Binary Bracelets

Lesson time: 15 Minutes   Basic lesson time includes activity only. Introductory and Wrap-Up suggestions can be used to delve deeper when time allows.

LESSON OVERVIEW

Binary is extremely important to the computer world. The majority of computers today store all sorts of information in binary form. This lesson helps to demonstrate how it is possible to take something that we know and translate it into a series of ons and offs.

TEACHING SUMMARY

Getting Started - 15 minutes
1) [Review](#)
2) [Vocabulary](#)
3) [Off and On](#)

Activity: Binary Bracelets - 15 minutes
4) [Binary Bracelets](#)

Wrap-up - 5 minutes
5) [Flash Chat](#) - What did we learn?

Assessment - 10 minutes
6) [Binary Assessments](#)

LESSON OBJECTIVES

Students will:

- Encode letters into binary
- Decode binary back to letters
- Relate the idea of storing initials on a bracelet to the idea of storing information in a computer

TEACHING GUIDE

MATERIALS, RESOURCES AND PREP

For the Student

- [Binary Bracelet Worksheet](#)
- [Binary Assessment](#)
- Pens and Pencils
- Scissors

For the Teacher

- [Lesson Video](#)
- This Teacher Lesson Guide
- [Binary Bracelet Worksheet](#)
- [Binary Assessment](#)
- Computer for opening or images of an open computer
- Optional: Write a short message on the board in binary

GETTING STARTED (15 MIN)

1) Review

This is a great time to review the last lesson that you went through with your class. We suggest you alternate between asking questions of the whole class and having students talk about their answers in small groups.

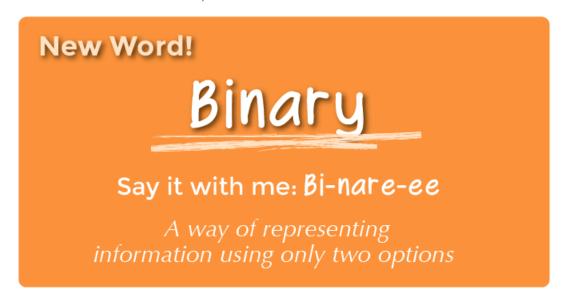Here are some questions that you can ask in review:

- What did we do last time?

- What do you wish we had had a chance to do?

- Did you think of any questions after the lesson that you want to ask?

- What was your favorite part of the last lesson?

LESSON TIP *Finishing the review by asking about the students' favorite things helps to leave a positive impression of the previous exercise, increasing excitement for the activity that you are about to introduce.*

2) Vocabulary

This lesson has one new and important word:

Binary - Say it with me: Bi-nare-ee
A way of representing information using only two options

3) Off and On

- If you've written a short message on the board in binary, call the students' attention to it and ask if anyone knows what it is or what it means.

- Put the message aside and move on to prepping for the activity.
- You can start by asking the class if they have ever seen inside a computer.
  - What's in there?
  - This is a good place to actually show them the inside of a computer (or pictures of the inside of a computer).
- Wires carry information through the machine in the form of electricity.
  - The two options that a computer uses with respect to this electrical information are "off" and "on."
    - When computers represent information using only two options, it's called "Binary."
  - That theme of two options doesn't stop when the information gets to its destination.
- Computers also *store* information using binary.
  - Binary isn't always off and on.
    - Hard Disk Drives store information using magnetic positive and magnetic negative.
    - DVDs store information as either reflective or non-reflective.
  - How do you suppose we can convert the things we store in a computer into binary?
    - Let's start with letters.
    - Use the [Binary Decoder Key](#) to show how a computer might represent capital letters.
      - **This is a good time to mention that each spot where you have a binary option is called a "binary digit" or "bit" for short.**
      - **Ask if anyone knows what a grouping of eight bits is called** (it's a byte.)
      - **Fun fact: A grouping of four bits is called a nibble.**
    - Go over a few examples of converting letters into binary, then back.
    - Afterward, write an encoded letter and give the class a few seconds to figure out what it is.
    - When the class can figure out your encoded letters on their own, you can move on to the activity.

ACTIVITY: (20 MIN)

4) [Binary Bracelet Worksheet](#)

LESSON TIP *You know your classroom best. As the teacher, decide if students should do this individually or if students should work in pairs or small groups.*

*You **do not** need to cover the whole of binary, including counting and converting numbers back and forth from decimal. This lesson is intended to be a fun introduction to how computers store information, not a frustrating lesson in bases.*

Directions:

1. Find the first letter of your first name in the Binary Decoder Key.

2. Fill in the squares of the provided bracelet to match the pattern of the squares next to the letter that you selected.

3. Cut the bracelet out.

4. Tape the bracelet around your wrist to wear it!

5. Share your bracelet with your classmates to see if they can figure out your letter.

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	■□■□	□■□■

LESSON TIP

If your class has extra budget for materials, try doing this exercise using thread (or pipe cleaners) and beads to create the binary bracelets instead of pen and paper. You can provide any combination of two colors in beads to the students, but black and white tend to be easiest, given the way that the key is done.

After the activity, revisit the message that was on the board and see if your class can decypher it using what they've learned.

WRAP-UP (5 MIN)

5) Flash Chat: What did we learn?

- What else do you think is represented as binary inside of a computer?
- How else might you represent binary instead of boxes that are filled or not filled?
- What was your favorite part about that activity?

ASSESSMENT (15 MIN)

7) Binary Assessment

- Hand out the assessment worksheet and allow students to complete the activity independently after the instructions have been well explained.
- This should feel familiar, thanks to the previous activities.

EXTENDED LEARNING

Use these activities to enhance student learning. They can be used as outside of class activities or other enrichment.

Binary Images

- There are several great resources on the web for taking this activity to the next level.
- If your students are interested in how images (or even music) can be represented as binary, you can find more

details in Thinkersmith's **Binary Baubles**.