
SAM
LABS
Vernier
Ball Toss

Learn

Key Information

How much energy does it take to toss a ball?

- Energy is the ability to do work. When an object has energy, it can exert a force on another object.
- There are different forms of energy:
    - Kinetic energy is the energy of motion.
    - Potential energy is associated with a system (or group) of objects and determined by their positions.
- When one object exerts a force on a second object, it transfers some of its energy into it. For instance, when you toss a ball, you transfer some of your energy into the ball.

Unplugged Activity

How does energy move and change?

- What are some different forms of energy?
- What are some situations where energy is transferred from one thing to another?
- What are some situations where energy is transformed from one kind to another?

Unplugged Activity

Complete a KWL chart to record your knowledge

KWL Chart

Name _____

Date _____

Topic: _____

Know	Wonder	Learned
What do you think you already know about this topic?	What do you wonder about this topic? Write your questions below.	After you complete your project, write what you learned.

Key Information

What factors determine how much energy is transferred in a ball toss?

- Exerting more force on the ball means you are transferring more energy into the ball.
- As the ball rises into the air, the gravitational force will transform some (maybe all) of its kinetic energy into gravitational potential energy.

Unplugged Activity

Explore Force and Mass

Take a variety of balls (large, small, heavy, light) and practice tossing them above the Go Direct Motion Detector. As you toss the balls, pay particular attention to how much *force* you need to exert on the ball to get it to a certain height.

- Which balls require more force?
- Do bigger balls always require more force?
- If the hoop is higher, does it require more force?

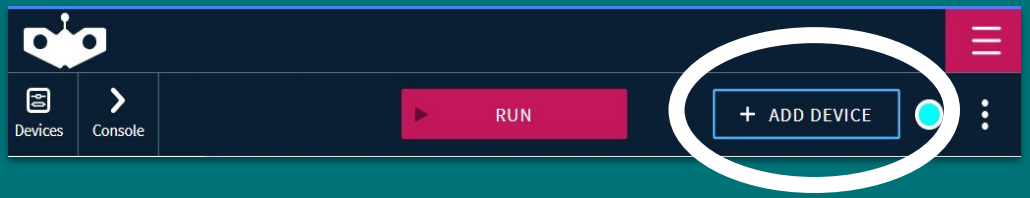
Do

Guided Lab - Part 1

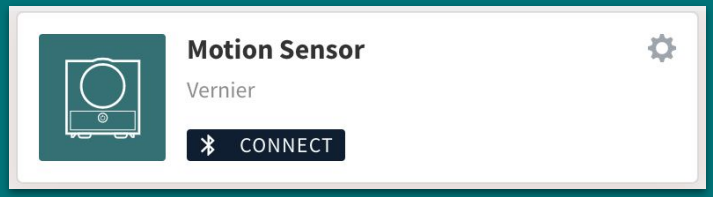
Guided Lab - Part 1

Design and code a program that measures the relative strength of the electromagnet

