Mission 4:
Display Games

Student Workbook

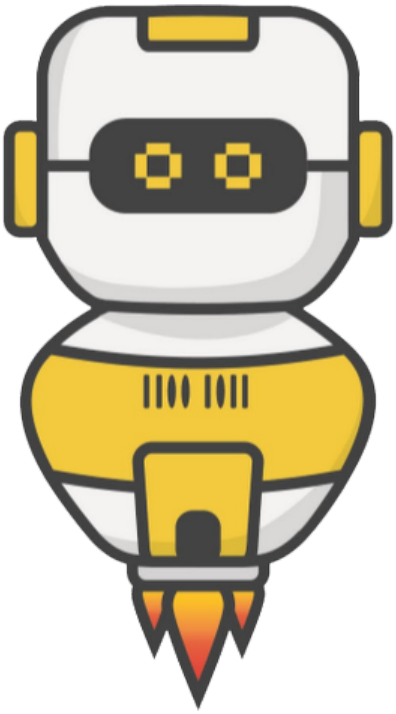
FIRIA LABS

Mission 4: Display Games ✓

Learn some CodeX display basics and create your first game.

Greetings!

From car dashboards to giant stadium scoreboards, you see LED displays **everywhere**, and most of them are controlled by software. The CodeX display is small, but with *your code*, it can do a lot!



Go to the Mission 4 Log and fill out the Pre-Mission preparation.

Mission 4: Display Games

In Mission 4, you will program the CodeX to display text and get input from the user by pushing buttons to create a game.

Mission 4: Get started

- Go to https://make.firialabs.com/ and log in.
- Go to Mission 4 
- Click **NEXT** and start Mission 4.

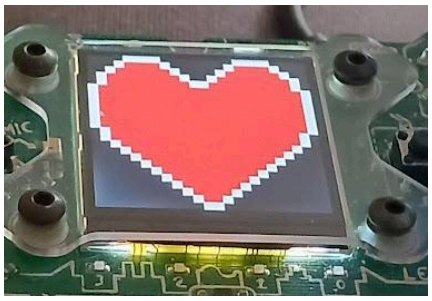
Objective #1: Back to the display

In Mission 2, your program displayed an image. The first image you displayed was a HEART.

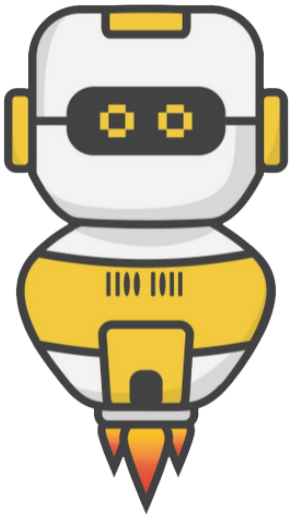
- You will practice displaying an image on the LCD screen.

