

Module 1: Cybersecurity Basics (programming / Raspberry PI)

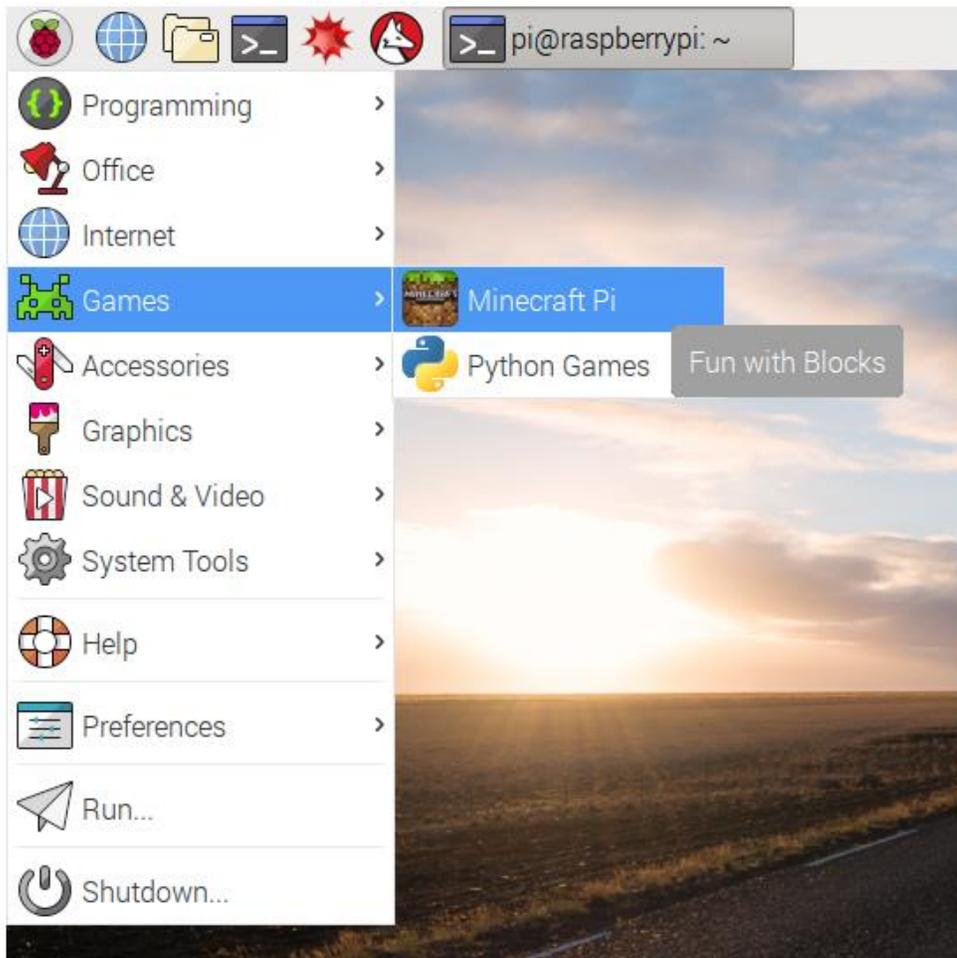
The main goal of this module is to understand importance of computer programming and how it relates to Cybersecurity. The module will presents interesting hands-on exercises in which participants will setup, run and use a Raspberry Pi. We will first understand that a Raspberry Pi is a small computer that runs an operating system installer called NOOBS (New Out Of Box Software). Each camper will be instructed on what the Pi is, the parts of it, and the first time setup. During this time, the chosen operating system will be completing the first boot up. Since this takes some minutes, each camper will be instructed on the basics of computer science. This will include an explanation as to what hardware and software is, what a computer needs to run, and basic types of operating systems. Once the installation is completed, each camper will be given a tour of his/her Raspberry Pi. This will include navigating the main menu of the device, creating a text file on the main screen, and learning basic Linux commands in the terminal and syntax. Finally, the campers will be instructed to launch “Minecraft”; they will be shown where it is in the menu. They will be given a small explanation as to what Minecraft is and what we will be doing with the program. Next, they will be instructed (and shown) how to execute the “Python 3 (IDLE)” program. They will use this to modify and augment the current game of Minecraft they are in. To correctly proceed, each camper must have an instance of Minecraft running as well as a “world” created that they are currently using. From here, each camper will be instructed as to what Python is and what scripts will be used to modify Minecraft in real time. Once all scripts have been written the campers shall proceed to the next area for the next activity.

Minecraft Activity Instructions

Section 1: Running Minecraft

1) Run Minecraft and create a new world

- To run Minecraft open it from the desktop menu
- To create a new world, click **Start Game** then **Create new**. The new world will begin to generate



2) The movement controls are similar to the PC edition of Minecraft

- The WASD keys are movement. E is inventory. SPACEBAR is jump. To fly press the SPACEBAR twice. Do the same if flying to fall. The Esc key is used to pause the game. The Tab key is used to focus on the mouse.

