



Wildcat Code

COMPASS

LEARNING TOPICS:

Variables

Logic Statements

If Then, Else Statements

Sensors

MATERIALS:

Micro:bit

Computer

Internet Access

INTRODUCTION:

Today, students will be programming their Micro:bits into a usable compass that will display N, E, S, and W.

Before starting with the activity, have students answer the introduction questions below:

- What kind of tools have you made this far with the Micro:bits? Which has been your favorite so far?

VOCAB:

Next, let's discuss some Micro:bit and computer science terminology:

Program – An algorithm that has been coded into something that can be run by a machine.

If, then, else Statements – Compares two or more sets of data and test them for a result. If results are true, then do (what you make the program do if results are true), else do (what you make the program do if results are false).

Variable – A value that can be changed and stores information that can be accessed.

Bug – Part of a program that does not work correctly.

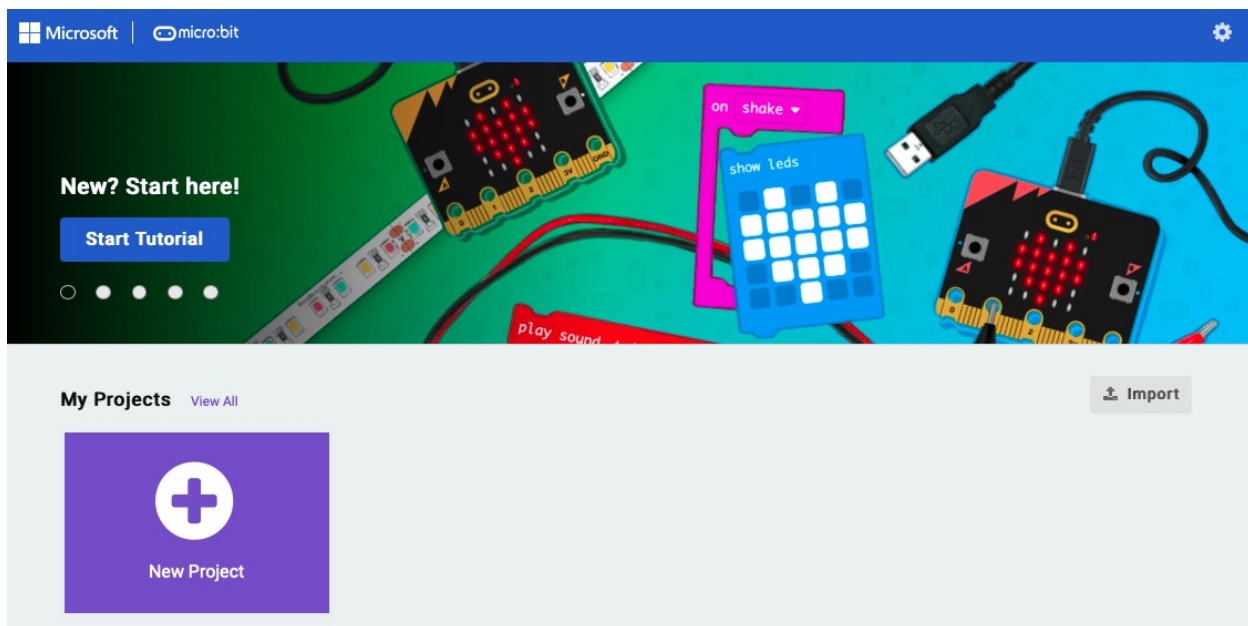
Debugging – Finding and fixing errors in a program.

Sequencing – The order in which a computer executes commands.

INSTRUCTIONAL CONTENT:

Let's get started! First, click or type the following link "<https://makecode.microbit.org/>" which will take you to today's activity on the Micro:bit website.

Review both the Micro:bits and the MakeCode tool with students if needed.



Once students have their MakeCode program loaded, have students click on “**New Project**”. Name the project “Compass”.