Heart1 × Pixels1 ×

```
1  from codex import *
2  display.show(pics.HEART)
```

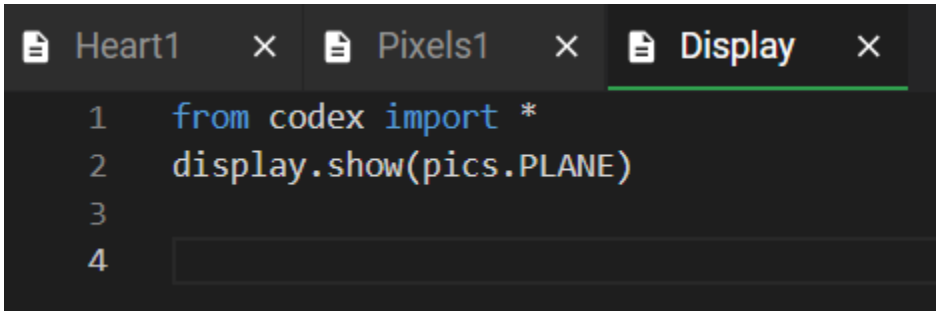


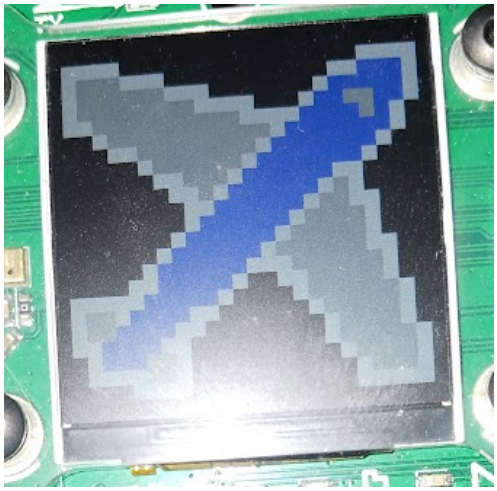
Objective #1: Back to the display



DO THIS:

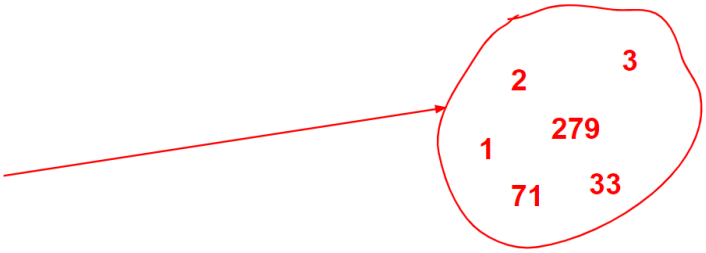
- Create a new file named **Display**
- Click the **File** menu button
- Select “New File...”
- Name the file **Display**
    - *no spaces in a file name*
- Click **Create**
- Add two lines of code to display a PLANE
- Run your code





Objective #2: Text messages

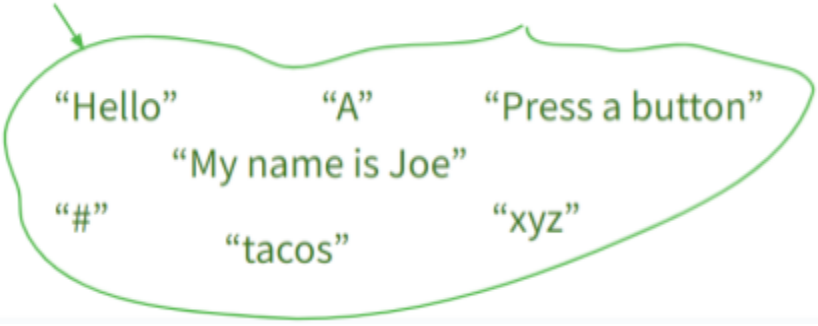
Computers work with different **types** of data. So far you have worked with:



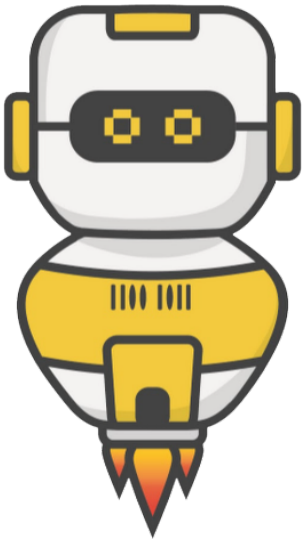
- **Integers**
  (counting numbers)
- **CodeX images**

You might also want to display words.

- Words, letters, and characters are the data **type string**
- Indicate a **string** by using **"quotation marks"**



Objective #2: Text messages



DO THIS:

- Go to the Mission Log
- Write examples of different data types
- Change the code in the display.show() function to display the text “Ahoy”

Display

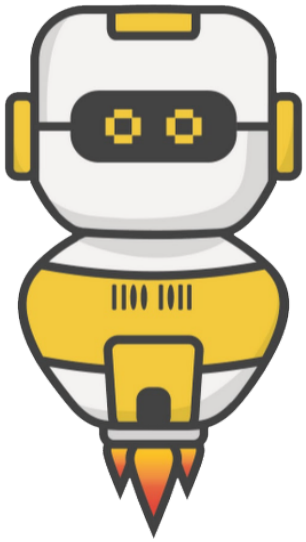
```
1   from codex import *
2   display.show("Ahoy")
3
```

Objective #3: Good with numbers?

