

Compass

60 minutes (2 periods)

Microbit Basics

WHAT THIS LESSON DOES

Embark on a journey to understand compass sensors, their functionality, and their role in robotics. Learn how to use the Microbit's built-in compass sensor, calibrate it for accurate readings, and write code to utilise it. Discover the wide range of applications for compass sensors in robotics.

WHAT STUDENTS SHOULD BE ABLE TO DO

- Develop an understanding of the function and importance of compass sensors in robotics.
- Comprehend the working mechanism of compass sensors, particularly in relation to the Earth's magnetic field.
- Gain knowledge about the microbit compass and its features.
- Learn how to calibrate the microbit compass for accurate readings.
- Acquire skills to program the microbit compass for specific tasks.
- Explore various applications of compass sensors in robotic navigation and orientation.

BEFORE THE LESSON

- Have micro:bit devices ready so pupils can calibrate the compass and run the heading code.
- Check a sample micro:bit yourself: run calibration by rotating it in all directions, then confirm compassHeading displays a number.
- Where possible, free desks of large metal objects and spare magnets so calibration is less distorted.

Compass

HOW THE LESSON RUNS

Understanding Compass Sensors

How Compass Sensors Work

The Microbit Compass

Calibrating the Microbit Compass

Programming the Microbit Compass

Compass Sensor Applications

TEACHING MOVES

- 1. Understanding Compass Sensors. Frame the compass as a direction tool for robots: holding a heading and finding a way back, not only telling north for humans.
- 2. How Compass Sensors Work. Stress the chain: magnetometer senses the field, the microcontroller turns that signal into orientation relative to magnetic north.
- 3. The Microbit Compass. Show the micro:bit and name the built-in magnetometer so pupils know the sensor is on the board, not a separate add-on.
- 4. Calibrating the Microbit Compass. Run `input.calibrateCompass()` and have every pupil rotate the board in all directions until on-screen calibration finishes.
- 5. Programming the Microbit Compass. Get pupils to calibrate, then use `basic.showNumber(input.compassHeading())` and turn the board so they see the reading change.
- 6. Compass Sensor Applications. Discuss the lesson examples: hold a heading while avoiding obstacles, return to a start point, and combine with other motion sensors.

WHAT TO WATCH FOR

- Pupils expect accurate headings straight away and skip or rush calibration. Make calibration non-negotiable before any heading work. Repeat rotate-in-all-directions until the board finishes, then compare readings.
- Pupils treat the heading number as random or as a button label, not degrees toward magnetic north. After `showNumber(compassHeading())`, have them face roughly north, south, east and west and watch how the value moves with the board.
- Pupils think nearby metal, cases or stacked boards will not affect the reading. Link back to magnetic interference in calibration. Retest with clutter cleared and notice steadier values.

DIFFERENTIATION

- Emerging: Pair them with a partner and focus first on completing calibration by rotating the micro:bit correctly. Stay with them while they get `showNumber(input.compassHeading())` on screen before interpreting values.
- Developing: Have them explain their sequence: calibrate, then read heading, then show the number, in their own words. Ask them to turn slowly and say when the heading crosses familiar directions.
- Proficient: Challenge them to trigger a simple action from heading, such as showing a different icon when facing a chosen direction. Ask how they would use heading with another sensor idea from the applications step, without adding new kit.