LEARN ON THE LAND

PINNGUAQ

OCTOBER 2020

PINNGUAQ

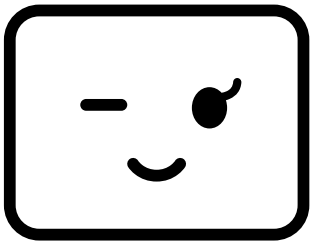
Welcome!

We are so glad to offer our Learning on the Land through STEAM kit to you! In this kit, we will explore our environment and our role as Environmental Stewards. We will read about the **Innunguiniq** principles (how to become a capable human being) to learn about our responsibilities towards our environment. In this kit, you can find instructions and information on how to complete each activity.

We hope you enjoy our STEAM activities, and that you have fun coding your own projects!

Sincerely,

Your friends at Pinnguaq



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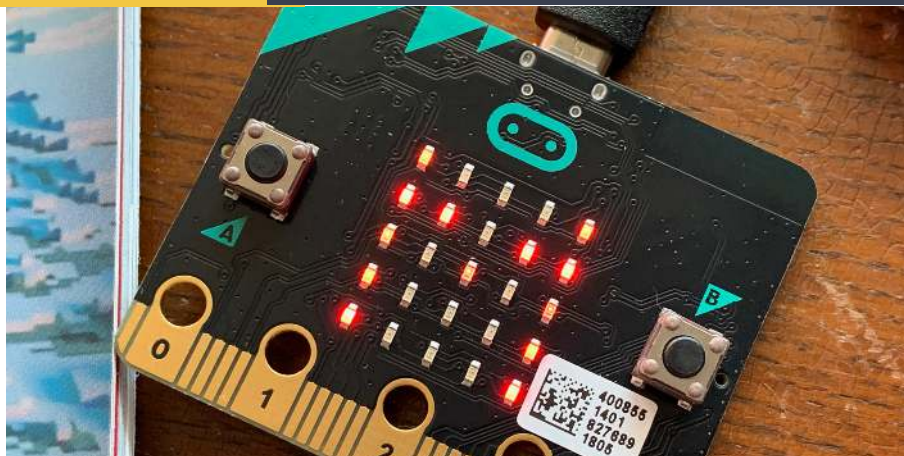

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MICRO:BIT INTRODUCION ACTIVITY

OVERVIEW

Let's get your Micro:bit set up and get to know it. The micro:bit and enviro:bit technology will help you become an Environmental Steward and follow the Inuit principles of Qanuqtururangniq and Avattimik Kamatsiarniq. The micro:bit and the enviro:bit have incredible sensors that will give you information about your environment! It is important to observe the world around you as an Environmental Steward.

BACKGROUND INFO

The micro:bit is a pocket-sized computer. You can program this mini computer with your computer and the MakeCode editor. You can use the online editor, or the offline editor that is installed onto your computer and loaded onto the USB. Or, you can install the offline editor that is on the USB stick that came in your kit onto any computer. Follow the steps below to get to know how to code and use your Micro:bit.

VOCABULARY

Micro:bit is a pocket sized computer with an LED display, and information inputs and outputs.

Code is the language we use to communicate with computers.

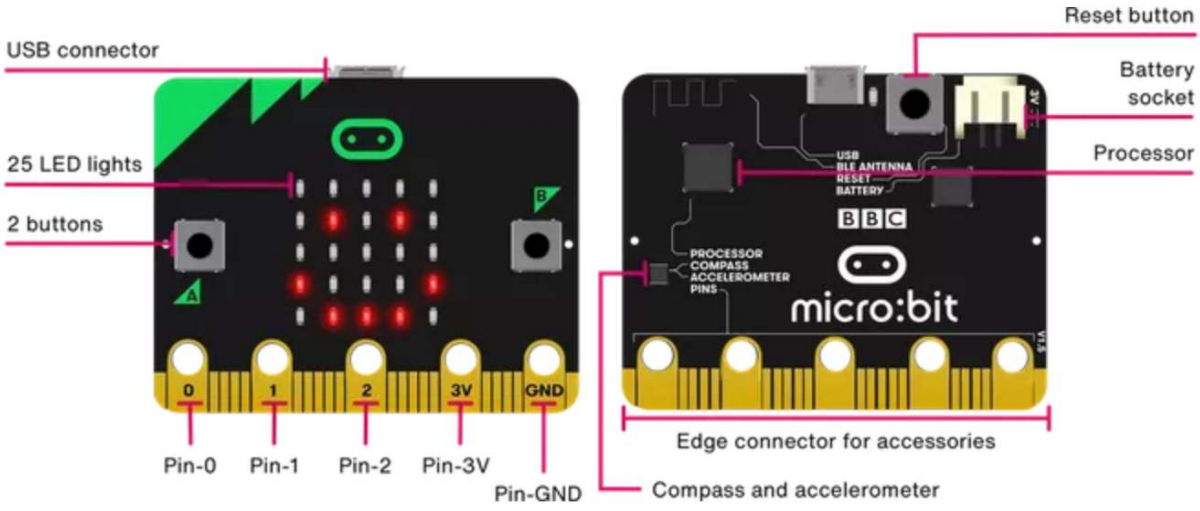
Materials you will need:

- a micro:bit
- two (3) AAA batteries
- A battery pack

GET TO KNOW YOUR MICRO:BIT! PLUG IT IN AND BE SURPRISED!

- Put the 2 AAA batteries into the battery pack.
- Match the + and - symbols to put each battery in correctly.
- Plug the battery pack into the micro:bit. You plug the battery pack into the white box at the top left corner of the micro:bit.
- Read the Hello message on the micro:bit display.
- Follow the arrow and press Button A.
- Follow the arrow and press Button B.
- Shake the micro:bit and watch the display.
- Play chase the dot by tilting your micro:bit.
- Now you are all set to learn how to code your microbit!
- In Activity Two, you will create a name badge with your micro:bit.

At a glance



- .The Micro:bit has inputs (ways to take in information) and outputs (ways to send out information).
- Your Micro:bit is just like any other computer and will only do what you tell it to do.

TAKE A CLOSER LOOK AT YOUR MICRO:BIT -- FRONT

1. **Buttons** -- 2 Buttons on the front. A and B buttons that can be used separately or together to make things happen.

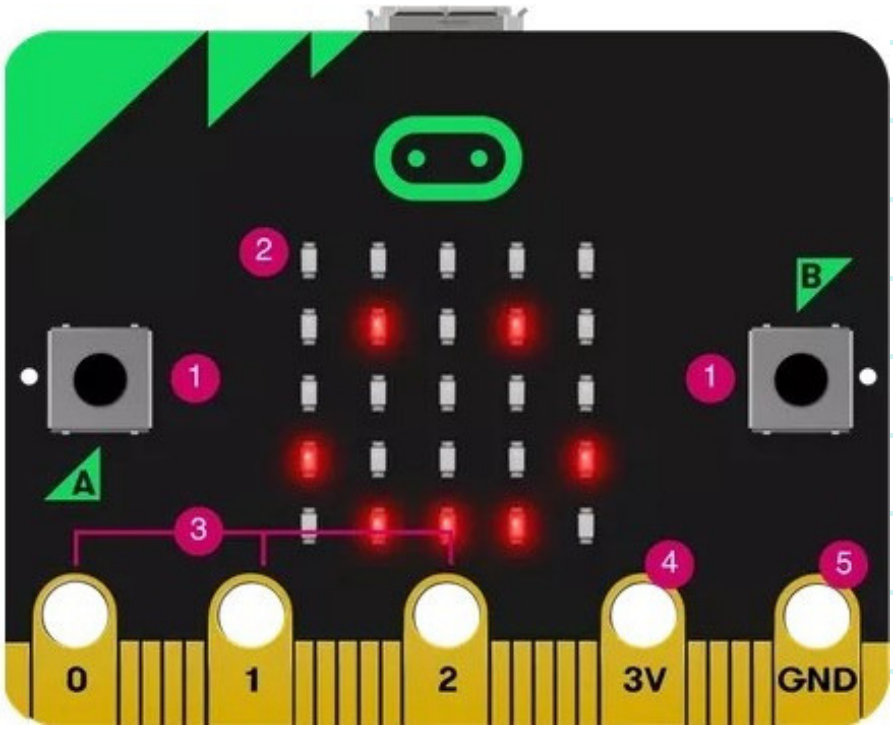
2. **Lights** -- There are LED lights in a square 5x5 grid on the front of the micro:bit. These can display pictures, words and numbers. They can also act as light sensors and measure how much light is shining on your microbit.

3. **Pins --** The pins along the bottom edge allow you to connect headphones, and other sensors and electronics to be able to do more things with your micro:bit. The Enviro:bit will connect to this part of the Micro:bit in the later activities. These are general purpose Input and Output pins (GPIO).

4. **3 Volt Power Pin (Pin-3V)** -- This pin lets you power external LED lights and other electronics.

5. **Ground Pin (Pin-GND)** -- The GND Pin is used to complete electrical circuits when you connect headphones, LEDs or external switches to your micro:bit. These are part of the power system of the micro:bit.

! **Important! Don't connect the Ground Pin and the 3V pin together!**



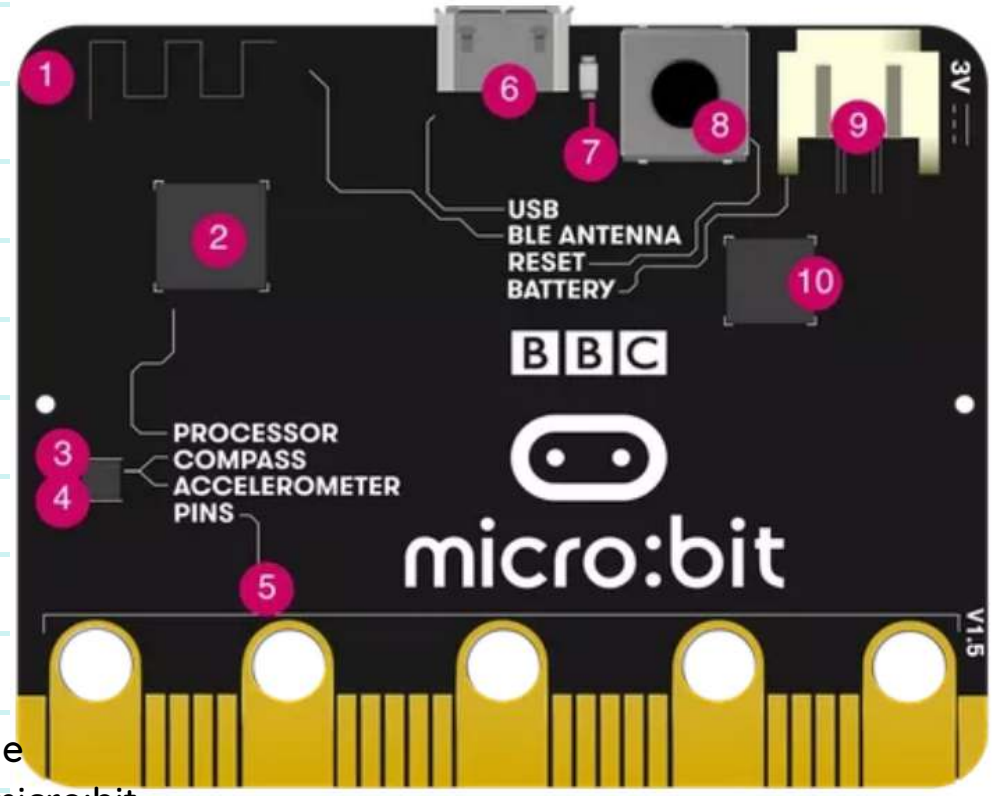
TAKE A CLOSER LOOK AT YOUR MICRO:BIT -- BACK

1. **Radio And Bluetooth antenna** -- Your micro:bit can communicate with other micro:bits by radio, and with other devices using Bluetooth.

2. **Processor and Temperature Sensor** -- The processor is the brain of the micro:bit. It also contains a temperature sensor so you can measure how warm your environment is.

3. **Compass** -- Find magnetic North or measure the strength of magnetic fields using the compass.

4. **Accelerometer** -- Measures gestures and forces in 3 dimensions.



5. **Pins** -- Connect your micro:bit to make sound, sense, touch and more.

6. **Micro USB socket** -- This is where you will plug in the micro USB to download your code programs onto your micro:bit.

7. **Single LED** -- This little light on the back of your micro:bit flashes when you are downloading a program. It also lights to show that it is being powered from the USB.

8. **Reset Button** -- Restart your micro:bit programs with the reset button.

9. **Battery socket** -- You can plug in your battery pack for power on the go when you don't want to be plugged into the computer for power.

10. **USB Interface Chip** -- The interface chip controls the USB connection. It is used for putting code onto the micro:bit (this is called flashing code). It sends and receives data back and forth to your computer.

01

ENVIRONMENTAL STEWARD NAME BADGE

OVERVIEW

Let's Get set up with the Microbit and make a fun Environmental Steward Name badge to get to know how to code the micro:bit.

BACKGROUND INFO

The Micro:bit is a mini computer. You can program the micro:bit computer using code. Code is the language we use to tell computers what to do. We are going to use the MakeCode language. You can use the online code editor https://makecode.microbit.org/ or use the offline code editor installed on your computer. The offline editor is also on the USB stick so you can install the offline MakeCode editor on any computer.

WHAT'S AN ENVIRONMENTAL STEWARD?

Environmental Stewards are people who watch and take care of our land and water. The Inuit values and beliefs show the importance of living a good life and taking care of our environment.

"Avattimik kamatsiarniq requires we pay careful attention to the environment as an important part of survival and sustainability. The care and importance we place on this also impacts on our personal health and well-being. For all of these reasons, it is important to think about the environment we grow up in and how we become good caretakers and good contributors to a healthy and positive environment."

-Shirley Tagalik, on Inuit Principles of Conservation

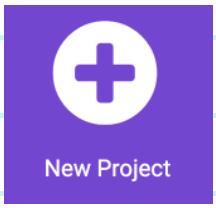
STEP BY STEP

you will need:

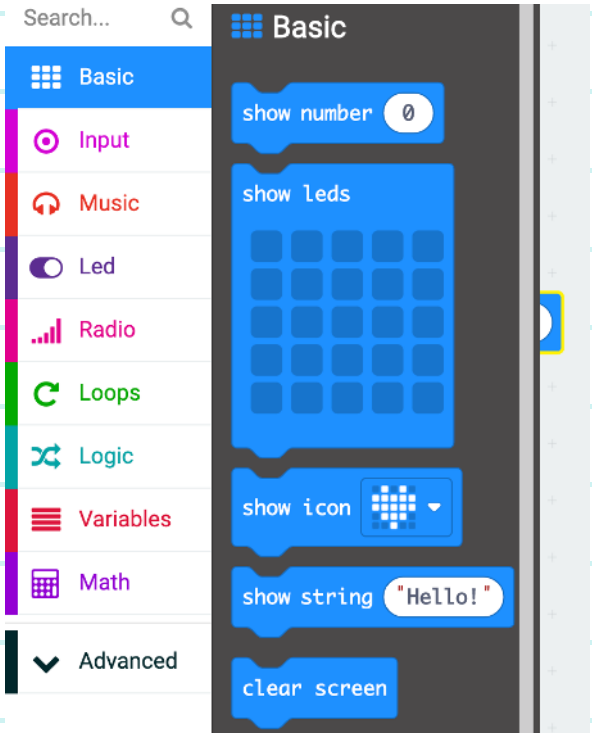
- a micro:bit
- a computer
- the MakeCode editor
- a mini usb cord

1. Go to the microbit MakeCode editor online https://makecode.microbit.org/ or the offline editor on your computer.

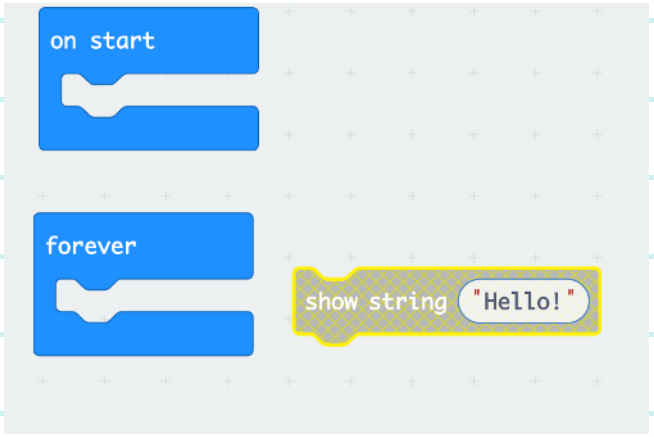
2. Click to create a New Project. Give your project a name. For example: "Name Badge".



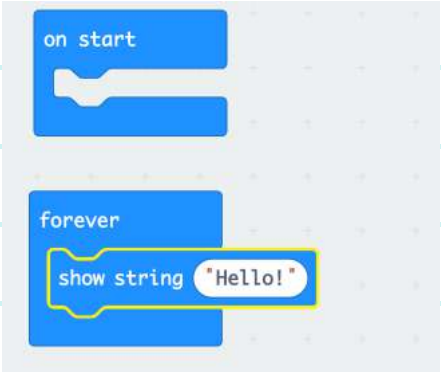
3. Click on the blue Basic block tab and find: "Show String".