A Go to https://edu.workbencheducation.com/

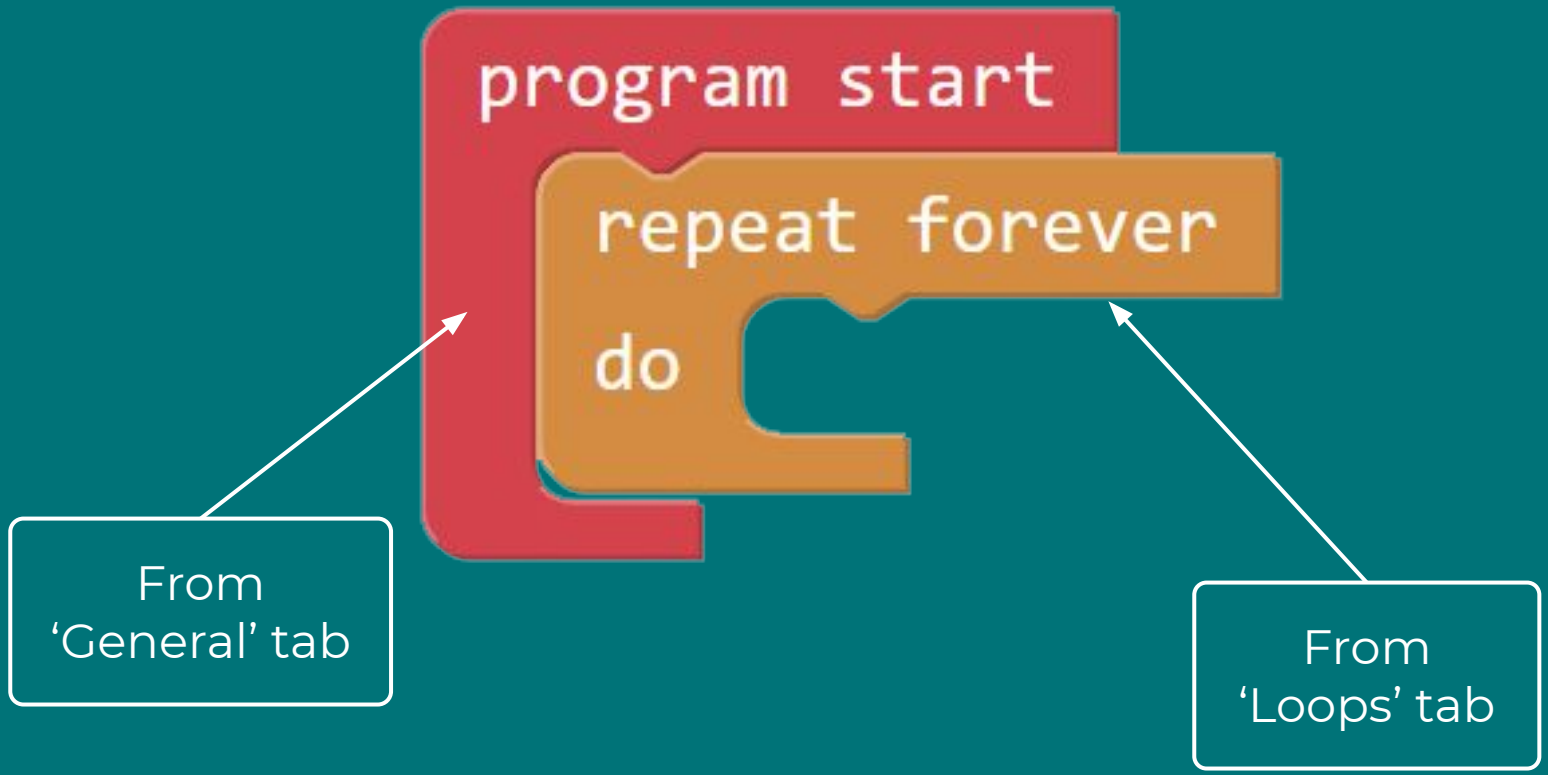


B On the Workspace click ‘ADD DEVICE’ and select: ‘Motion Sensor’

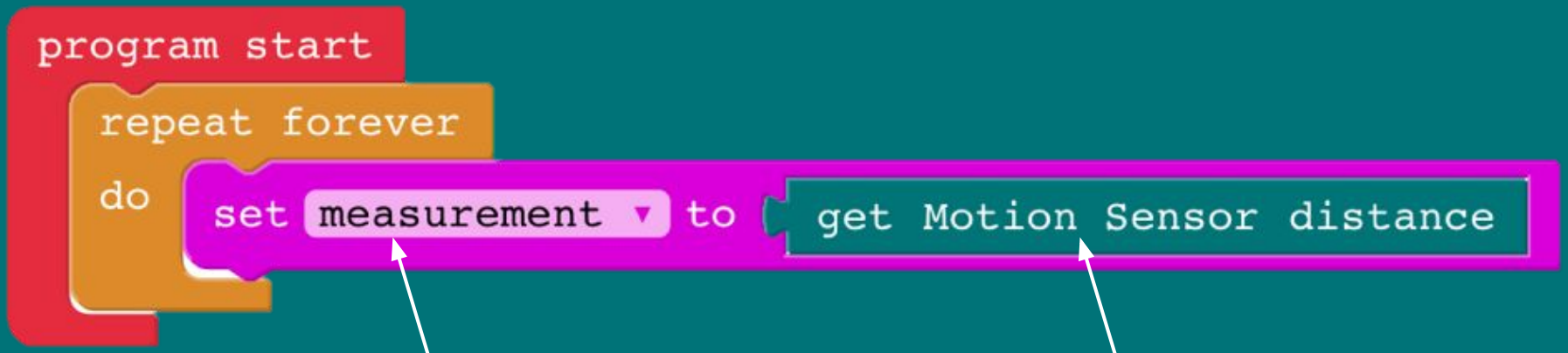


C Connect the Motion Detector, click ‘CONNECT’ and ‘Pair’.

