

# Variables

This lesson introduces the use of variables to store data or the results of mathematical operations. Students will practice giving variables unique and meaningful names. And we will introduce the basic mathematical operations for adding subtracting, multiplying, and dividing variables.



## Lesson Objectives

Students will...

- Understand what variables are and why and when to use them in a program.
- Learn how to create a variable, set the variable to an initial value, and change the value of the variable within a micro:bit program.
- Learn how to create meaningful and understandable variable names.
- Understand that a variable holds one value at a time.
- Understand that when you update or change the value held by a variable, the new value *replaces* the previous value.
- Learn how to use the basic mathematical blocks for adding, subtracting, multiplying, and dividing variables.
- Apply the above knowledge and skills to create a unique program that uses variables as an integral part of the program.

## Lesson Plan Structure

- Introduction: Variables in daily life
- Unplugged Activity: Rock Paper Scissors scorekeeping activity
- Micro:bit Activity: Make a game scorekeeper
- Project: Make a scorekeeper
- Project Mods
- Assessment: Rubric
- Standards: Listed

## Introduction

Computer programs process information. Some of the information that is input, stored, and used in a computer program has a value that is **constant**, meaning it does not change throughout the course of the program. An example of a **constant** in math is 'pi' because 'pi' has one value that never changes. Other pieces of information have values that **vary** or change during the running of a program. Programmers create **variables** to hold the value of information that may change. In a game program, a variable may be created to hold the player's current score, since that value would change (hopefully!) during the course of the game.

Ask the students to think of some pieces of information in their daily life that are **constants** and others that are **variables**.

- What pieces of information have values that don't change during the course of a single day (constants)?
- What pieces of information have values that do change during the course of a single day (variables)

Constants and variables can be numbers and/or text.

### **Examples**

In one school day...

- Constants: The day of the week, the year, student's name, the school's address
- Variables: The temperature/weather, the current time, the current class, whether they are standing or sitting...

Variables hold a specific type of information. The micro:bit's variables can keep track of numbers, strings, booleans, and sprites. The first time you use a variable, its type is assigned to match whatever it is holding. From that point forward, you can only change the value of that variable to another value of that same type.

- A number variable could hold numerical data such as the year, the temperature, or the degree of acceleration.
- A string variable holds a string of alphanumeric characters such as a person's name, a password, or the day of the week.
- A boolean variable has only two values: true or false. You might have certain things that happen only when the variable called gameOver is false, for example.
- A sprite is a special variable that represents a single dot on the screen and holds two separate values for the row and column the dot is currently in.

## Unplugged: Keeping Score

To experience creating and working with variables, have students pair up and play Rock Paper Scissors.



Ask students to keep track of their scores on paper. You can also have students play in groups of three with the third student acting as the scorekeeper.

Students will keep track of how many times each player wins as well as the number of times the players tie.

Play: Have students play Rock Paper Scissors for about a minute. When done, ask the students to add up their scores and how many 'rounds' they played.

Play again: Tell students they will now start over and play again for another minute. When done, ask the students to add up their scores and how many 'rounds' they played.

Ask some students to share how they kept track of player scores. There may be some variety, but most will have written down the players' names and then beside or below the names, marks representing the 'wins' of each player. And they may have made a separate place for recording ties.

Game 1		
	W	T
Mary	IIII	I
Sam	IIII	III

  

Game 2		
	W	T
Mary	IIII	I
Sam	IIII	IIII

Sample Score-keeping sheet

Ask the students what parts of the score sheet represent **constants**, values that do not change through the course of a gaming session. Example: The players' names are constants.

Ask the students what parts of the score sheet represent **variables**, values that do change through the course of a gaming session. Example: The players' number of wins are variables.