Section 2: Basic Python Commands

- 3) You will have to create an instance of the Python 3(IDLE) from the Raspberry Pi menu. Click the raspberry, click Programming, then Python 3(IDLE)
- 4) If you have not, make sure you have an instance of Minecraft running and make sure you are the world you created. This will not work otherwise.

- 5) Make sure to hit the ENTER key after each line
- 6) Here is the first command that we will run. It will print a “Hello world” into the chat of the current game

```
from mcpi.minecraft import Minecraft

mc = Minecraft.create()

mc.postToChat("Hello world")
```

- 7) Enter the previous into the Python 3 (IDLE) window.
- 8) After each line, hit enter. Once the final line is written, the “Hello world” message will appear in your game
- 9) Next we will find the current position you are at. To do this type the following statement into the Python window
- 10) Next type pos into the same window and you will get a message in blue giving coordinates. These are your current coordinates. If you move you will need to rewrite the same lines of code to get your new current position

```
pos = mc.player.getPos()
```

- 11) Next, lets teleport to a new location. Type the following into the Python window

```
x, y, z = mc.player.getPos()
mc.player.setPos(x, y+100, z)
```

- 12) Notice what happen? You got teleported 100 blocks into the air. Pretty cool, right? We are only just beginning and scratching the surface of what you can do with Python and this Minecraft
- 13) For the next code, we will be placing a simple stone block. To preface the code, each block in Minecraft is assigned a number. Stone in this version is 1. The following code will complete this process. NOTE: if you do not see the block appear in front of you, turn around and it should be behind or beside you.

```
x, y, z = mc.player.getPos()
mc.setBlock(x+1, y, z, 1)
```

14) Now let's be a magician and change this stone block to a dirt block without destroying it. The following code will make us amateur magicians. Make sure you are looking at the stone block you just placed.

```
mc.setBlock(x+1, y, z, 2)
```

15) And abracadabra! You have just transformed solid stone into dirt! You can look any block and have it turn into dirt! This is a great trick for parties.

16) Next let's create a floating cube of solid stone. To do this, type the following code

```
stone = 1  
x, y, z = mc.player.getPos()  
mc.setBlocks(x+1, y+1, z+1, x+11, y+11, z+11, stone)
```

17) Awesome right? This can be done with any block id and any (almost) any size. Just remember, the bigger you make it, the longer it will take to render the cube.

Well, that was everything for the basic commands. Let's move on to more advanced scripts.

Section 3: Python Logic

18) Exit out of the Python 3 (IDLE) window and open a new one up. For this first code, I need to explain what we will be creating. For this part, we will have a blue flower drop every time we walk. We will be using our current location to drop a flower on the ground (or even the air). We will be using loops and the “while” loop in particular. This loop will execute certain code if a condition is true (or sometime false). The code works by saying if you move it’ll drop a flower. Enough explanation, let’s write the code and see it in action!

```
from mcpi.minecraft import Minecraft
from time import sleep

mc = Minecraft.create()

flower = 38

while True:
    x, y, z = mc.player.getPos()
    mc.setBlock(x, y, z, flower)
    sleep(0.1)
```

19) Awesome right! Although cool, I ask you to press **CTRL + C** keys on your keyboard in the Python window. This will end the script from running. The sleep(0.1) is the rate of flowers being dropped. You can change this number to see more or less flowers being dropped. Just remember to retype for it to take effect

20) What if we want to see the block we are standing on? The next code fragment will grant this wish. Inside of the while True: is the next part goes. Exclude the first while True: at the top of the code

```
while True:
    x, y, z = mc.player.getPos()
    block_beneath = mc.getBlock(x, y-1, z)
    print(block_beneath)
```

21) For the next part, we will be modifying the previous code. What are we modifying it to do? Thank you for asking. We will be adding a thing called an **if** statement. Why are we doing this? Because it is very cool. Anyway, the way the if statement will work is if we are standing on a grass block we will plant a flower. If it is not a grass block the flower will not be planted. Here is the code

```
grass = 2
flower = 38

while True:
    x, y, z = mc.player.getPos() # player position (x, y, z)
    block_beneath = mc.getBlock(x, y-1, z) # block ID

    if block_beneath == grass:
        mc.setBlock(x, y, z, flower)
    sleep(0.1)
```

22) This is nice. We made a little garden. Now let's defy physics. For this last activity, we will be modifying the previous code (yes again). This time will be adding an **else** statement to the if statement. The logic behind it is again, if we are on a dirt block we will plant a flower. Then if we are not a dirt block, the block below us will become a dirt block. Just a note, if you fly random dirt blocks will begin to appear behind you. This is where the physics are being defied. Code time!

```
if block_beneath == grass:
    mc.setBlock(x, y, z, flower)
else:
    mc.setBlock(x, y-1, z, grass)
```

23) If you walk over the grass you just created, a flower will be planted. We can make a sky garden now.

This has been the Minecraft Activity for the Raspberry Pi. Like I said before, these are just some of the things you can do with Minecraft and Python. I encourage all of you to modify the code I have given you but to also write your own and see what all you can do with the Minecraft! I hope you all enjoyed doing this as much as I enjoyed teaching it to you!