MICROBIT PROGRAMMING (BLOCK-BASED)
(Time required 30-45 minutes session)

Introduction

In this activity, we will build a digital compass that will keep you on track to the North Pole using the micro:bit's onboard compass chip!

Parts Needed (included in the kit):
1x micro:bit
1x Micro B USB Cable
1x micro:bit Breakout (with Headers)
1x Breadboard
4x Jumper Wires
2x LEDs
2x 100Ω Resistors

Compass Introduction

The compass, or technically the magnetometer, measures a magnetic field. Magnetic fields come in different sizes, but the biggest is the one produced by Earth itself, which is why compasses work.
The micro:bit has an onboard compass (a.k.a. a magnetometer) that can detect its orientation using Earth's magnetic field. Depending on the version that you have, the accelerometer and compass can be on separate ICs or combined into a single IC. The magnetometer detects magnetic north and then represents your heading in degrees with north being 0 degrees, east being 90 degrees, south being 180 degrees and west being 270.

**Compass Activity Wiring Diagram**
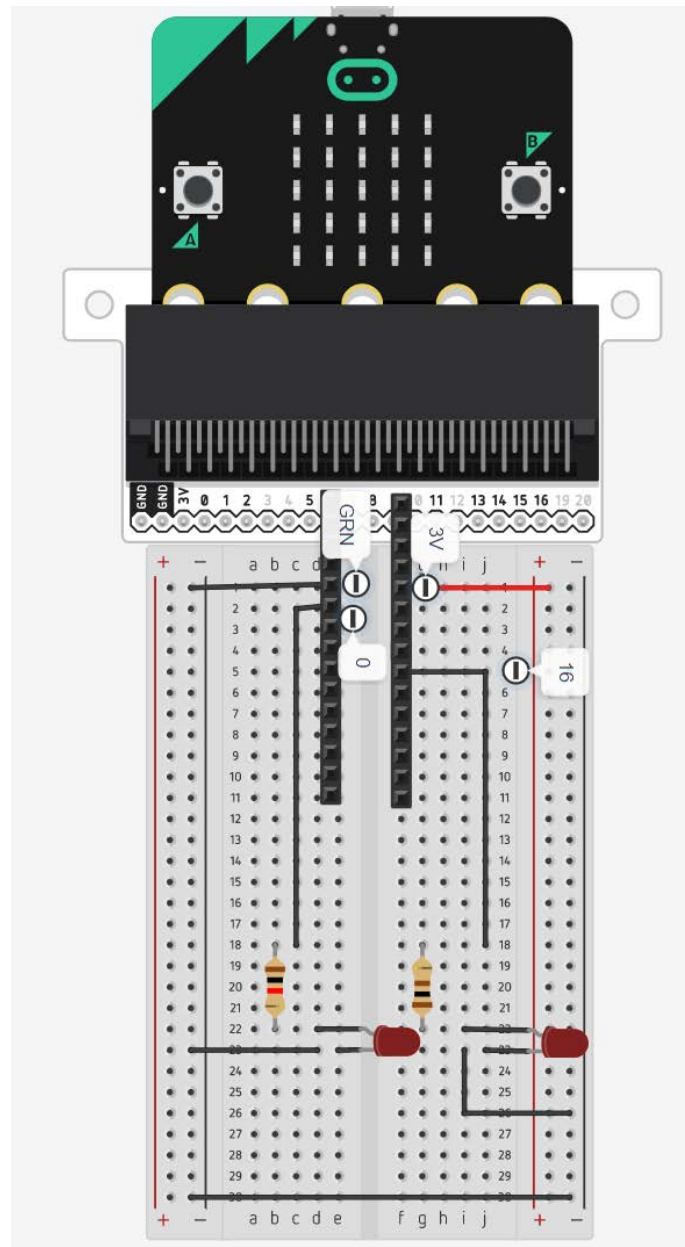
Compass Heading

The compass heading block returns the heading that you are facing if you are holding the micro:bit flat with the pins toward you. Zero degrees is north. We store this heading in a variable called item.

