CEC Continuing Education Center

DesignNews

MicroPython Embedded Applications

DAY 2 : MicroPython and Switches

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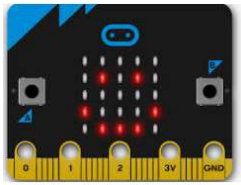
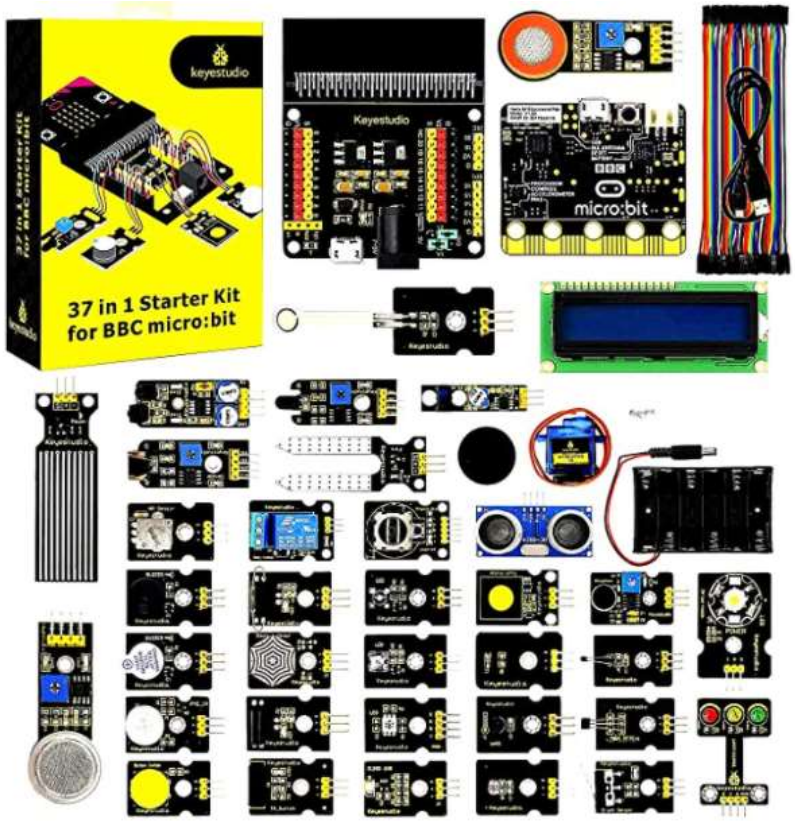
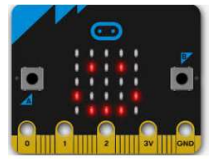
Don Wilcher

Visit ‘Lecturer Profile’ in your console for more details.



Course Kit:
Keyestudio 37 in 1 Starter Kit with BBC micro:bit



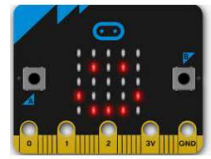


Agenda:

Lab Activities:

- Review of Tactile Switches
- Review of Circuit Schematic Diagram
- Testing on Tactile Switches with REPL
- Wiring and Testing External Tactile Switches with REPL
- Creating an Up-Down Counter with Tactile Switches

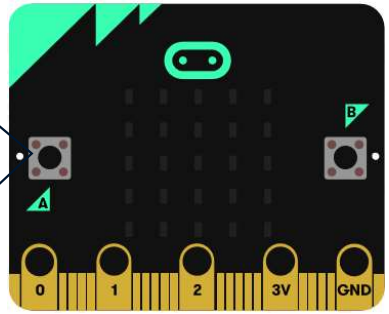
Lab Activities



Review of Tactile Switches

button_a.is_pressed() --- > False
Button A not pressed

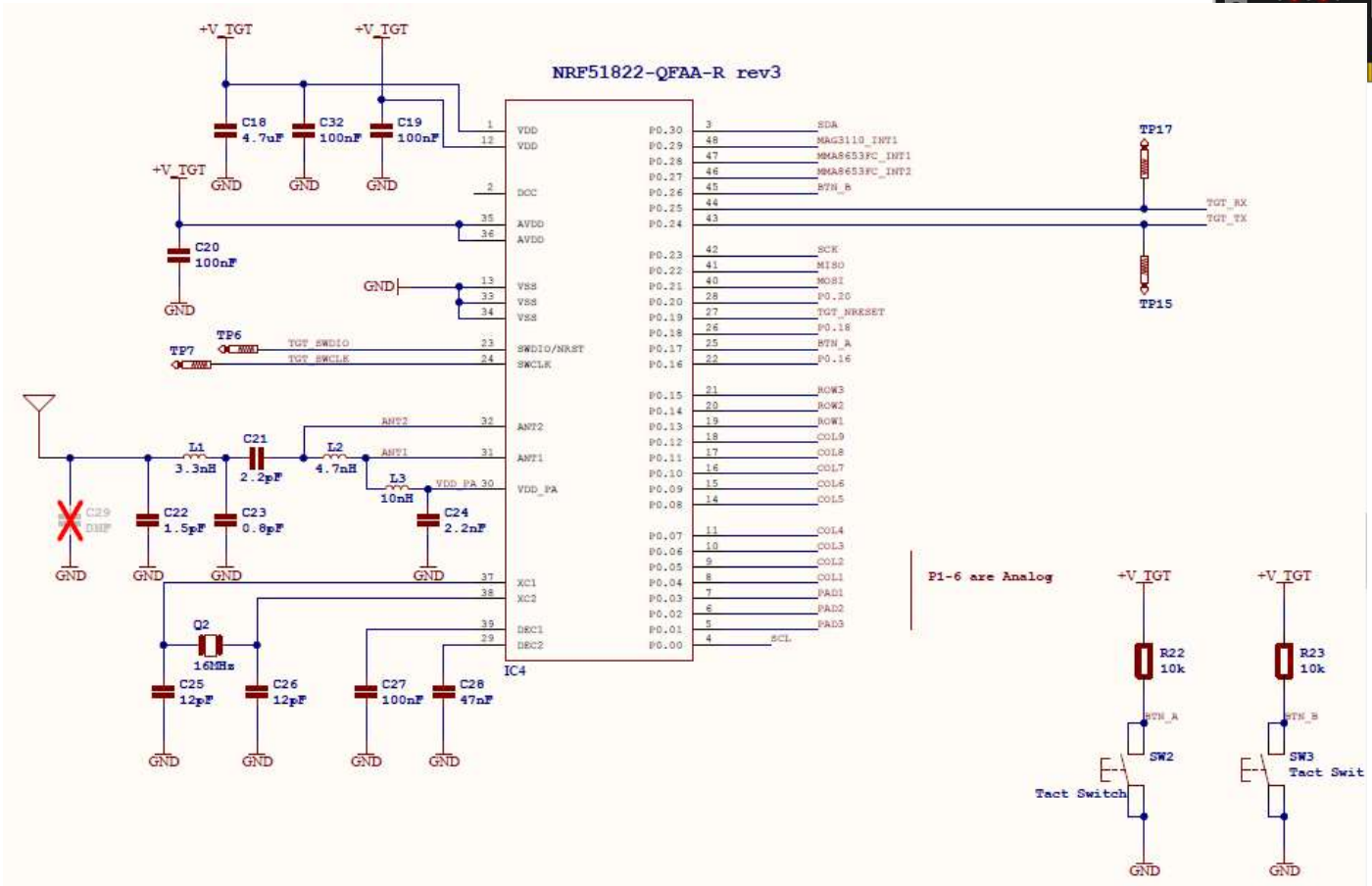
button_a.is_pressed() --- > True
Button A press and hold



