

LESSON 18

Microbit Compass and Thermometer

60 minutes

Microbit Adventures

WHAT THIS LESSON DOES

Follow this guide to program your Microbit to function as a compass and thermometer. You'll create a new project, set up variables for direction, code buttons to display direction and temperature, and test everything on your device.

WHAT STUDENTS SHOULD BE ABLE TO DO

- Understand and utilise the compass and temperature sensor features of the Microbit.
- Develop proficiency in creating and setting variables in a Microbit project.
- Apply conditional logic to program Microbit buttons for specific functions.
- Test and debug code using the simulator before transferring to the Microbit.
- Interpret and display data from the Microbit's sensors in a user-friendly format.

BEFORE THE LESSON

- Open makecode.com on the board and confirm it loads through the school filter and that pupils can reach it on their devices.
- One device per pupil or pair, plus a Microbit and its USB cable each if you are flashing to hardware.
- Have your own compass and temperature program working so you can model the finished behaviour.
- Know your school's flashing routine: whether the .hex downloads and drags across, or pairs directly.

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HOW THE LESSON RUNS

- Create a new Microbit project
- Create the 'direction' variable
- Set the 'direction' variable
- Program the A button
- Check the direction and display it
- Program the B button
- Test your code
- Send your code to your Microbit

TEACHING MOVES

- 2. Create the 'direction' variable. Show the compass image and walk the room round 360 degrees: north at 0, east at 90, south at 180, west at 270. This anchors the number ranges they meet in step 5.
- 3. Set the 'direction' variable. Ask why this sits inside forever and not on start. Draw out that the heading changes constantly, so the code must keep re-reading it, not check once.
- 4. Program the A button. Point out the + button on the if block before they start. They must click it twice to get the two else-if lines, or the later conditions will have nowhere to go.
- 5. Check the direction and display it. Talk through why north needs 'greater than or equal to 315 OR less than 45': it wraps across zero. The other three are simple ceilings checked in order.
- 6. Program the B button. Keep this separate in their heads: it is its own on-button-pressed block. Nothing in it touches the direction variable.
- 7. Test your code. Model the simulator first. Drag the compass dial, press A, then drag the temperature slider and press B. Insist they test all four directions before flashing.
- 8. Send your code to your Microbit. Let them physically turn and walk the device to different walls. Comparing its reading against your compass makes any wrong condition obvious.

WHAT TO WATCH FOR

- Pupils write the direction checks in the wrong order and every reading shows the same letter, because a later condition can never be reached once an earlier one is always true. Have them read the if/else-if chain top to bottom out loud with one example number, showing that the first true line wins and the rest are skipped.
- Pupils put the compass reading on start instead of inside forever, so the direction never updates as they turn the device. Ask them to turn the Microbit and watch: if the letter never changes, walk them back to the forever block and the difference between reading once and reading continuously.
- Pupils expect the A button code to run on its own without pressing A, confusing button-triggered blocks with the forever loop. Point to the on-button-pressed header and explain that everything inside waits for that press, unlike forever which never stops.

DIFFERENTIATION

- Emerging: Pre-open a new MakeCode project on their device so they start at step 2, not at setup. Pair them with a partner and let them build one button between them before trying the second.
- Developing: Have them explain back to you why north uses OR while the others do not, in their own words. Ask them to predict what the display will show for a heading of 200 before they test it.
- Proficient: Challenge them to add a scrolling label so the temperature shows a degree symbol or units, using only blocks they already know. Ask them to work out and add a fifth direction, such as showing NE between two ranges.