4. Drag the "Show string" block onto the coding area.

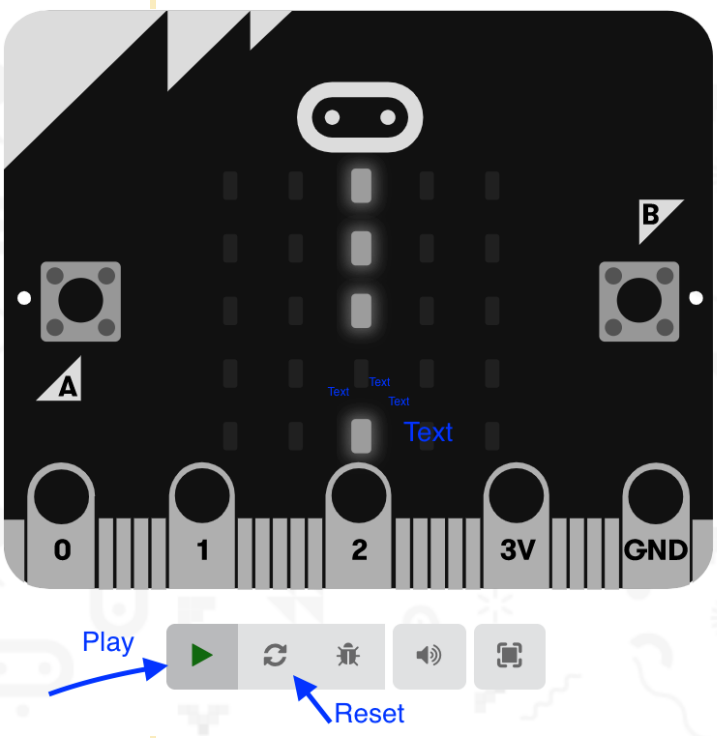


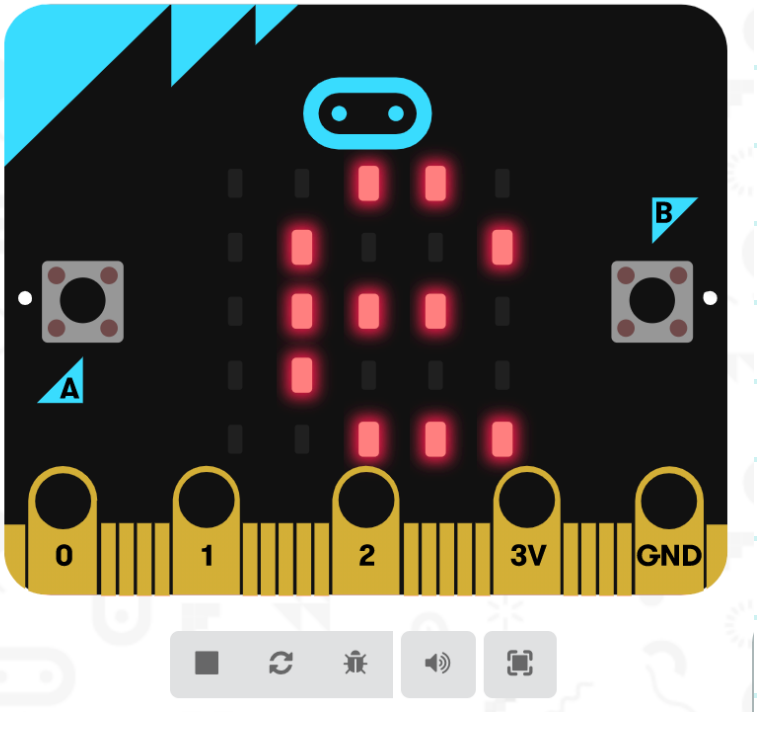
5. Drag the "show string" block into the space inside the Forever block. Computers do exactly as we tell them to do. The Forever block tells the computer to keep running the code we put inside the block (forever). The Forever block is a loop block.



STEP BY STEP

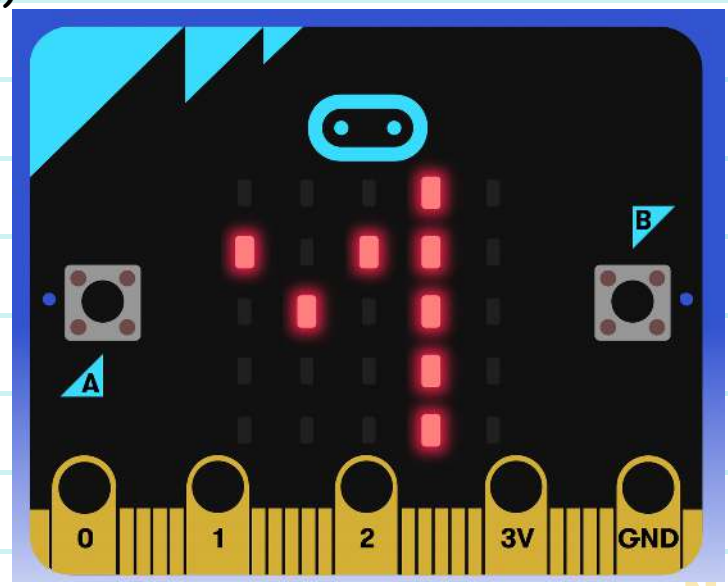
6 Click on the Play arrow to see the word Hello scroll across the display of the simulator. You may need to click on the reset symbol to start your code.





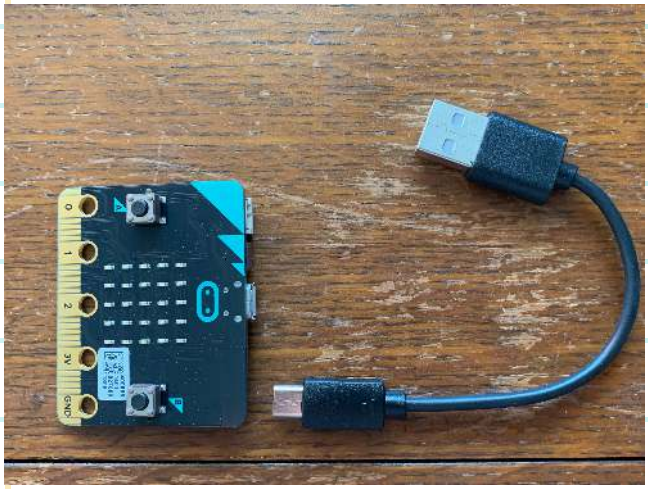
7 Double click on the word Hello inside the text bubble and type your name. Press enter. Make sure you see double quotation marks around your name like this. “Mary”

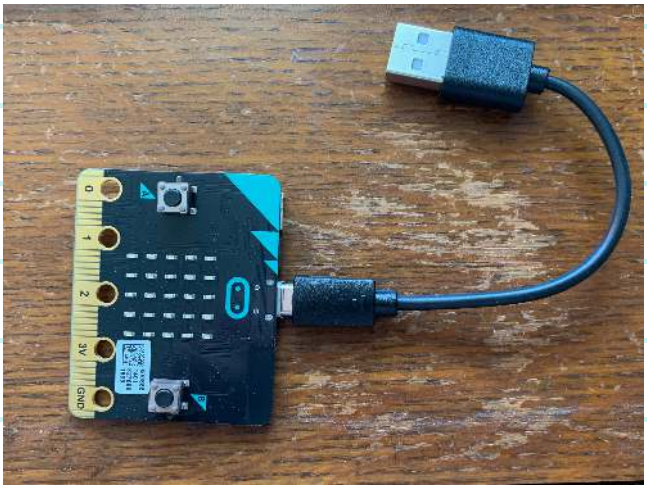
8 Now look at the simulator to see if you can see your name scrolling across the display of LED lights! (In the picture below you can see part of the M for my name, Mary.)



STEP BY STEP

9 Connect the mini USB cord from your kit to your micro:bit, then connect your micro:bit to the computer with the micro USB cord.

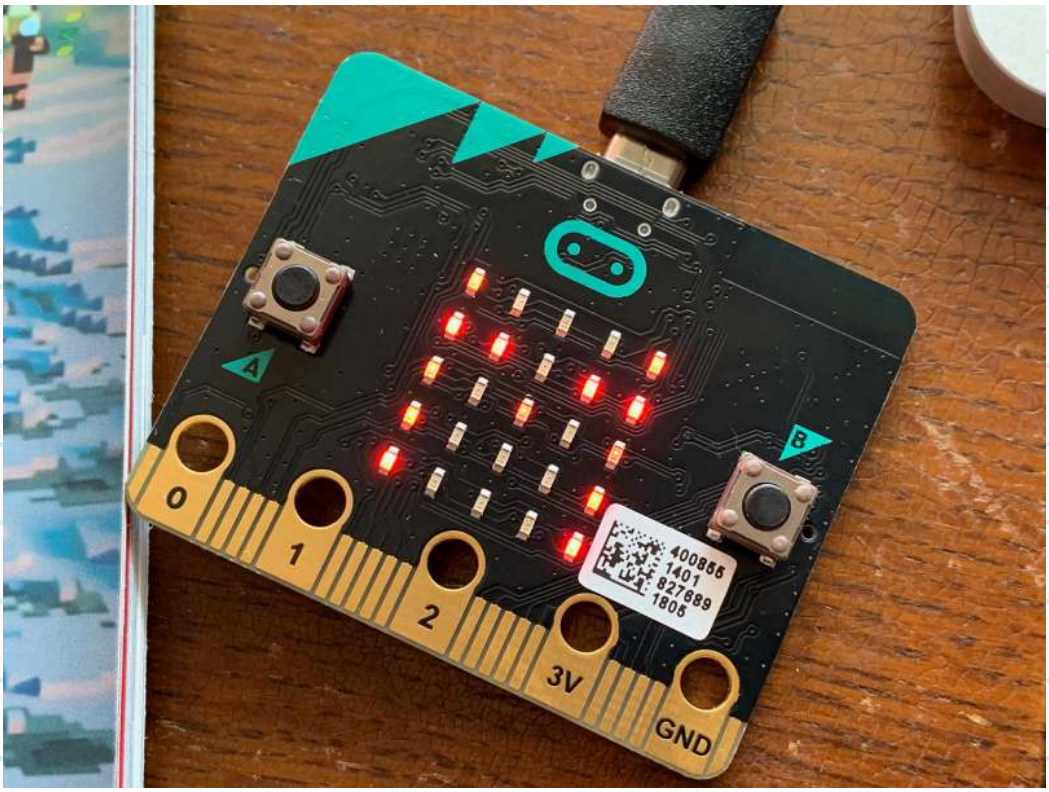




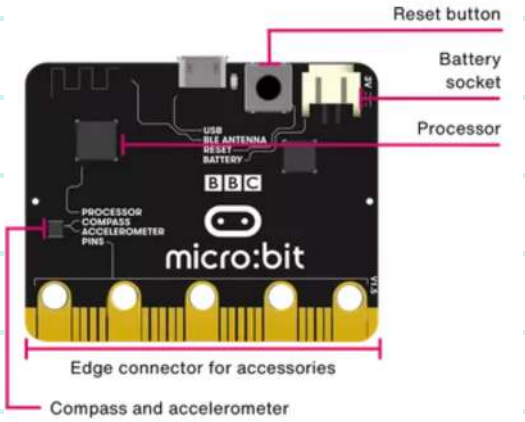
11 Click on the Download Button. This will transfer (flash) your code file to your micro:bit. The single LED light on the back of your micro:bit will flash when the code is downloading. When it is finished flashing (downloading) the file, your code will automatically start running on your micro:bit.

STEP BY STEP

12 When the code has finished downloading, you will see your name scrolling across the LED display!



13 Troubleshooting: If your name isn't showing, check your code. Next, try pressing the reset button on the back of your micro:bit.



Congratulations! You are an Environmental Steward!

02

MICRO:BIT DICE AND RACE FOR CHANGE GAME

OVERVIEW

Turn your micro:bit into a die (one) or dice (two) to use to play the Race for Change Board game in the publication.

BACKGROUND INFO

Open the publication to page 36 and 37 and play this board game to explore issues surrounding climate change. Learn about what is causing the climate crisis and how we can work to prevent it.

The game was created by Alana McCarthy. Alana is an illustrator, letterer and designer from Toronto.

VOCABULARY

Micro:bit -- a pocket sized computer with LED display, and information inputs and outputs.

Enviro:bit -- an accessory for the micro:bit with powerful sensors that let you do more with your micro:bit.

Accelerometer -- a motion sensor and is one of the sensors on the micro:bit. It measures the acceleration, or movement of objects.

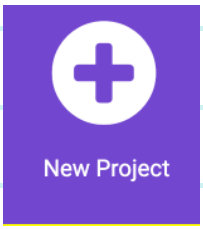
Random -- an action that happens without order or reason.

you will need:

- a micro:bit
- a computer
- the MakeCode editor
- a mini usb cord
- Root and Stem publication

STEP BY STEP

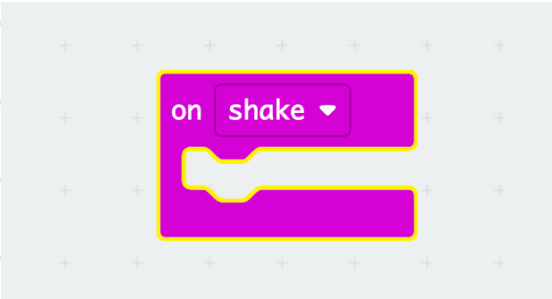
Using the accelerometer of the micro:bit we can create either one die or a pair of dice. We can code the micro:bit to show random numbers when we shake it.



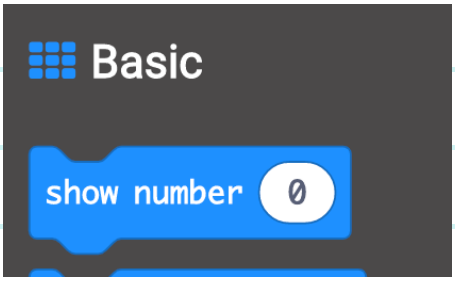
1. Open the make code editor and click the plus icon to create a new project. we will give our project a name, for example: "Dice".

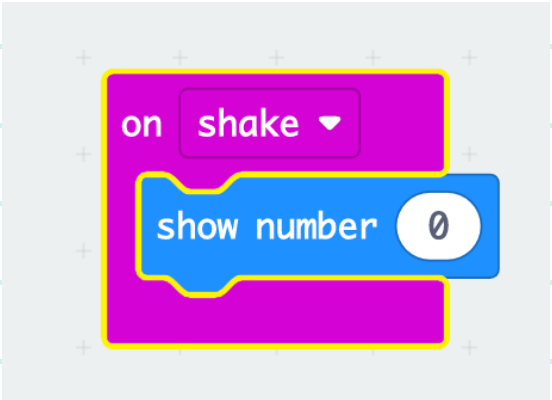
2. Click on the Input tab.

3. Drag the purple on shake block into the coding area. This means that shaking your micro:bit is the input and will trigger the micro:bit to run the code.



4. From the blue Basic tab, Drag the show number block. Put this block into the middle of the on shake block.

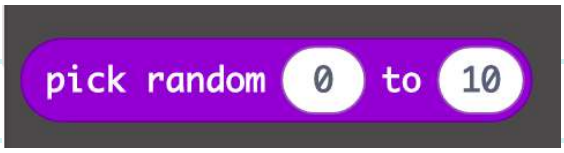




STEP BY STEP

5 Each die (one of the dice) shows numbers from 1 to 6. When you roll the dice, you get a random number. You can code your micro:bit to show numbers from 1 to 6 to be one die, which is just one of two dice. Or, you can code it to show numbers from 1 to 12 to be two dice.

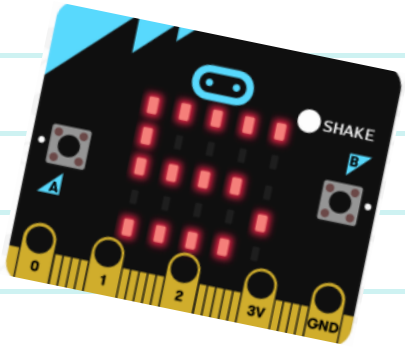
6 From the purple Math tab, choose the pick random block.



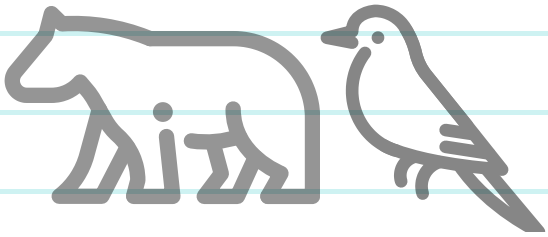
7 Drag this block into the oval opening in the show number block. Type in the numbers 1 to 6 to make your micro:bit into one die, or 1 to 12 to be two dice. I've made mine into one die.

8 Connect your micro:bit to your computer with the USB cord that came in your kit, and select Download. The single LED light on the back of your micro:bit will flash while the code is downloading.

9 Now shake your micro:bit and test your dice! Now you are ready to play the game!



03 SPOT THE SPECIES COUNTER

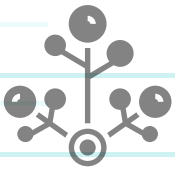


OVERVIEW

In this activity, we will think about the wildlife in our local habitat. We will observe what species live in our local environment and create a counter to track them.

