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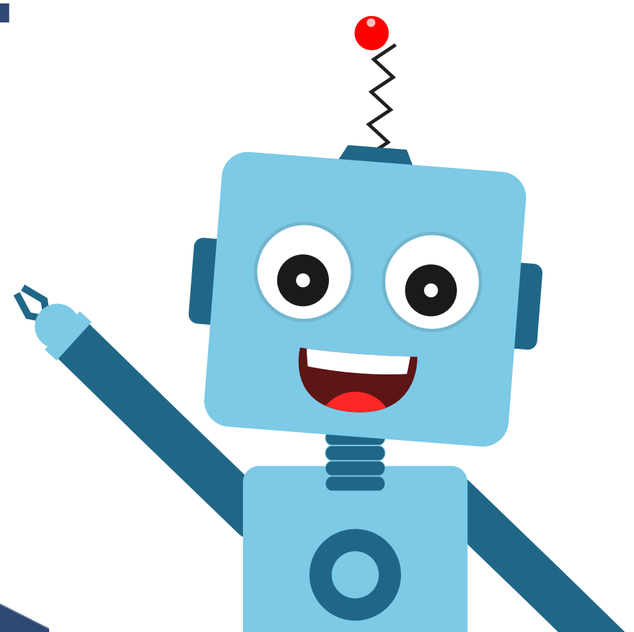
Loops in Python – While Loop

Session 7



Topics covered

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1. Introduction to loops

2. While Loop

3. Activity:
    1. Number counter using Quarky

Introduction to loops

In this activity, you will be introduced to the first of the two types of loops,

Introduction to Loops

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- In programming, repetition of a line or a block of code is also known as iteration.
- A loop is an algorithm that executes a block of code multiple times till the time a specified condition is met.

Increment Loops :

- Loops provide the facility to execute a block of code repetitively, based on a condition.
- To run a block of code in a loop, one needs to set a condition and set its number of iterations.
- Each time the condition is true, and the block of code executes once, it is counted to be one iteration.
- Before moving to the next iteration, one needs to increase the count of iterations to two. This is called incrementing a loop.

Increment Loops

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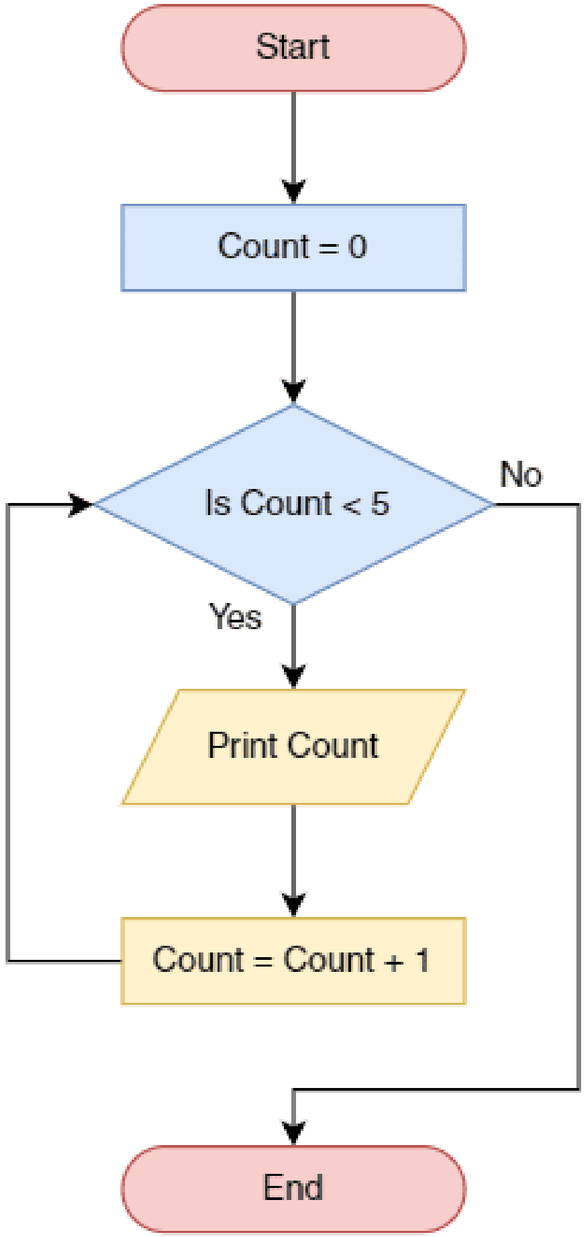
- For example, if you need to print numbers 0 to 4, you will execute a block of code with the Print statement in five iterations.