And

Much of the rest of this code is straightforward, but the logical and block is used. This combines two logical statements into one statement that returns true when both of the other statements are true and only true

Building the "Push Button Activity"

Step 1: Go to https://makecode.microbit.org/# and create a New Project
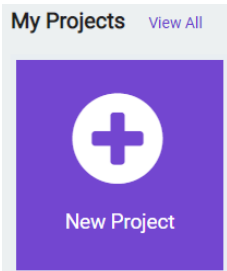
Step 2: Click on New Project and give it a project name **Compass Activity** and click Create
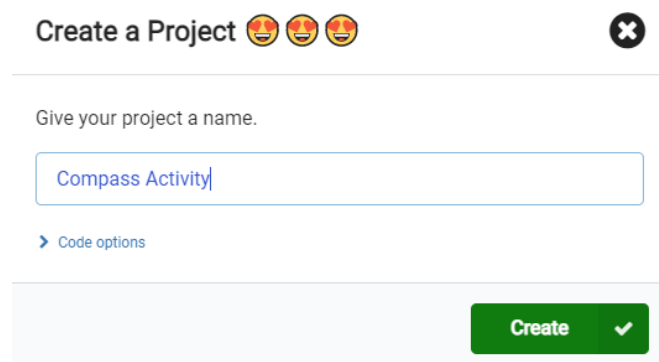
Step 3: Once the MakeCode is launched, click on the **Input | more** category, then select and drag **calibrate compass** block into the **on start** block

Step 4: Click on the **Variables** category and create a variable named **item**. Once the **item** variable has been created select and drag the **set item to 0** block into the **forever** block

Step 5: Click on the **Input** category, then select and drag the **compass heading ()** block into the **set item to** block
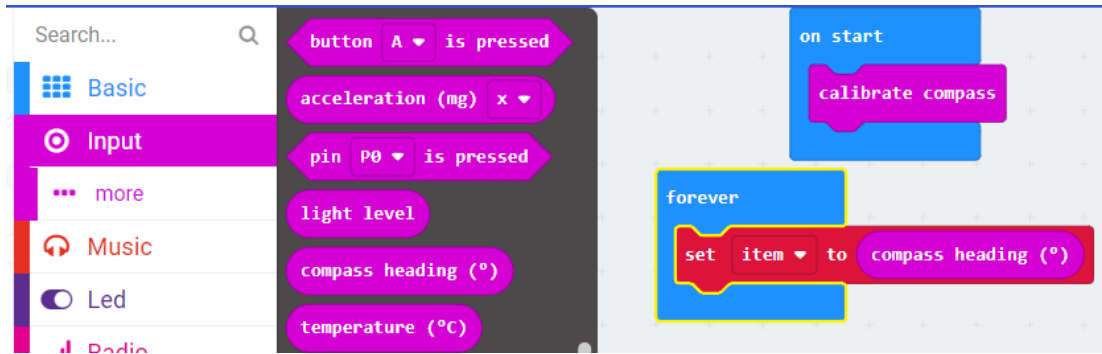
Step 6: Click on the **Logic | Conditionals** category then select and drag the **if <true> then** block into the **forever** block

Step 7: Click on the **Logic | Boolean** category then select and drag the **< > and < >** block into the **if <true> then** block

Step 8: Click on the **Logic | Comparison** category then select and drag the **<0> = <0>** block into the left **< > and < >** block. Repeat the same step to add comparison block to the right of the **< > and < >** block

Step 9: Click on the **Variables** category then select and drag the **item** block into the **if <true> then** block. Change the equals to (=) to greater than (>). Change the in the comparison block from 0 to 10.