Lab Activities

Review of Tactile Switches

Review of Circuit Schematic Diagram:
Original Circuit Schematic Diagram



Source:

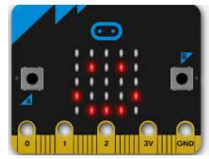
https://github.com/bbcmicrobit/hardware/blob/master/V1.5/SCH_BBC-Microbit_V1.5.PDF

Question 1

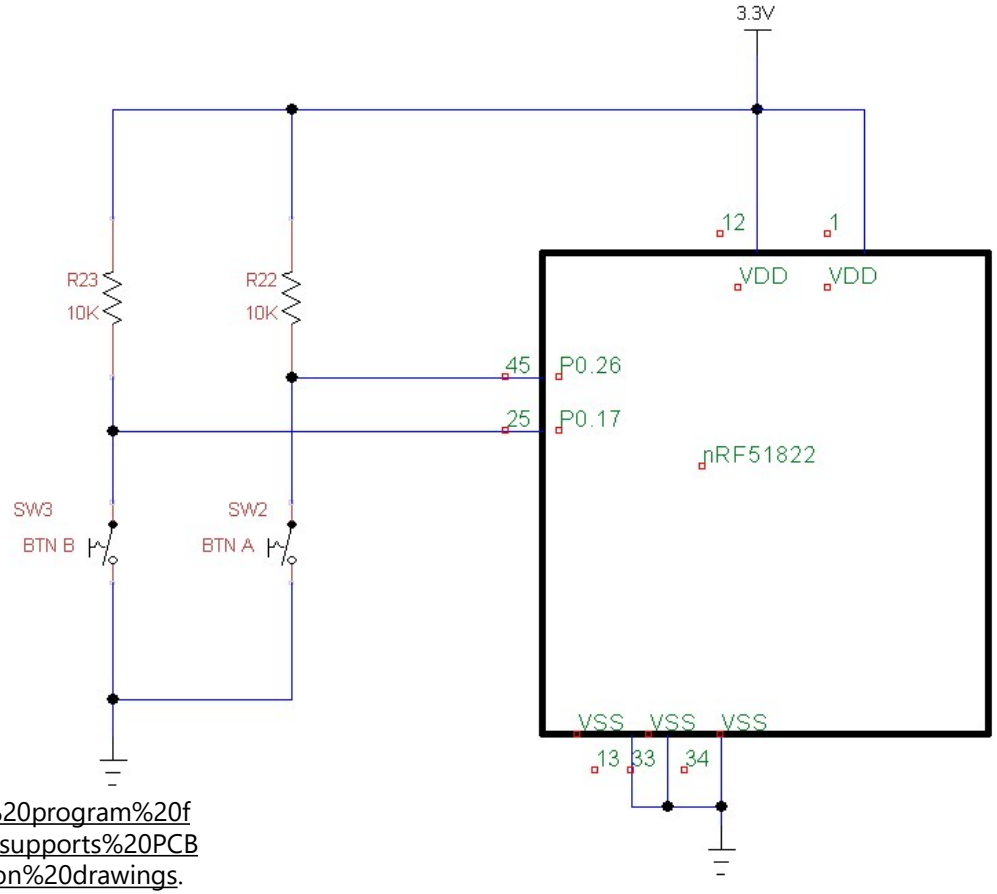
What is the micro:bit microcontroller's part number?

Review of Tactile Switches

Lab Activities



Review of Circuit Schematic Diagram: Created in TinyCAD



10KΩ Surface Mount Device (SMD) resistor

Tactile Switch

Source:

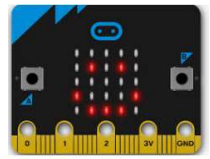
https://sourceforge.net/projects/tinycad/#:~:text=TinyCAD%20is%20a%20program%20for,commonly%20known%20as%20schematic%20drawings.&text=It%20supports%20PCB%20layout%20programs,block%20diagrams%2C%20and%20presentation%20drawings.

