LESSON 2

SENDING BINARY MESSAGES

WHAT IS COMPUTER SCIENCE?

- Computer science is commonly thought to be the study of computers themselves – the physical machines we have on our desks and carry around in our pockets.

- **Computer Science is the study of information and information processes**

THINK, PAIR, SHARE

- What is your personal definition of "information"?
- OR
- What other words come to mind when you hear the word: "information"?

INFORMATION:

- One possible definition: the answer to a question
- The simplest question we can ask is a **binary question**
- **Binary Question:** a question to which there are only two possible answers
  - Example: Do we have a quiz today?
  - Example: Which do you prefer: Coke or Pepsi?
- **Binary Message:** a message that can only have one of two possible values

PARTNER WORK

- Imagine that you and your friend have not been able to communicate for the entire summer, and you have a chance to ask her one binary question that she will answer. What binary question do you want to ask?

  - Think: multiple choice question with two answers (for now)

TODAY'S ACTIVITY

- Now that you've come up with a binary question, let's talk about how you need to answer it. Answering a binary question is easy when we speak to each other, but it becomes more difficult when we are separated.

- Today we will focus on how a binary message can be sent over a distance. You will build the device that sends them.

RULES:

- You have 5 minutes
- Stay on your side: You may not walk to the other side of the room
- No language: That means no writing or talking to communicate
- No projectiles

CHALLENGE 1: 5 MINUTES

- Send a binary message
- Would your device still work if?
  - There was something in between you and your partner?
  - You couldn't see your partner?
  - You were in a loud room?
  - You partner wasn't paying attention?

CHALLENGE 2:

- Now create a device that gives **four** possible messages
- Should you modify your device?
- Should you use it in a different way?
- Should you make a new device entirely?

CHALLENGE 3:

- Eight possible messages!

CHALLENGE 4:

- N-possible messages
- Could we keep increasing the number of messages forever? Could our devices be used for questions with 16, 32, or 1,000,000 possible responses?

DISCUSS WITH YOUR PARTNER

- How could you use your device to respond to much more complex questions (for example one with 1,000 possible responses).

- Come up with a system for using your device and describe it in such a way that another group could pick up your device and use it to send messages this way.

DISCUSSION:

- Could you use another groups device to send your set of messages? Why or why not? What would you need to know from the other groups?

- Based on what you've seen in today's activity what do you think are the limitations on the kinds of information we can send with binary messages?

MAIN TAKE-AWAYS:

- From an engineering perspective: the simplest way to physically send an infinite number of messages over some distance is to make a binary message device, and to send unique sequences of binary states. This is how the internet at a physical level actually works.
- Physical Limitations: signal loss, noise, unclear binary states, obstructions, obstacles, etc.
- Informational Limitations: the length of a message limits the number of things you can represent as binary states.