Step 10: Click on the **Variables** category then select and drag the **item** block into the **if <true> then** block. Change the equals to (=) to less than (<). Change the in the comparison block from 0 to 180.
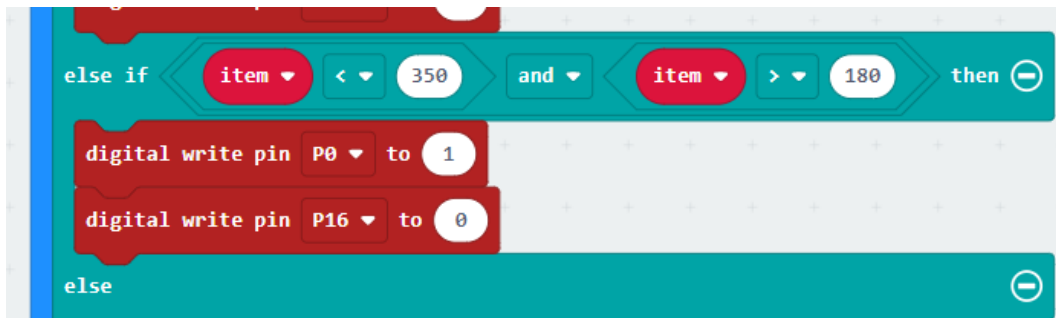
Step 11: Click on the **Advance** category then **Pins** then select and drag the **digital write pin P0 to 0** block into the **if <true> then** block.

Step 12: Right click on the **digital write pin P0 to 0** and select duplicate. Drag the copy block to the **if <true> then** block. Change ping **P0 to pin P16** and 0 to 1
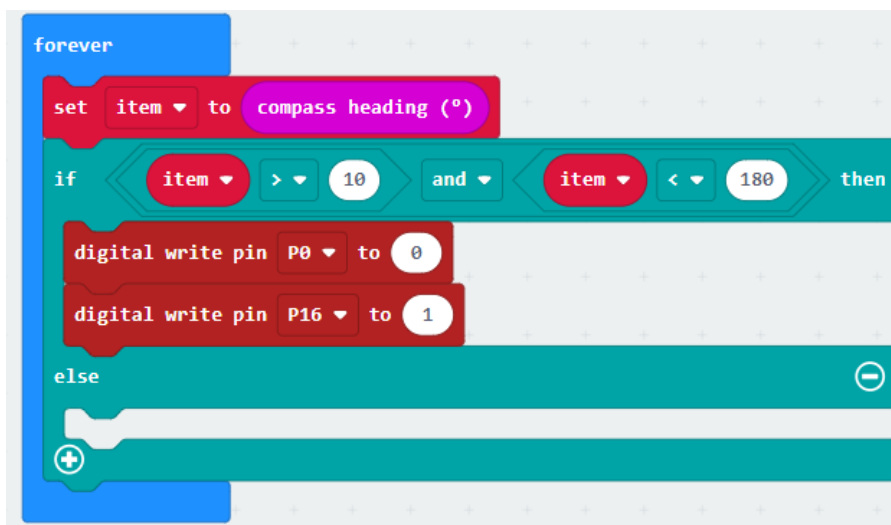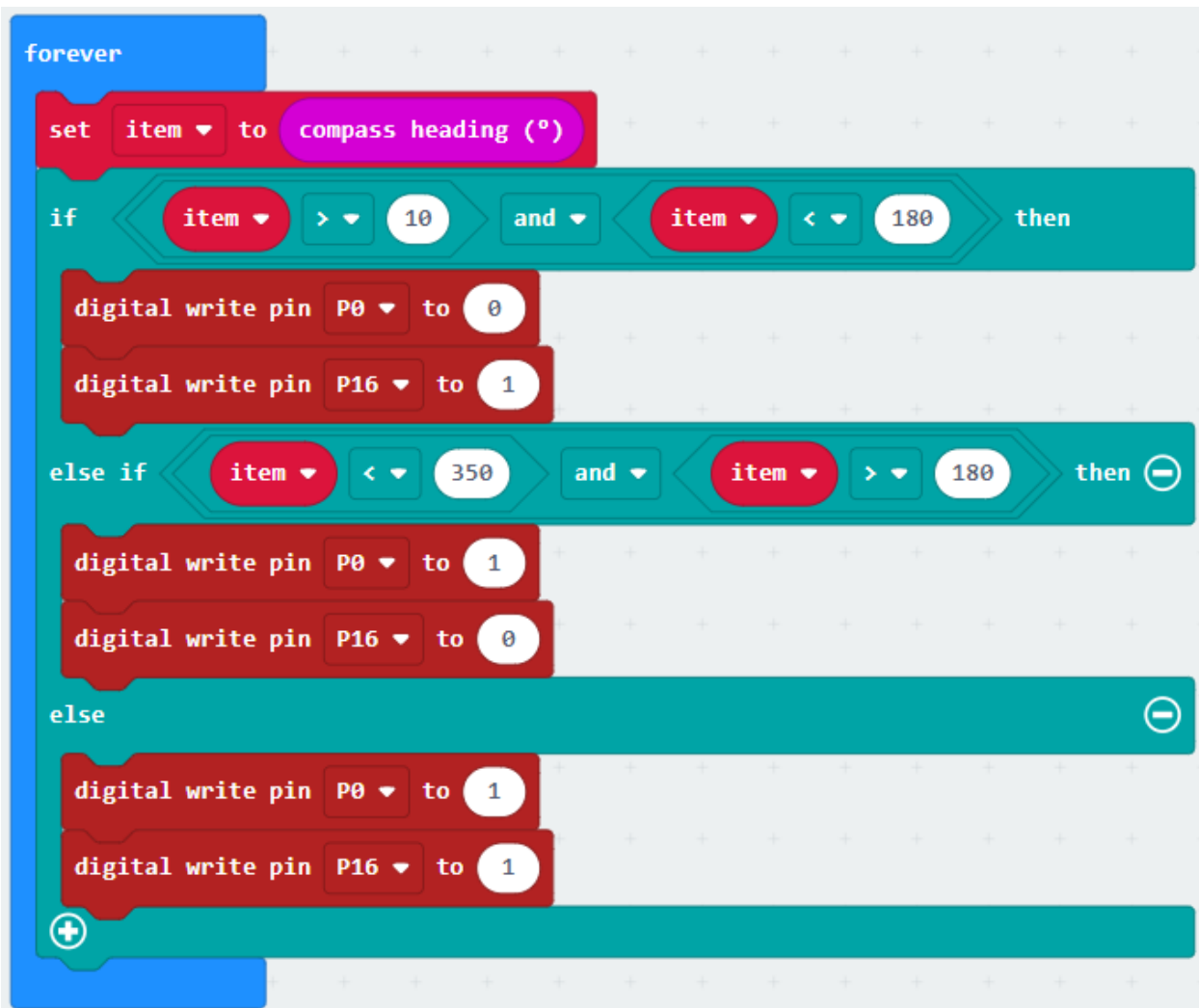