- With each passing iteration, you will increment the count by one.



Increment Loops

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Let us understand loops with a flowchart:

- Here every time the condition (Count < 5) is true, “Print count” gets executed. So, we do not have to write the “Print” statement multiple times. The loop takes care of that.

- What is important to note is that every loop must have an exit condition. In our example, the exit condition is (Count < 5). The loop will exit when the condition becomes false.

- Also, most loops will have a variable that is called a counter variable in programming terms. The counter variable keeps track of how many times the loop is executed. In this example, the “count” variable is our counter.

Benefits of Loops

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Below are the two important benefits of loops:

- Reduces lines of code
- Code becomes easier to understand

Different types of loops

Loops make our code more manageable and organized. Let us now see what the different types of loops are:

- While Loop
- For Loop
- Nested Loop

While Loop

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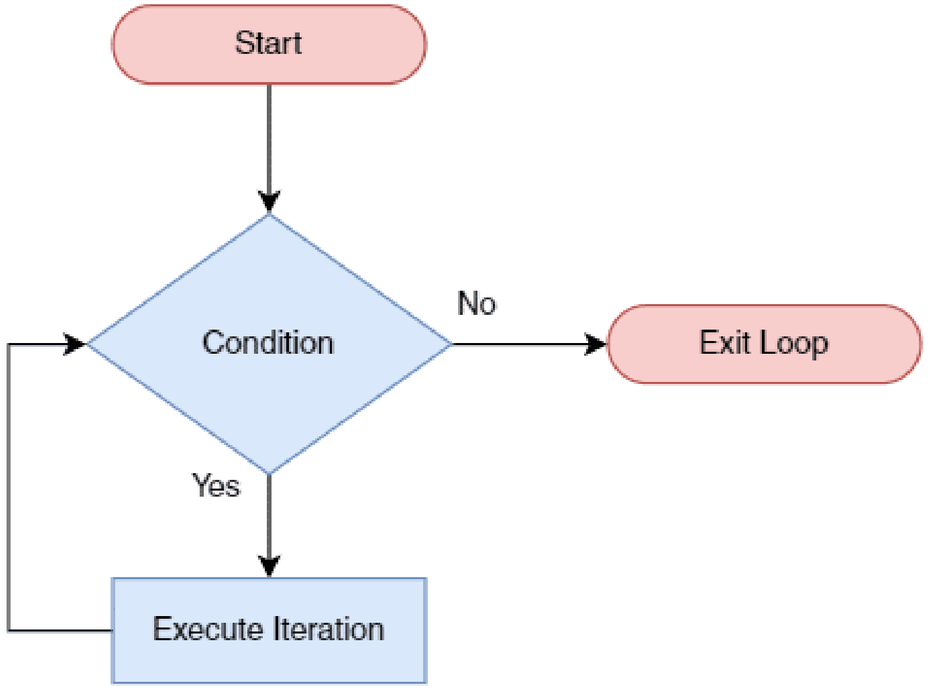
- The While loop can execute a set of commands till the condition is true.
- While Loops are also called conditional loops.
- Once the condition is met then the loop is finished.



The syntax of the while loop is:

```
while condition: # condition is Boolean expression returning True or False
STATEMENTs BLOCK 1
```