A computer is very good at doing math.

- When you define a **variable**, you assign it a value
- So far you assigned a **literal** value
- You can also assign a value by doing math

```
num = 2 + 2
```



DO THIS:

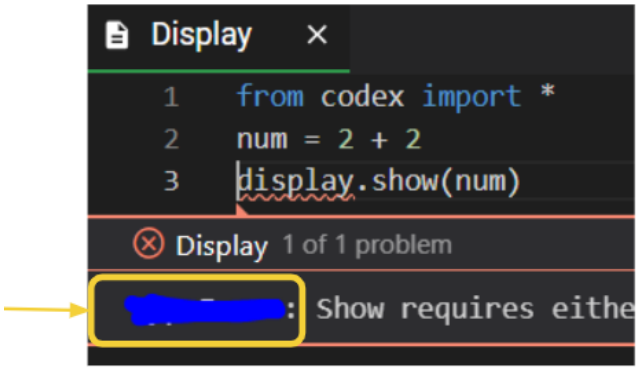
Use a simple calculation to assign a value to a variable

- Add a line of code that uses the assignment statement shown above
- Use the display.show() statement to show the num variable

```
Display ×
1  from codex import *
2  num = 2 + 2
3  display.show(num)
4
```

The code caused an error

- Go to your Mission Log and write the error message



Objective #4: Converting types

Why does display.show(num) not work?

- display.show("Ahoy") works
  - **"Ahoy"** is a type **string**
- display.show(pics.HEART) works
  - **pics.HEART** is a type **CodeX image**
- display.show(num) does not work
  - **num** is a type **integer**

Why does display.show(num) not work?

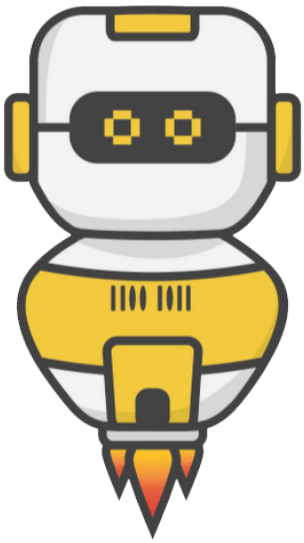
It doesn't work with an **integer**, but it will work with a **string**

- If an integer is converted, or changed, to a string, then display.show() will work -- no error
- Python has a function that will convert (change) any value to a **string**
  - **str()**

EXAMPLES:
For each of these examples, the value in the (parenthesis) is changed to a "string"

- str(1)
- str(num)

Objective #4: Converting types



DO THIS:

Modify your code by using the **str()** conversion function.

- Change the display.show(num) code to use the **str()** function
    - *Be careful to match your parenthesis*
- Run your code

Display

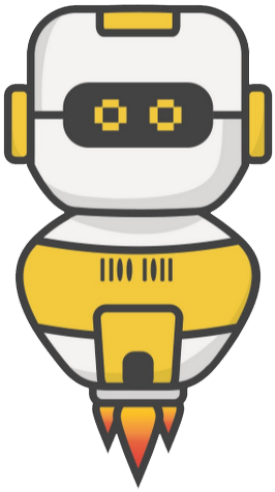
```
1  from codex import *
2  num = 2 + 2
3  display.show(str(num))
4
```

Objective #5: Second show message

Can you display two messages?

In Mission 3, you tried showing two (or four) different colors in a pixel. This didn't work until you slowed down the program by using a sleep().

What do you think will happen if you try to display two messages?



DO THIS:

- What do you think will happen if you try to print two messages?
- Go to the Mission Log and write your prediction
- Then change your code to display two messages:

Display

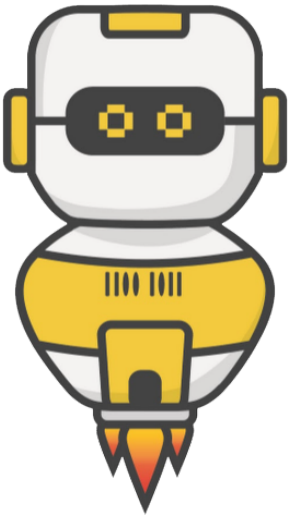
```
1   from codex import *
2   display.show("Hello")
3   display.show("World")
4
```

Objective #6: Printing text

The display.show() command will only show one thing at a time. So, just like the pixels, the second thing is displayed on top of the first thing.