BACKGROUND INFO

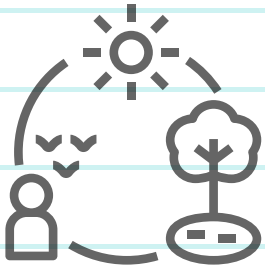
WHY IS OUR LOCAL WILDLIFE IMPORTANT?



Think about the local ecosystems. What habitats exist in our environment. What changes are happening? Global warming and climate change is happening quickly, and it's affecting the environment. This affects how long we can access the sea ice for travel, hunting, and fishing. Humans are not the only beings affected by climate change. Plants and animals are also affected, and it's crucial to observe their patterns so we can predict how they will react to these changes. We can observe the species in our environment by studying:

- Their migration: where they go and for how long
- The population: how many of them live in a certain place.

Our job as environmental stewards is to note the changes that are happening to the plants and animals in our environment and take action to protect them. As Inuit say: "our actions come back to us."



VOCABULARY

Ecosystem -- an ecosystem is a community of different living organisms that live and interact with each other in an environment
Habitat -- a place where a living organism makes its home
Climate change -- Climate change is the process of the planet getting warmer. This means that the weather will be more extreme and unpredictable.

STEP BY STEP

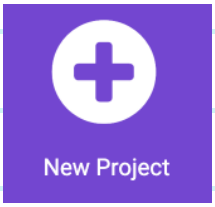
We want our micro:bit to track the wildlife we see. We will add code to our project so that when we press a button, the program will add one to the counter and keep track of how many times we've added to it.

you will need:

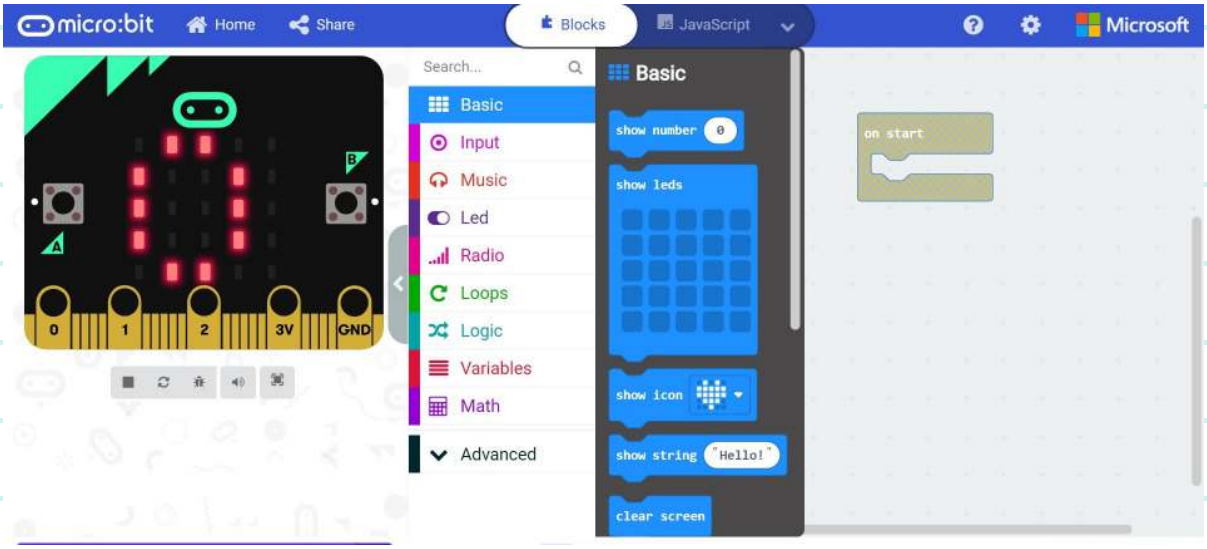
- a micro:bit
- a computer
- the MakeCode editor
- a mini usb cord

1. Choose an animal from the local environment you want to study.

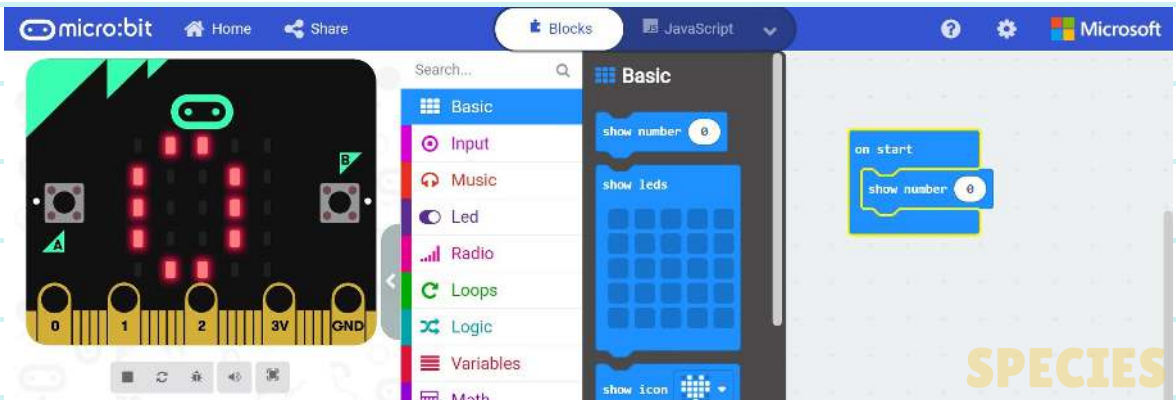
2. Open the make code editor and click the plus icon to create a new project. we will give our project a name, for example: "Arctic Fox Counter."



3. We want the counter to start at 0. In the code library on the left, click the first tab to find the blue "on start" block and drag it to the code area.



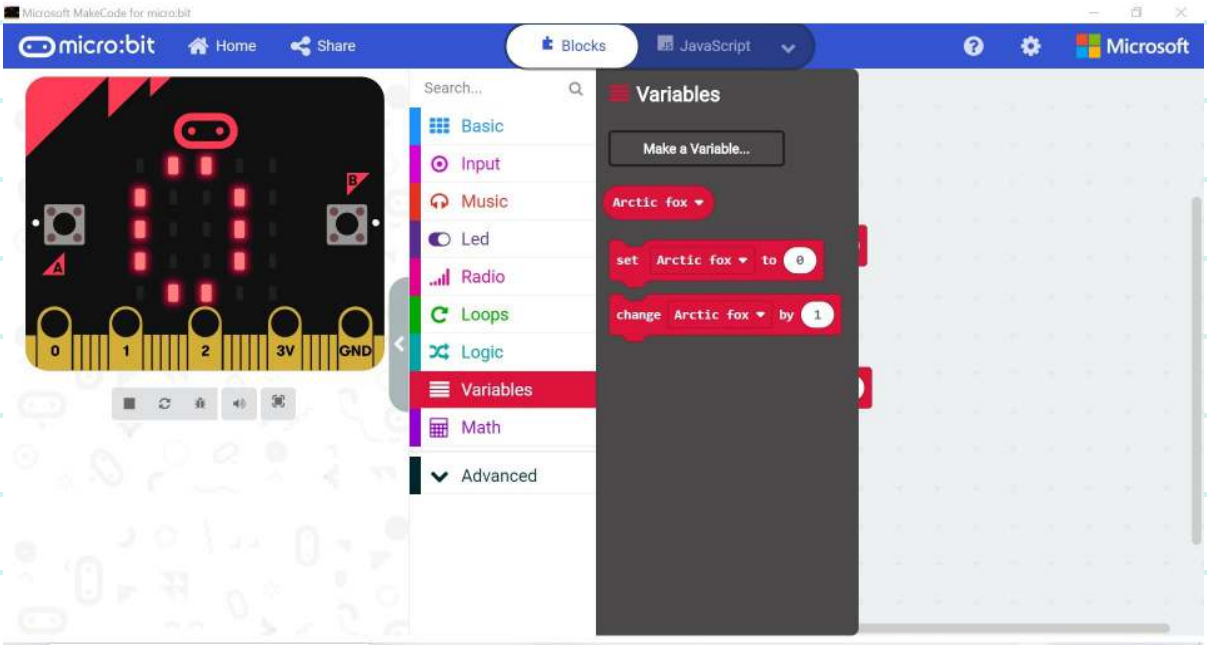
4. From the same library, click and drag the "show number 0" block to the workspace. Place it under the first block. This will show us how many species we've tracked so far.



STEP BY STEP

The “Variables” blocks are handy for keeping track of things that change. We will use these blocks to keep count of the arctic fox or other species we are tracking.

5 In the code library on the left, click the red “Variables” tab. Click “make a new variable” and give it the name of the species you chose in Step 1.



6 Drag the red “Set Arctic fox to 0” block to the code area and place it under the blue code blocks.

STEP BY STEP

7 We need the counter to change the number and show us how many species we have tracked when we press the A-button. In the red “Variables” tab, drag the “Change Arctic fox by 1” block and put it under the purple block.

8 We also want the micro:bit to show the number of times we pressed the A-button, so we will go back to the blue “Basics” tab and grab the “show number 0” block. Place it under the red “change Arctic fox by 1” block.

9 Go back to the “Variables” tab and drag the red “Arctic fox” bubble to the “show number 0” block.

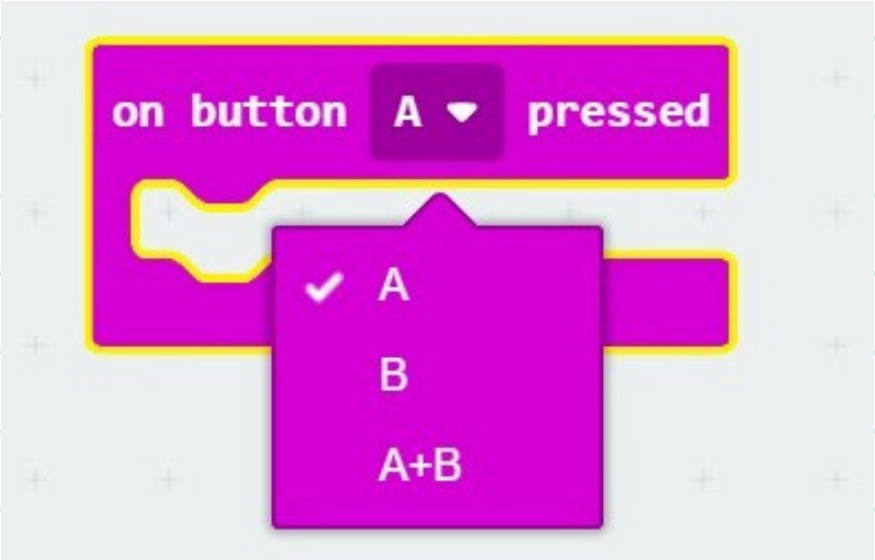
STEP BY STEP

10 Now try it out on the simulator on the left side of the screen! Click the A-button to add to the counter. Each time you press the a-button, the simulator will add one and show you on the screen.

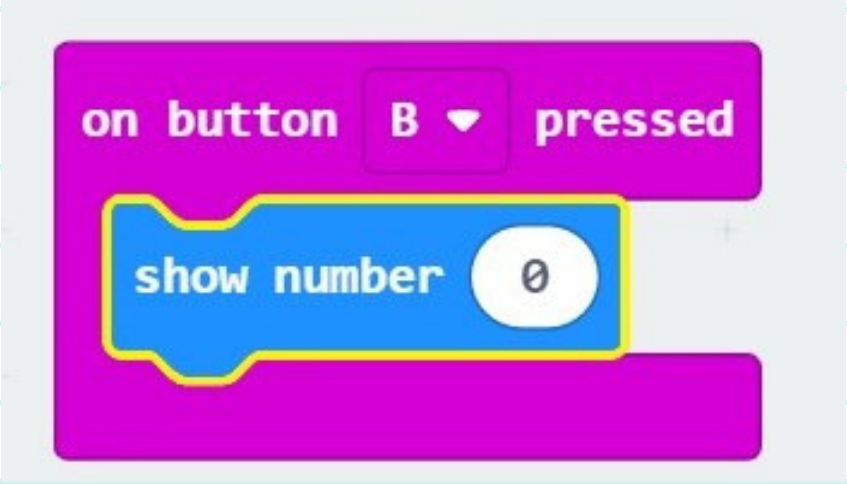
SHOW THE COUNTER

The micro:bit can only show one-digit numbers on the screen, so when we reach the number 10, it will scroll and then disappear. To solve this problem, we will add code to show us what number we have reached on the counter. We will add code to the B-button.

1 Click the second “Input” tab and select the “when A-button pressed” block and bring it to the code area. Change it from A to B by clicking the A and selecting B instead.

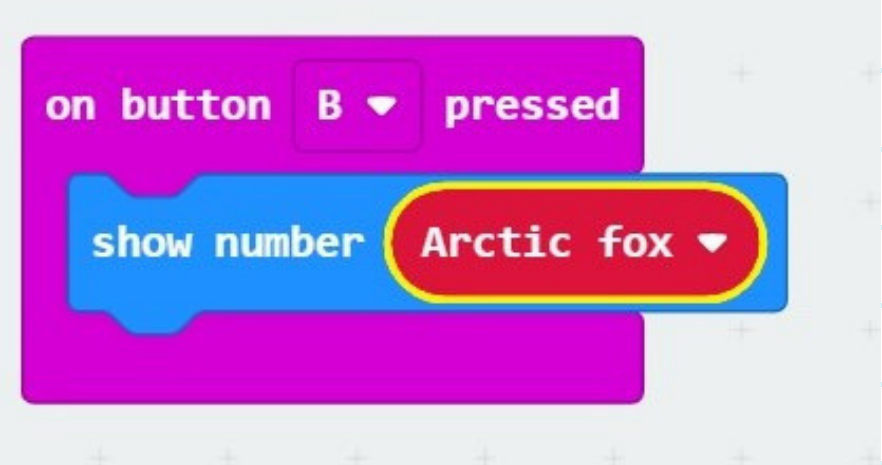


2 Add the code block “show number 0” from the “Basics” tab.



STEP BY STEP

3 Add the red “arctic fox” bubble from the variables tab.



RESETTING THE COUNTER

! We want to program the micro:bit to reset the counter when the A and B buttons are pressed at the same time.

1 In the library, drag the purple “when A button pressed” block to a space in the code area. Click the A button to open the menu and select A+B.

2 From the “Variables” tab, add a red “set arctic fox to 0” block to this code.

Now when you press both A and B buttons the counter will reset to 0!

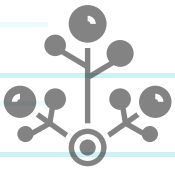
04

COMPASS NORTH

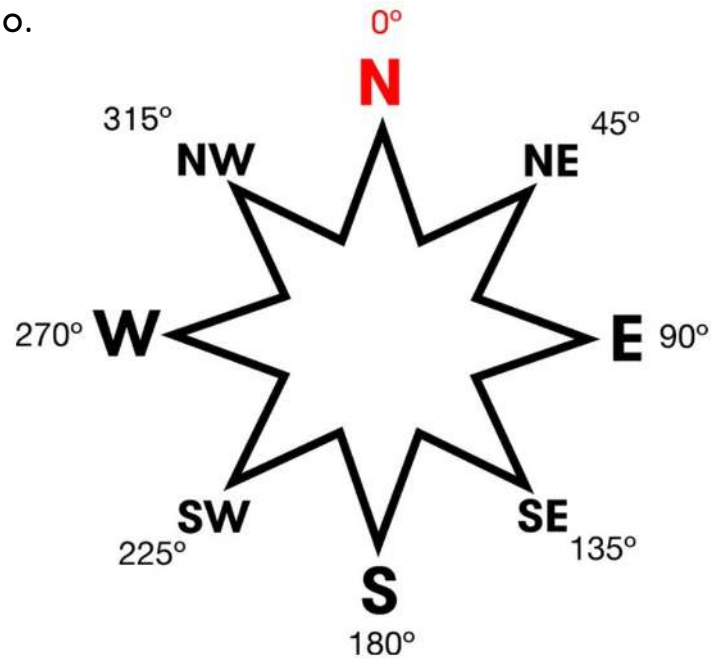
OVERVIEW

Let's make a compass on the micro:bit!

HOW DOES IT WORK?



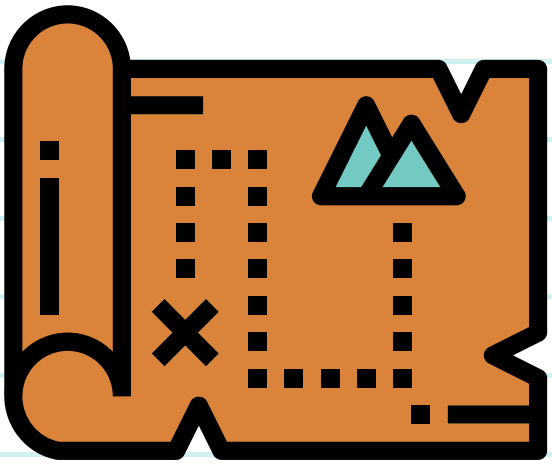
The micro:bit has a compass sensor called a magnetometer. It can sense the Earth's magnetic field and tell us the north and south poles' direction. When we press A, the micro:bit will take a reading from the magnetometer (compass sensor), and it will show us the numerical compass bearing on the LED display. If you are facing north, the micro:bit compass will show 0 on the screen. You can use this diagram to understand the degrees and what direction they correspond to.