Step 13: Click on the plus (+) to create an additional **else if** statement block
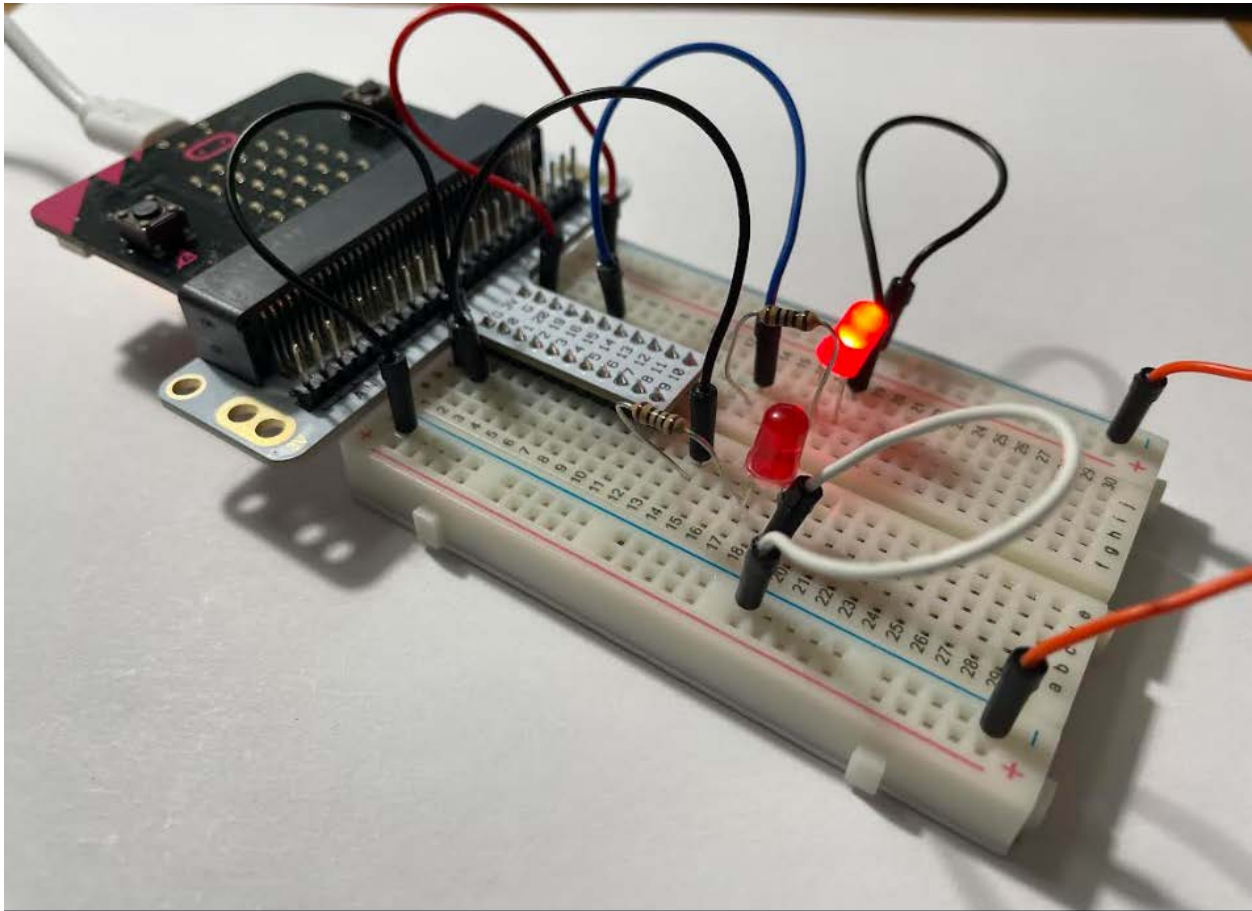
Step 14: Repeat steps 7 – 12 but the following changes as the figure below

