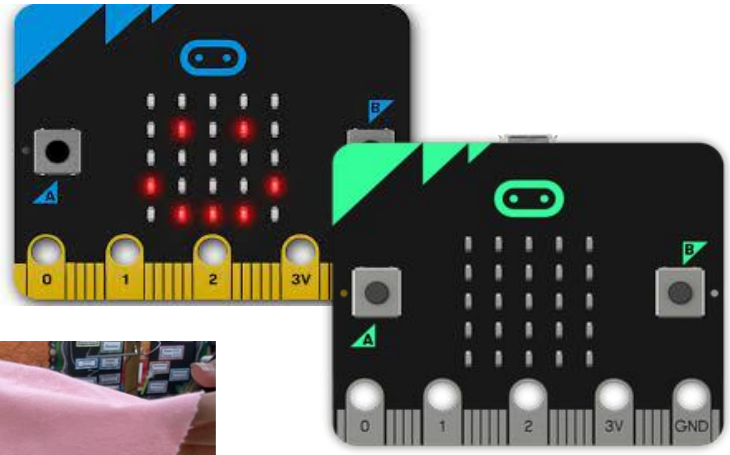
SCIENCE NORTH SCIENCE NORD

Grade 6 Science - Earth and Space Systems

Lunar Lander Technologies

Materials



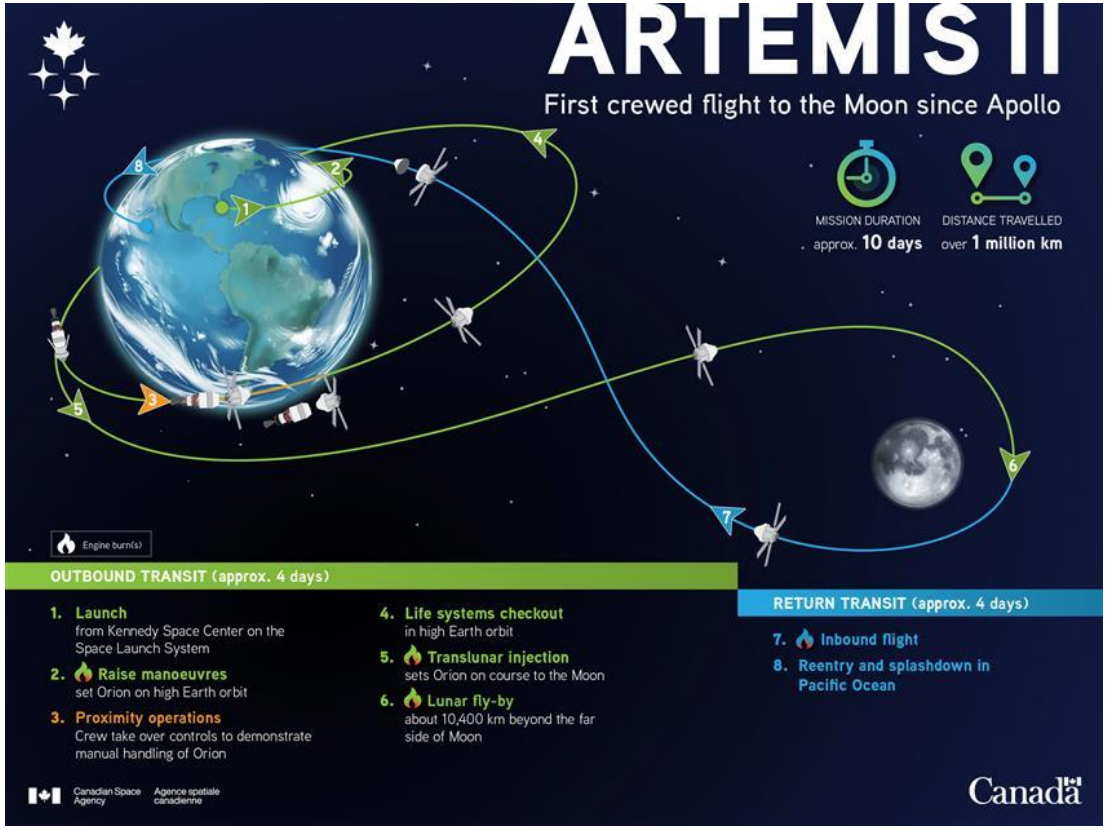
Here is what you will need:

1. 2 Micro:bits + USB cord per group
2. Variety of building materials for the lunar lander design challenge (tape, cardboard, egg cartons, news paper, straws, paper tubes, etc.

Introduction Part A: Canadian Lunar Exploration

Explore the CSA Website and learn about how we are going to the moon!

Artemis II



Discuss!

Why is Artemis II such an important step in Canadian Space exploration??

CSA Astronaut Jeremy Hansen

Watch This Video!

Artemis II Mission & Jeremy Hansen

Canadian Lunar Rover

Discussion

What are some of the challenges of deploying a Lunar Rover, especially during Lunar night?

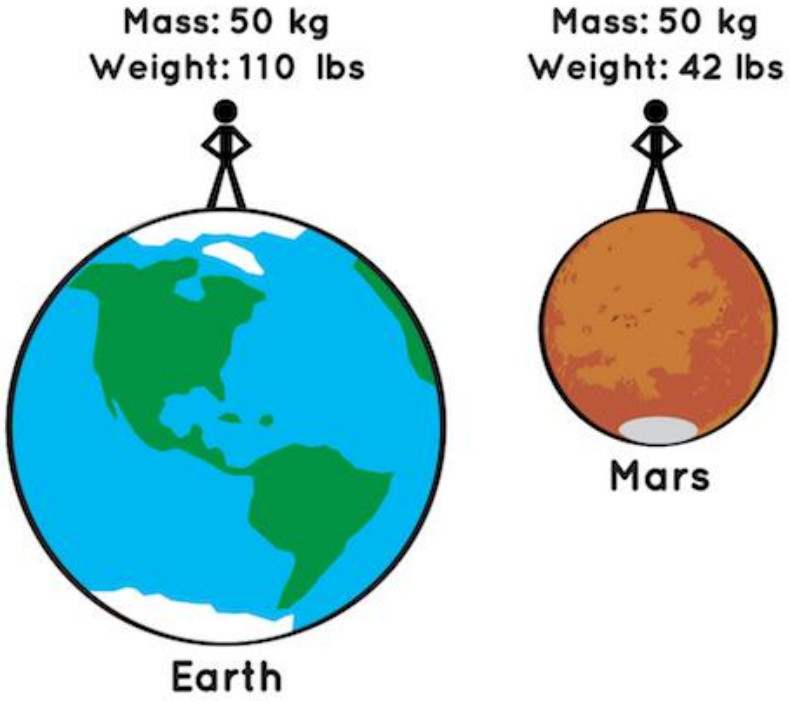
How do you think they land the rover on the moon? Are there any risks?

