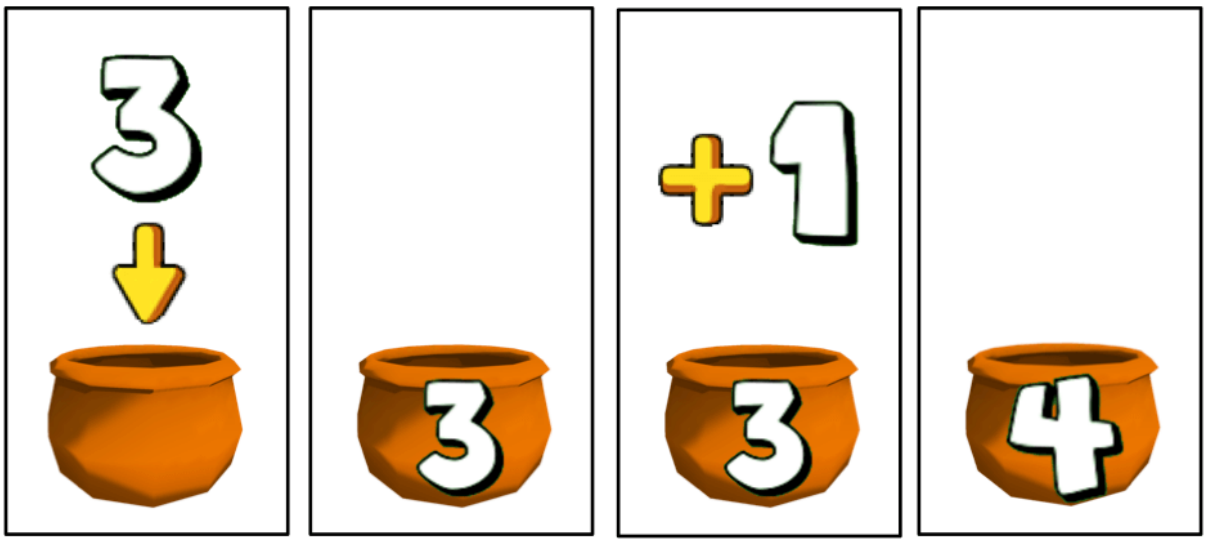
Variables and Electronic Devices

The ideas of variables, servers, and electronic devices like a servomotor are powerful. A variable is used in all programming languages that computers understand and execute. This is powerful since variables can be used to store data and values that the computer can reference in memory and do complicated mathematical and algorithmic operations. Computer memory is often limited by architectural and programmatic constraints. Therefore, it is important to use variables efficiently.



Reference:
https://blog.codespark.com/posts/teaching-kids-variables-inequalities-crocodile-catch

A server can be thought of as a computer that does computations and provides data and information to other computers in a network. These are powerful and run the entire computing world because they connect us to the internet and with each other.

Reference: https://www.racksolutions.com/news/blog/what-is-a-server/

There are other physical electronic devices in the world that can interact with servers. A servomotor is another device that is different from servers. This is an electromechanical device that allows precise and direct control of the angular position of its axis. These measurements are powerful and important for many results, experiments, and programs.

Reference: https://clr.es/blog/en/what-is-servo-motor-and-when-is-it-used/

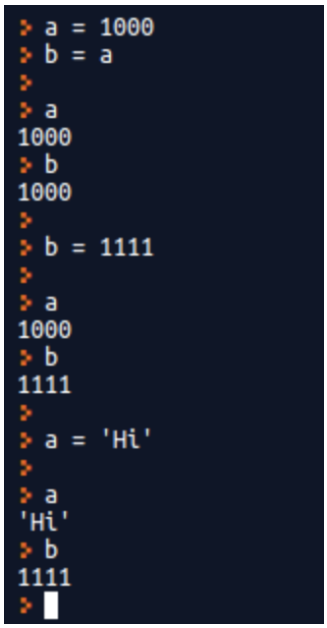
Part I: Variables

In this first part of the activity, we will learn about an additional programming feature known as a variable.