Step 15: Click on the **Advance** category then **Pins** then select and drag the **digital write pin P0 to 0** block into the **else** block, change its value to 1. Add an additional **digital write pin P0 to 0,** change the P0 to P16 and its value to 1.
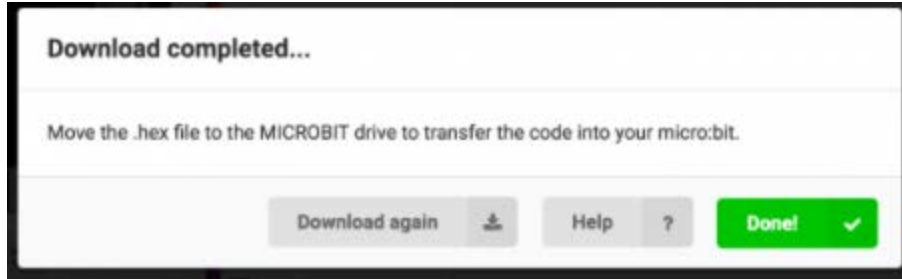
Final Prototype

Plug the USB cable to the micro:bit

Step 16: Click the download button in the lower lefthand corner of the code window. It will downloaded most probably in the Downloads folder

Step 17: Simply click and drag your program file from its download location to your micro:bit drive, which shows up as an external device.

Download completed...

Move the .hex file to the MICROBIT drive to transfer the code into your micro:bit.

Download again   Help ?   Done! ✓

Step 18: When your code is loaded you will first see instructions on the micro:bit LED array. The instructions will ask you to draw a circle, move the micro:bit around until all of the part of the circle have been added and it displays a smiley face. This process is to calibrate the micro:bit's magnetometer with its surroundings. The LEDs will start to turn on --- one or the other, or both. While standing still, rotate in the direction of the LED that is on. When both LEDs are lit, you are facing generally north (if you are outside)! You now have a compass that helps you find north, or any other direction you choose if you change the code!

Congratulations! You have successfully completed this activity.

Reference: Sparkfun Inventor's Kit for micro:bit Experiment Guide
https://learn.sparkfun.com/tutorials/sparkfun-inventors-kit-for-microbit-experiment-guide