Watch This Video!

[Canadian Lunar Rover Website](#) & [Video](#)

SCIENCE NORTH SCIENCE NORD

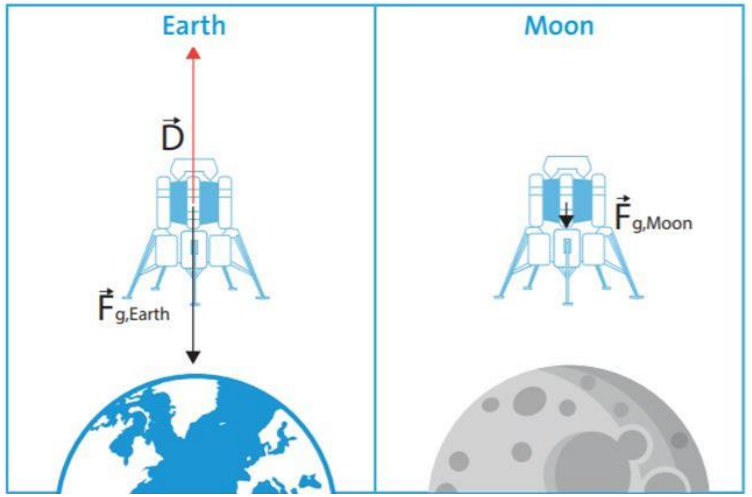
Lunar Lander Physics



This means that when the lander approaches the moon its mass stays the same but its weight is 6 times less because the gravity on the moon is less.

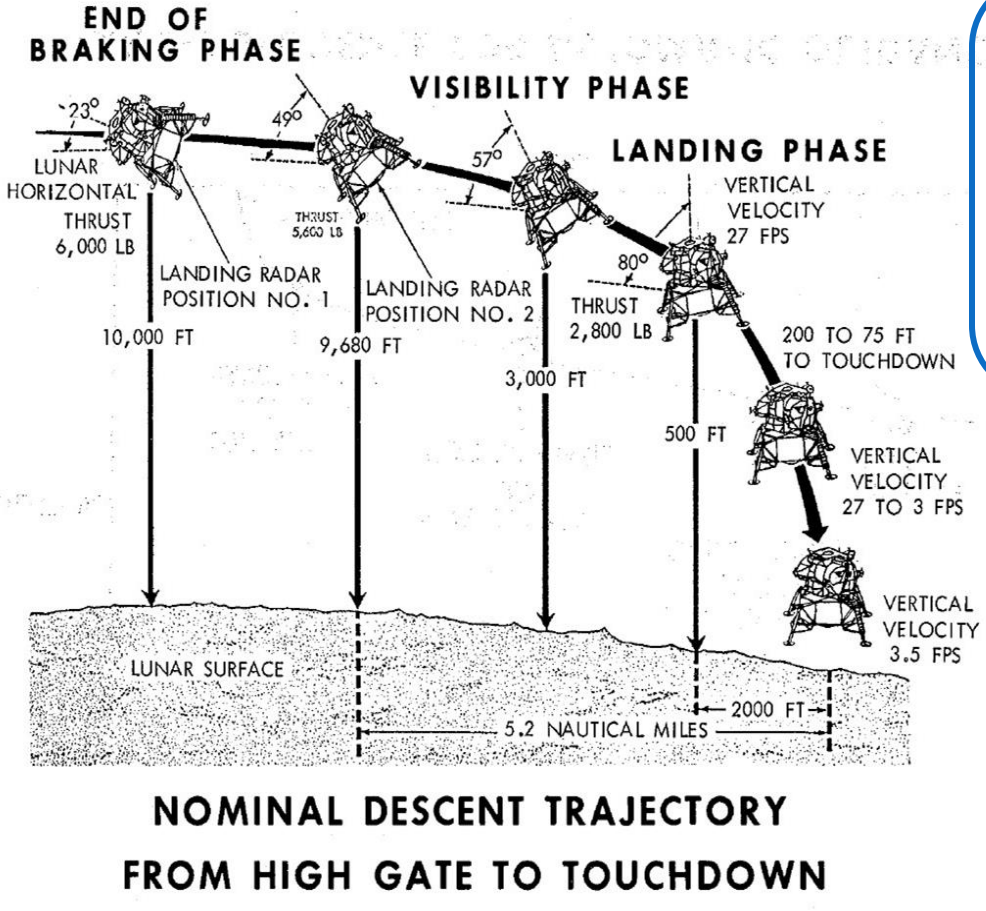
Landing on the moon requires less deceleration than landing on earth