Create a Project 🥰

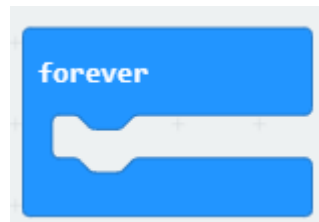
Give your project a name.

[Code options](#)

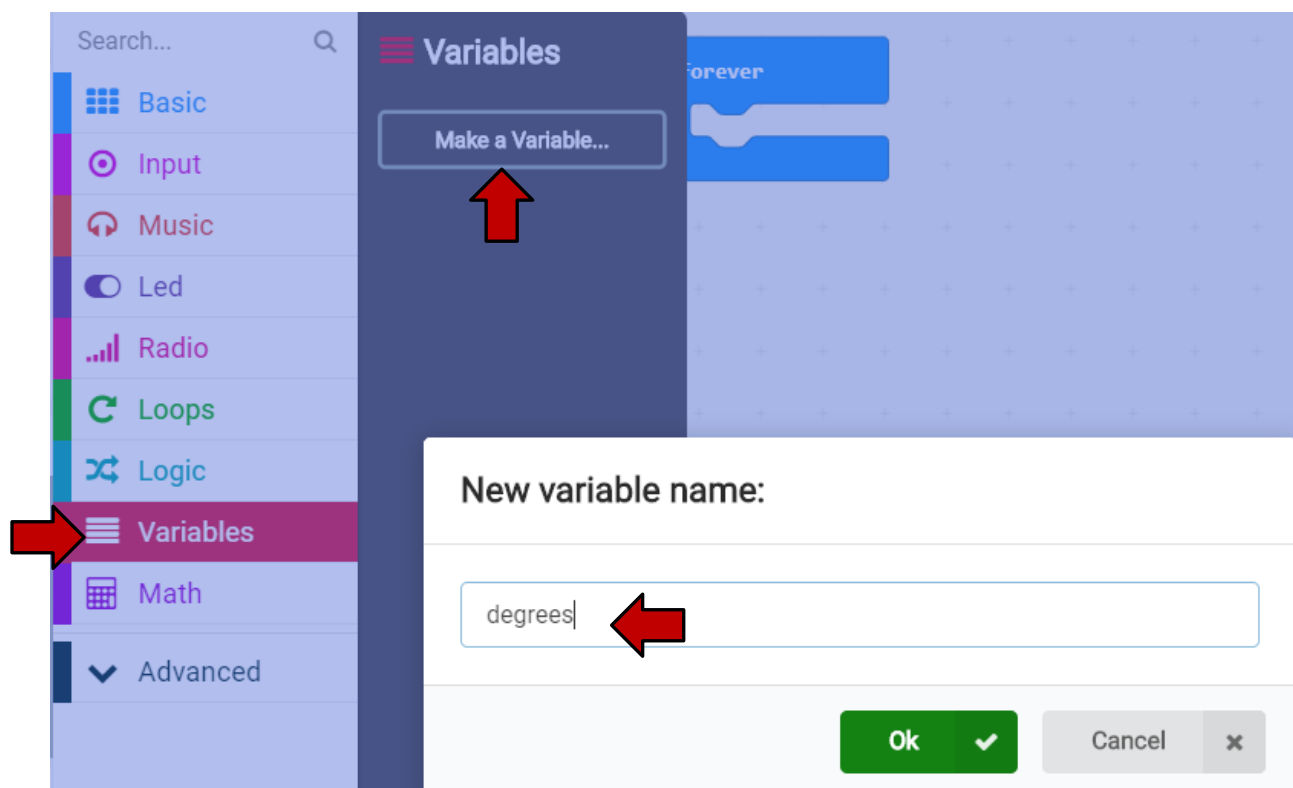
Create ✓

Students will be programming a compass through the Micro:bit with the built-in Magnetometer.