Here's a diagram of the cardinal points of a compass and the measurement they correspond to in degrees.

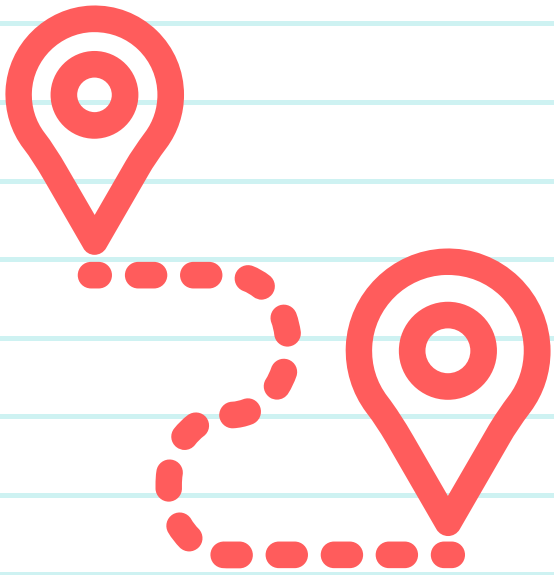
VOCABULARY

- **micro:bit** -- a pocket-sized computer with LED display, and information inputs and outputs.
- **Compass** -- A tool for finding direction.
- **Magnetometer**-- an instrument for measuring the magnitude and direction of a magnetic field.
- **Magnetic field**-- The earth's magnetic field has two poles: the north and south.
- **Compass Heading**-- another word for the direction the compass is pointing towards. Compass directions are measured clockwise from north.

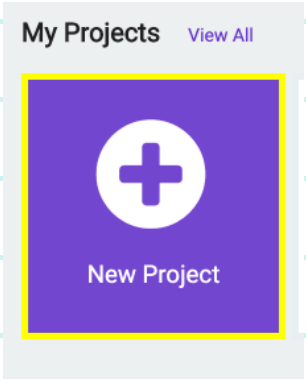


MATERIALS

- micro:bit
- Computer
- MakeCode online or offline editor



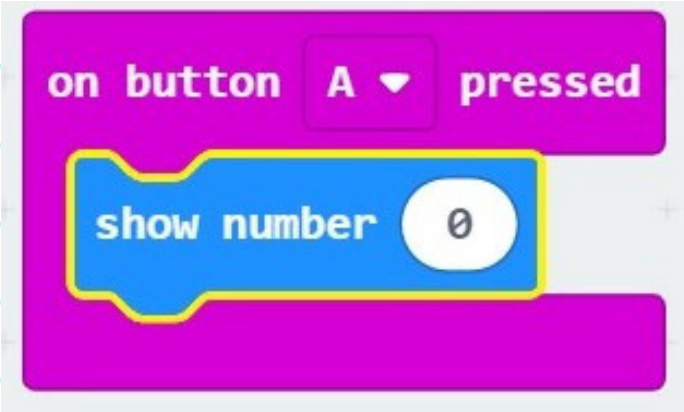
CODING THE COMPASS



1. Open the make code editor and click the plus icon to create a new project. we will give our project a name, for example: "Compass North."

2. We want the micro:bit to take a reading when we press A. Open the “Input” tab and select the “on A button pressed” block.

3. We want the micro:bit to show us the reading it takes. Use the “show number 0” block in the blue “Basic” tab.

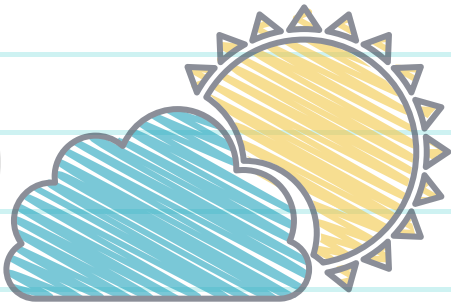


4. The number we want the micro:bit to show is the compass heading. The heading tells us the micro:bit’s direction degrees. In the purple “Input” tab, select the “compass heading” bubble block.

Now try out your compass! Use the diagram to understand the direction and the degrees they correspond to.

05

HOW COLD IS IT?



OVERVIEW

We will learn how to take a temperature readings with the enviro:bit!

HOW DOES IT WORK?

We will use the enviro:bit to take temperature readings. For this activity, we will take the enviro:bit out and take temperature readings. If it is too cold for the enviro:bit, try taking some inside temperature readings.

NON-COMPUTER ACTIVITY

Why is it important to measure temperature?

Read the comic strip titled: “bytesized” about the dangers of sea ice.

How is the climate changing?

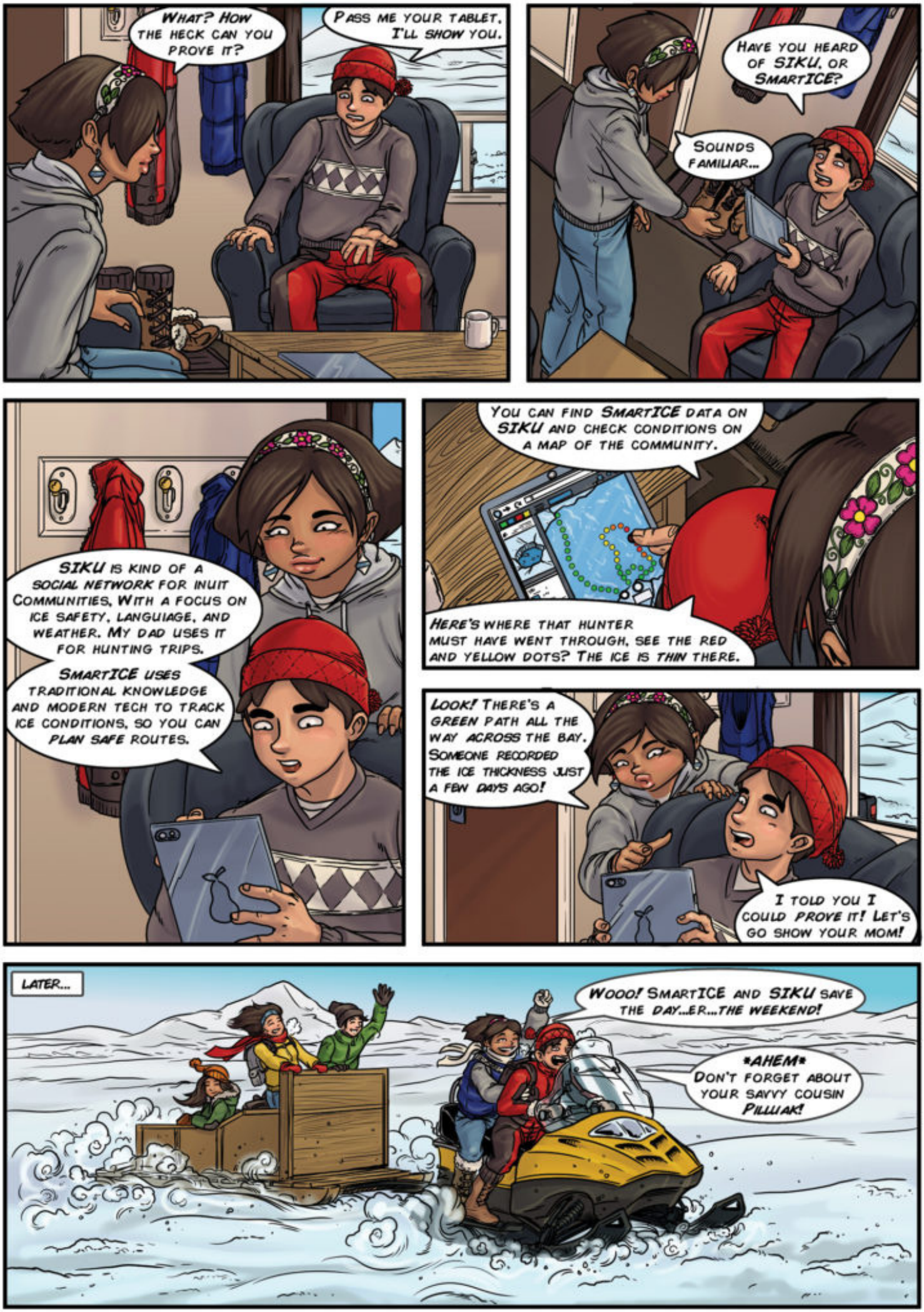
How does this affect the land?

Siku and **SmartIce** are apps that use the data we collect to inform our community about the environment. We can take our local climate measurements, such as temperature and sea ice thickness at different locations. Not only does this information help us to stay safe, over time, but it also shows us patterns and what changes are happening.

Please note the micro:bit does not work at temperatures below -25°C. Cold temperatures can break it!

Bytesized was created by Ian MacLean. Ian is a professional pixel artist/animator and illustrator who has worked in the gaming industry for 16 years. The comic can also be found on pages 28 and 29 of the Root and Stem publiication, Issue One.

bytesized
Sanak! Sanak! Guess what?
My cousin finally learned how to knock? Oh, wait...
Very funny. No, Tomson, Janah, and Deena are all going to Sirmilik Park this weekend.
You want to come?
Oh, I'd love to, Pilluak, but there's no way my mom will let me go. A hunter went through the ice last week and now she's all freaked out.
With the sea ice becoming so unpredictable, she doesn't want me anywhere near the bay.
Hmmm... that is a problem...
Aha! What if I can prove the ice is safe?

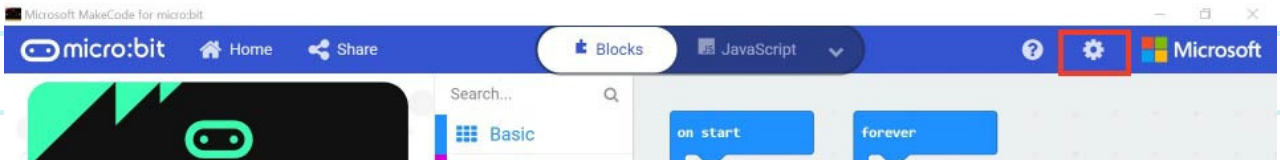

WHAT? HOW THE HECK CAN YOU PROVE IT?
PASS ME YOUR TABLET, I'LL SHOW YOU.
HAVE YOU HEARD OF SIKU, OR SMARTICE?
SOUNDS FAMILIAR...
SIKU IS KIND OF A SOCIAL NETWORK FOR INUIT COMMUNITIES, WITH A FOCUS ON ICE SAFETY, LANGUAGE, AND WEATHER. MY DAD USES IT FOR HUNTING TRIPS.
SMARTICE USES TRADITIONAL KNOWLEDGE AND MODERN TECH TO TRACK ICE CONDITIONS, SO YOU CAN PLAN SAFE ROUTES.
YOU CAN FIND SMARTICE DATA ON SIKU AND CHECK CONDITIONS ON A MAP OF THE COMMUNITY.
HERE'S WHERE THAT HUNTER MUST HAVE WENT THROUGH, SEE THE RED AND YELLOW DOTS? THE ICE IS THIN THERE.
LOOK! THERE'S A GREEN PATH ALL THE WAY ACROSS THE BAY. SOMEONE RECORDED THE ICE THICKNESS JUST A FEW DAYS AGO!
I TOLD YOU I COULD PROVE IT! LET'S GO SHOW YOUR MOM!
LATER...
WOOO! SMARTICE AND SIKU SAVE THE DAY...ER...THE WEEKEND!
AHEM DON'T FORGET ABOUT YOUR SAVVY COUSIN PILLIAK!

COMPUTER ACTIVITY

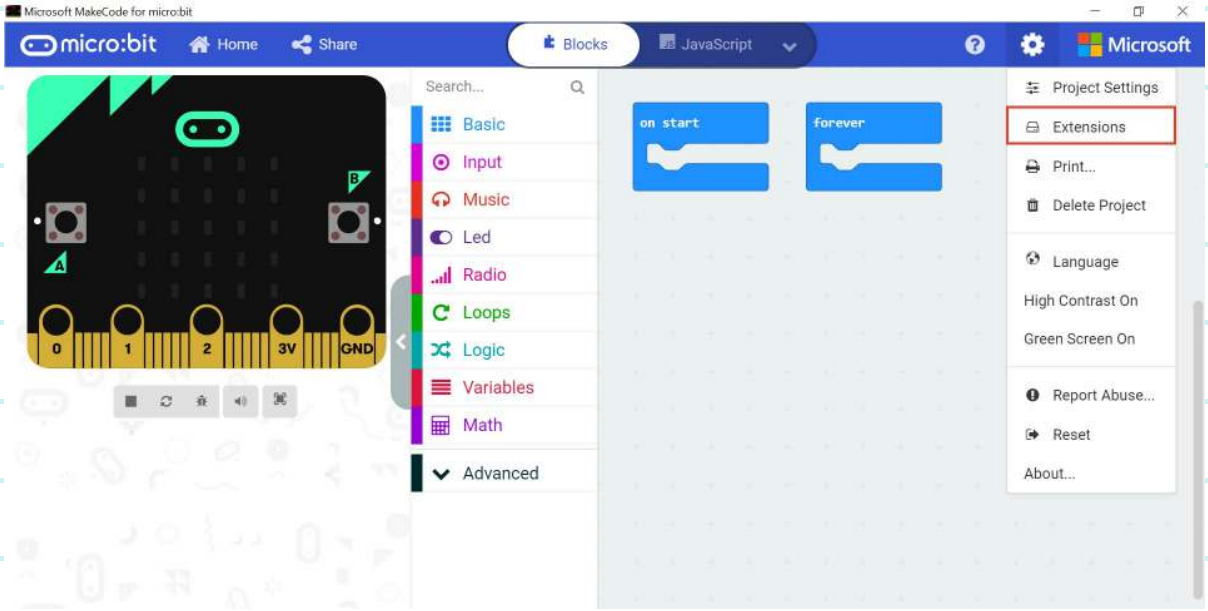
ADDING THE ENVIRO:BIT EXTENSION

! For this activity, we will need to add the enviro:bit extension to our MakeCode Editor. Open up the MakeCode editor and create a new project.

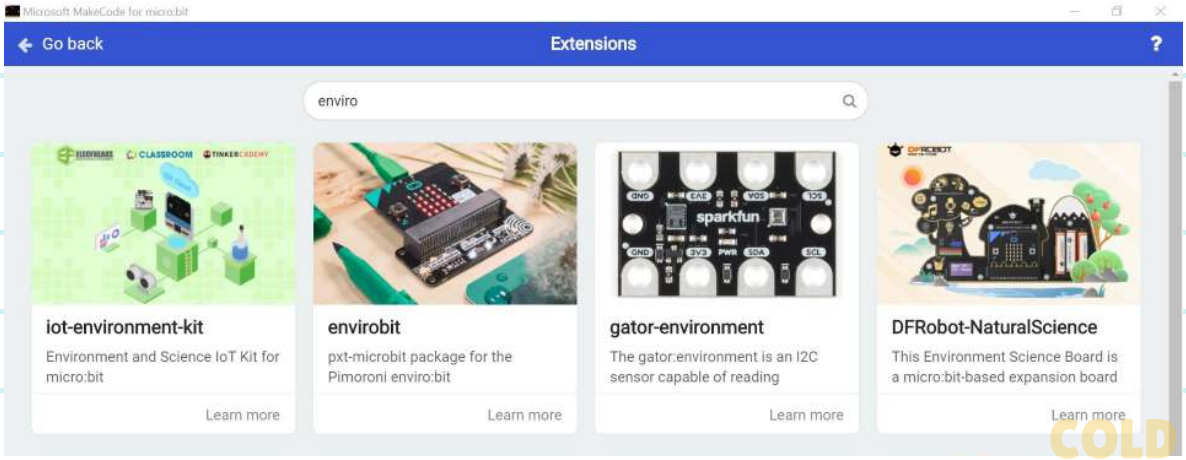
1 Click the settings button in the top right corner next to the Microsoft logo.