See ScienceInSchool.org



Explore NASA Space Place - Mass vs Weight & Gravity

Lunar Lander Telemetry



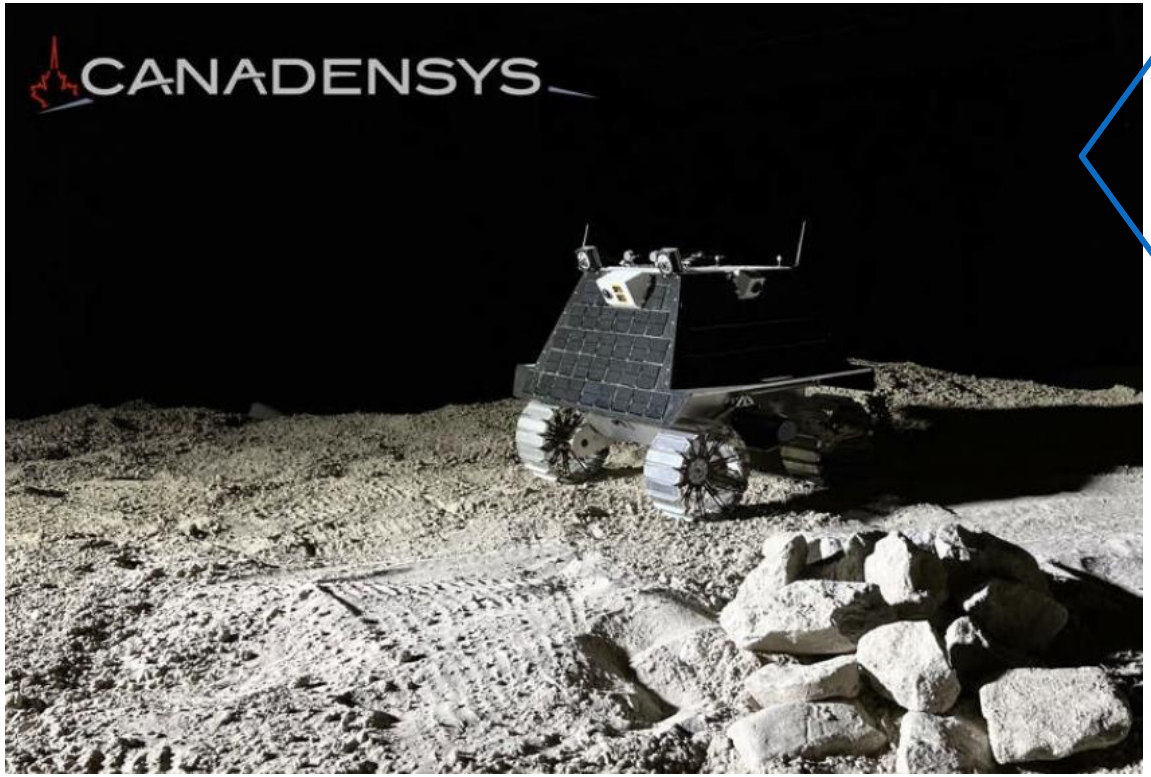
NOMINAL DESCENT TRAJECTORY
FROM HIGH GATE TO TOUCHDOWN

Telemetry automatically collects, transmits and measures data using various sensors on the lander. The data is transmitted back to a central location for analysis to adjust and control the lander or similar technologies

TALES FROM THE LUNAR MODULE GUIDANCE COMPUTER

SCIENCE NORTH SCIENCE NORD

LUNAR LANDER CHALLENGE



DISCUSSION

What are some of the challenges to landing any payload on the moon?

Can you think of any solutions?

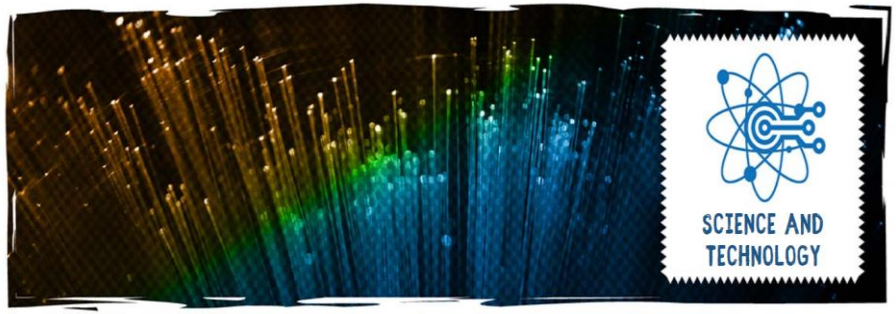
What data would be helpful to measure for a lunar lander?

Why is it important to know the rate of acceleration of the lander?

Canadensys Aerospace

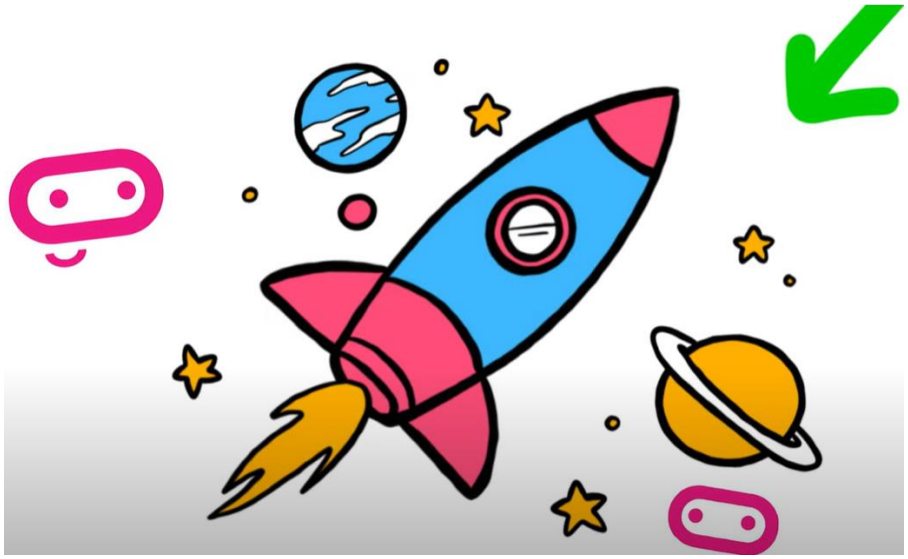
ACTION PART A:
LUNAR RESUPPLY MISSION

LUNAR RESUPPLY MISSION



Try out the LUNAR RESUPPLY MISSION by the CSA where you design a lunar lander to safely bring the rover payload to the surface. Make sure to build your lander so it can support and protect the payload (**Micro:bit + battery pack**)

Action Part B: Lunar Lander Telemetry



Watch This Video!

Accelerometer

Now that you've built your lunar lander, what kind of telemetry can we add to it to help measure landing data?

Why would we want to know the rate of acceleration/ deceleration of our device?

Let's Build an Accelerometer!