Guided Lab - Part 1



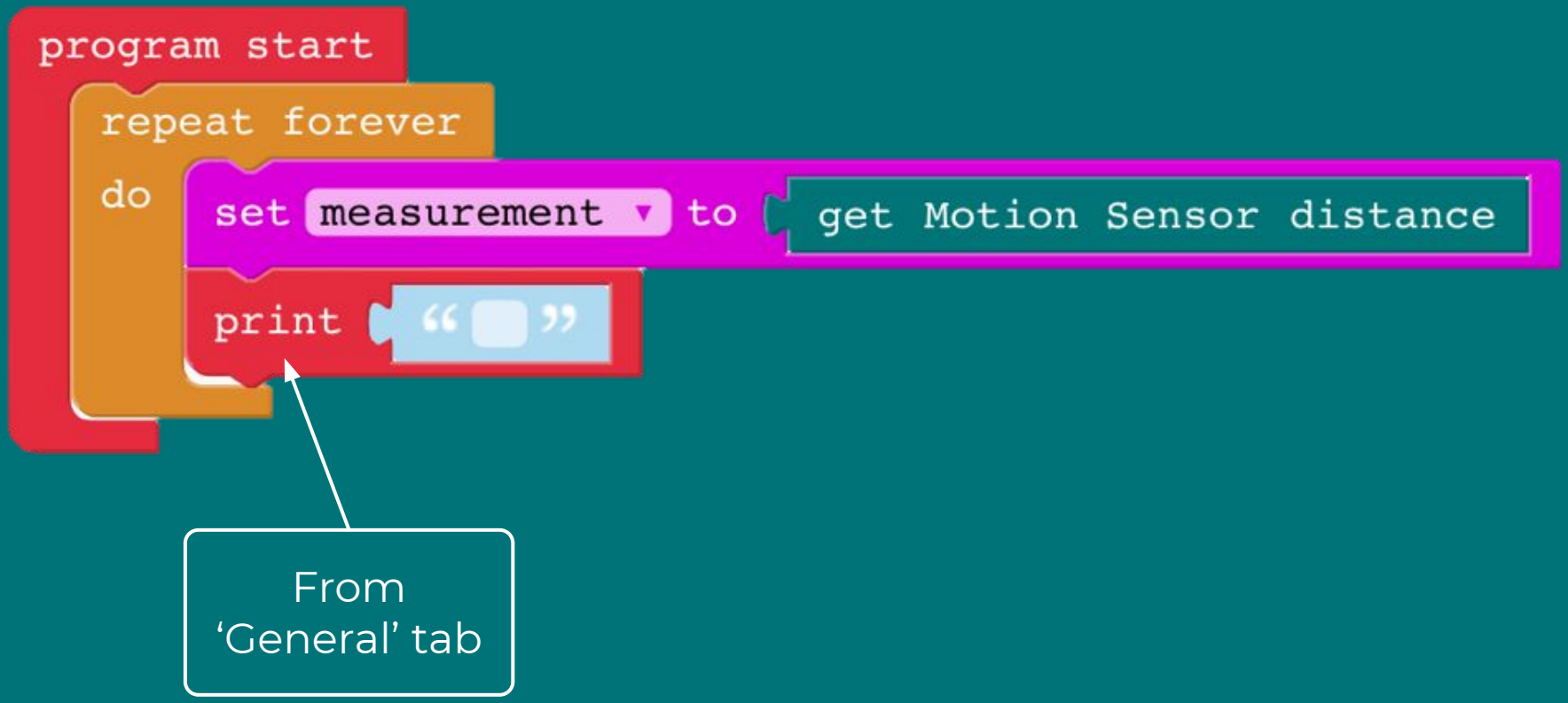
Guided Lab - Part 1



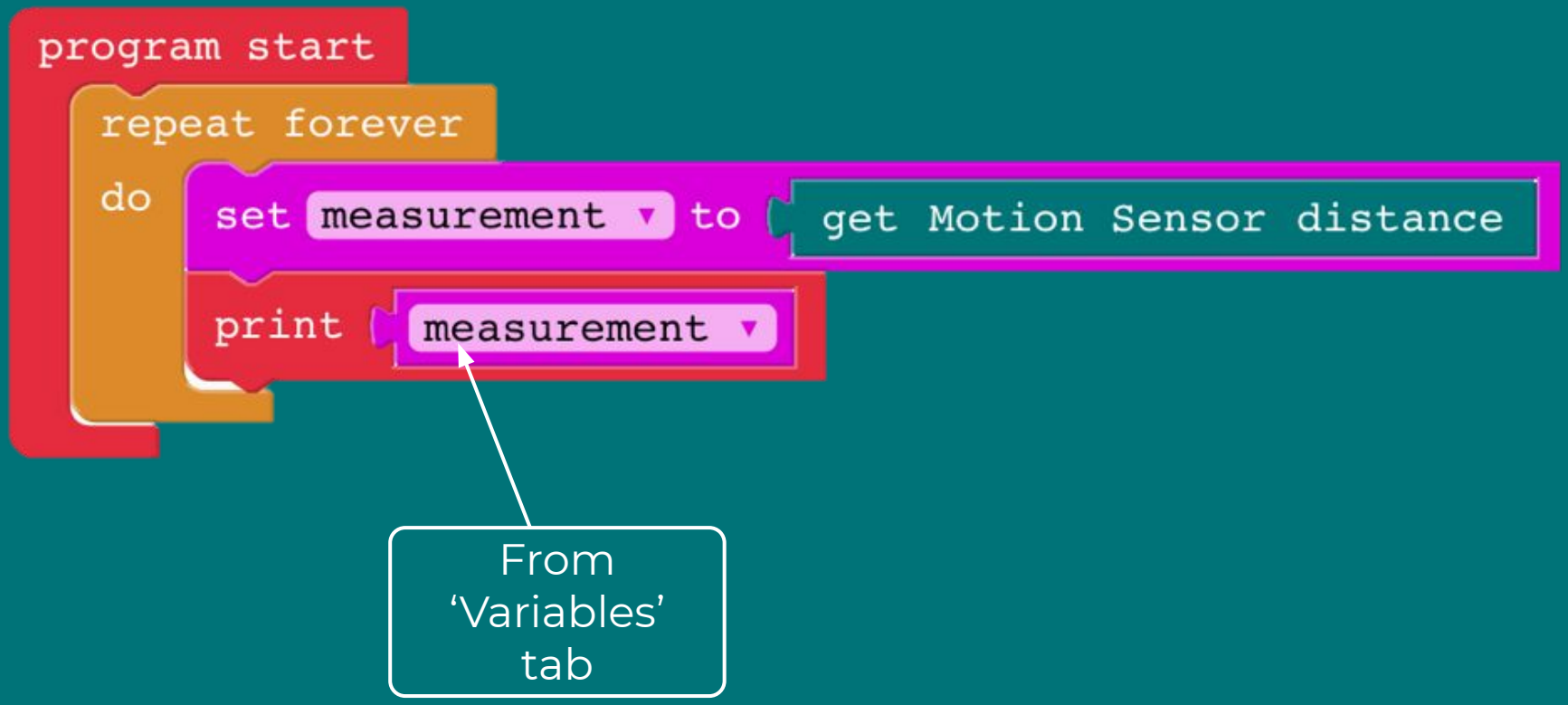
From ‘Variables’ tab
Create ‘measurement’ variable

From