2 Select the second option “Extensions”



3 Type “enviro” into the search bar at the top of the screen. And select the “envirobit” extension.

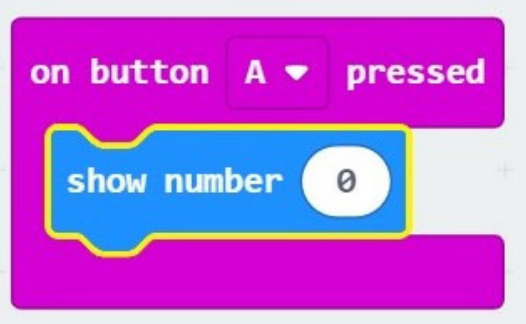


CODING THE ENVIRO:BIT

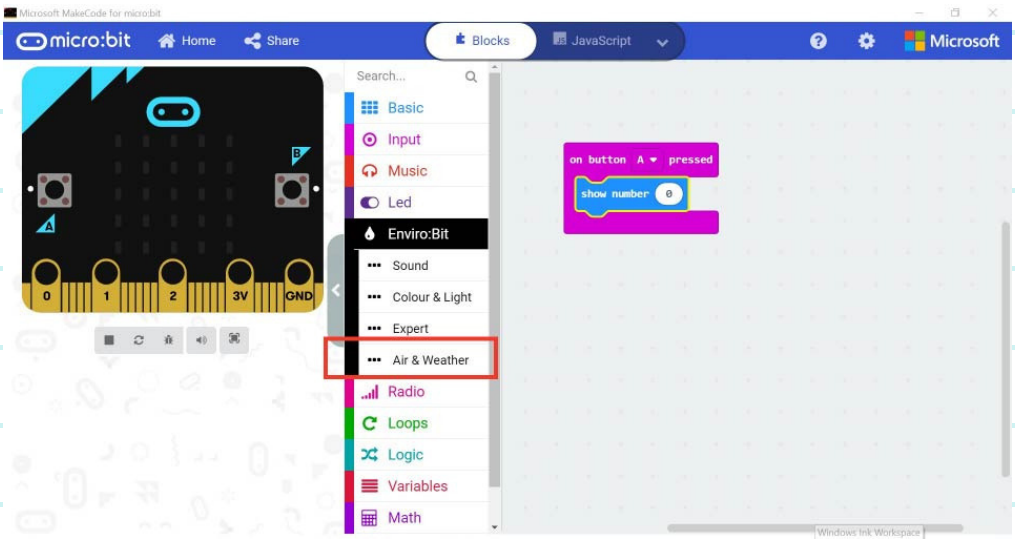
Let's add the code to make our enviro:bit take temperature readings. We want the enviro:bit to take a reading when we press the A button.

1. Go to the code library on the left and select the Input tab. Select the purple "on A button pressed" block and bring it to the code area.

2. In the "Basics" tab, select the blue "show number 0" block and drag it into the first block. When you press the A button on the micro:bit simulator, it will show the number 0 on the display.



3. When you click on the black envirobit tab, there are four options: Sound, Colour & Light, Expert, and Air & Weather. Select "Air & Weather".

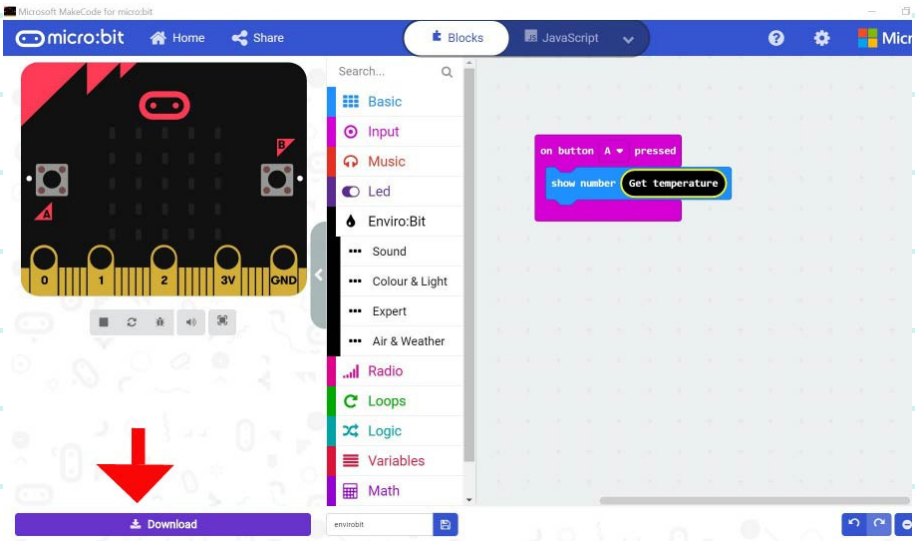


4 Drag the black “Get temperature” bubble to the blue “show number 0” block.

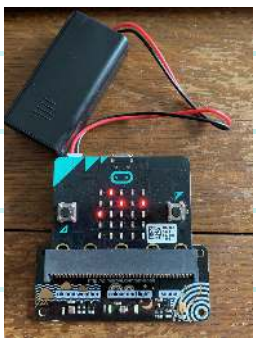
DOWNLOAD YOUR CODE

Now you can plug in your micro:bit to your computer using the USB cord and download the code to take temperature readings.

1 First, make sure its plugged into the computer, next you can click the “Download” button on the bottom left of the MakeCode editor.



2 A window will appear. Click the green download button. Now you can unplug your micro:bit from your computer. Plug in the battery pack, snap on the enviro:bit and take some temperature readings!



05

MEASURING AIR PRESSURE WITH THE ENVIROBIT

OVERVIEW

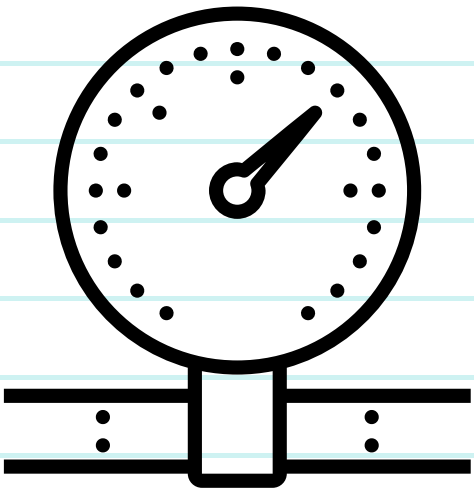
By using the enviro:bit addon with a micro:bit, you can gain access to a number of sensors that the micro:bit itself does not have. One such sensor measures the air pressure (or atmospheric pressure). We will be using Microsoft MakeCode to create a program that will display the current air pressure on the Micro:bit's display.

HOW DOES IT WORK?

By using our Qanuqtururangniq skills, we will measure air pressure. Meteorologists measure atmospheric pressure because it can help us predict the weather. We can measure Low-Pressure Systems when often we'll see cloudiness, wind and even rain! When we have High-Pressure Systems, we can expect to have dry, clear weather.

you will need:

- a micro:bit
- enviro:bit
- a computer
- the MakeCode editor
- a mini usb cord
- Ziploc/other sealable bag



COMPUTER ACTIVITY

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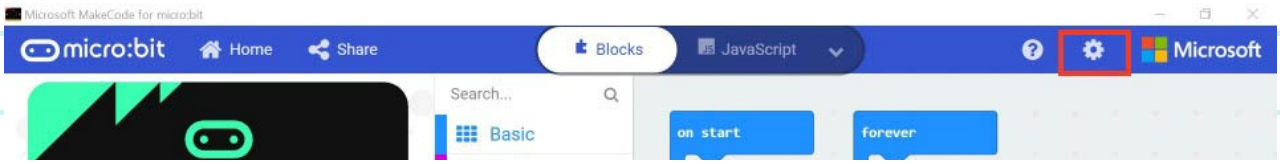
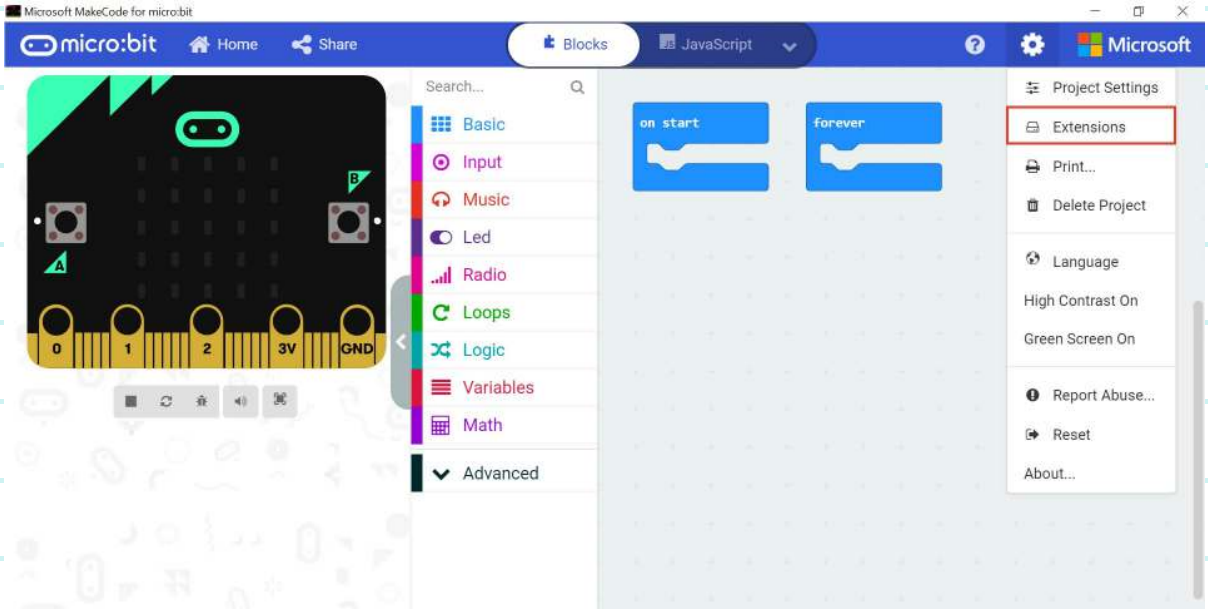
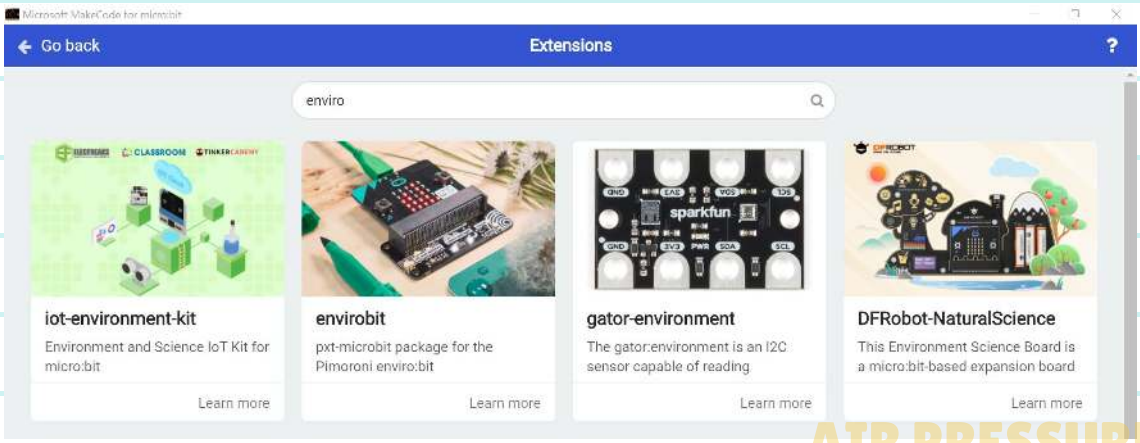


2 **Select the second option “Extensions”**



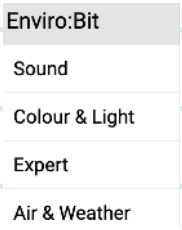
3 **Type “enviro” into the search bar at the top of the screen. And select the “envirobit” card.**



DISPLAYING AIR PRESSURE USING THE MICRO:BIT'S LED DISPLAY

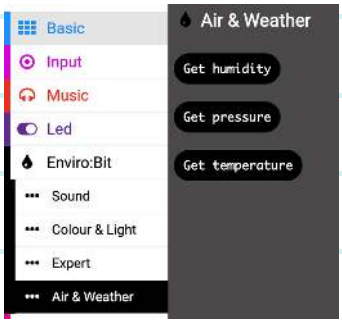
! To display the air pressure that's being measured by the enviro:bit, we need to combine the "Get pressure" block from the Enviro:Bit category with code that will display text on the micro:bit.

1 Click on the "Enviro:Bit" category. This will reveal the sensor categories on the Enviro:bit.

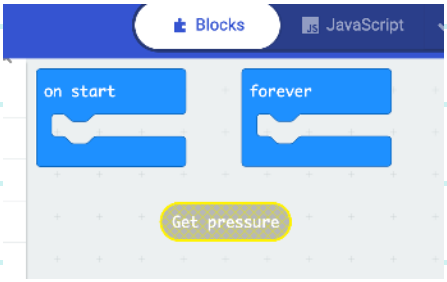


2 To read the pressure off of the sensor on the enviro:bit, you will need to use some of the blocks that can be found in the enviro:bit's "Air & Weather" category.

3 Click on "Air & Weather". This will reveal three blocks to do with measuring the environment around the enviro:bit.



4 The block that reads the air pressure is the "Get pressure" block. Drag a "Get pressure" block into the code area.



DISPLAYING AIR PRESSURE USING THE MICRO:BIT'S LED DISPLAY

! To display the air pressure that's being measured by the enviro:bit, we need to combine the "Get pressure" block with code that will display text on the micro:bit. You can find a block that does this in the "Basic" category.

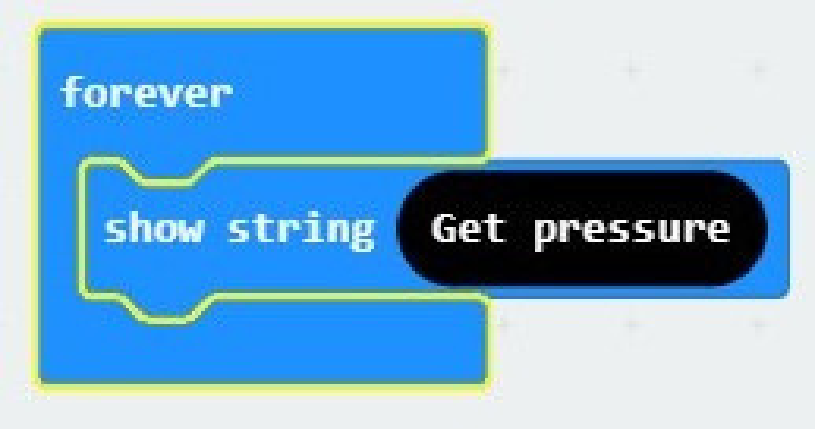
1 Click on the "Basic" category. This will reveal a number of blocks that do simple or basic things on the micro:bit.

2 The block we're looking for is called "Show string" which displays a string—programmer talk for "text"—by scrolling it across the micro:bit's LED display. We can also display numbers this way. Drag a "Show string" block into the code area.

3 Did you notice that the "Show string" block has a bubble that's about the same shape as the "Get pressure" block? This is MakeCode telling us that we can put the "Get pressure" block into that space. Click and drag the "Get pressure" block in the code area into the empty bubble in the "Show string" block. If you're successful, it should look as below.

4 Click and drag the "Show string" block (now carrying the "Get pressure" block as well) into the "Forever" block. It should snap into place and should no longer have lines crossing through it. If you're successful, it should look llike the picture below.

5 Click and drag the “Show string” block (now carrying the “Get pressure” block as well) into the “Forever” block. It should snap into place and should no longer have lines crossing through it. If you’re successful, it should look like the picture below.



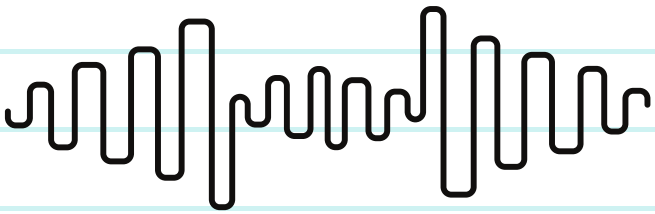
6 Download your program onto your micro:bit and connect your micro:bit to the enviro:bit.

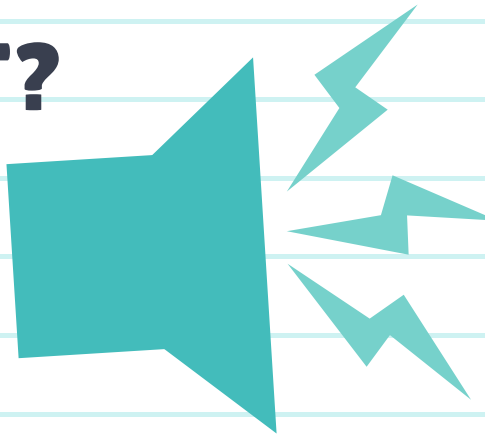
7 Connect the battery pack to the micro:bit and try measuring the air pressure where you are.
What is happening now on your micro:bit? Does a number scroll across the LED display? Is it always the same number, or does the number change? This number is the air pressure being read from the enviro:bit by your program and being displayed, as instructed, on the micro:bit’s LED display.
Try putting the micro:bit into a clear, sealable plastic bag and squeeze the bag gently (we don't want the bag to pop!) What is happening now?

Congratulations! You now have a device that can measure the current air pressure and tell you what it is!

06

HOW NOISY IS IT?





OVERVIEW

Learn how to measure the noise in your environment. Think about how noise can affect your health and wellness and the health of the animals and fish around you.

HOW DOES IT WORK?

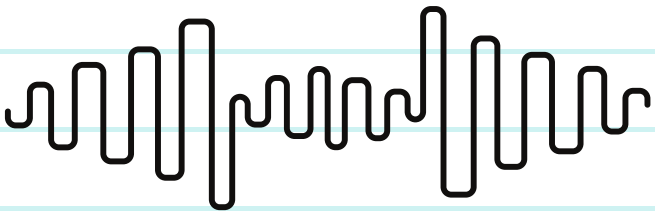
Our environment can have all sorts of sounds, especially in busy urban areas. Animals, like us, make sounds to communicate with each other. However, they can be disrupted by loud noises that are not part of their natural environment. This is a problem known as Noise Pollution. Marine mammals are especially affected by noise pollution because they use echolocation to communicate, navigate the ocean, and find food.