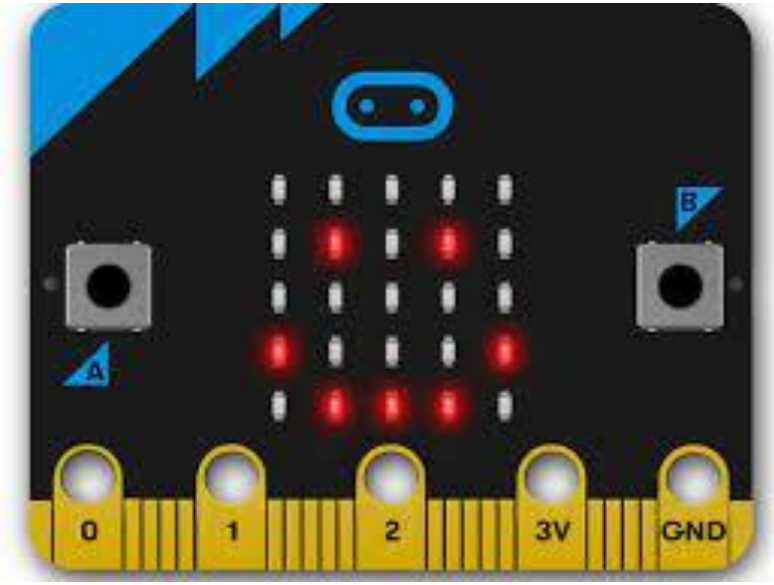
Micro:bits Accelerometer

SCIENCE NORTH SCIENCE NORD

Introducing Micro:bits

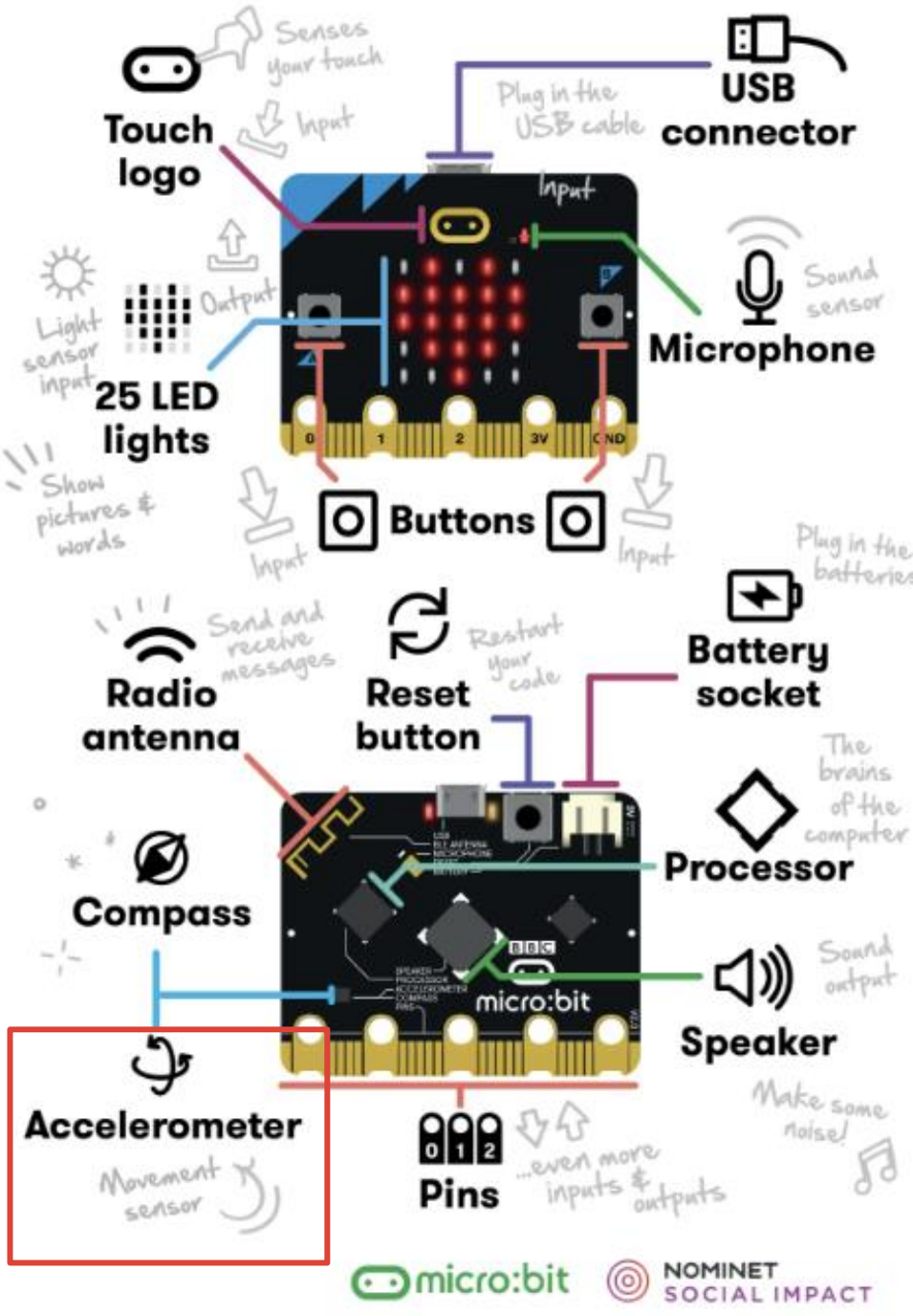
Want to learn more?

1. Micro:bit introductory lessons "First Steps"
2. Teacher-Made Micro:bit guide & science lessons
3. Make Code - try out a few tutorials!