- CodeX has another way to display a **string**
- Use **display.print("string")**

  All **display.print("string")** messages will be displayed, one after another -- each on its own line



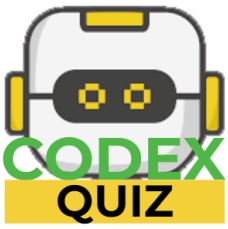
DO THIS:

Change your code to **print** the **strings**.

- Change the display.show() command to display.print()

Display

```
1  from codex import *
2  display.print("Hello")
3  display.print("World")
4
```



Mission Quiz: Typed and Printed

Test your skills by **taking the quiz**.

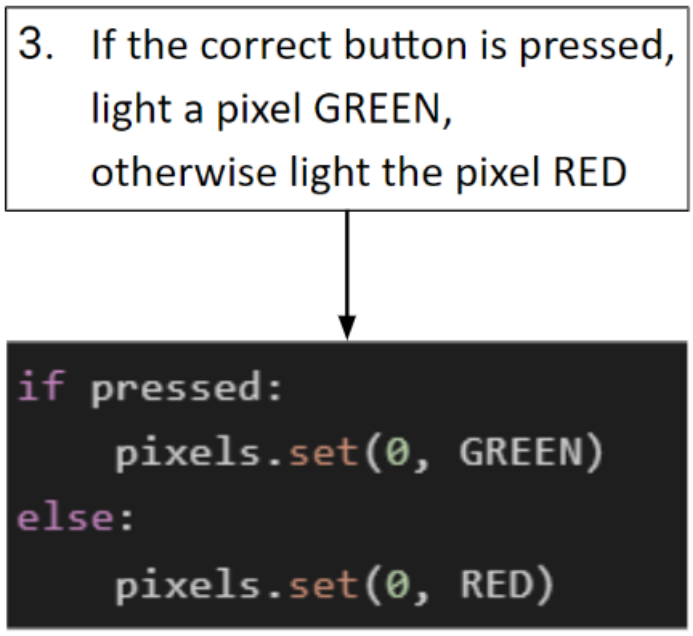
Objective #7: Branching

During the next objectives, you will create a button-pressing game. Here are the parts of the game:

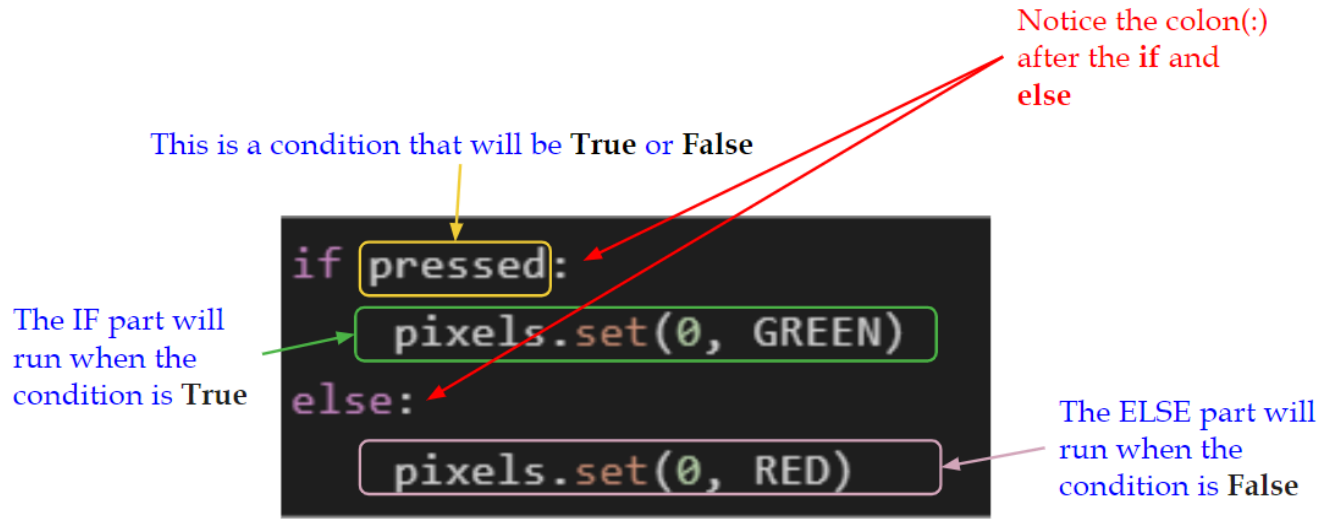
1. Display a button to press.
2. Press and hold the button. You will have one second.
3. If the correct button is pressed, light a pixel GREEN, otherwise light the pixel RED

