in unique patterns, these bits and bytes can then transmit information.
- Binary coding isn't just used for translating letters and numbers. Hard disk drives and DVDs, for example, store information in binary.
- Before digital computers used binary code, the analog method had continuously changing electrical, mechanical or hydraulic qualities. This increased the chance of small errors. Since binary has an exact and consistent code, errors are less likely and the information transmitted is more reliable.

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Binary Decoder Key

Black = 0 White = 1 Example: A = 01000001

A	■	□	■	■	■	■	■	□
B	■	□	■	■	■	■	□	■
C	■	□	■	■	■	■	□	□
D	■	□	■	■	■	□	■	■
E	■	□	■	■	■	□	■	□
F	■	□	■	■	■	□	□	■
G	■	□	■	■	■	□	□	□
H	■	□	■	■	□	■	■	■
I	■	□	■	■	□	■	■	□
J	■	□	■	■	□	■	□	■
K	■	□	■	□	■	■	□	□
L	■	□	■	■	□	□	■	■
M	■	□	■	■	□	□	■	□
N	■	□	■	■	□	□	□	■
0	■	□	■	■	□	□	□	□
P	■	□	■	□	■	■	■	■
Q	■	□	■	□	■	■	■	□
R	■	□	■	□	■	■	□	■
S	■	□	■	□	■	■	□	□
T	■	□	■	□	■	□	■	■
U	■	□	■	□	■	□	■	□
V	■	□	■	□	■	□	□	■
W	■	□	■	□	■	□	□	□
X	■	□	■	□	□	■	■	■
Y	■	□	■	□	□	■	■	□
Z	■	□	■	□	□	■	□	■

Using the key, code your initials in binary in the boxes.
Write your first initial on the top row and your last initial on the bottom row.