While Loop

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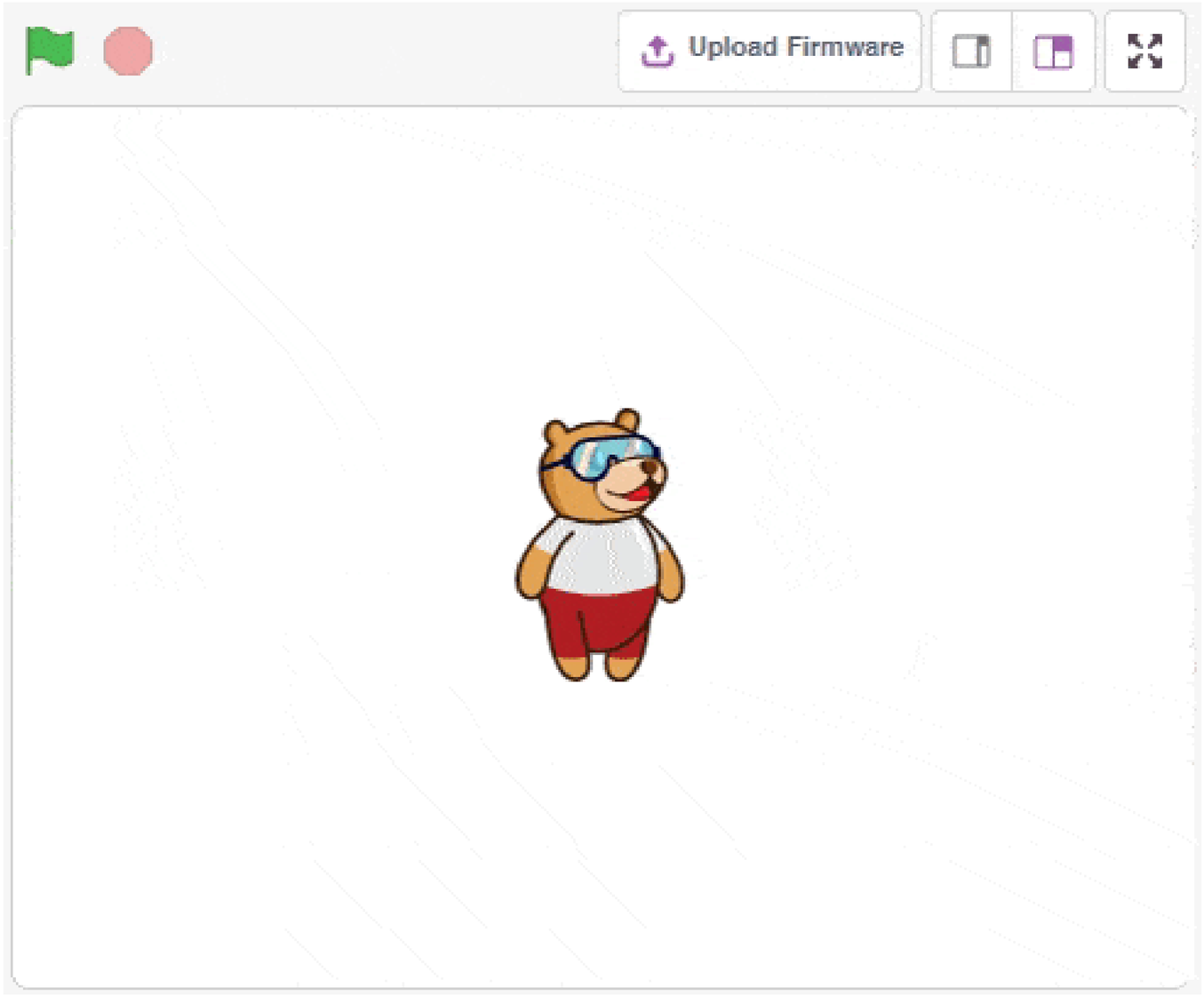
Example :

```
sprite = Sprite('Tobi’)

sprite.input("Enter the number")
N = int(sprite.answer())

i = 1

while (i <= 10):
        sprite.say(str(N) + " * " + str(i) + " = " + str(N*i), 1)
        i = i + 1

sprite.say("I am out of the loop!")
```