In essence, a variable in a program is an element that serves to represent or store information, which can be a number, a sequence of text characters known as string, among other

possibilities. This can be thought of as variables in mathematics where we represent a variable as a letter that stores value that can change. This is the opposite of a constant that does not change.

In many programming languages, variables can represent different types of values. For example, in the programming language Python, some different variable types include integers, floats(decimals), string, list, dictionary, and tuple. A dictionary is an object that has certain mappings of key to a value. For example, an example of a Python dictionary is {'Name': James, 'Age': 40, Country: “Brazil”}. A tuple is another data structure, which represents how data can be stored, that is called an immutable data structure. In other words, we cannot change the value inside of this data structure. An example of a tuple in Python is (1,2,3,4).



Reference: https://www.machinelearningwiki.com/python/python-variables-rules-conventions/

Variable creation

In the "Variables" tab, select the "Create variable" option, defining a name for it.

Example:

Setting the variable value

With the “Define as” block, we can assign a desired value to any existing variable in our program. This is stored in memory in a computer that we can reference and use at any time.

Directly changing the value of the variable

With the “Change by” block, implicitly a sum of the current value of the variable will be made with the value provided as an argument in the block itself.

The variables declared in the program can be useful for:

- Perform various algebraic operations, such as sums and multiplications;
- Store quantities that can be changed during the execution of the program;
- Be part of conditional and relational tests.
- Making programs more concise and efficient

With this exposure in mind, we will explore this new programming element to prepare a code that prints the multiplication table of a given number on the serial monitor.

Part 2: Servomotor

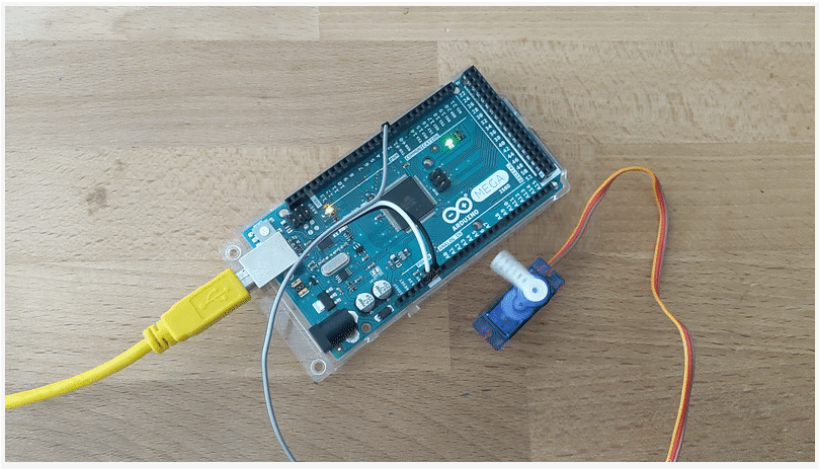
A servomotor is an electromechanical device that allows precise and direct control of the angular position of its axis. The drive of this device involves three pins: two pins for the power supply (5 V and GND), and one pin through which the angular position of the shaft can be controlled. In this case, we will use the Arduino to define this position over time.

Activity

a) Mount the servomotor drive circuit on the Tinkercad using one of the Arduino pins.

b) Prepare the program that positions the servomotor shaft at an angle of 30º.

c) Modify the program so that, now, the axis of the servomotor is rotated from 0º to 180 pass, in steps (or increments) of 10º, with an interval of 0.5 seconds (500 milliseconds) between each angular displacement. Check the operation of the system.
(Hint: Use a variable to store angle information throughout the execution of the program.)



Reference:
https://www.makersupplies.sg/blogs/tutorials/getting-started-with-servo-motors

d) Finally, do the physical assembly of the circuit with the Arduino disconnected. Once the assembly is finished and checked, connect the Arduino, load the program and observe the behavior of the system.