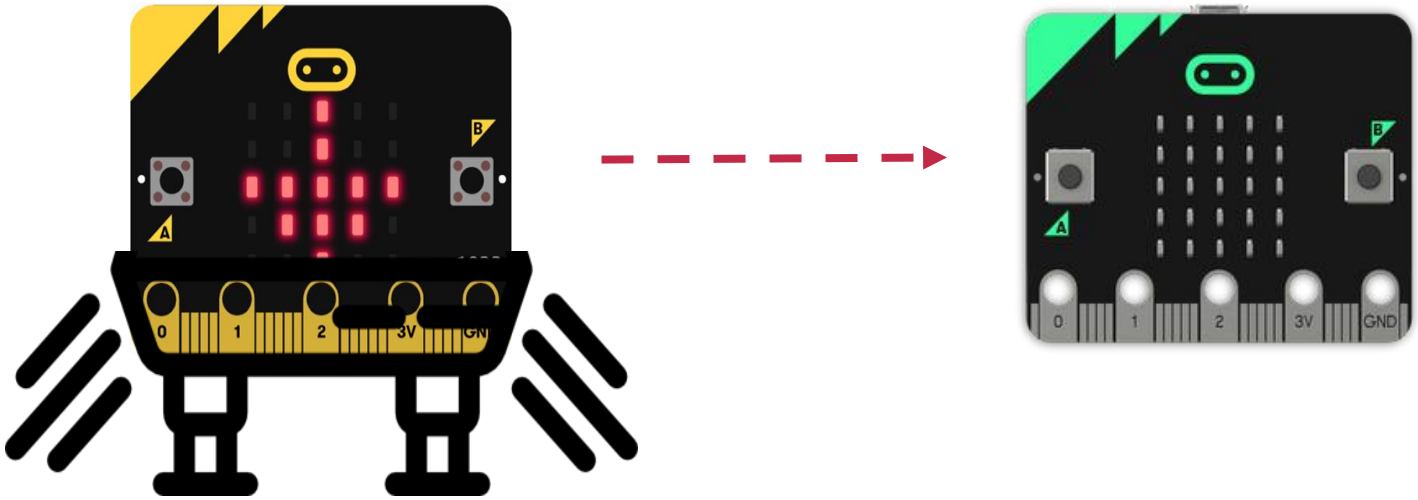
Watch This Video!

Computational thinking - Inputs & outputs



Micro:bits Inputs and Outputs
Micro:bits - Features (optional)

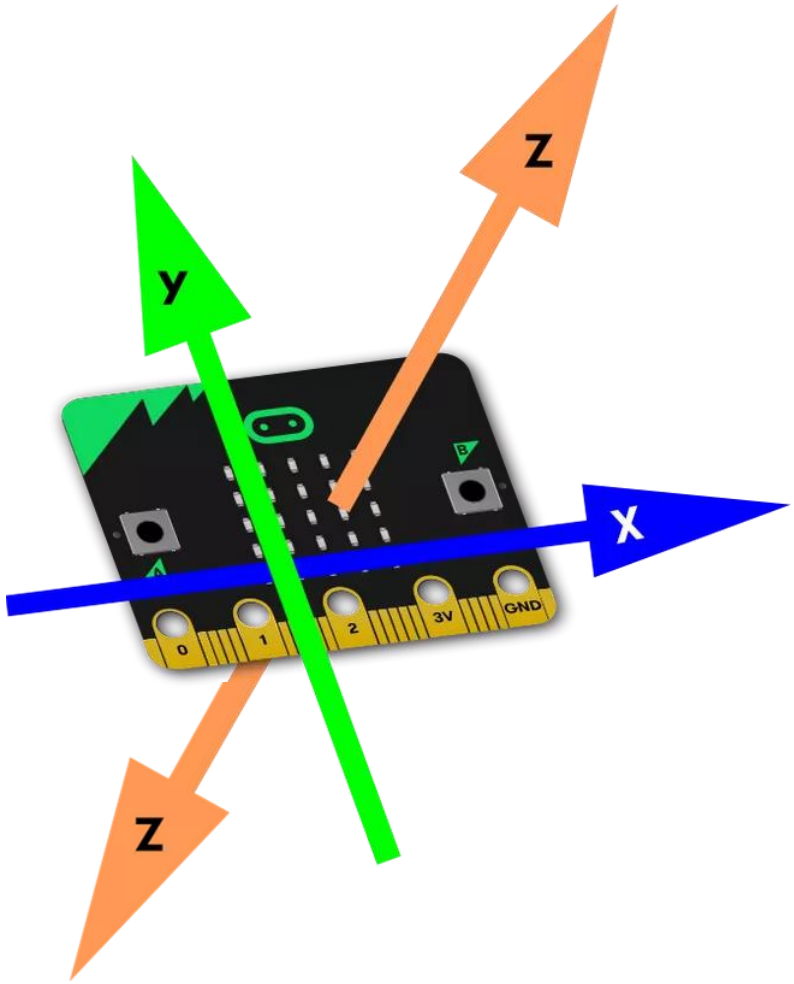
Radio Accelerometer



You will code one Micro:bit (SENDER) and attach it (and the battery pack) securely to your lander

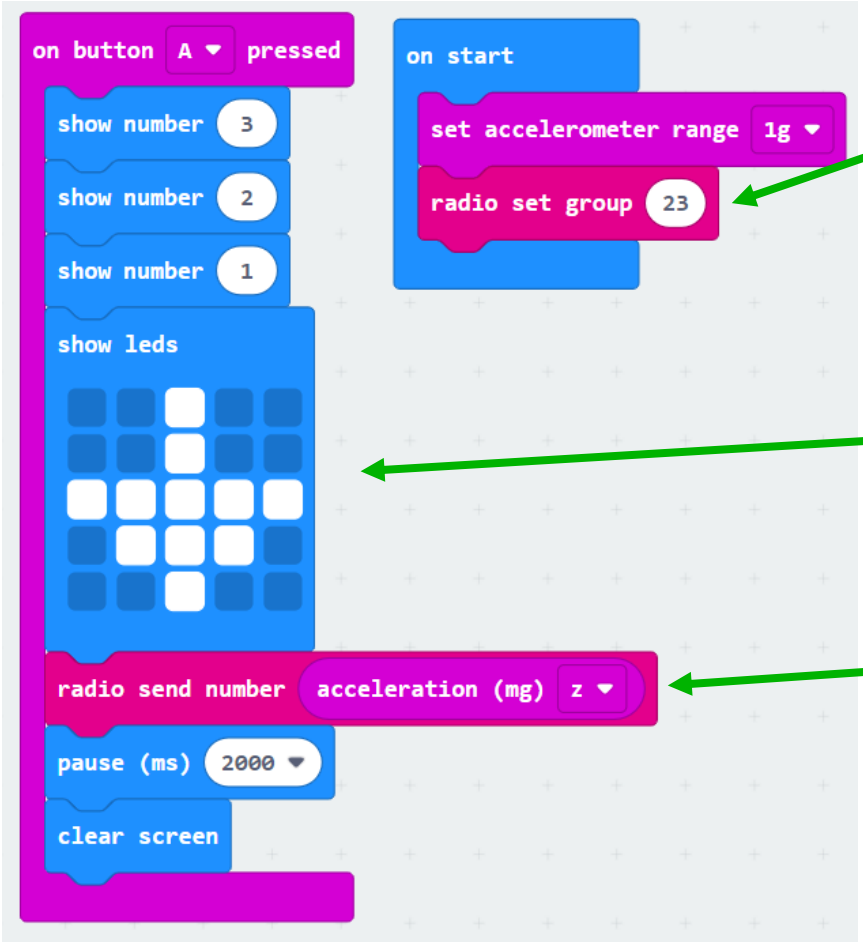
You will code the other Micro:bit (RECEIVER) to receive the acceleration rate data