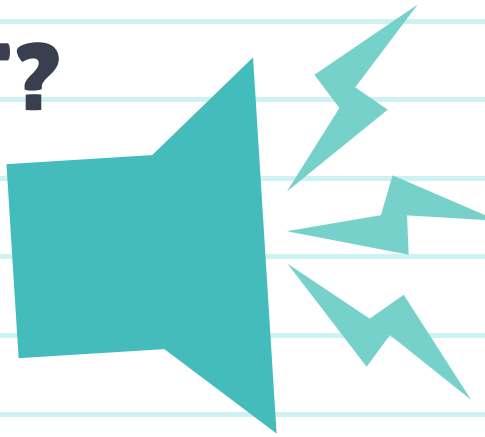
PILIMMAKSARNIQ AND QANUQTURURANGNIQ

To be stewards of the environment, we need to learn skills that help us understand this role. Our elders teach us that each person has an important job to learn skills so we can contribute as a community. Qanuqtururangniq is the ability to think deeply and use our knowledge that we learn from observation. We will use this teaching to observe changes in our environment. Using the micro:bit as a tool to help us measure the information, we will use our skills of observation to understand it.

06

HOW NOISY IS IT?





VOCABULARY

Echolocation -- A technique used by certain animals to find their way in dark environments. They emit a sound that is reflected back at them.

Qanuqtururangniq -- the ability to think deeply and use observation skills to understand our environment.

Sound sensor -- the Enviro:bit has a sound sensor built-in. You can measure the level of sound around you or make something happen with sound.

Noise -- noises are unwanted sounds that are disruptive to life.

Sound -- sounds are what we hear.

Micro:bit -- a pocket-sized computer with LED display, and information inputs and outputs.

Enviro:bit -- an accessory for the micro:bit with powerful sensors that let you do more with your micro:bit.

you will need:

- a micro:bit
- enviro:bit
- a computer
- the MakeCode editor
- a mini usb cord

COMPUTER ACTIVITY

ADDING THE ENVIRO:BIT EXTENSION

For this activity, we will need to add the enviro:bit extension to our MakeCode Editor. Open up the MakeCode editor and create a new project.

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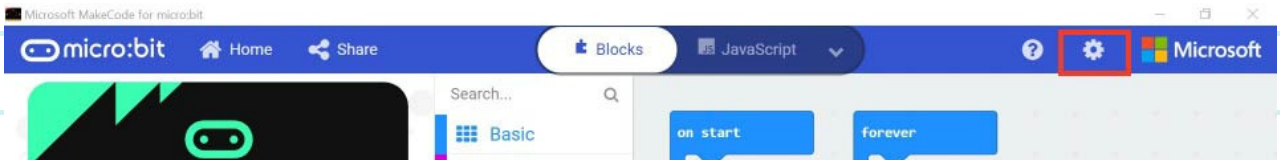

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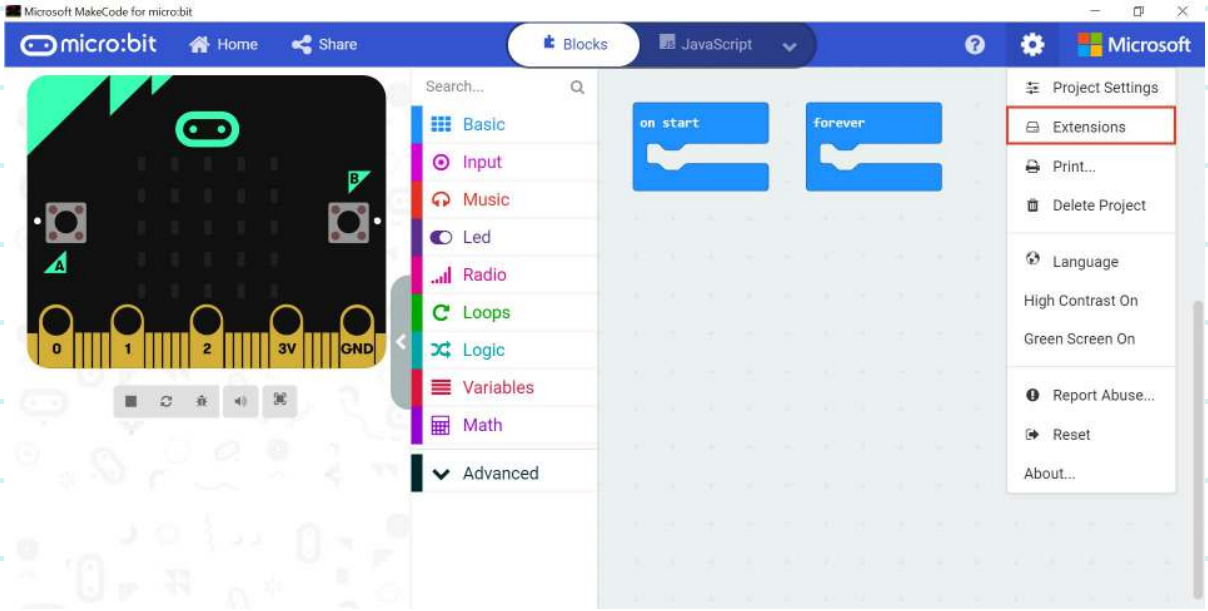
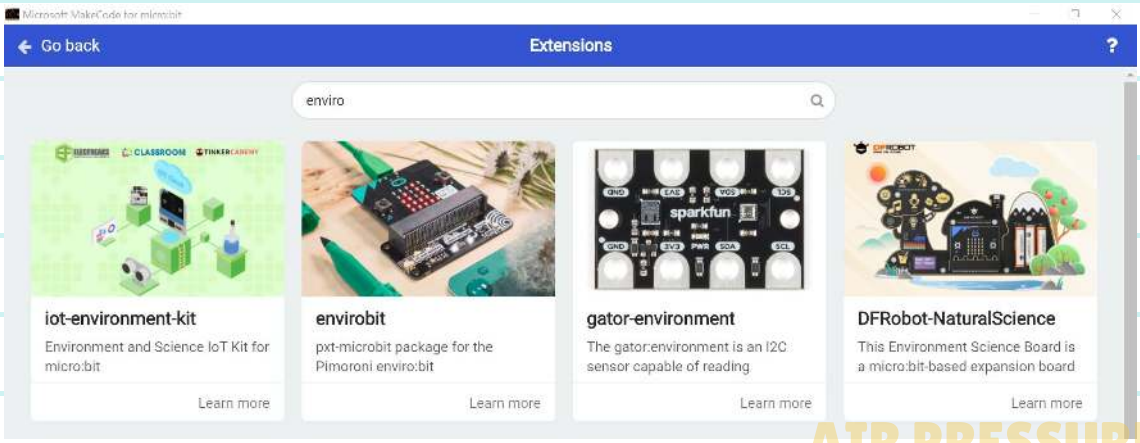
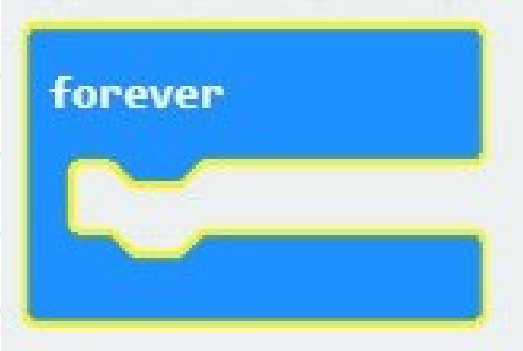


3 **Type “enviro” into the search bar at the top of the screen. And select the “envirobit” card.**

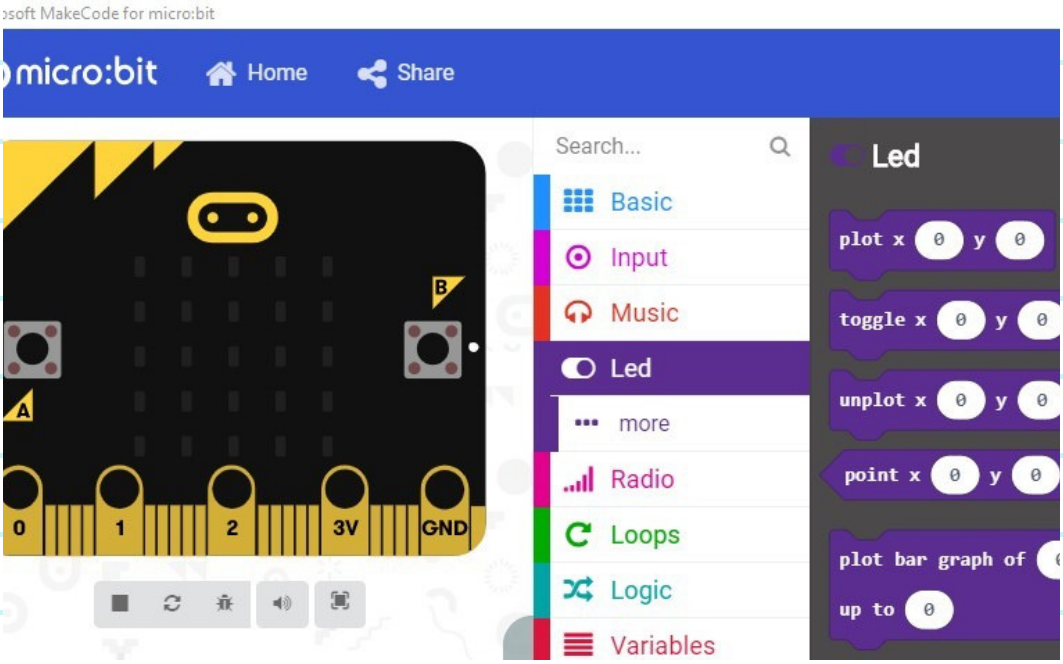


CODING THE NOISE SENSOR

1. Drag the Forever block into the middle of the code area. Computers only do what you tell them to do. This block makes the code run all the time when your micro:bit is connected to power through your computer or through the battery pack.

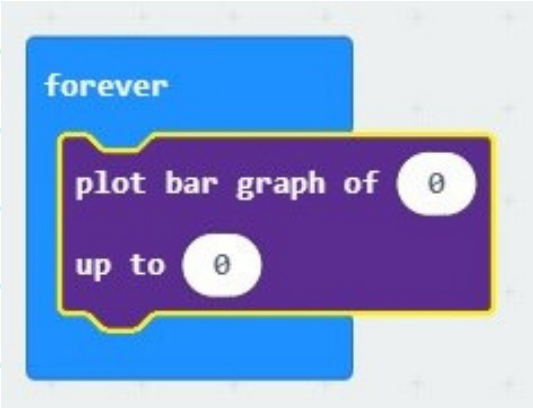


2. From the LED tab, get the plot bar graph of 0 up to 0 block. This block turns the LED display on the micro:bit into a graph display!

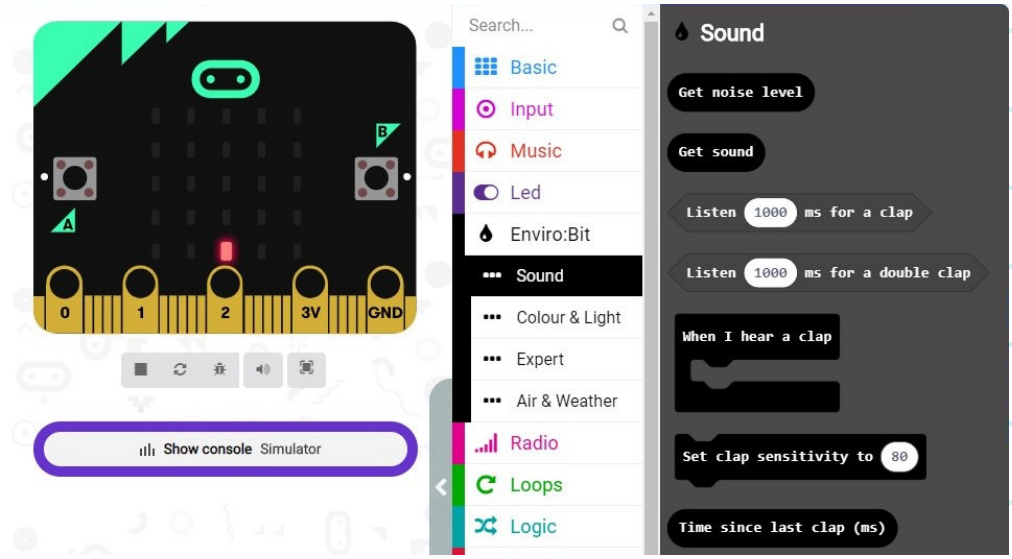


CODING THE NOISE SENSOR

3 Drag the block into the middle of the Forever block.



4 From the Enviro:bit tab open the Sound tab.



5 Drag the Get sound block into the first opening in the plot bar graph block.

CODING THE NOISE SENSOR

6. Leave the value set to 0 and the micro:bit will automatically choose the best scale to fit on the display screen.

7. Connect your Enviro:bit to your Micro:bit by snapping the Enviro:bit onto the bottom edge of the Micro:bit.

8. Connect your micro:bit to your computer with the USB cord from your kit. Download (flash) your code onto your micro:bit.

9. Test your code by making sounds and see if the Enviro:bit measures the noise level and shows the graph on the Micro:bit display!

10. You can disconnect the micro:bit from your computer, plug in your battery pack, and go measure some noise levels! How noisy is your environment?

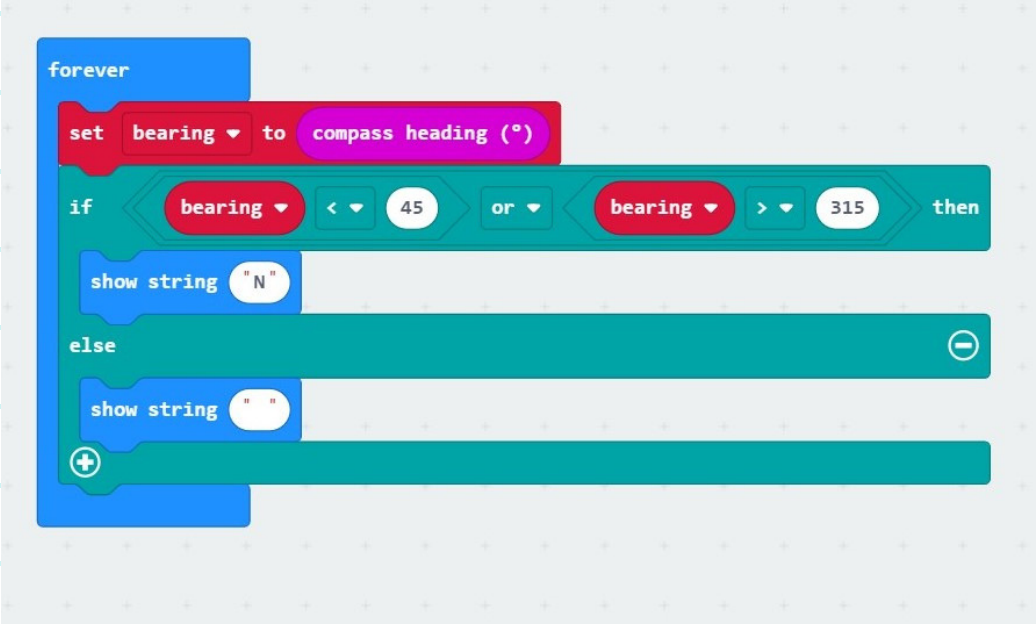
COMPASS NORTH CHALLENGE

OVERVIEW

Here's an extra activity to try once you've finished the first compass activity! The level of difficulty is intermediate if you would like to get into some more advanced coding. We will use the micro:bit's magnetometer readings to create a compass that shows the cardinal directions.

HOW DOES IT WORK?

The compass that you will create will use forever loops, variables, comparative statements, and If else statements. We will be analyzing this code to make the compass.



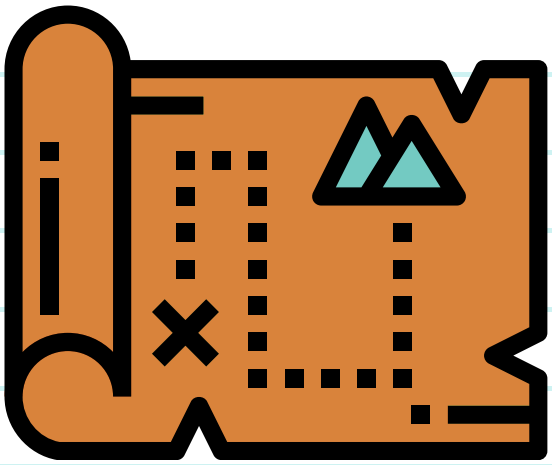
Here's the starter code! Copy the code or follow the directions below to import it into the MakeCode Editor from the USB key provided with your kit.

VOCABULARY

- **micro:bit** -- a pocket-sized computer with LED display, and information inputs and outputs.
- **Compass** -- A tool for finding direction
- **Magnetometer**-- an instrument for measuring the magnitude and direction of a magnetic field
- **Compass Heading**-- The heading is another word for the direction the compass is pointing towards and is measured clockwise from north.