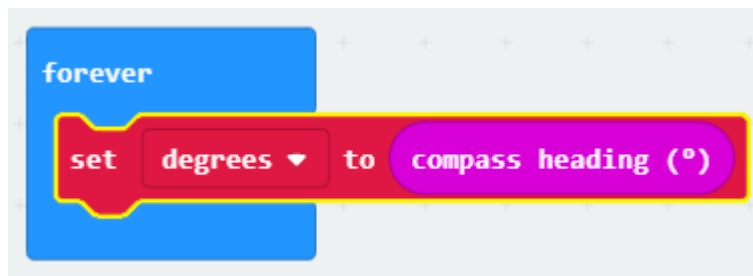
First, we will need a “Forever” block.



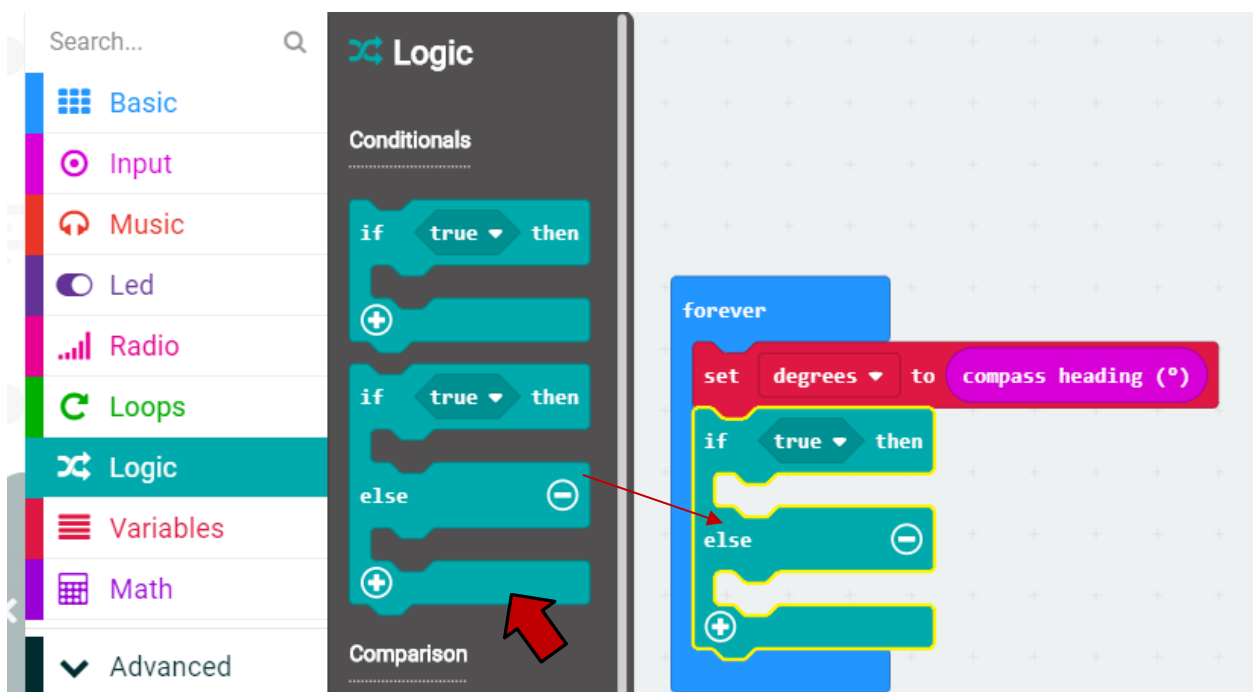
Next, we need to create variable called “degrees” which will be used to set the degrees for our compass.



Now, we will bring in our new “set degrees” block and attach a “compass heading” block as seen below.