Setting the Accelerometer

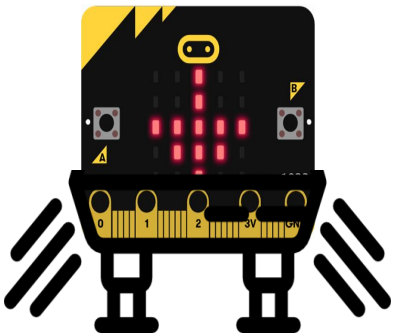


We are measuring the lander as it falls vertically, along the **Z axis**

1. SENDER (LANDER) CODE



Pick a unique 2-digit number for your set of Micro:bits. This is what helps them "talk" to each other



When you see the arrow, drop your lander!

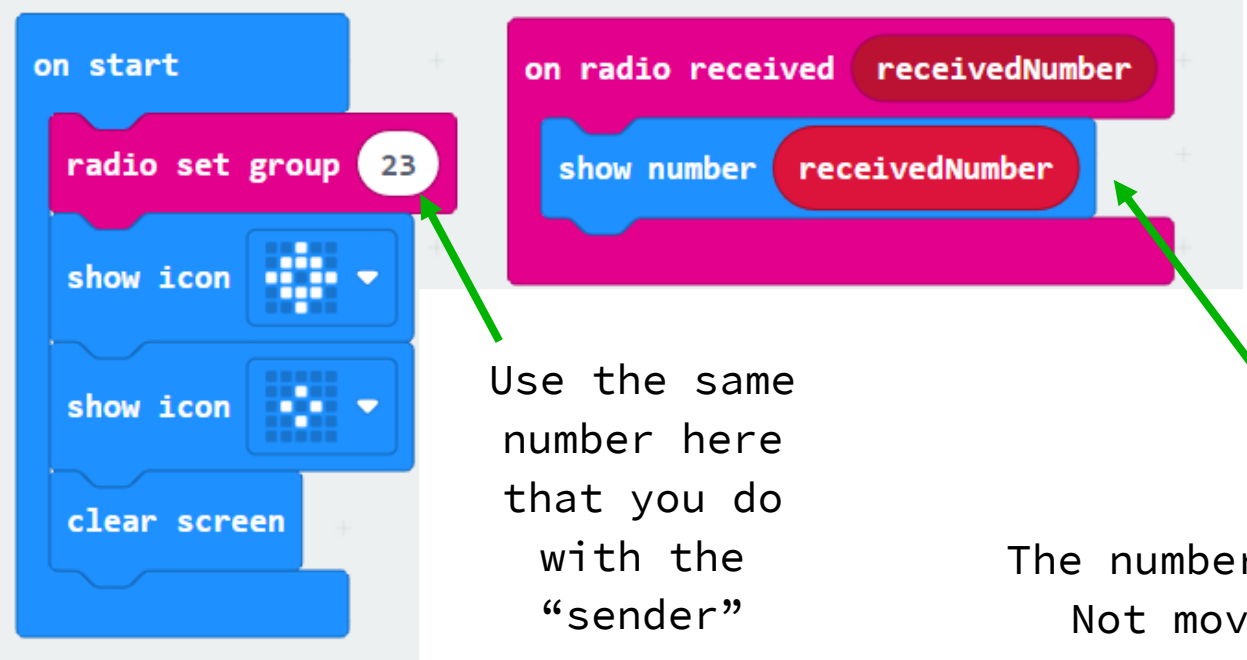
Z means a vertical plane (up and down)

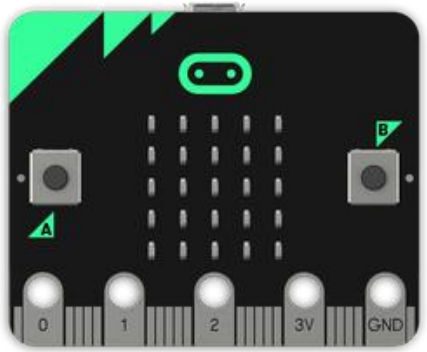
Try out this simple code in MAKECODE!

HEX File

SCIENCE NORTH SCIENCE NORD

2. RECEIVER CODE





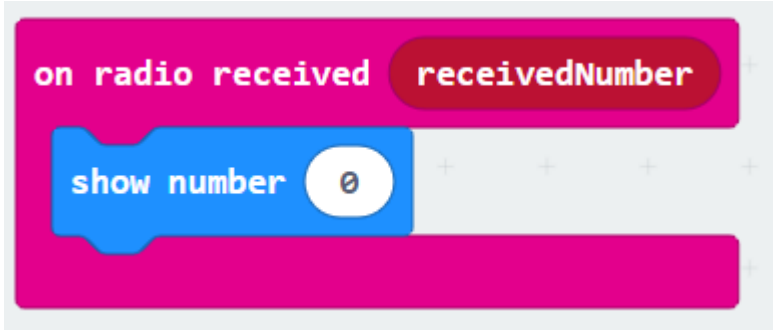
Use the same number here that you do with the "sender"

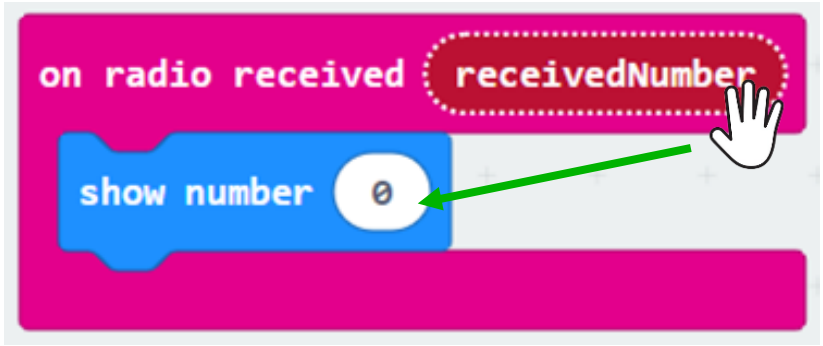
The number displayed will be:
Not moving = closer to 0
Moving Up =