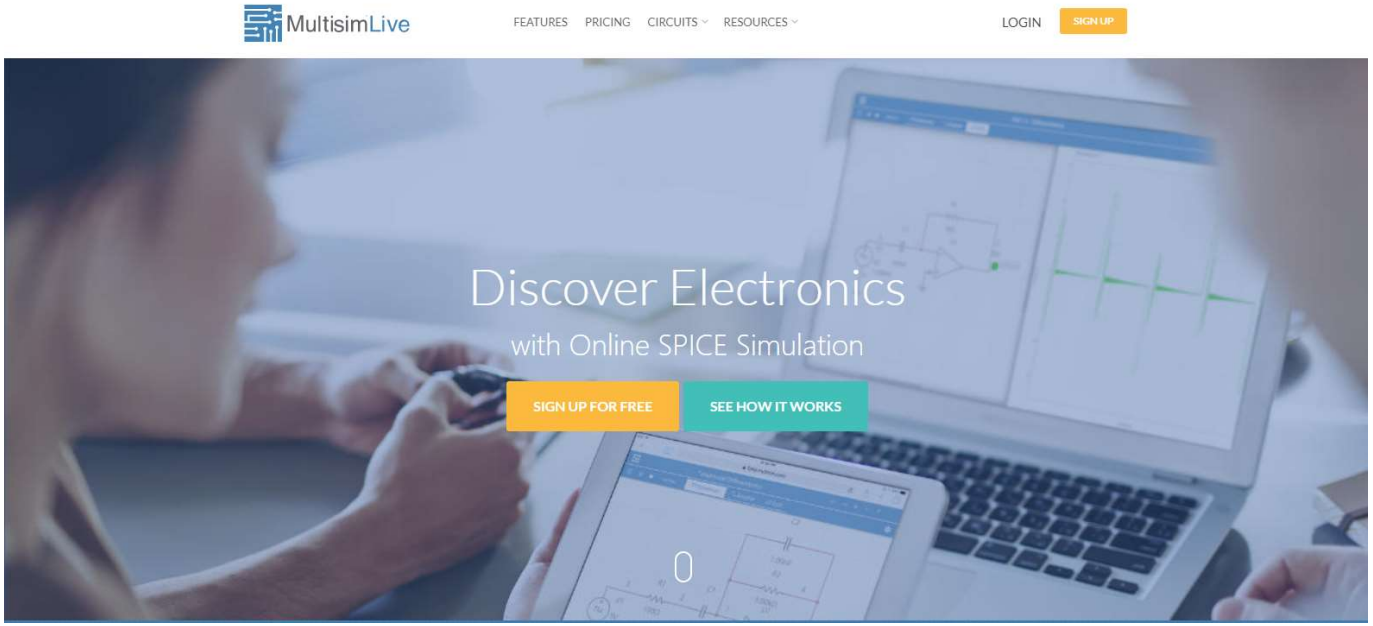
Question 2

What microcontroller port and pins are used for BTN B and BTN A?

Review of Tactile Switches

Lab Activities

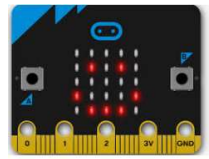




Source: https://www.multisim.com/

Review of Tactile Switches

Lab Activities

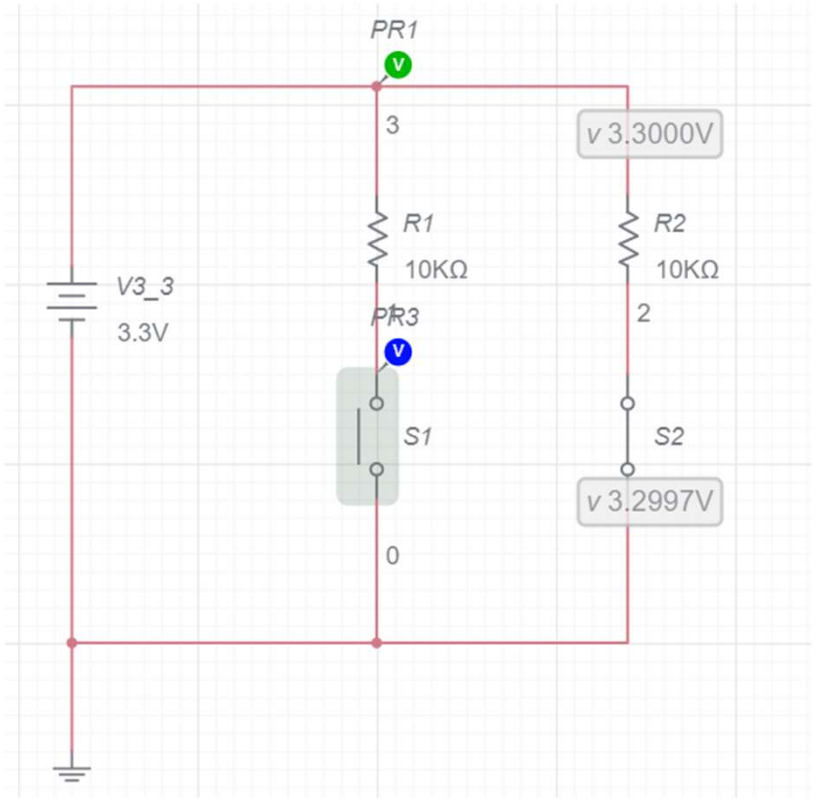


Review of Circuit Schematic Diagram:
Multisim Online Circuit Simulator

S1 = BTN_A
S2 = BTN_B

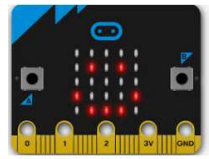
Tactile Switches

With S1 Open-→ Probe 3 = 3.2997V



Review of Tactile Switches

Lab Activities

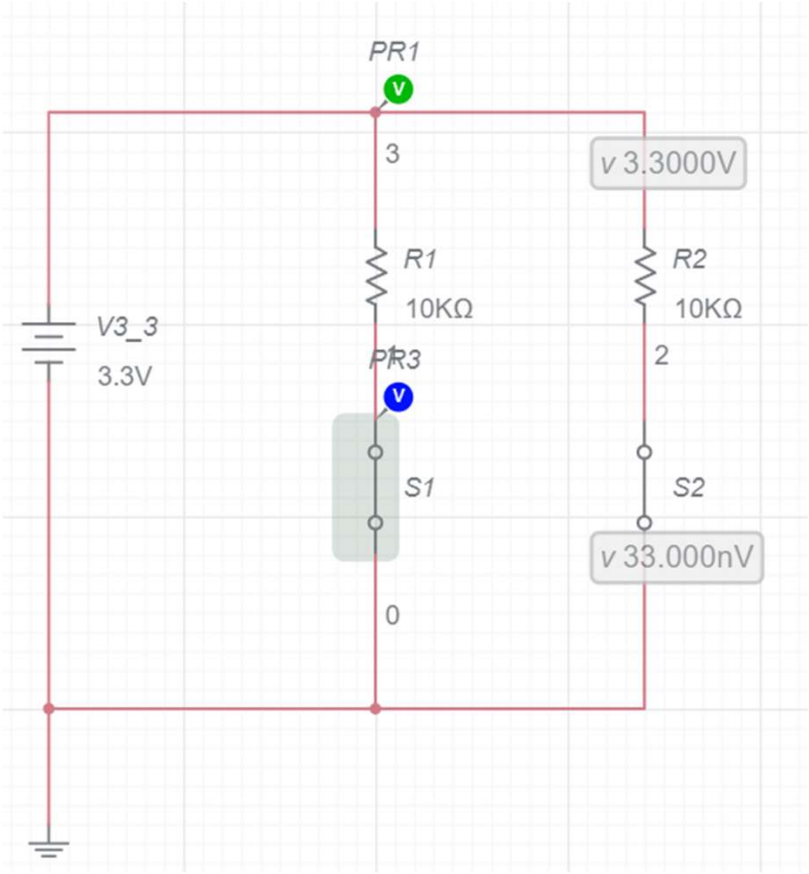


Review of Circuit Schematic Diagram:
Multisim Online Circuit Simulator

S1 = BTN_A
S2 = BTN_B

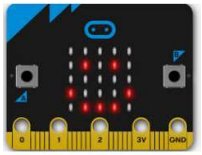
Tactile Switches

With S2 Closed-→ Probe 3 =33.000nV



# Coding with REPL:
Button_a.is_pressed()

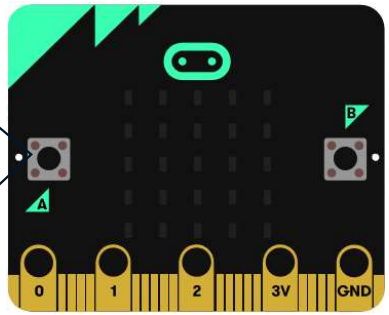
Lab Activities
Review of Tactile Switches



```
BBC micro:bit REPL
>>> running_time()
805563
>>> button_a.is_pressed()
False
>>> button_a.is_pressed()
True
>>>
```

