Name(s)_____ Period _____ Date _____

Activity Guide - Binary Message Devices

Scenario: You are going to build a device out of classroom supplies to send information to a classmate on the other side of the room. There are some basic rules and constraints:

- **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: Simple Binary Message (state A or B)

Time Limit: 5 mins

- Choose the **binary question** your device will be used to answer.
- **Create a device** using classroom items to send a simple binary message - state A or B.
- **Try to make it fail-proof.** Consider a few obstacles. Would it still work if…
  - There was something in between you and your partner?
  - You couldn't see your partner?
  - You were in a loud room?
  - Your partner wasn't paying attention?

Record how to use your device to send a state A / B in the table below

Your Binary Question: _____

Message	How to send with your device
A:	
B:	

Check-in with the Teacher

- Demonstrate the messaging systems
- Record this information about your device in your journal using a table similar to the example above.
- Your teacher may use the rubric to assess your device.

Challenge 2: Complex Messages (4 possible messages)

Time Limit: 5 mins

Not all questions have only two possible answers. Your new **challenge is to invent a way** to use your device to send an answer to a question that has **4 possible answers!** Think about these things:

- Should you modify your device?
- Should you use it in a different way?
- Should you make a new device entirely?

You've got 5 minutes! GO!

After you've done some testing, make a note below about how to use your device to send 4 possible messages. (enough that another person could pick up your device and use it).

Message	How to send with your device

Challenge 3: Complex Messages (8 possible messages)

Time Limit: 5 mins

What if you wanted to ask an even more complex question with **8 possible answers?**

Just as before update your device and test it out. Record how to use your device in the table below.

Message	How to send with your device

Challenge 4: Complex Messages (16 - n possible messages)

Time Limit: 5 mins

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? Some things to think about...

- Our alphabet only has 26-letters, yet we can spell many words
- Our number system only has 10 digits yet we can represent many numbers
- Think back to your simple two-state device. Could you simply use it differently, rather than modifying it?

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).
- Use the space below to **describe the system you develop** in such a way that another group could pick up your device and use it to send messages this way.

Class Discussion

Follow your teacher's instructions for presenting your work to the class. You might need to:

- Describe how your system works
- Provide a simple example of your system
- Do a live demonstration of your system being used

Use the rubric to assess your learning.

Name(s)_____ Period _____ Date _____

Rubric - Binary Message Devices

Bit-Sending Device Rubric

If directed by your teacher, evaluate your efforts in working collaboratively with your team members to complete the project by completing the following rubric. Otherwise, move directly to the reflection questions.

Criteria	Yes	No	Comments
You and your partner(s) iteratively developed a bit-sending device that can be put into exactly two distinct states, and student could successfully send and receive a single binary message.			
You and your partner(s) modified or used the device differently to send/receive more than a single binary message (4, 8, 16...n possible messages).			
You and your partner(s) presented (written or spoken) the functionality of the device in a manner that allowed others to easily understand how to use it.			
You contributed meaningfully to the efforts of your group, were engaged in the activity, offered your own ideas, and responded to the ideas of your classmates.			

Reflection:

Note: These questions also appear in Code Studio and can be answered there.

1. Multiple Choice: A binary question is defined as:

    A. A piece of information that is sent in pairs
    B. Two questions which share the same answer
    C. A message which can be in two possible states
    D. A question which can be answered in only one of two possible ways

2. Provide an example of a question that could not be answered with a binary message. Explain why this is the case, making reference to the definition of a binary message.

3. Modify your question so that it *could* be answered with a binary message. Explain why it can now be answered with a binary message.