‘Motion Sensor’ > ‘Values’ tab

Guided Lab - Part 1



Guided Lab - Part 1



Run your program

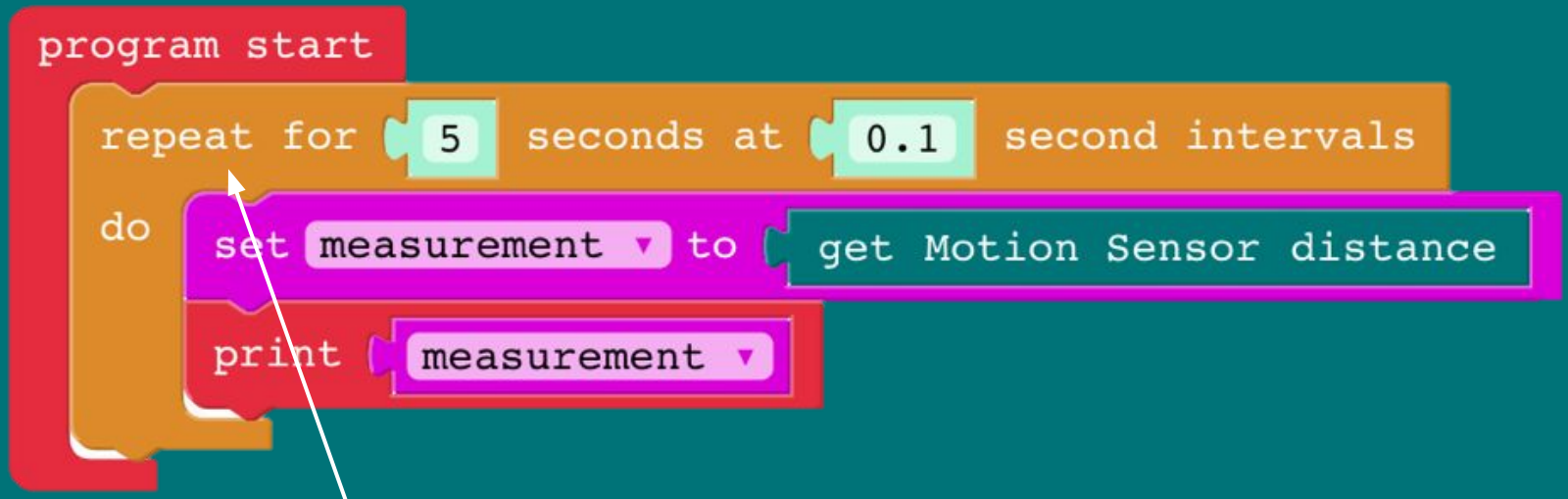
Do the Motion Detector readings make sense?