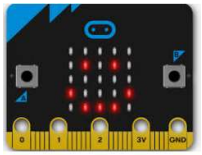
button_a.is_pressed() --- > False
Button A not pressed

button_a.is_pressed() --- > True
Button A press and hold



Lab Activities

Review of Tactile Switches

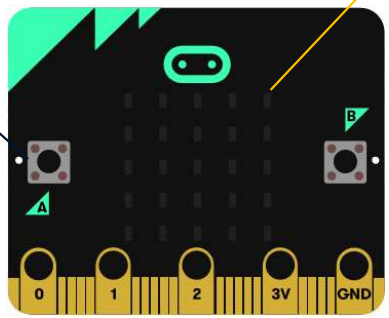


MicroPython Code:
Button_a.is_pressed()

```
1 from microbit import *
2
3 sleep(10000)
4 display.scroll(str(button_a.get_presses()))
5
```

Will scroll the number of times the Button A has been pressed on the LED Matrix

button_a.is_pressed() --- > True
Toggle Button A several times before 10seconds has expired



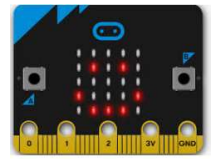
Source: BBC micro:bit MicroPython Documentation Release 1.0.1, pp 9-10

Question 3

When running REPL, what MicroPython instruction allows testing BTN A and BTN B tactile switches?

Lab Activities

Review of Tactile Switches



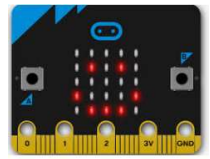
MicroPython Code:

```
from microbit import *
import time
import random
while True:
    # Just keep emitting three random numbers in a Python tuple.
    time.sleep(0.05)
    print((random.randint(0, 100), random.randint(-100, 0), random.randint(-50, 50),)
```

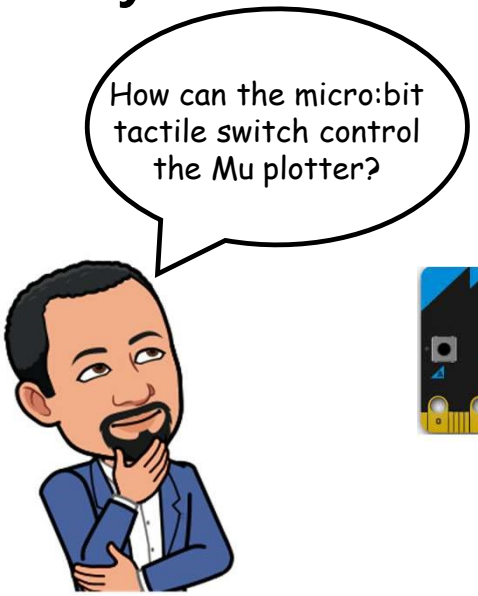
Source: https://codewith.mu/en/tutorials/1.0/plotter

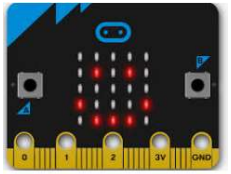
Lab Activities

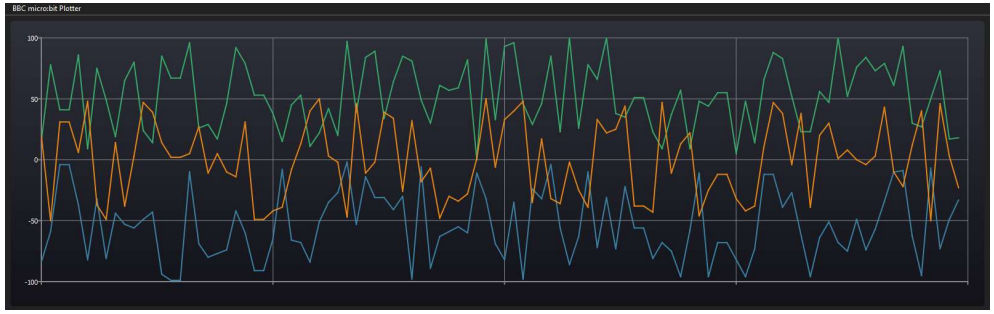
Review of Tactile Switches



MicroPython Code:



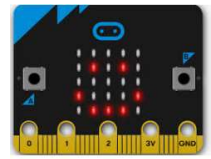




Source: https://codewith.mu/en/tutorials/1.0/plotter

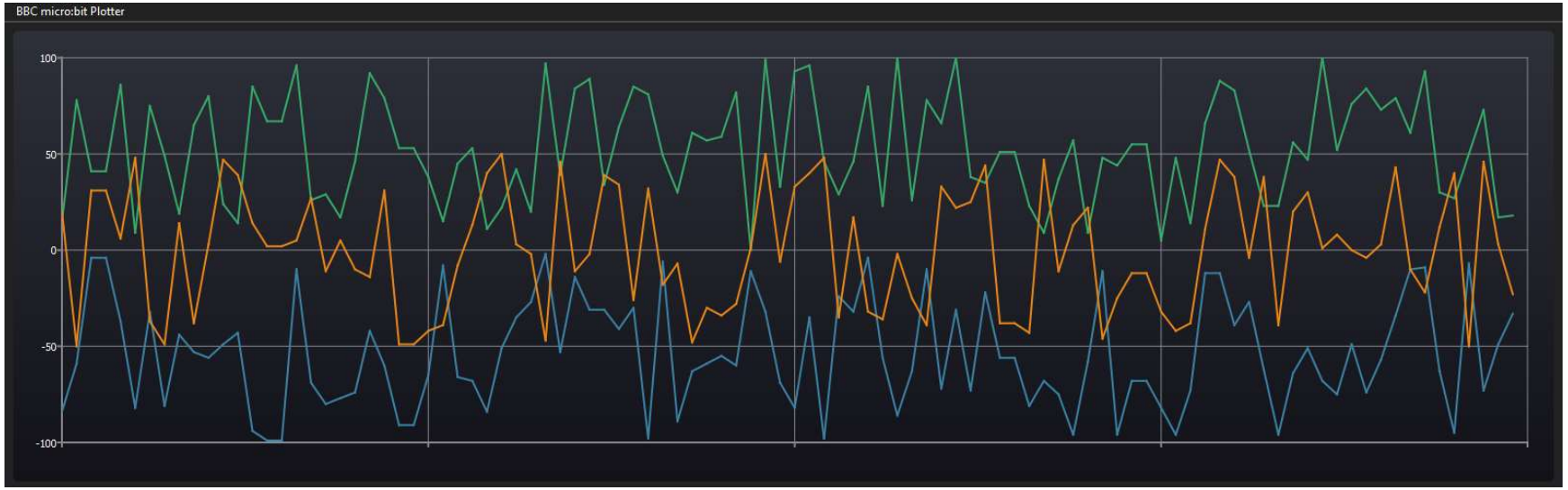
Lab Activities

Review of Tactile Switches



MicroPython Code Generated:

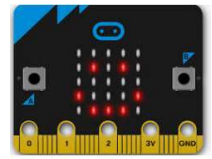
Output Result



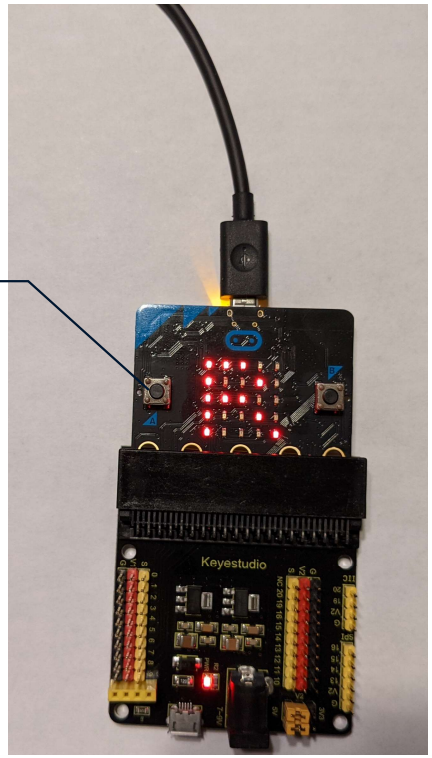
Source: https://codewith.mu/en/tutorials/1.0/plotter

Lab Activities

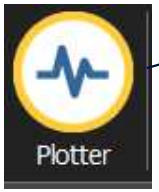
Review of Tactile Switches



Pressing Button_A will start the plotter



Click on this Mu icon to view the plotter

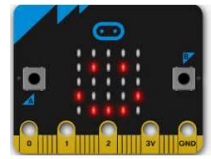


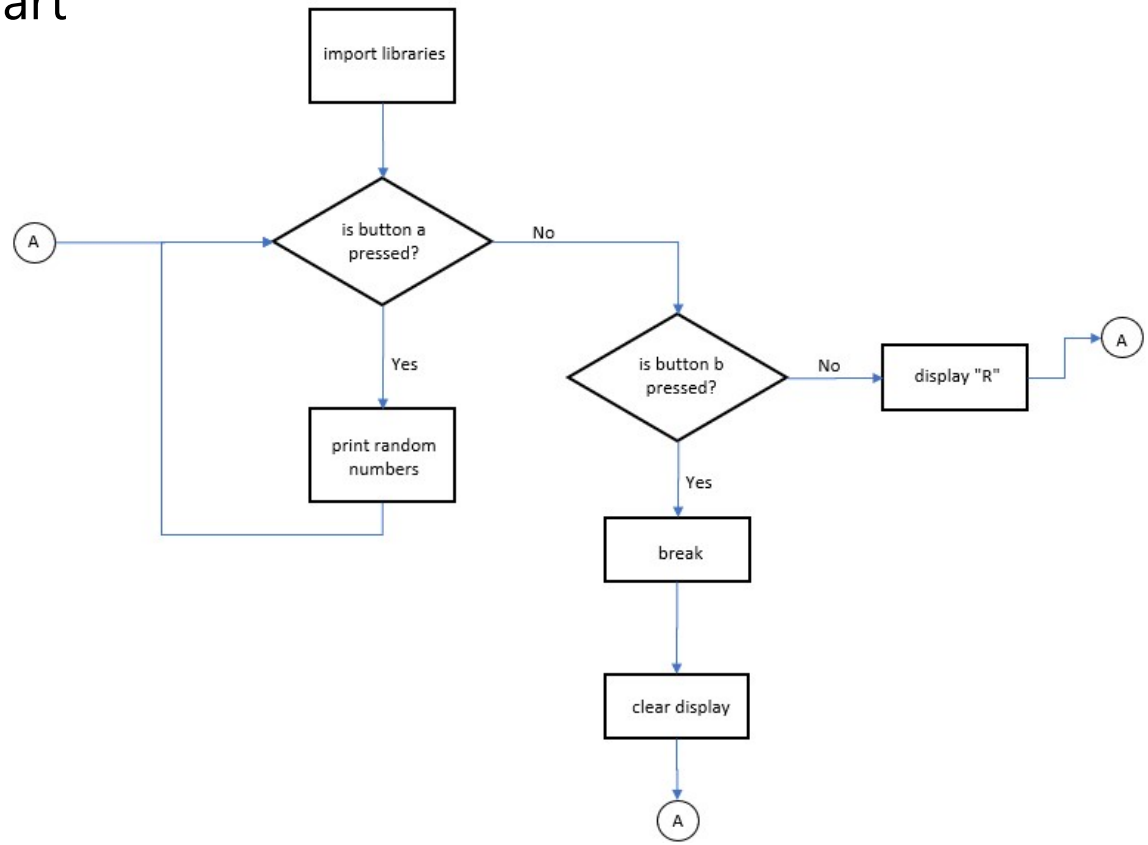
Click link to watch micro:bit plotter in action!

https://youtu.be/31OxAYcI_j0

Lab Activities

Review of Tactile Switches: Button Plotter Flowchart

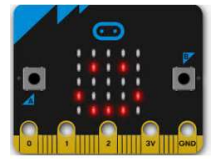




MicroPython Code:
Button_Plotter

Lab Activities

Review of Tactile Switches



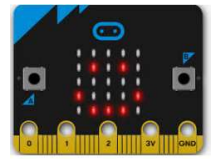
```
from microbit import *
import time
import random
while True:
    if button_a.is_pressed ( ):
        time.sleep(0.05)
        print((random.randint(0, 100), random.randint(-100, 0), random.randint(-50, 50)))
    elif button_b.is_pressed():
        break
    else:
        display.show('R')
display.clear()
```

Question 4

When reviewing the Button Plotter Flowchart, what coding process is required first?