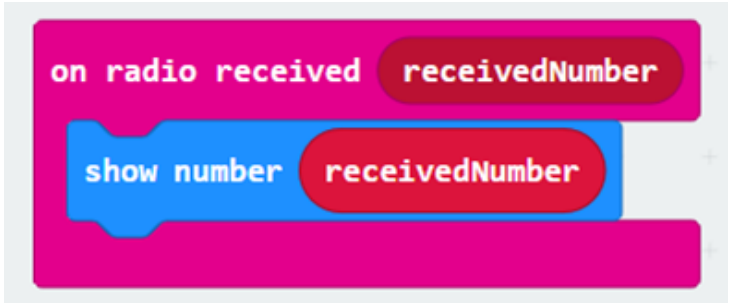
HEX File

QUICK TIP!

Drag the “receivedNumber” block down to the show number space and it will click into place

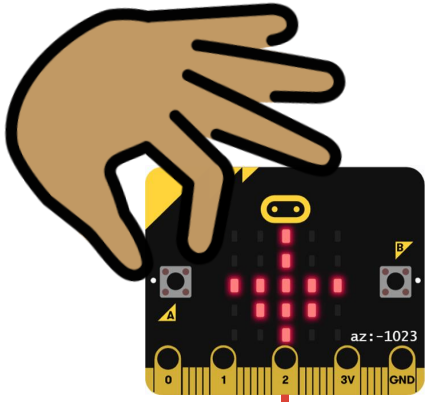






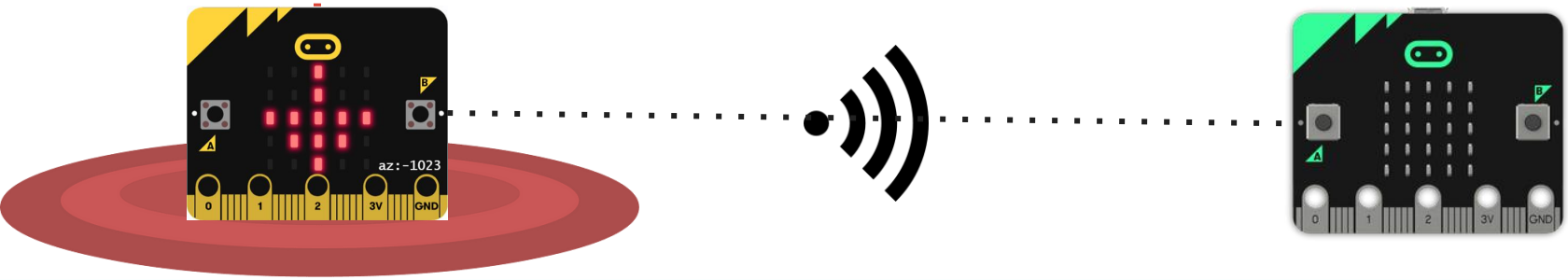
HEX File

3. ACCELEROMETER DROP TEST

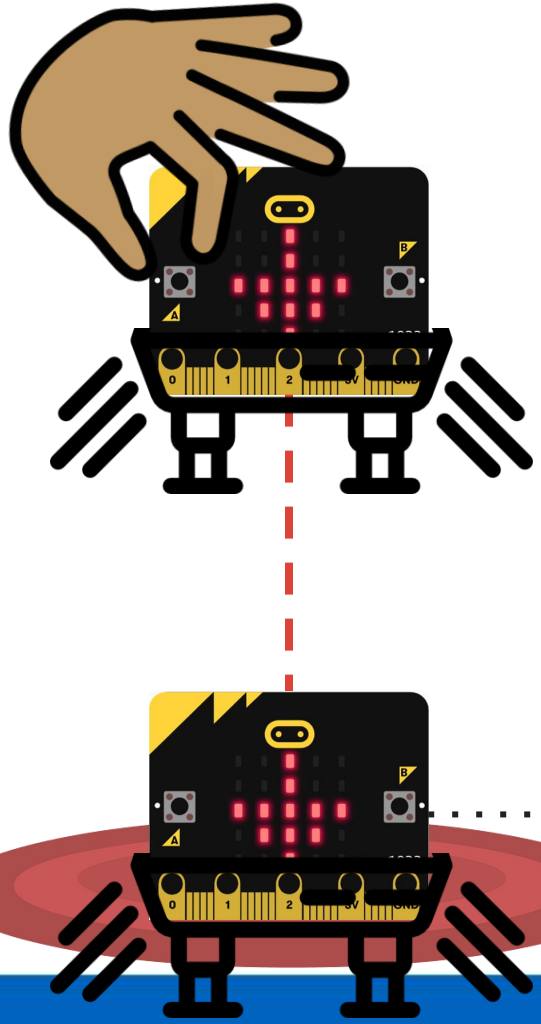


Test it out by CAREFULLY dropping your Micro:bit between your hands or on to a soft carpeted surface