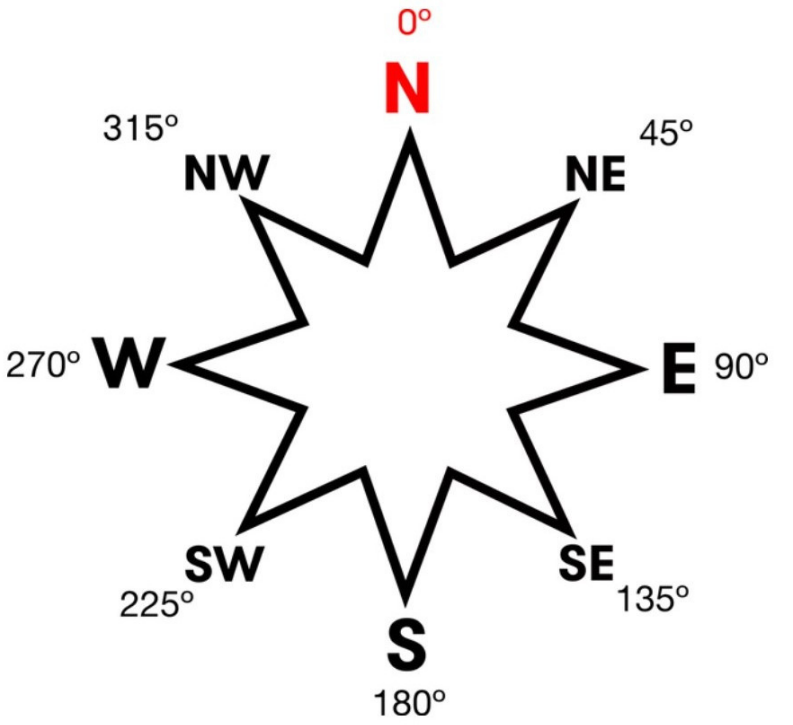
MATERIALS

- **micro:bit**
- **Computer**
- microbit-compass.hex **file found on the USB in your kit.**
- **MakeCode online or offline editor**



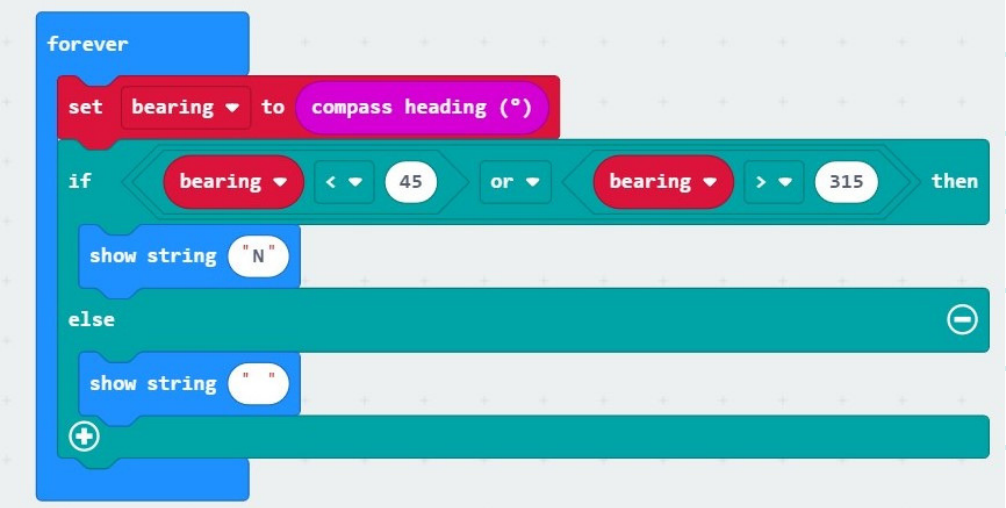
CARDINAL POINTS DIAGRAM

This diagram will help us to understand how to translate the cardinal points into numerical measurements that the micro:bit will understand. A circle is measured in degrees. A full circle is 360 degrees, with 0 degrees at the very top.



UPLOADING THE STARTER CODE

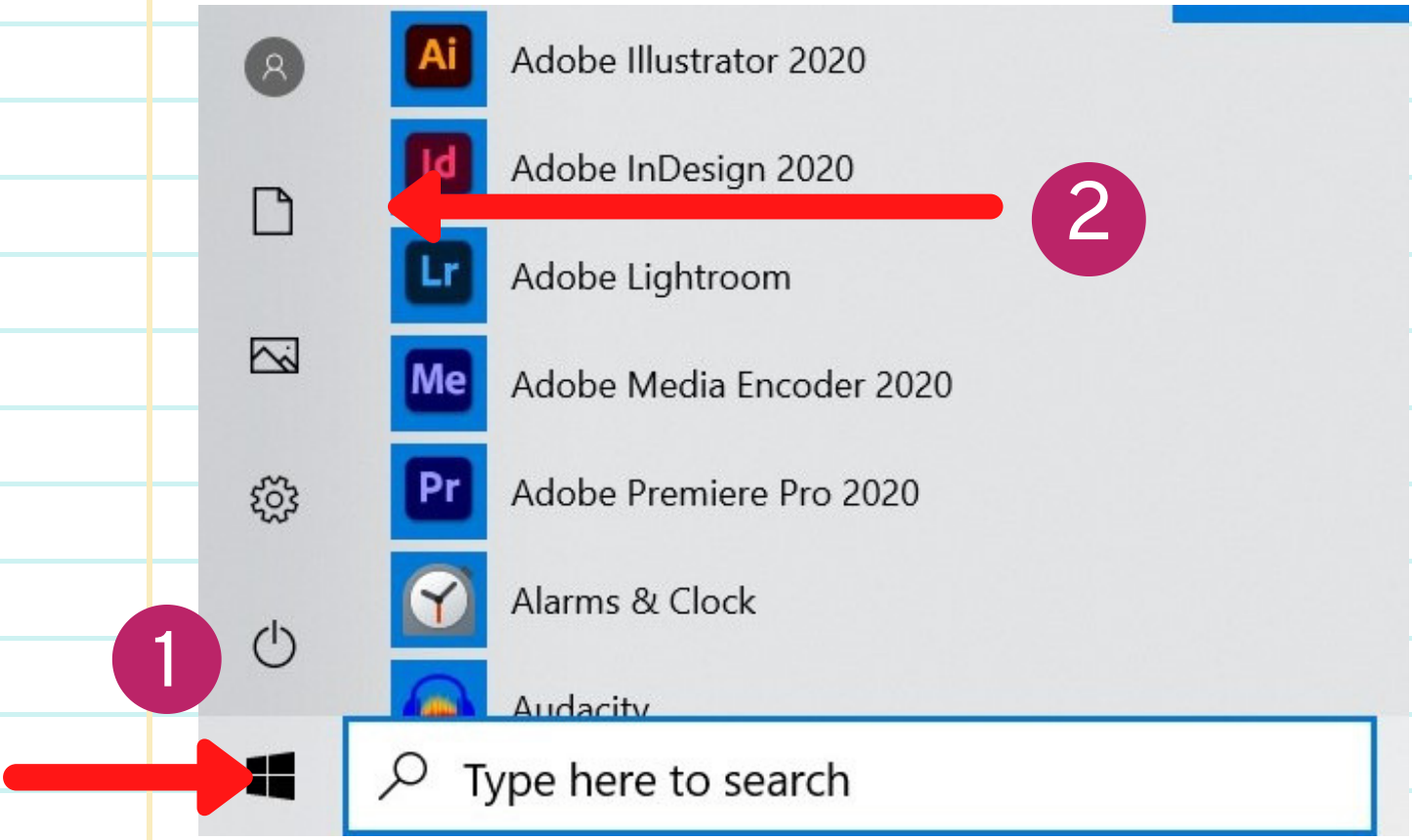
1. Open the MakeCode editor and follow the steps below to import the starter code or copy the code manually.



UPLOADING THE STARTER CODE

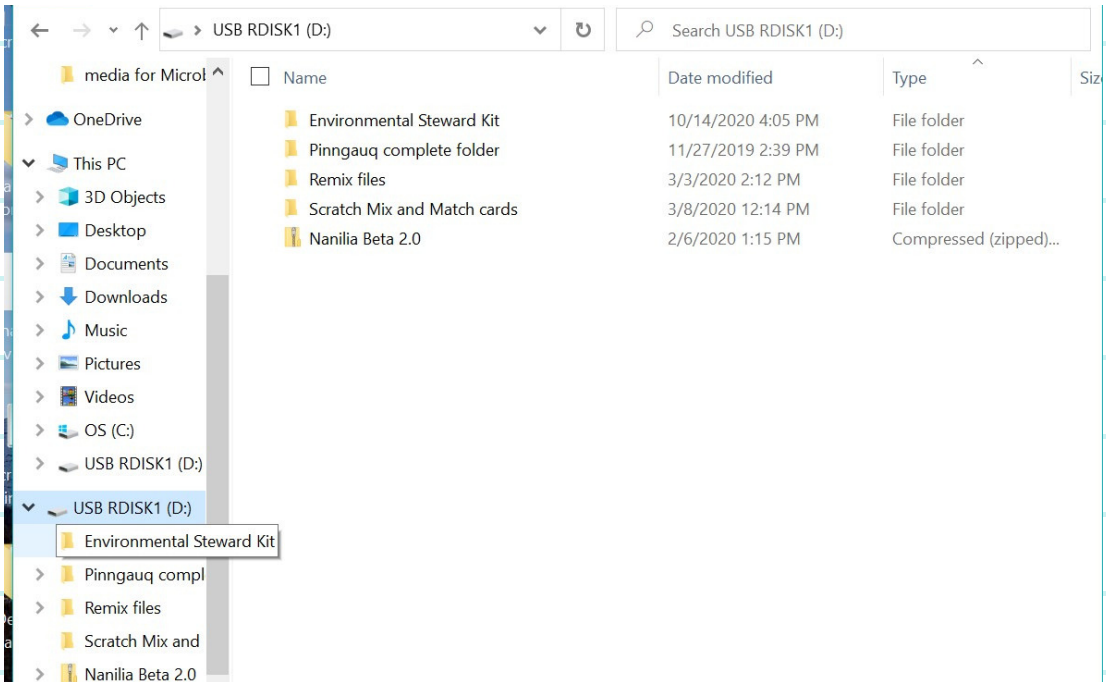
1. On your computer, click the windows icon at the bottom left of the screen. This is known as the "Start" button.

2. Click on the "Documents" icon on the left above the start button.

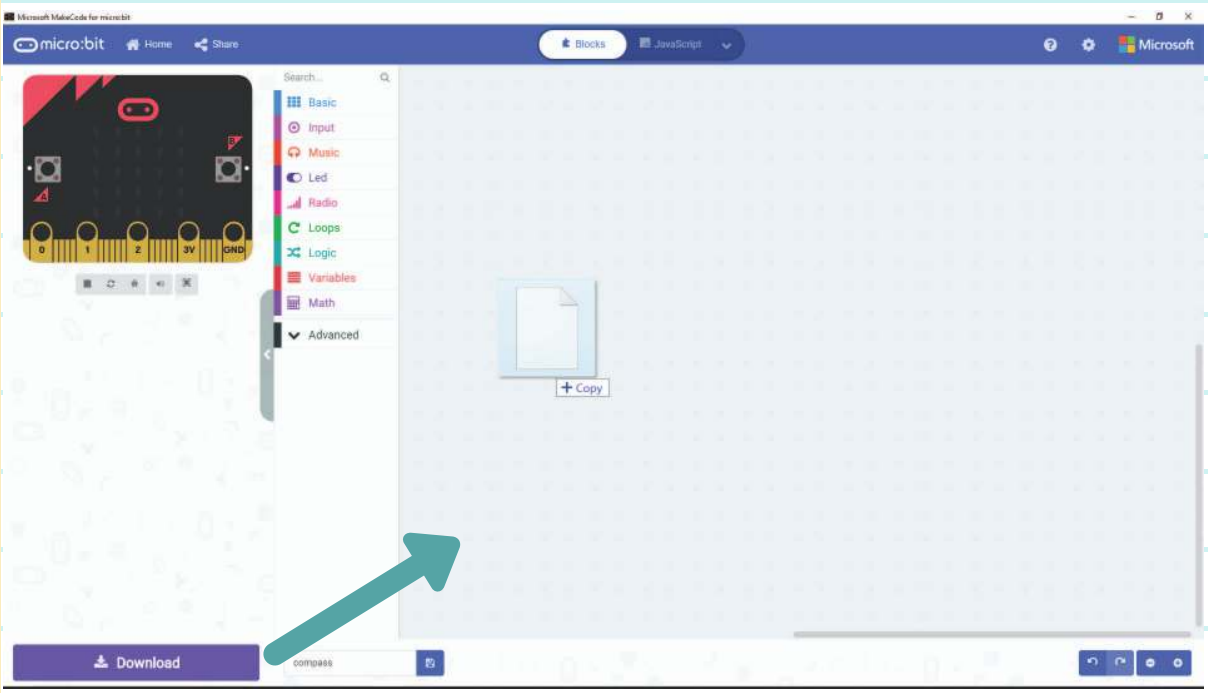


UPLOADING THE STARTER CODE

3 A window will appear. Find the location of the USB drive.



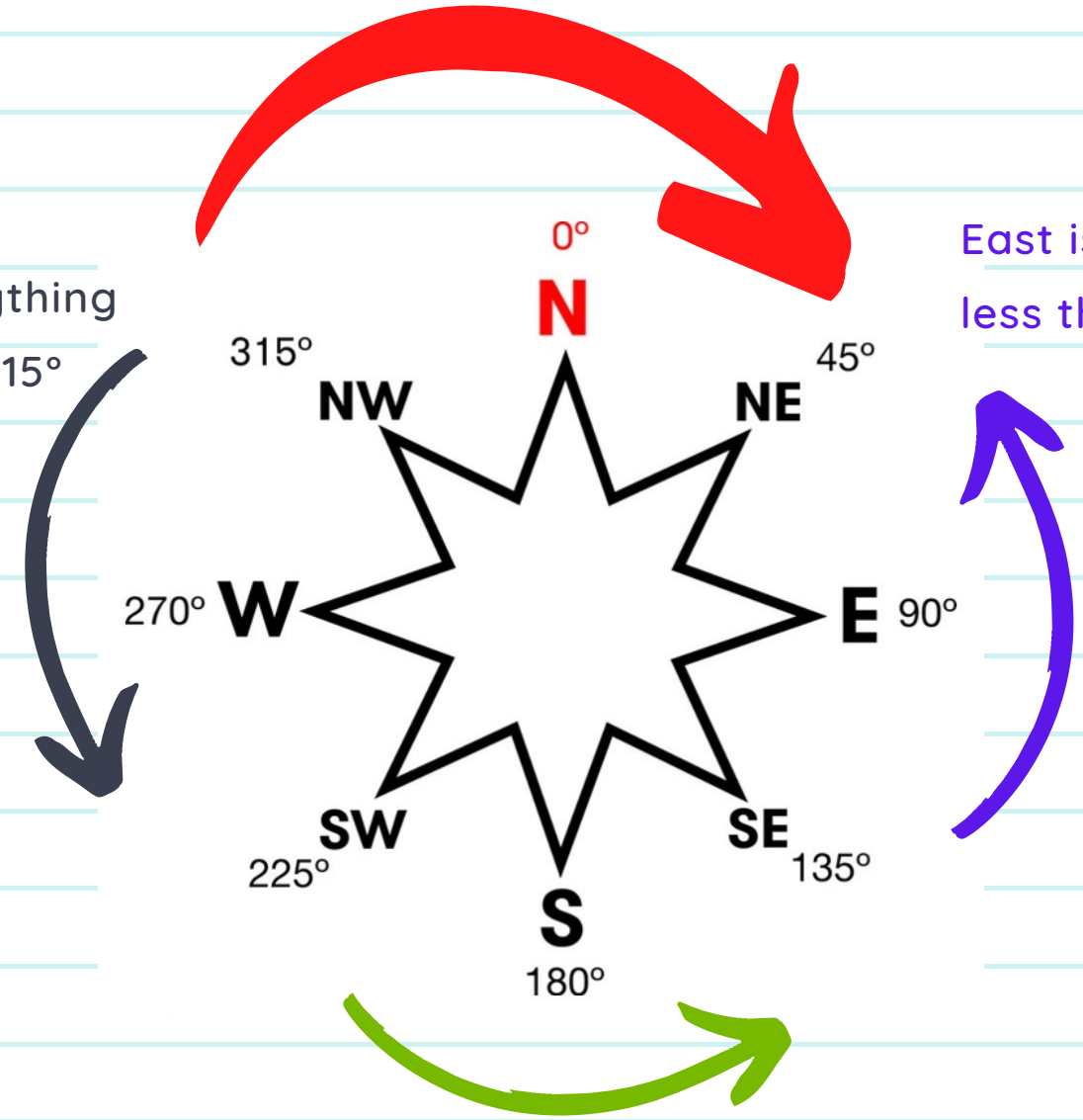
4 Click on the folder to open it. Select the "microbit-compass.hex" file and drag it into the MakeCode code area.



CARDINAL POINTS DIAGRAM

This Diagram will help us to understand how to translate the cardinal points into numerical measurements that the micro:bit will understand.