Output



ACTIVITY

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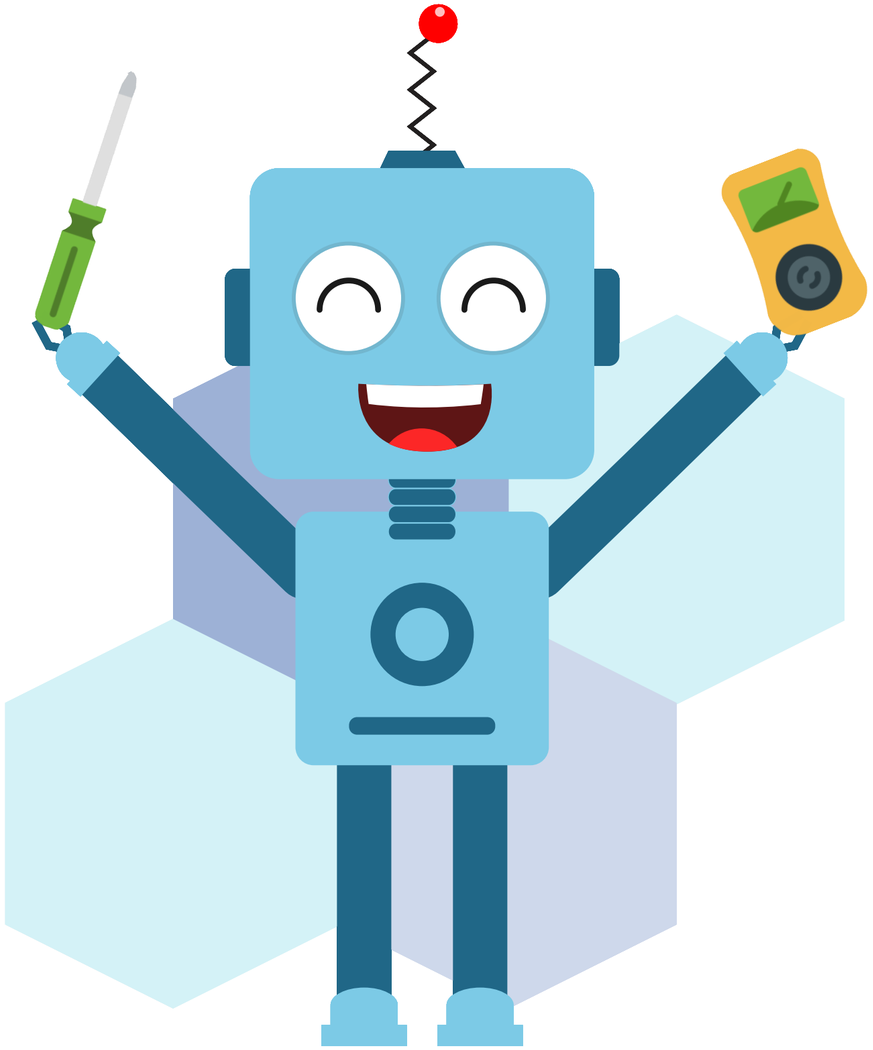
Number Counter using Quarky

Let’s create a code to print 1-9 number on the LED of Quarky using the logic of while loop.



Let's Code

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- In order to start counting from 1 to 9 and display the same on Quarky's display, we will be writing the code using while loop as follows:

```
while i <= 9:
  quarky.showtext(str(i), [0, 225, 225])
  time.sleep(1)
  i = i + 1
```

  - **showtext()** function is used to display the required text on Quarky's display in the required color.

```
showtext([1],[2])
[1]:Char-TEXT="A" , [1]:((A-Z),(0-9))
[2]:Num_Array-COLOR=[R,G,B] ,[2]: (R-(0-255),G-(0-255),B-(0-255))
Number:(R,G,B)
```