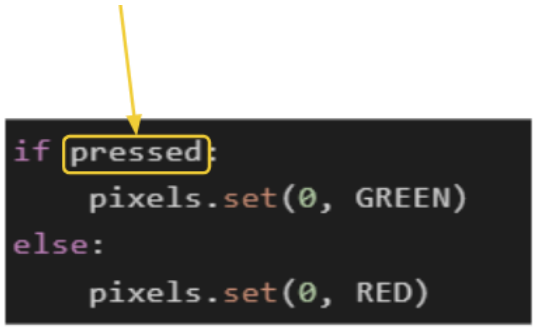
Step #3 is a new concept -- branching.

- Branching is when the computer makes a choice between two things.
- Here is an example of branching.
- Notice the indenting -- this is very important!



Take a closer look at branching:





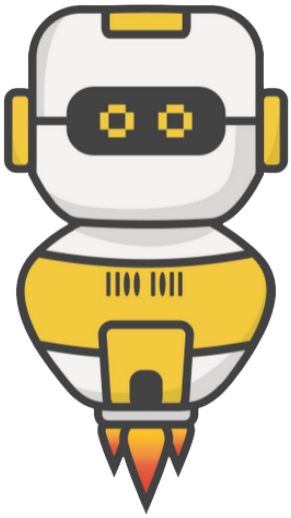
In this example, pressed will be either **True** or **False** (no "quotations")

This is a data **type**: **Boolean**

Objective #7: Branching

Now you know four data types:

- Integer -- Examples: 1, 54, 720
- CodeX image -- Examples: pics.HEART, pics.MUSIC
- String -- Examples: “Hello”, “Press A”, “cake”
- Boolean -- Examples: True, False



DO THIS:

The best way to learn about branching is to try it:

- Delete most of your code
- Type the code below
- Run the code
  - Do you see a GREEN light?
- Change line 5 to **pressed = False**
- Run the code
  - Do you see a RED light?