North can be described between 315° and 45°



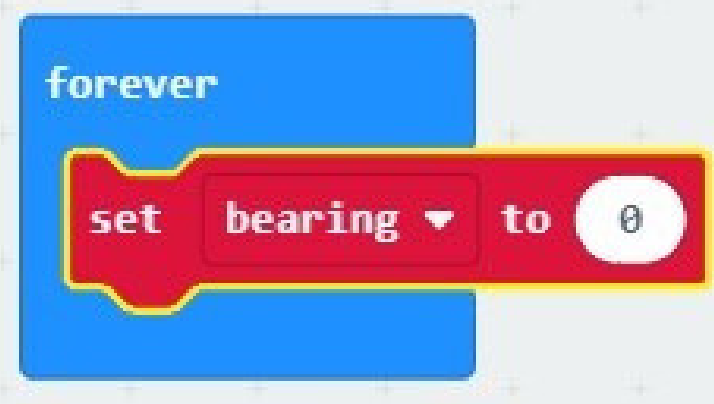
West is anything less than 315°

East is anything less than 135°

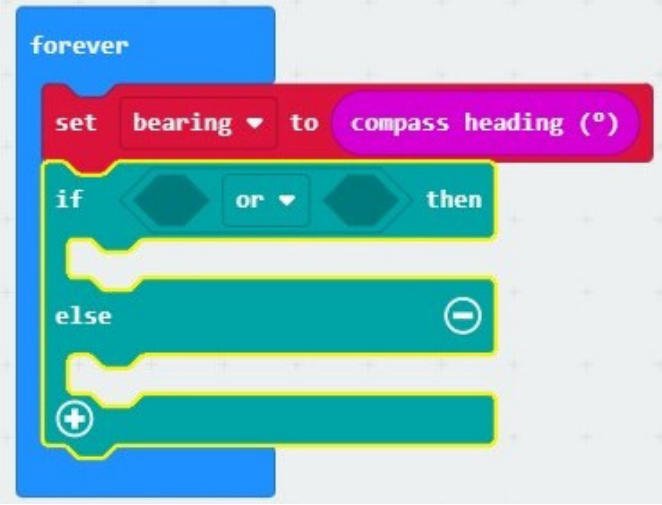
South is anything less than 225°

BREAKING DOWN THE CODE

1. The forever loop tells the micro:bit to keep taking readings of the compass heading in degrees.
    a. The compass heading input block continuously takes measurements from the magnetometer and inputs that information in degrees (°).
    b. The Variable block defines the “bearing” as the compass heading measurement. We use a variable block because this measurement changes as the compass moves and changes direction.



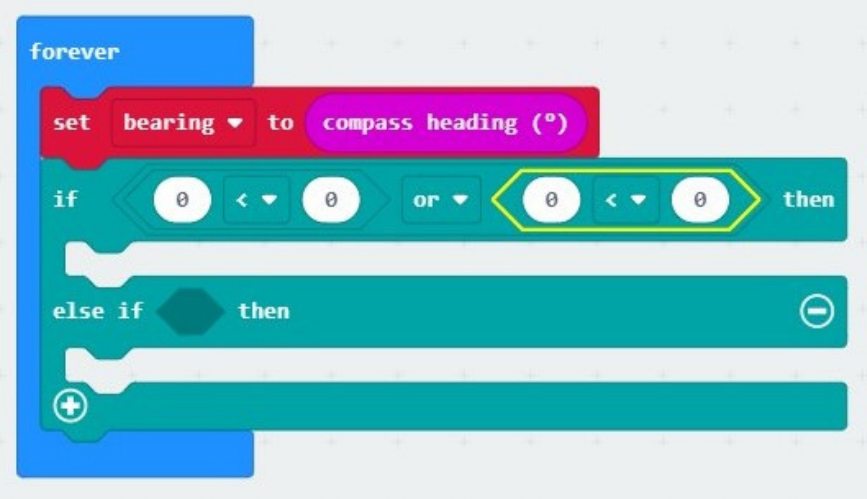
    a. The green block is an “If, then, else” statement block.
        i. Within the If-Else statement block are Boolean blocks. These blocks generate an input if one of the inputs prove to be true. For example: The micro:bit will show “N” for north if the numerical compass bearing is less than 45° or greater than 315



CHALLENGE P.7

BREAKING DOWN THE CODE

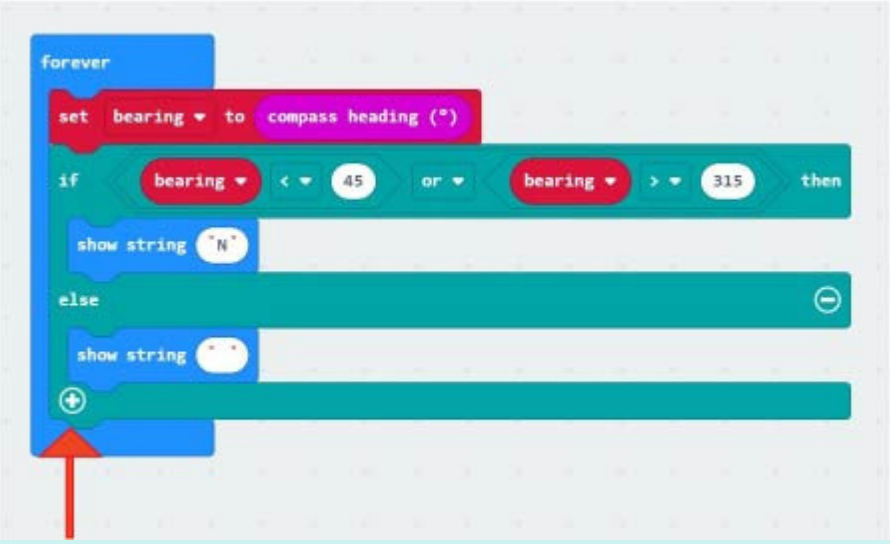
i. Within the OR block are the comparative blocks. These use mathematical operations to compare two inputs. In this case, we are using greater-than or less-than operators to compare to the compass heading reading of the micro:bit.

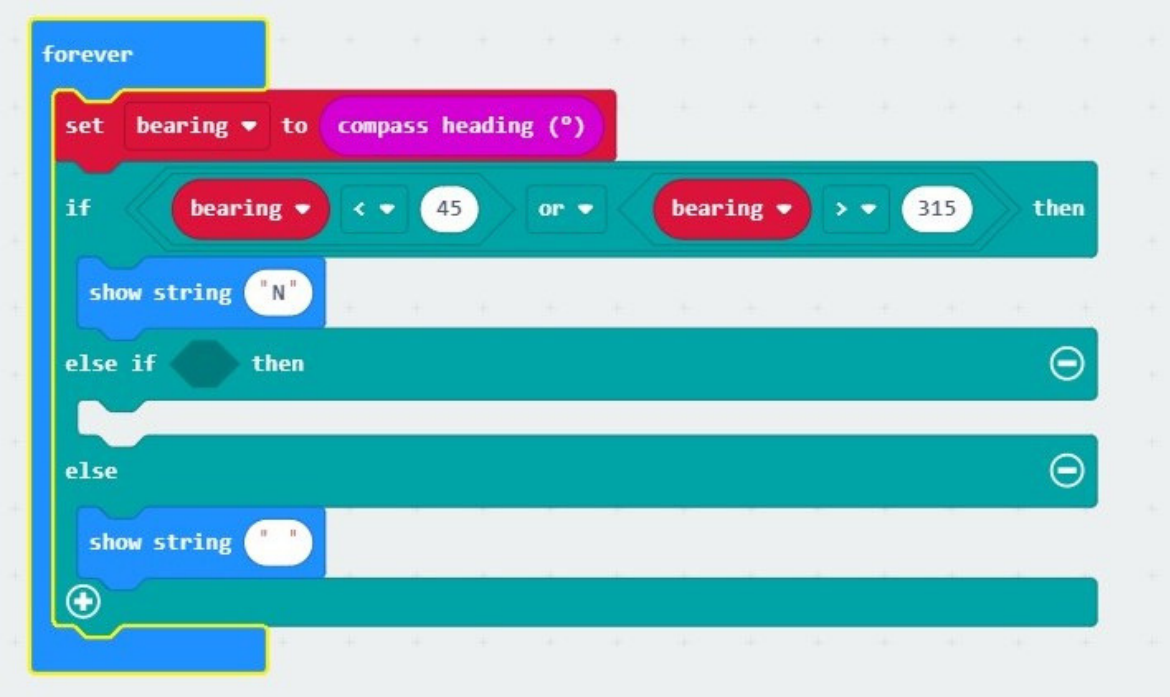


LET'S CODE!

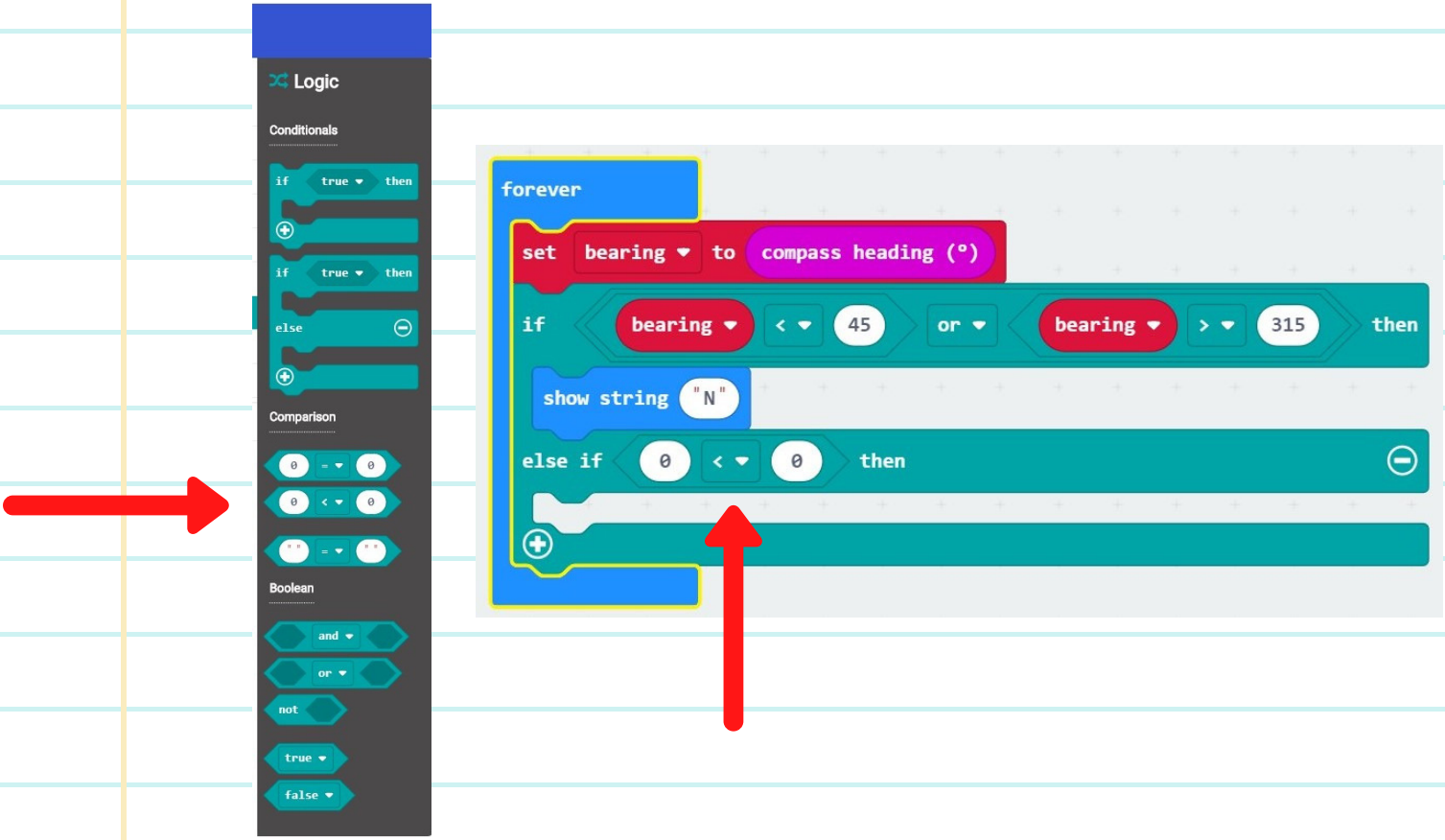
Now we will add the code to the other cardinal points East, South, and West, using the above code and the Cardinal points diagram.

1. Click the + symbol at the bottom of the if-else statement block to add a new else-if statement.

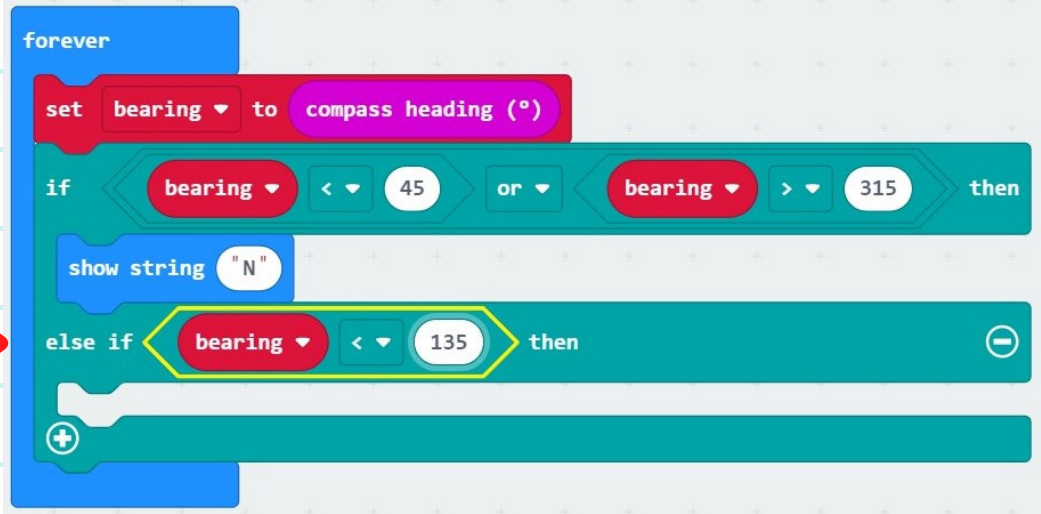




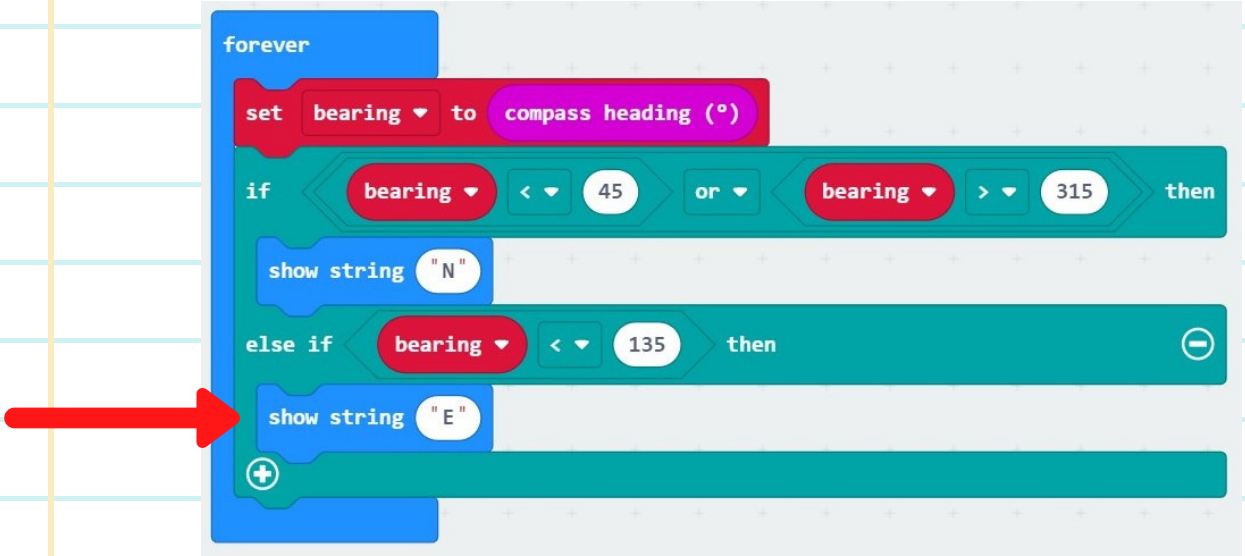
2. Notice the space in the new else-if statement. This is where we will add the comparative blocks. In the code library, select “Logic” and under the Boolean section, Select the less- than block and place it in this space.



3. Now that we have this statement in place, we can compare two inputs. The first input we want to compare is the compass bearing for East. When we look at the cardinal points diagram, East corresponds to a compass heading of 90° and a compass bearing less than 135°.



4. Finally, if this statement is true, then is should show E for east. Use the “show string” block and place it below the code we just made. Enter the letter E.



Code the rest of the Cardinal Points by following the Cardinal Points Diagram!

Congratulations!

You have learned how to use technology to help you learn about and take care of the land.

You have earned your position as Environmental Steward.

We hope you have enjoyed coding the micro:bit and using the sensors on the enviro:bit to observe your environment.

Look for more micro:bit activities at Pinnguaq.com.

PINNGUAQ

CONGRATULATIONS!