(1-9) Number Counter

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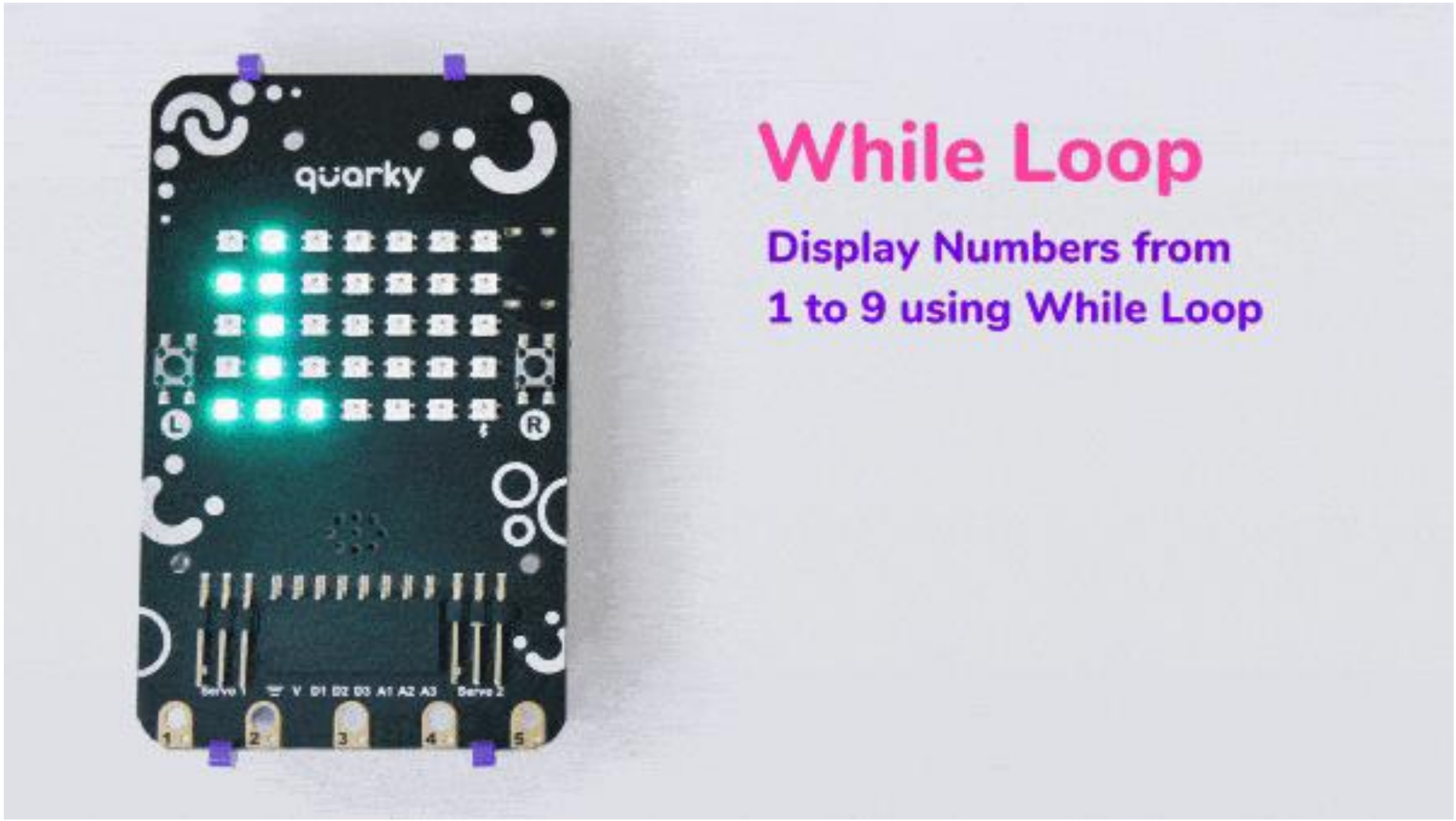
```
sprite = Sprite('Tobi')
quarky = Quarky()
import time
quarky.setbrightness(15)
i = 1
# Count from 1 to 9
while i <= 9:
  quarky.showtext(str(i), [0, 225, 225])
  time.sleep(1)
  i = i + 1
quarky.cleardisplay()
```