Debug

How can I get data for just a short period of time so I can better understand it?

Debug Opportunity

How can I get data for just a short period of time so I can better understand it?

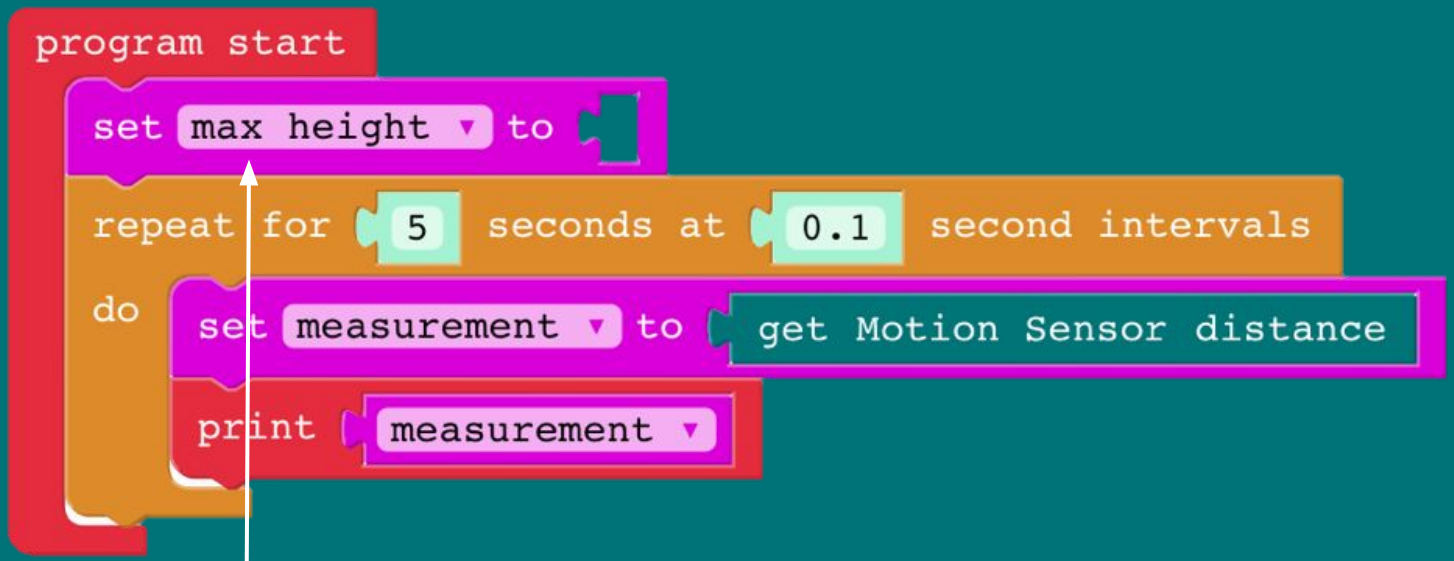


Do

Guided Lab - Part 2

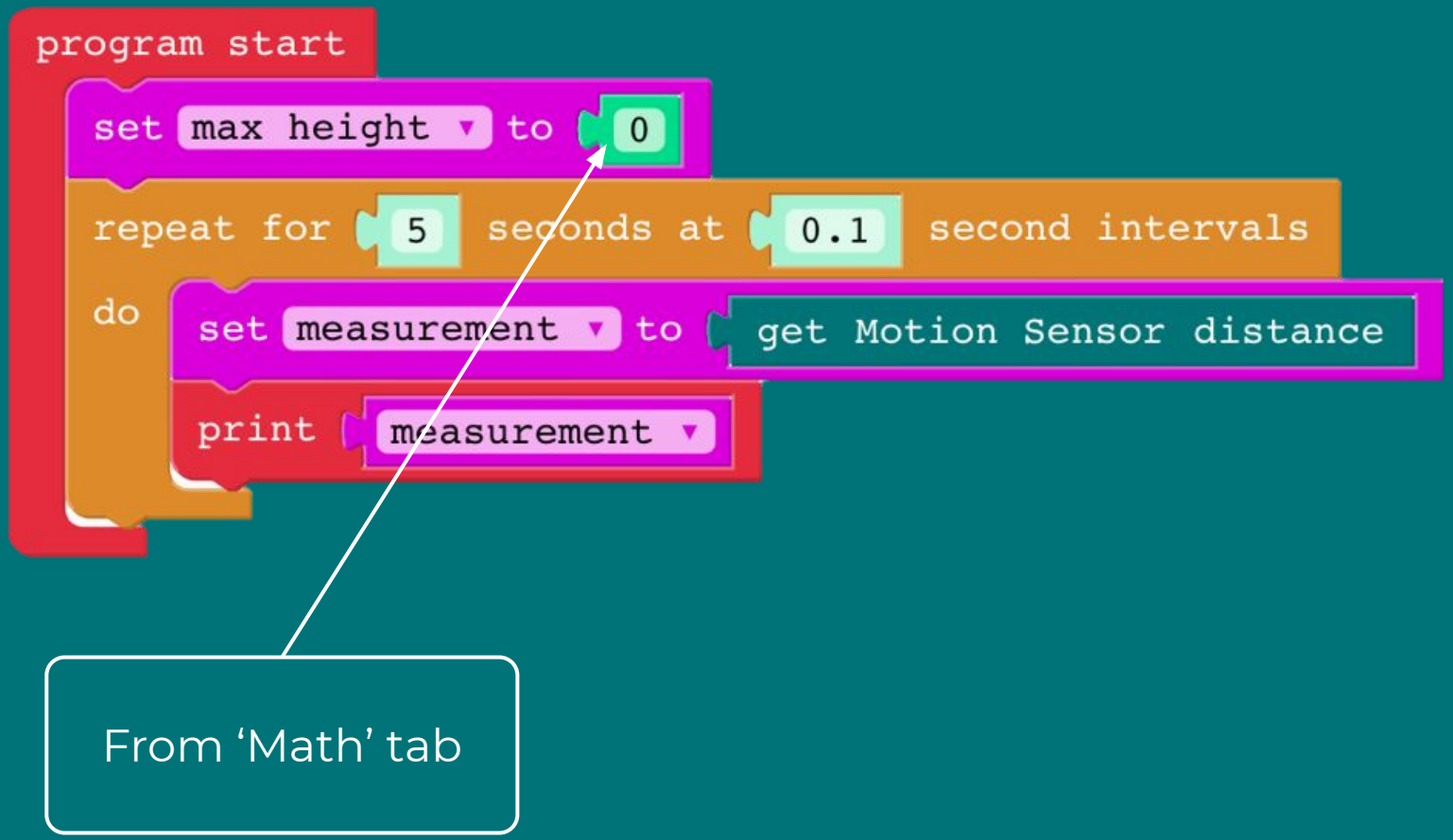
Guided Lab - Part 2

Design and code a program that automatically finds the maximum height the ball reaches.