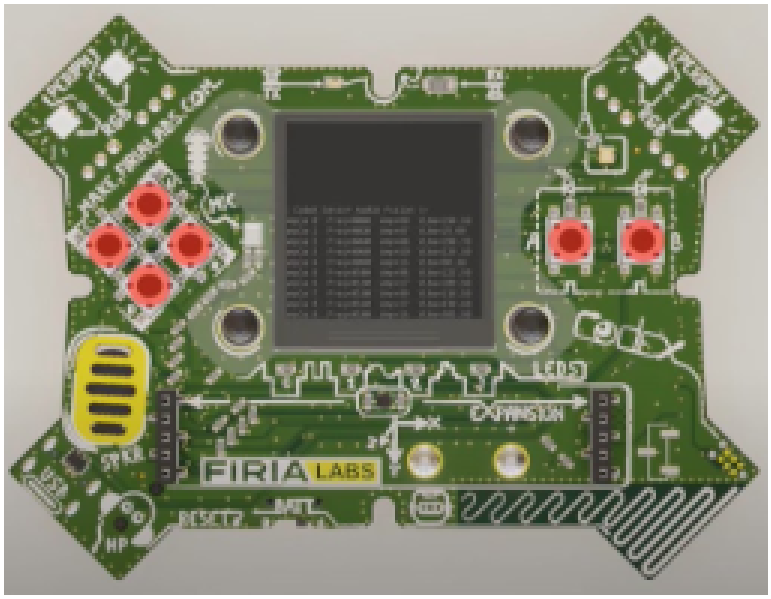
Display

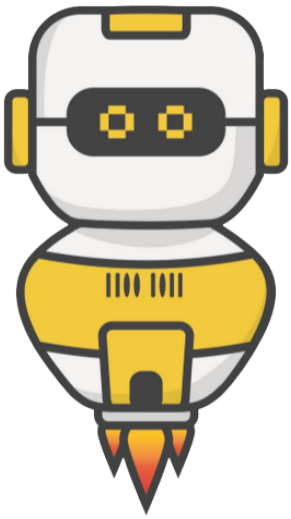
```
1   from codex import *
2   from time import sleep
3
4   sleep(1)
5   pressed = True
6   if pressed:
7       pixels.set(0, GREEN)
8   else:
9       pixels.set(0, RED)
10
```

Objective #8: Button hunting

The game you will make will use four of the six buttons.

- Look at the picture of the CodeX.
- Can you find all 6 buttons?





DO THIS:

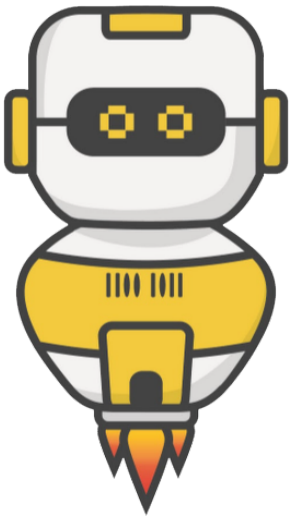
- Close the instructions panel
- Use the camera to rotate the CodeX until you see the front
- Click on all 6 buttons

Objective #9: Gamer input

There are 2 ways to check for a button press:

- buttons.**was**_pressed(**BTN_A**)
  - Checks to see if button A was pressed since the last check
- buttons.**is**_pressed(**BTN_A**)
  - Checks to see if button A is currently pressed

Any of the 6 buttons can be checked in ( ).



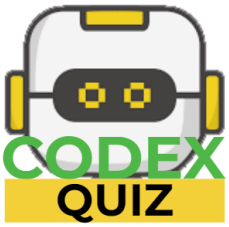
DO THIS:

For this game, you will check for currently pressed

- Add line 4
- Change line 6
- Run the code and press Button A
- Run the code again and do not press Button A
- Do you get the results you expect?

Display

```
1   from codex import *
2   from time import sleep
3
4   display.show("Press Button A")
5   sleep(1)
6   pressed = buttons.is_pressed(BTN_A)
7   if pressed:
8       pixels.set(0, GREEN)
9   else:
10      pixels.set(0, RED)
```



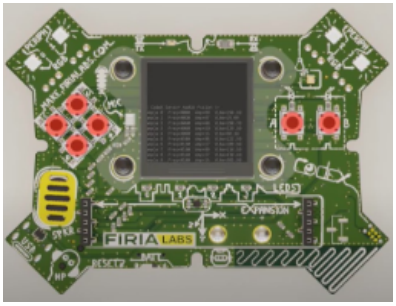
Mission Quiz: Buttons and Branching

Test your skills by **taking the quiz**.

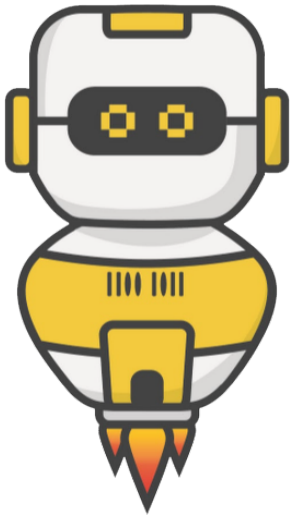
Objective #10: For the win!

Now just check a few more buttons and you have a serious twitch game!