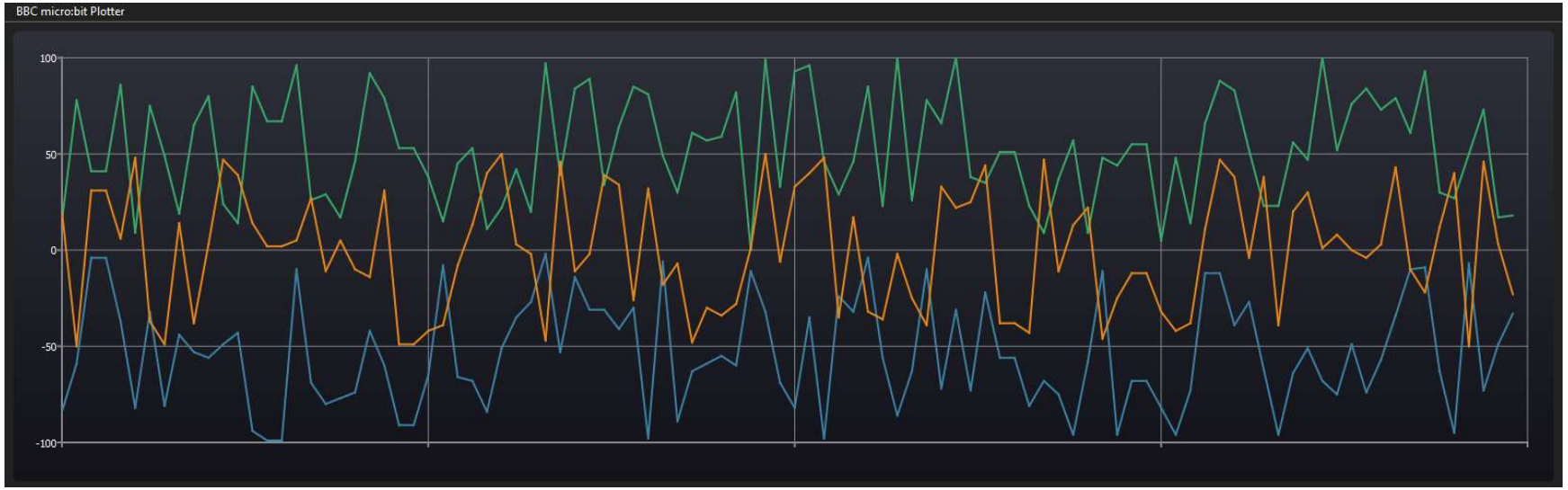
Lab Activities

Review of Tactile Switches



MicroPython Code:

Output Result

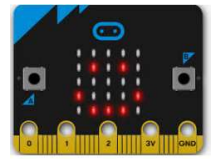


Source: https://codewith.mu/en/tutorials/1.0/plotter

Question 5

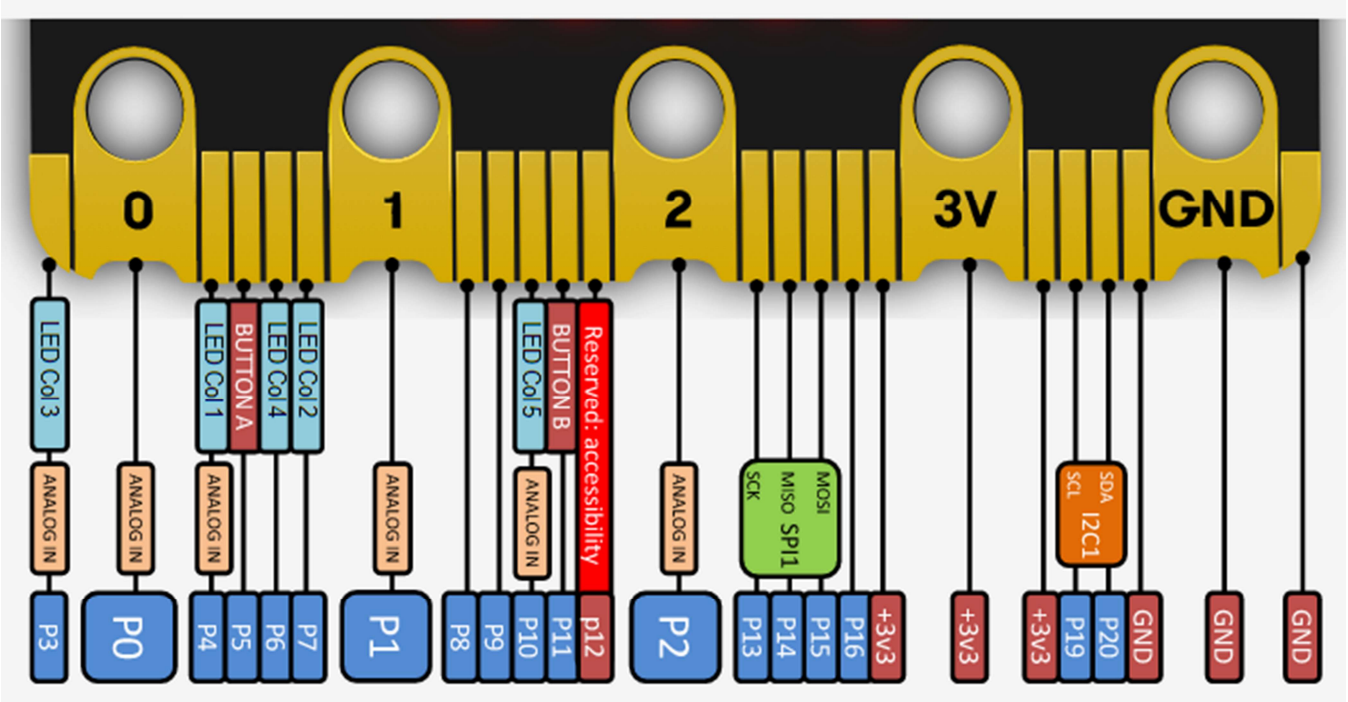
What MicroPython instruction allows the Button Plotter to generate sporadic patterns?