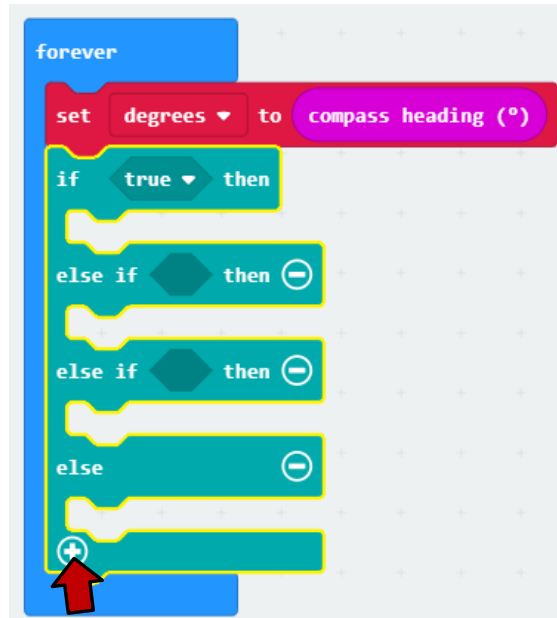


Once that is done, we no need to bring in an “if then else” block.



Show students how to add additional “else if” statements to the “if then else” block.

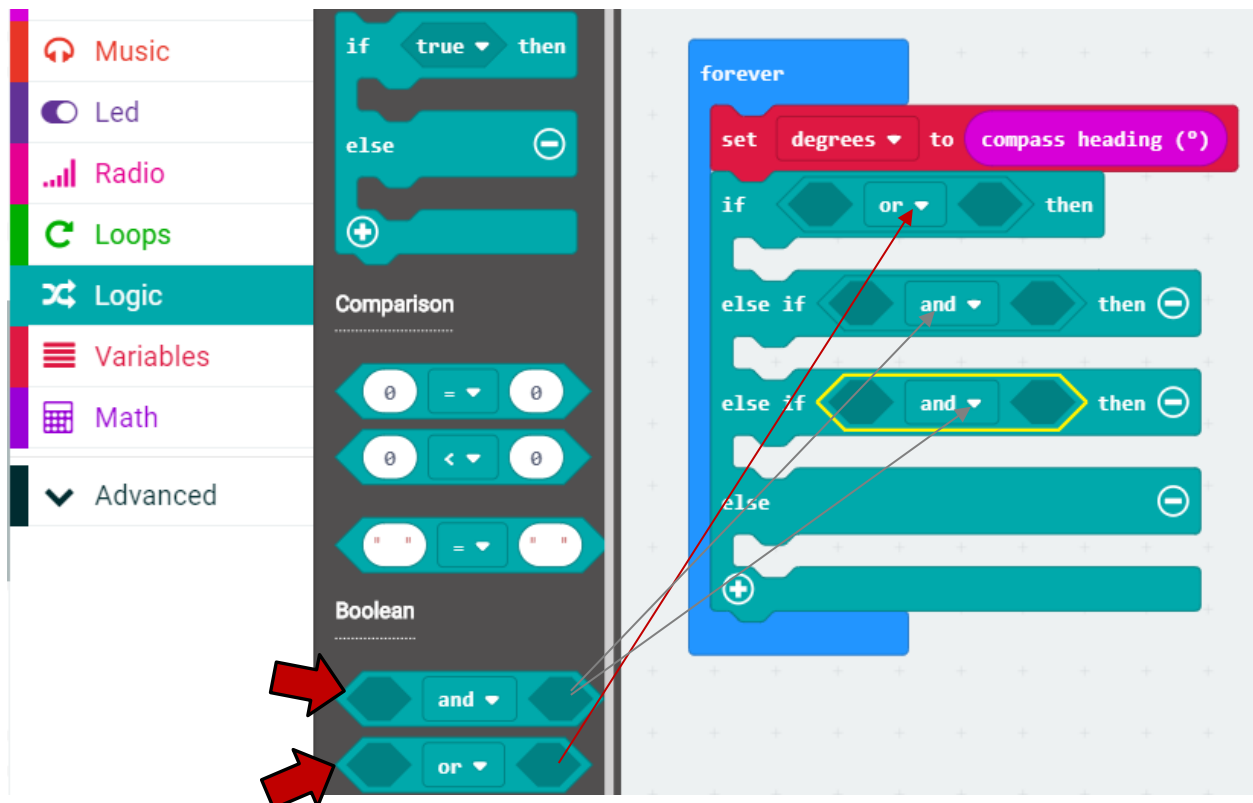
- o Two “else if” will be added as they are required for this project.
- o Click on the plus sign to add.
- o Code should look like the image below.