Test it out 3 times and record the numbers displayed



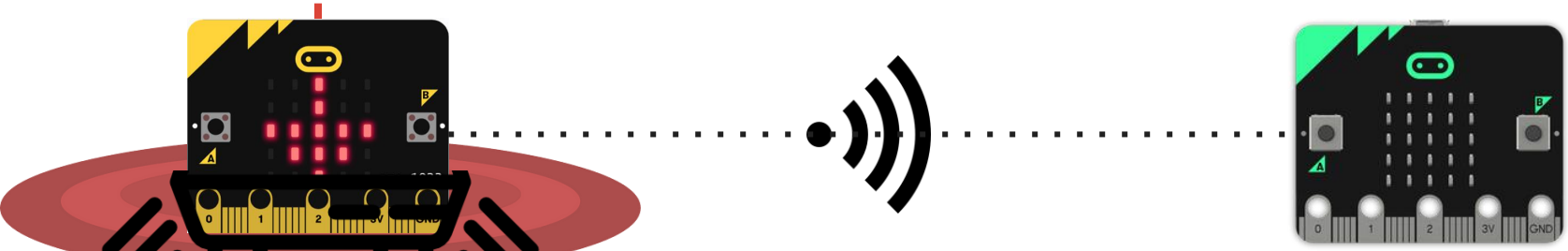
4. Lunar Lander drop test



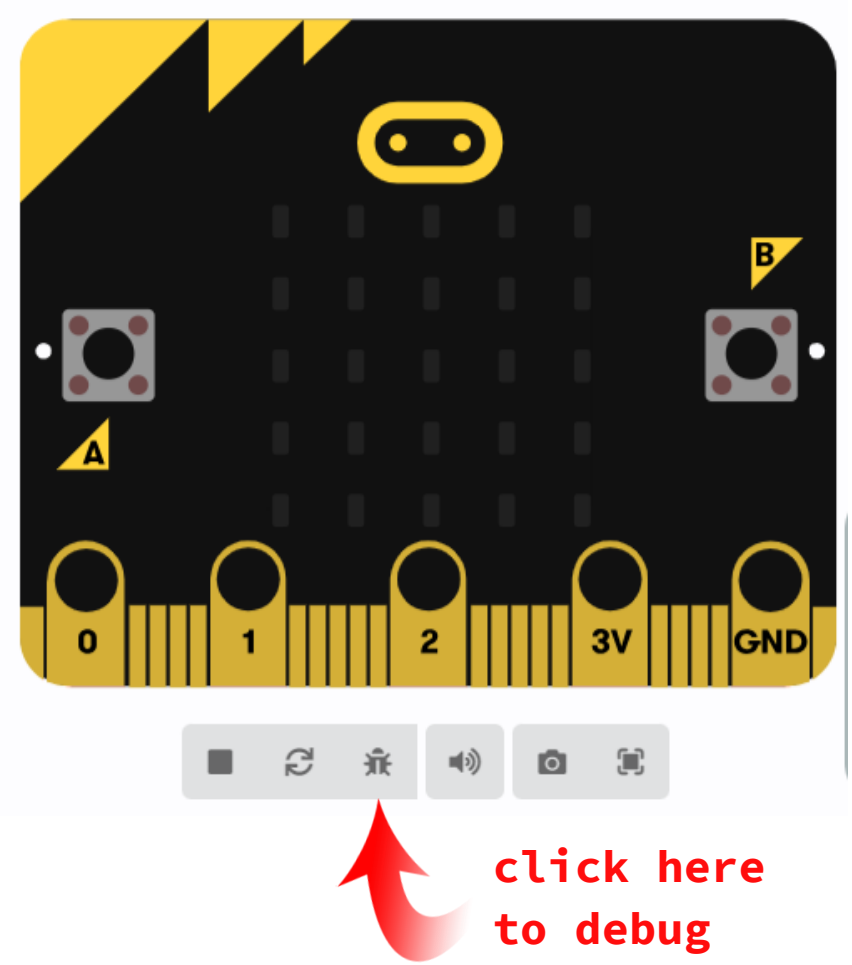
Attach your Micro:bit to your lunar lander.

Test it out by CAREFULLY dropping your Micro:bit between your hands or on to a soft carpeted surface.

Test it out 3 times and record the numbers displayed. Are they any lower?



DEBUGGING



IT DOESN'T WORK!

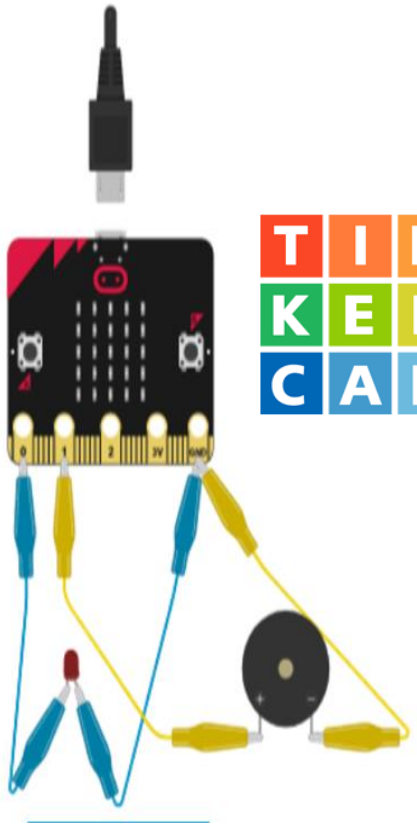
- A micro:bit is only as good as the code! Go through it carefully and even restart from scratch if you have to.
- Think like a machine. Take it one step at a time and test out each step separately as you go
- Ask a classmate or teacher for help.
- When it doubt, look it up online!

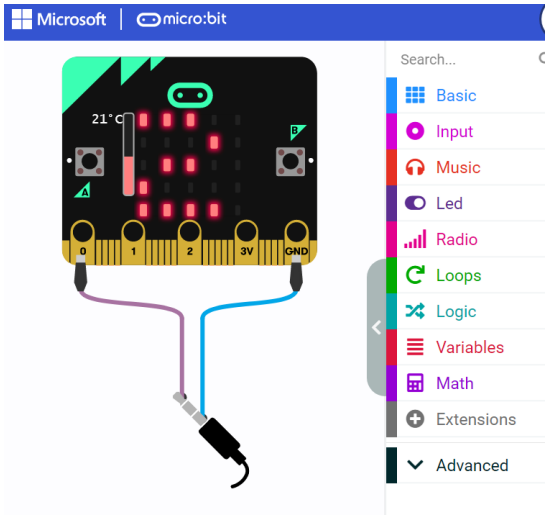
Consolidation

Reflection

- Compare your data from dropping the Micro:bit with and without the lunar lander. Was there a significant decrease in deceleration?
- Why is it important to be able to measure the acceleration or deceleration of a lunar lander?
- What other telemetry would be useful for a successful lunar landing?

Accomodations





No micro:bit? No problem!

- You can still build, test, and debug using MakeCode!
- You can also build virtual Micro:bits in Tinkercad too!

Additional Resources

Black Gold School District micro:bits!

Canadian CubeSat Project

micro:bit Rockets