Output



(9-1) Number Counter

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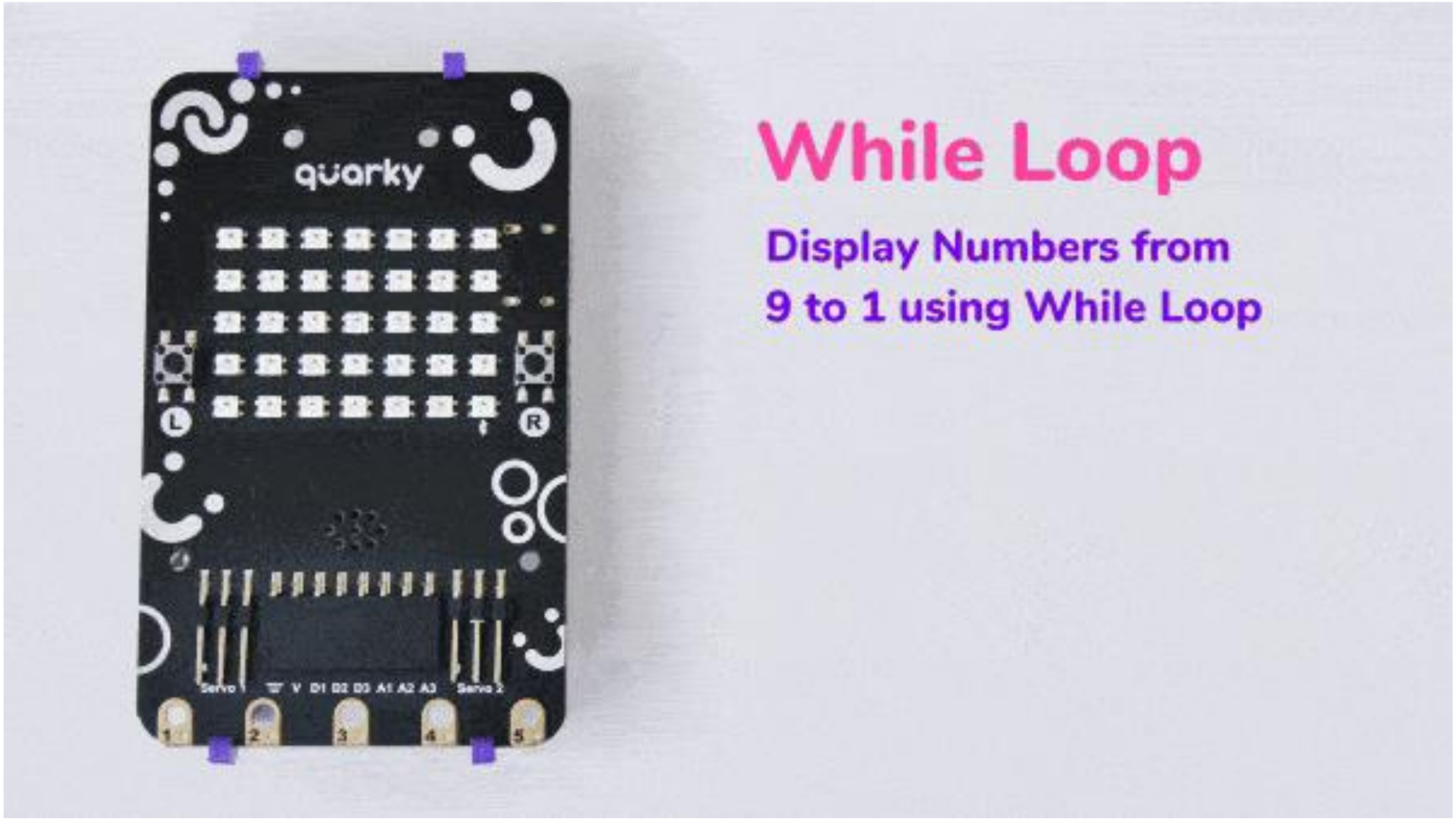
```
sprite = Sprite('Tobi’)
import time
# Instantiate the quarky object
quarky = Quarky()
i = 9
# Set the brightness level
quarky.setbrightness(15)
# Count from 9 to 1
while i >= 1:
        quarky.showtext(str(i), [0, 225, 225])
        time.sleep(1)
        i = i – 1
quarky.cleardisplay()
```

Output



Number counter using quarky(Final Code)

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```
sprite = Sprite('Tobi’)
import time
# Instantiate the quarky object
quarky = Quarky()
i = 1
# Set the brightness level
quarky.setbrightness(15)
# Count from 1 to 9
while i <= 9:
                quarky.showtext(str(i), [0, 225, 225])
                time.sleep(1)
                i = i + 1
quarky.cleardisplay()
time.sleep(4)
i = 9
# Set the brightness level
quarky.setbrightness(15)
# Count from 9 to 1
while i >= 1:
                quarky.showtext(str(i), [0, 225, 225])
                time.sleep(1)
                i = i - 1
quarky.cleardisplay()
```

AVERAGE AGE

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- First, we will create a step creates a variable called sum and sets it to 0. This variable will be used to keep track of the total age of all the students.

```
#Create a sum variable
sum=0
```

- Then the user to enter the number of students, reads the input as a string, and converts it to an integer using the **int()** function. The resulting integer is stored in the variable num.

```
#Take input from the user
num=int(input("Enter how many students: "))
```

- Then we will simply print out a message to the user to prompt them to enter the age of each student.

AVERAGE AGE

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- Furthermore, we use main loop of the program. It initializes a counter variable i to 0 and repeatedly loops through the following steps until i reaches the value of num: Reads the user input as a string using the **input()** function.

```
i=0     #create iteration variable
while i<num:
```

- Converts the input string to a number using the eval() function (which can handle both integers and floating-point numbers).adds the resulting number to the sum variable.
- Then, Increments the i-counter variable by 1.”we calculate the average age of the students by dividing the sum variable by num, and prints out the result along with a message to the user.

```
sum+=n
 i+=1
print("The average age is:", sum/num)
```

AVERAGE AGE(Final code)

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```
sum=0   #Create a sum variable
num=int(input("Enter how many students: ")) #Take input from the user
print("enter age:")
i=0      #create iteration variable
while i<num:
  n=eval(input())
  sum+=n
  i+=1
print("The average age is:", sum/num)
```

AVERAGE AGE(Final Output)

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