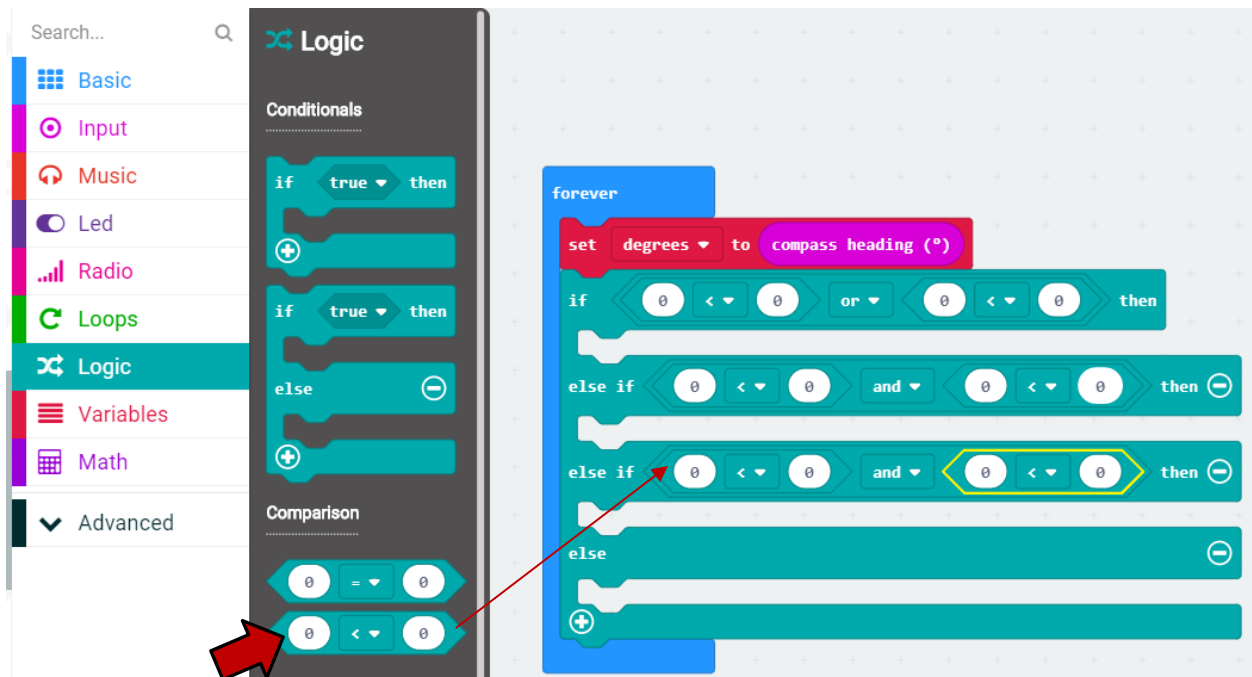
Now, we will use **Boolean** blocks from the **Logic** tab.

Boolean: form of data with only two values.