Lab Activities



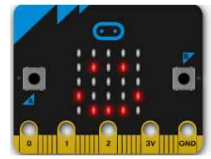
Wiring and Testing External Switches with REPL

micro:bit Edge Connector pinout

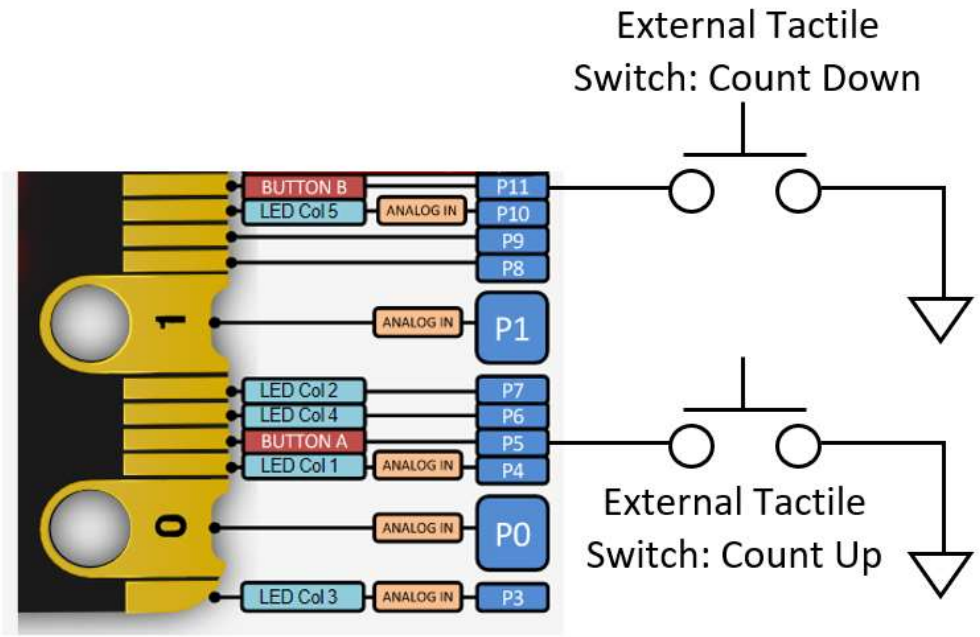


Source:
https://tech.microbit.org/hardware/edgeconnector/#pins-and-signals

Lab Activities

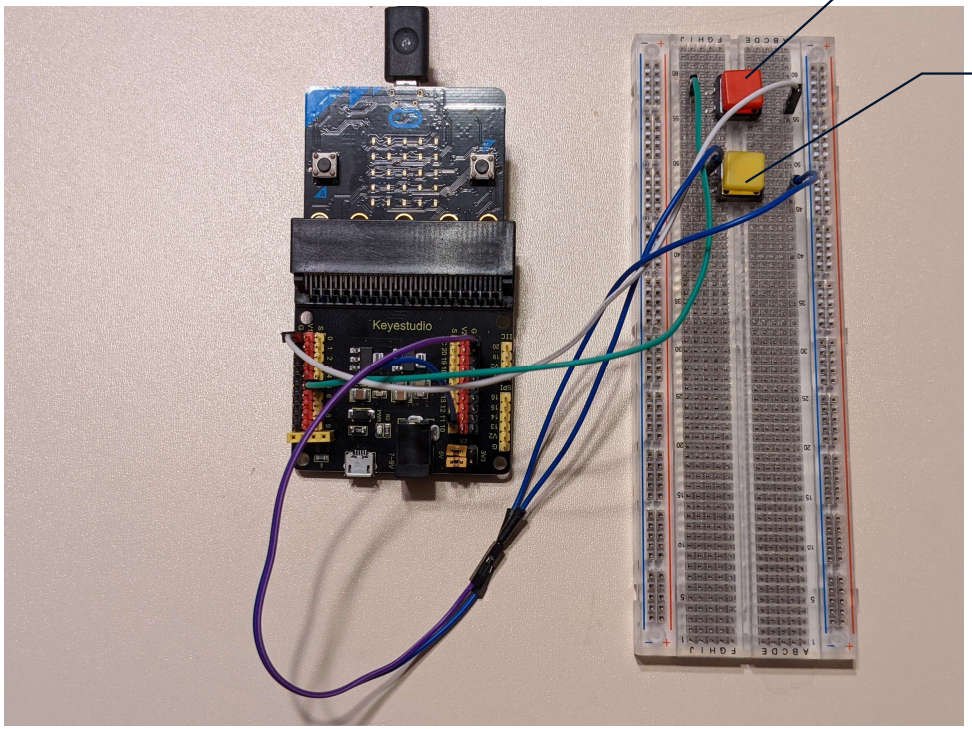


Wiring and Testing External Switches with REPL



Lab Activities

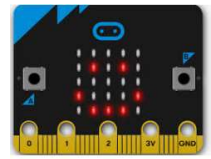
Creating an Up-Down Counter



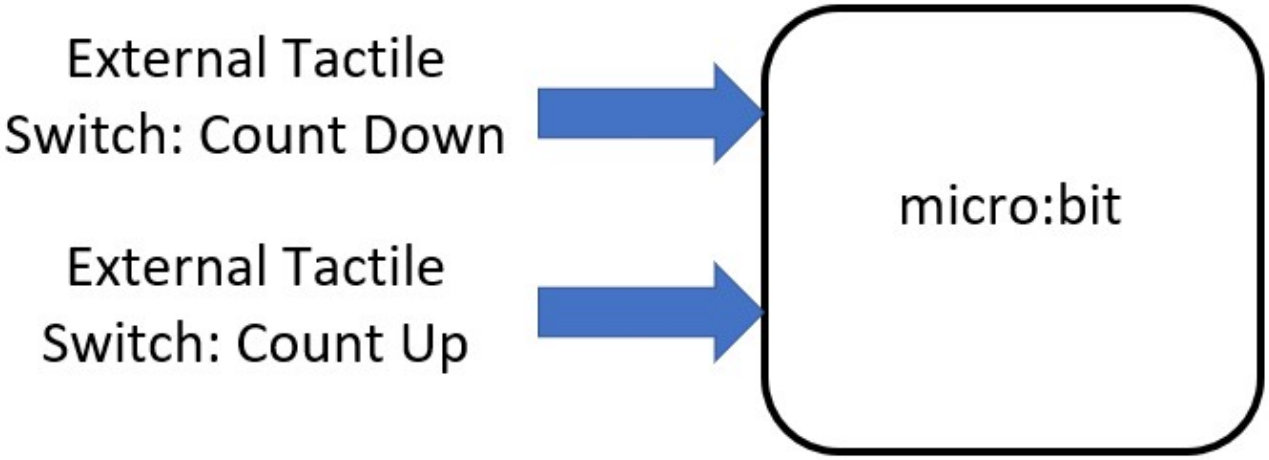
Pressing External Button A will increment the counter