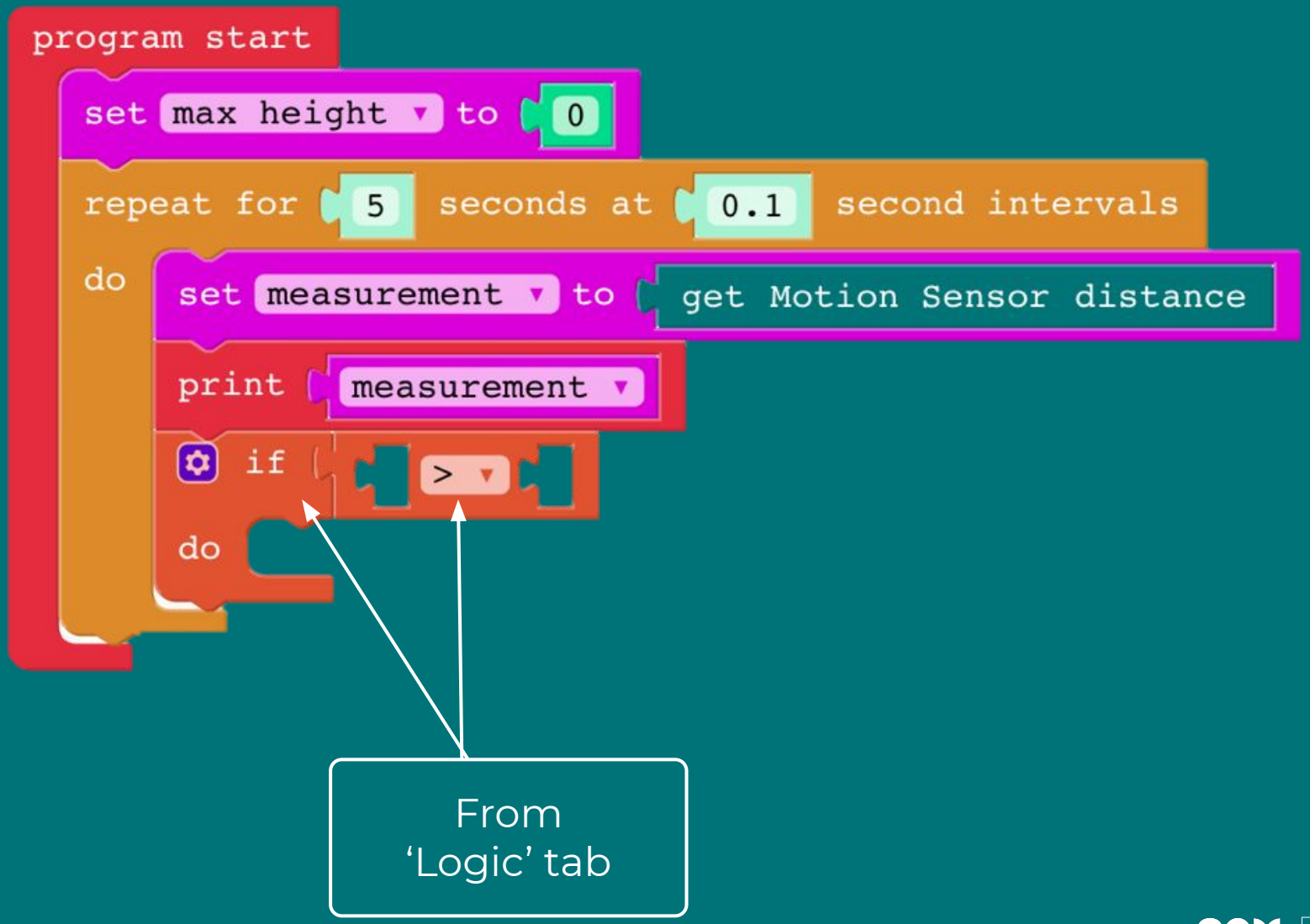


From ‘Variables’ tab, create new variable

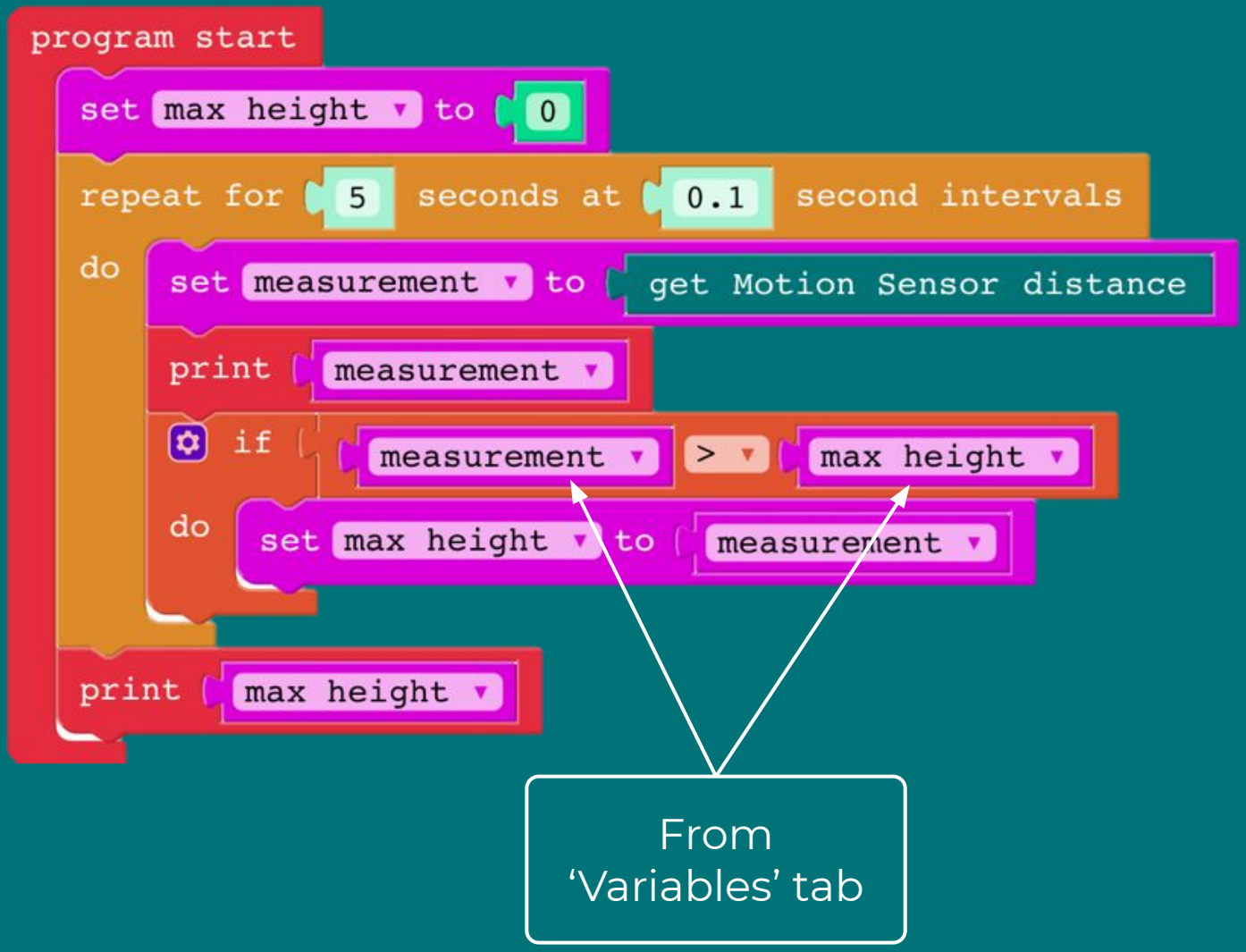
Guided Lab - Part 2



Guided Lab - Part 2



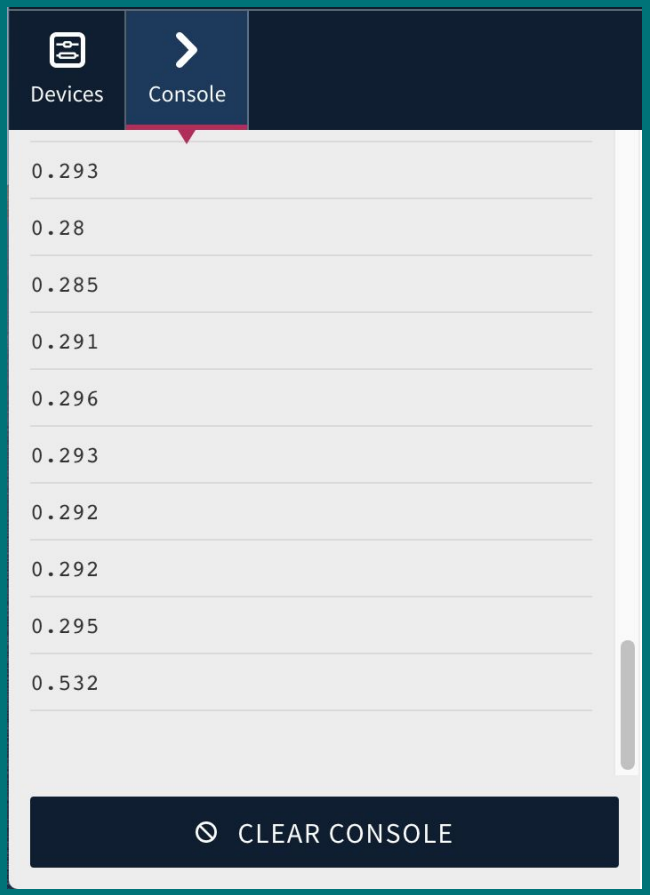
Guided Lab - Part 2



Guided Lab - Part 2

Run your program

The last value printed in the Console will be the maximum height recorded by the Motion Detector.



Extension Activities

Design Brief 1
Google Sheet

Log your maximum height data to a Google Sheet. Can you add in details about which ball was tossed to better describe each maximum height?

Design Brief 2
RGB LED

Change the LED color depending on how high you threw the ball. Can you use the LED color to alert you if you reached your desired height?

Design Brief 3
Google Sheet + RGB LED

Log your maximum height data into a Google Sheet and change the LED color to visualize the maximum height of each toss.

Reflect

Exit Tickets

When does the ball have the greatest amount of kinetic energy? the least?

At what sensor reading(s) does the ball have the least amount of kinetic energy?