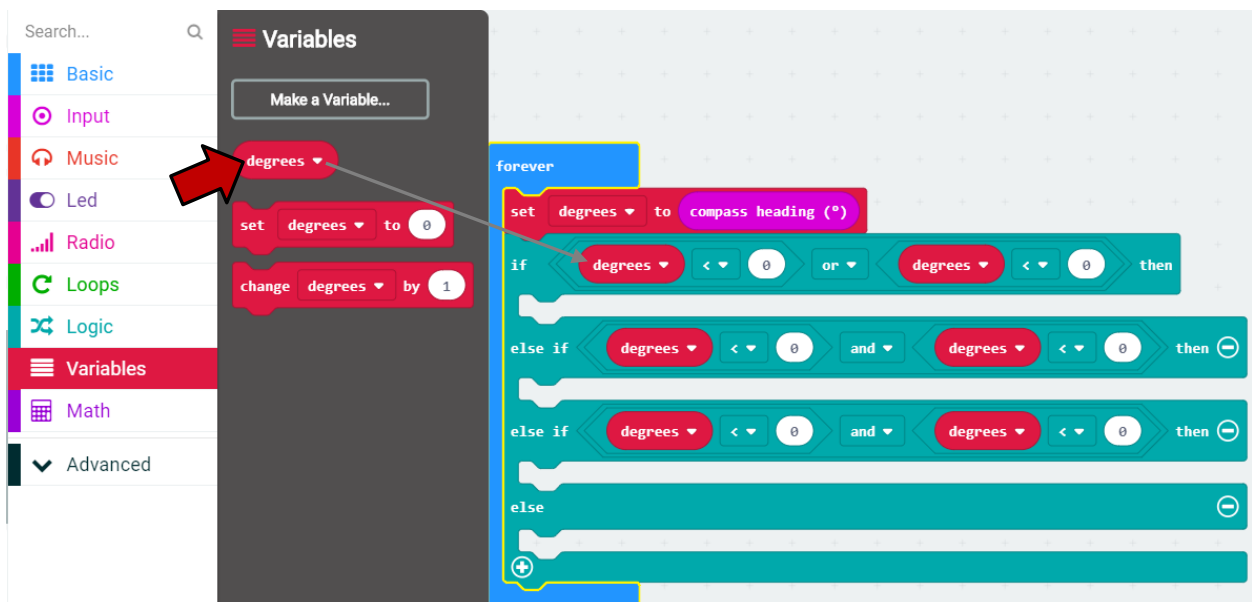
Drag one “or” Boolean block and place it in the first “if” statement. With the remaining “else if” statement we will use an “and” Boolean block. Code should match picture below.



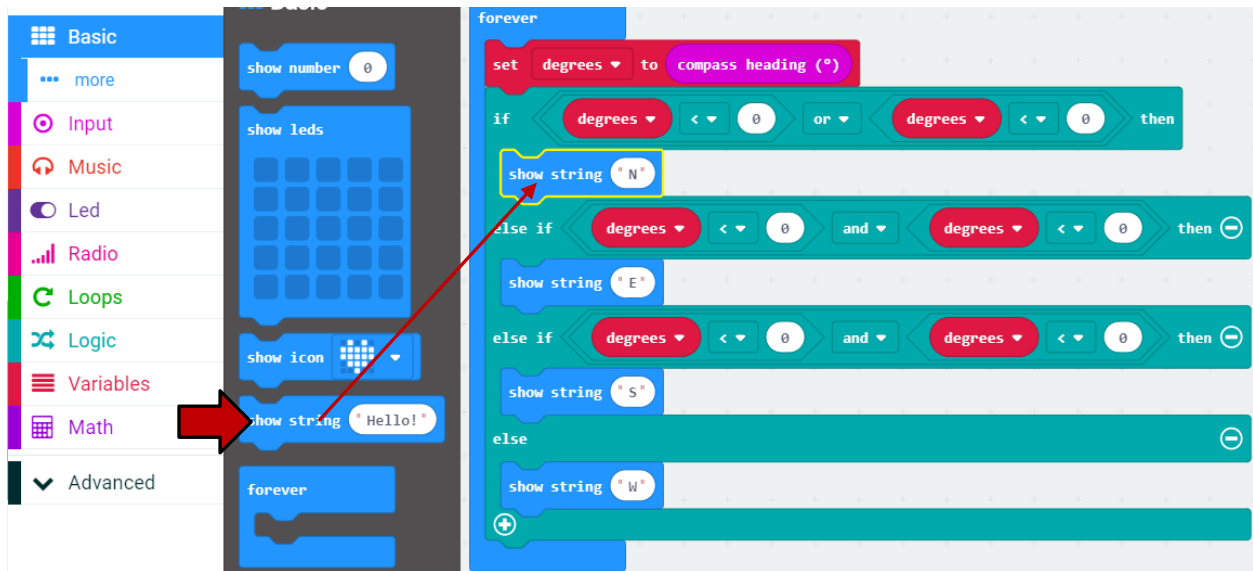
We will continue to use blocks from the logic tab. This time we will use the “less than” comparison blocks and place them in each Boolean block as seen below.