Pressing External Button_B will decrement the counter

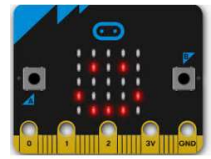
Lab Activities



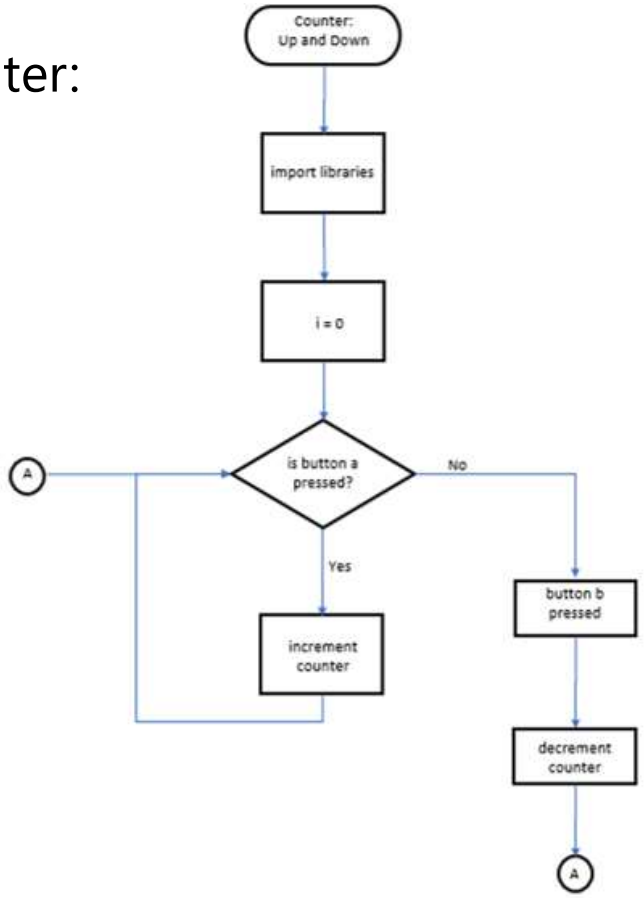
Creating an Up-Down Counter Block Diagram



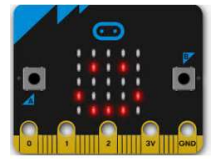
Lab Activities



Creating an Up-Down Counter: Flowchart



Lab Activities



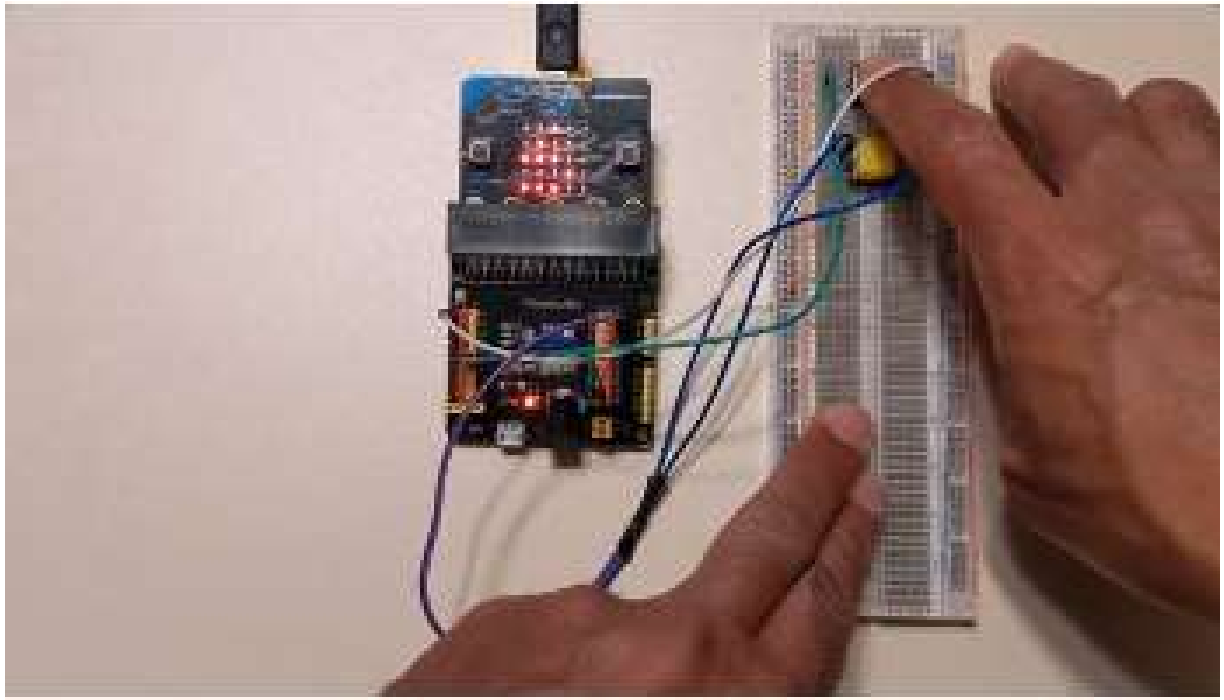
MicroPython Code:
Up-Down Counter

Creating an Up-Down Counter

```
1  from microbit import *
2
3  i=0
4
5  while True:
6      if button_a.is_pressed ( ):
7          i = i + 1
8          display.scroll(i)
9          sleep(1000)
10     elif button_b.is_pressed():
11         i = i - 1
12         display.scroll(i)
13         sleep(1000)
14
```

Lab Activities

Creating an Up-Down Counter



Video Source: https://youtu.be/2V61R1QlTFA

Question 6

What equation in the MicroPython Up-Down Counter is used to decrement the count values?

Thank you for attending

Please consider the resources below:

- BBC micro:bit circuit schematic diagram
  https://github.com/bbcmicrobit/hardware/blob/master/V1.5/SCH_BBC-Microbit_V1.5.PDF
- Multisim Online
  https://www.multisim.com/
- BBC micro:bit MicroPython Documentation Release 1.0.1, pp 9-10
  https://microbit-micropython.readthedocs.io/en/v1.0.1/
- Mu Plotter Tutorial
  https://codewith.mu/en/tutorials/1.0/plotter
- micro:bit Edge Connector Pinout
  https://tech.microbit.org/hardware/edgeconnector/#pins-and-signals
- Counter-Up-Down YouTube Video
  https://youtu.be/2V61R1QlTFA

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