



Binary Bracelets

A Bracelet that Spells out a Word in Binary

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

1. Write out the letters of a word you want to put on your bracelet.
2. Tie a knot in one end of the elastic string to keep the beads from sliding off when you add them.
3. Slide beads onto the elastic in the order of the letters, according to the table above.
4. Make sure the order is right.
5. Tie a knot on the second end of the elastic to keep the beads from sliding off.
6. Tie a knot connecting the two ends of the elastic, cut off excess elastic, and your bracelet is ready to put on your wrist!
7. Count how many bytes are in your bracelet! (Hint: It equals the number of letters in the bracelet!)

What is Binary?

- Humans use a “base 10” numbering system because we count things using our 10 fingers. Each finger represents a digit from 0 to 9. Each number in our base 10 number system is made of a string of digits from 0 to 9.
- Computers, however, use a binary system. They count in “base 2” because their switches have only two options: off and on. In binary code, there are only two digits: 0 and 1. Zero represents “off” and 1 represents “on.” In binary each number is represented by a string of 0s and 1s. Every 0 or 1 in the string is called a “bit,” and a string of 8 bits is called a “byte.” Back in 1963 each letter of the alphabet (along with all of the other symbols on a keyboard) were assigned a standard byte, as shown in the table above. Black represents 0 and orange represents 1.



Sample bracelet that reads “liger”



Morse Code Bracelets

A Bracelet that Spells out a Word in Morse Code

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

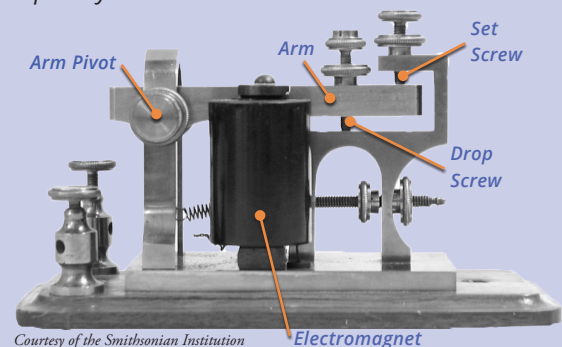
1. Write out the letters of a word you want to put on your bracelet.
2. Tie a knot on one end of the elastic string to keep the beads from sliding off when you add them.
3. Slide beads onto the elastic in the order of the letters according to the table (left) and add “space” beads between each letter.
4. Tie a knot on the second end of the elastic to keep the beads from sliding off.
5. Tie a knot connecting the two ends of the elastic, cut off excess elastic, and your bracelet is ready to put on!

What is Morse Code?

Morse code is a binary form of communication that assigns different patterns of on/off electric pulses produced by a telegraph machine to different letters of the alphabet. In the early 1800s, before voice could be electronically communicated, various versions of electrical telegraphs and telegraph codes were invented in different countries. These telegraph machines could send only “on” and “off” electric pulses to a receiving end. In the 1830s, American inventor Samuel Morse developed a new version of the electric telegraph that made audible clacks and created Morse code to go with it. Over the next decade, the original Morse code was simplified from using many different lengths of pulses to using only two lengths of pulses: short dots and long dashes.

In Morse’s machine, a transmitter sends electric pulses down a wire that triggers electromagnets in a receiver (pictured below). When the electromagnet is triggered, the metal arm is attracted downward, causing the drop screw attached to the arm to drop and make a clacking sound. Then, the electromagnet turns off, and the arm raises to touch the set screw, making a quieter clacking sound that signals the end of the dot or dash. The length of time between the two clacks indicates whether the pulse is a dot or a dash. Each letter has a pattern of one to four dots and dashes. In the table above, dots are orange and dashes are black. Notice how the letter “E” is the shortest, at only one dot. This is because “E” is the most frequently used letter in the English alphabet, and making more frequently used letters short speeds up communication.

Morse code can be communicated using electric currents, radio waves, light, and sound with a binary, on/off mechanism. In World Wars I and II, electrical and radio telegraphy using Morse code was essential for quick communication between infantry, warplanes, warships, and military bases. Nowadays, Morse code isn’t used as much as it was during the 1800s and 1900s because there are easier ways to communicate, like cellphones, but Morse code is still extremely versatile. You can even blink it!



Courtesy of the Smithsonian Institution



Sample bracelet that reads “liger”