Next, we will use the degree variable we created. We will place a “degree” block on each left side of all the comparison blocks as seen below.



Now, we will add the text that will represent our directions. Grab 4 “show string” block and connect it after each “then” statement. Change each text to represent a direction as seen below.



Ask students: What are the degrees for each direction on a compass?

Answer:

Degrees required for Micro:bit:

- o N= 0° or 360°
- o E= 90°
- o S= 180°
- o W= 270°

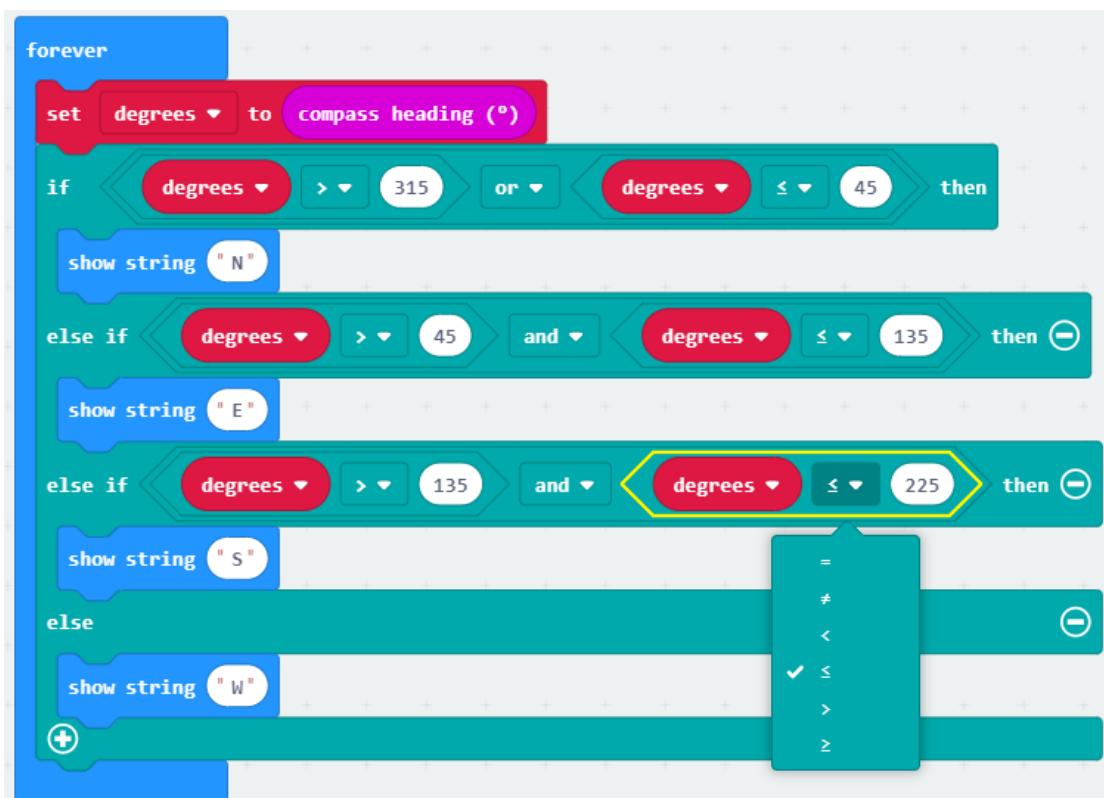
- o N= 315° & 45°
- o E= 45° & 135°
- o S= 135° & 225°
- o W= 225° & 315°

Explain to students the answers and how it can differ on the Micro:bit.

Now we will add the degrees required for each direction using the Micro:bit degree answers previously mentioned. Match the degrees as shown in the image below.

