

Western Engineering Outreach

Micro Bit: Compass

Grade 6-8

Meet Today's ENG HERO!



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Dr. M Capretz is the Associate Dean, Research in the Faculty of Engineering and a Professor of Software Engineering in the Department of Electrical and Computer Engineering at Western University. Dr. M. Capretz has been involved with software development and research and teaching in software engineering for more than 30 years. Her main fields of expertise include Data Analytics, Machine Learning, Cloud Computing and Health Informatics. To learn more about Dr. M. Capretz, please visit: https://www.eng.uwo.ca/electrical/faculty/capretz_m/index.html

Learning Goals:

- Grade 6: C3.1 solve problems and create computational representations of mathematical situations by writing and executing efficient code, including code that involves conditional statements and other control structures
- Grade 7: C3.1 solve problems and create computational representations of mathematical situations by writing and executing efficient code, including code that involves events influenced by a defined count and/or sub-program and other control structures
- Grade 8: C3.1 solve problems and create computational representations of mathematical situations by writing and executing code, including code that involves the analysis of data in order to inform and communicate decisions

Materials:

- Laptops
- Internet
- This website:

<https://makecode.microbit.org/>



Engineering and Science Connections:

Background:

What is coding?

Code is a set of instructions that a programmer gives to a computer to tell the computer what they want it to accomplish.

Why do we need this set of instructions?

Computers cannot think for themselves, they can only read what they are being told. We must communicate with computers to be able to make them function.

Can we tell a computer what to do out loud?

No, computers only speak very specific languages, that must be given to them through text.

What languages do you speak?

Do we think computers understand these languages? Do you know the names of what some of the languages computers do understand are?

- Drag and Drop
- Scratch Hour of Code
- Java
- C++
- Python
- HTML

When software engineers finish writing their code, do you think they write it once, and start using it right away? Or do you think they might do something else first?

They do something called *debugging* where they test their code, and try to find any mistakes they made or ways to make the code better.

Today we are going to use Drag and Drop coding to Program a Micro Bit.

Activity:

Intro:

The earth is like a gigantic magnet. The top of the earth being the north of a magnet and the bottom of the earth like the south pole of a magnet.

This is how a compass works. A magnetized needle is placed on a balance point and it will always align with the magnetic field of the earth. Knowing the northern direction helps you always travel in the right direction. The earth is magnetic because of liquid metallic rock in outer core of the earth. This liquid rock has magnetic particles and these particles all align with one another creating a larger magnetic field over the entire earth.

By magnetizing a piece of metal and allowing it to move freely (ie. floating on water) the piece of metal will always align north to south. This is very important with boats because compasses are used to head in correct directions! Without a compass it is very difficult to move from place to place.



Recommendation: If you have never coded before this website will walk you through an introduction tutorial of making a flashing heart on Micro Bit, <https://makecode.microbit.org/#editor>

Next, take a few minutes to explore the different code blocks and what they do. Once you are comfortable using the code blocks, try to figure out a way to build a compass on Micro Bit. The full code with steps will be posted below for whenever you get stuck or need a hint.

It may even be helpful to read the code and understand it first and then try to recreate similar code without looking at the posted code.

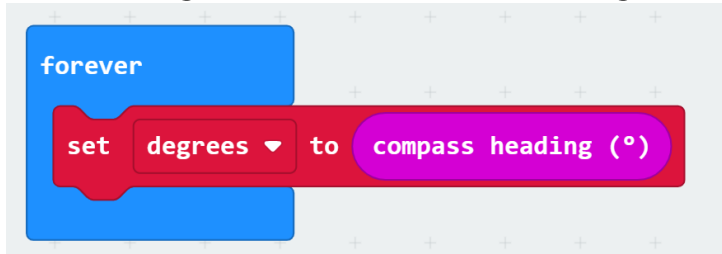
Code for the compass:

1. Create a loop that will continuously update the reading of the compass



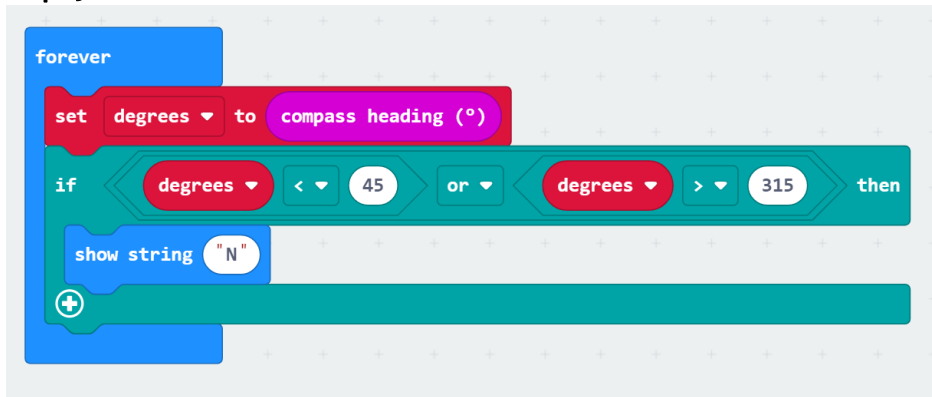
```
forever
```

2. Store the reading of the Micro Bit in a variable called 'degrees'



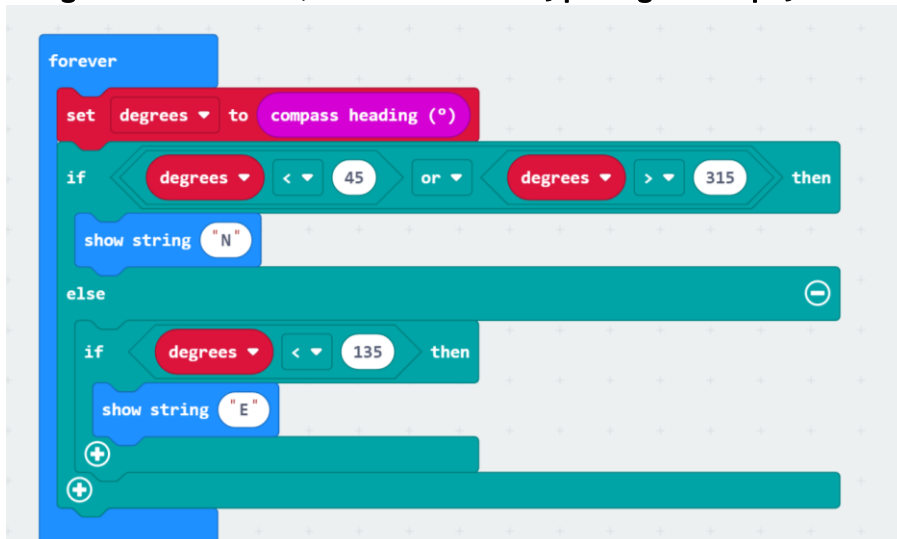
```
forever
  set degrees to compass heading (°)
```

3. If 'degrees' is less than 45 or greater than 315 then the compass heading is mostly pointing towards North. Display 'N' on Micro Bit.



```
forever
  set degrees to compass heading (°)
  if degrees < 45 or > 315 then
    show string "N"
```

4. If 'degrees' is less than 135, the Micro Bit is mostly pointing East. Display 'E' on the Micro Bit.



```
forever
  set degrees to compass heading (°)
  if degrees < 45 or > 315 then
    show string "N"
  else
    if degrees < 135 then
      show string "E"
```

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5. If 'degrees' is less than 225, the Micro Bit is mostly pointing South. Display 'S' on Micro Bit

```
forever
  set degrees to compass heading (°)
  if degrees < 45 or degrees > 315 then
    show string "N"
  else
    if degrees < 135 then
      show string "E"
    else
      if degrees < 225 then
        show string "S"
```

6. If none of these conditions are true then the Micro Bit must be pointing West. Display 'W' on the Micro Bit.

```
forever
  set degrees to compass heading (°)
  if degrees < 45 or degrees > 315 then
    show string "N"
  else
    if degrees < 135 then
      show string "E"
    else
      if degrees < 225 then
        show string "S"
      else
        show string "W"
```

7. Load your code and test out the Micro Bit.

What Did You Learn?



- What coding is and how computers follow instructions in coding languages.
- How to use Drag and Drop coding to program a Micro Bit.
- How to debug code and think through coding solutions.

Future Learning



- What are some other games or programs you could code on?
- Investigate these further by trying to code these programs and watching the Micro Bit tutorials for help whenever you get stuck or need a hint.

Share your creations!

We would love to see what you made. Email us at discover@uwo.ca or tag us on social media.

Instagram: @westernueng

Twitter: @westernueng

Facebook: @westernueng

Thanks for discovering with us!