- You can use whatever buttons you want
- You have 6 buttons to choose from:
  - BTN_A
  - BTN_B
  - BTN_U
  - BTN_D
  - BTN_L
  - BTN_R



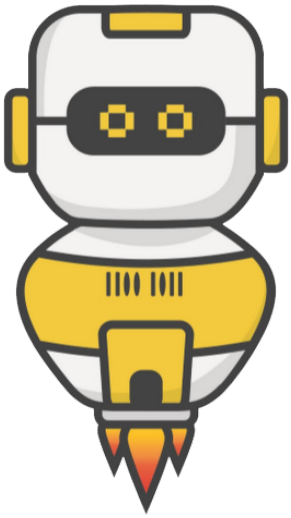
- What 4 buttons do you want to use for your game?



DO THIS:

- Go to the Mission Log and record the four buttons you will use for your game

Objective #10: For the win!



DO THIS:

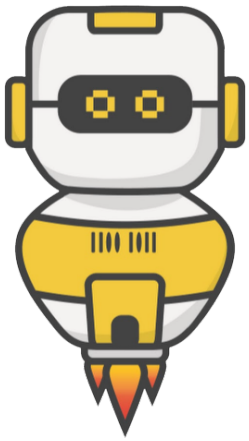
- In your code, copy line 4 through line 10
- Paste the code below line 10
- Change Button A to the second button you want to use
    - Change it in the display.show()
    - Change it in buttons.is_pressed
- Change the pixel from 0 to 1

```
1   from codex import *
2   from time import sleep
3
4   display.show("Press Button A")
5   sleep(1)
6   pressed = buttons.is_pressed(BTN_A)
7   if pressed:
8       pixels.set(0, GREEN)
9   else:
10      pixels.set(0, RED)
11
12  display.show("Press Button L")
13  sleep(1)
14  pressed = buttons.is_pressed(BTN_L)
15  if pressed:
16      pixels.set(1, GREEN)
17  else:
18      pixels.set(1, RED)
19
20
```

- Paste the code again, below the current code
- Change the button to the third button you want to use
    - Change it in the display.show()
    - Change it in buttons.is_pressed
- Change the pixel to 2

```
from codex import *
from time import sleep

display.show("Press Button A")
sleep(1)
pressed = buttons.is_pressed(BTN_A)
if pressed:
    pixels.set(0, GREEN)
else:
    pixels.set(0, RED)

display.show("Press Button L")
sleep(1)
pressed = buttons.is_pressed(BTN_L)
if pressed:
    pixels.set(1, GREEN)
else:
    pixels.set(1, RED)

display.show("Press Button B")
sleep(1)
pressed = buttons.is_pressed(BTN_B)
if pressed:
    pixels.set(2, GREEN)
else:
    pixels.set(2, RED)

```

- Paste the code one more time, below the current code
- Change the button to the fourth button you want to use
    - Change it in the display.show()
    - Change it in buttons.is_pressed
- Change the pixel to 3



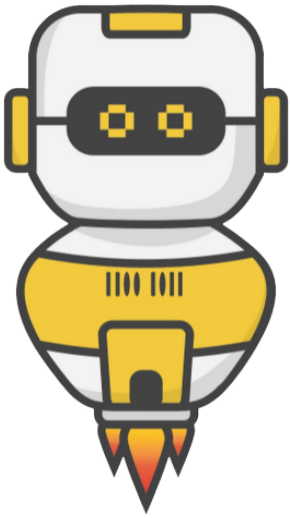
At this point you should have code for the four buttons you chose.

DO THIS:

- Run the code
- If you have any errors, fix them
- Try pressing all the buttons and getting all green lights
- Try the code again, missing some of the buttons
- Do you get the results you expect?
- Make any changes you need to so that your program works correctly
- Have someone else try your game

Mission Complete

You have completed the fourth mission.



Do this:

- Read your "Completed Mission" message
- Complete your Mission 4 Log
    - Post-Mission Reflection
- Get ready for your next mission!

Post-Mission Reflection

Detecting the press of a button is used in many applications in the real world.

What are some ways you might write a program to detect the press of a button? _____

_____

_____

What are the four data types used in this Mission? _____

_____

What do you remember about branching? _____

_____

_____

Wait! Before you go ... Clear the CodeX

Go to FILE -- BROWSE FILES

Select the "**Clear**" file and open it

Run the program to clear the CodeX

Okay. Now you can go.