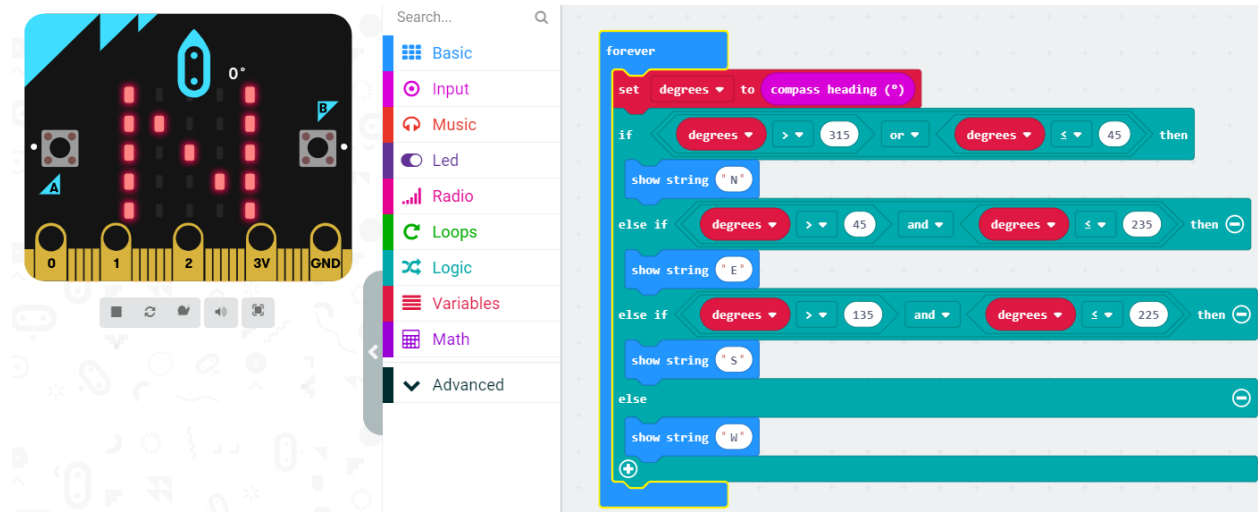


Lastly, we will change the value of the comparison blocks to properly work with our program. Change the first set of comparison blocks to “greater than” and the others to “less than or equal to” as seen below.



The first Boolean statement is an “or” rather than an “and” because the degrees will be between 315-0 and 0-45. The rest will be “and” statements.

Students can test their program using the Micro:bit shown on the left of their screen. Turn the Micro:bit logo to change the degrees.



Have students upload their program to the Micro:bit and use their compass.

Once done, challenge students to include “NE, NW, SE, SW” in their compass. Using an image of a compass can help determine the degrees.

Hint: (Micro:bit does not support decimals, round up.)

Sample Solution:

```
forever
  set degrees to compass heading (°)
  if <<degrees>> > 338 or <<degrees>> ≤ 23 then
    show string "N"
  else if <<degrees>> > 23 and <<degrees>> ≤ 68 then
    show string "NE"
  else if <<degrees>> > 68 and <<degrees>> ≤ 113 then
    show string "E"
  else if <<degrees>> > 113 and <<degrees>> ≤ 158 then
    show string "SE"
  else if <<degrees>> > 158 and <<degrees>> ≤ 203 then
    show string "S"
  else if <<degrees>> > 203 and <<degrees>> ≤ 248 then
    show string "SW"
  else if <<degrees>> > 248 and <<degrees>> ≤ 293 then
    show string "W"
  else
    show string "NW"
  +
```

LEARNING OUTCOMES:

By completing this activity, you will learn:

- Logic Statements
- Programming Helpful Tools

CLOSURE:

Reflect with students on the following questions:

- How can this tool be useful?
- Is there a simpler method on creating this compass? If so, how?

REFERENCES:

Micro:bit Makecode. (n.d.). Retrieved September 16, 2021, from <https://makecode.microbit.org/>