Mission 9:
Game Spinner

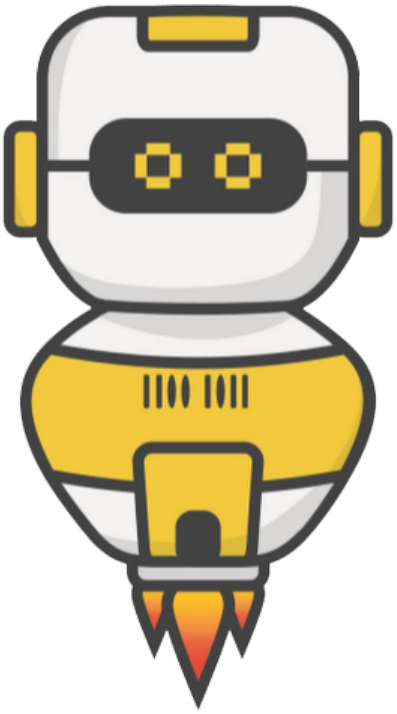
Student Workbook

FIRIA LABS

Mission 9: Game Spinner

Learn to animate a game spinner with custom functions.

Let's get animated



In the last mission, the program used random numbers. For this mission, you will ramp up the random and use it for a game spinner animation.

Go to the Mission 9 Log and fill out the Pre-Mission preparation.

- In the last mission, you learned about random numbers. Other than a game, give an example of when you want to select a random person?

Mission 9: Game Spinner

In this project you will make a game spinner that can:

- Choose the next person to answer a question
- Select a path to take in a maze
- Decide which pizza slice to eat
- Be a spinner for a game
- And anything else you can think of!

Mission 9: Get started

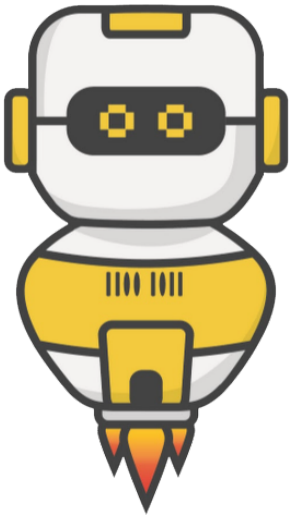
- Go to https://make.firialabs.com/ and log in.
- Go to Mission 9 
- Click **NEXT** and start Mission 9.

Objective #1: Random arrow

Review getting a random number from Mission 8. You will use the random number to display an arrow from the predefined list: pics.ALL_ARROWS

You can either:

- Get a random number and use it to display an arrow
- Use random.choice to display a random arrow

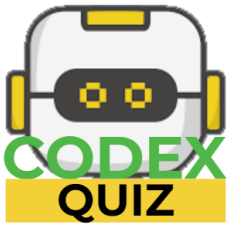


DO THIS:

- Start a new file named **Game_Spinner**
- Import the codex module
- Import the random module
- Assign a random **number** to a variable
- Use **display.show()** to display the list item at the number
    - Use CodeTrek if you need help

```
from codex import *
import random

num = random.randrange(8)
display.show(pics.ALL_ARROWS[num])
```



Mission Quiz: Which arrows

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

Objective #2: Click to flick

Some board games have a game spinner with an arrow that you flick.

- You will use a button press instead of a flick to “spin” your arrow.
- Make your game spinner arrow change whenever you press either BTN_A or BTN_B.

Two things to learn:

- Current button press (Mission 4)
- Logical operators

Current button press

- In Mission 4, you learned about buttons.is_pressed()
- It checks ***right then*** to see if a button is pressed and will do something if it is.
- For this program, you will use **buttons.is_pressed()** for both A and B buttons

Objective #2: Click to flick

Comparisons

- In earlier missions, you used a condition in an if statement

```
if buttons.was_pressed(BTN_A):
    break
```

```
if choice == 0:
    # do something
```

```
if buttons.was_pressed(BTN_L):
    choice = choice - 1
    if choice < 0:
        choice = LAST_INDEX
```

Logical operators

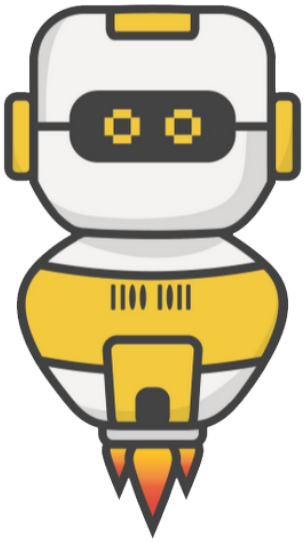
- What if you have two conditions you want to check at the same time?
- For example:
  - Button A pressed OR button B pressed
- Use a logical operator!
- They combine two conditions together

LOGICAL OPERATORS:

- AND
  - two conditions must be true
- OR
  - one of two conditions (or both) must be true

Objective #2: Click to flick

DO THIS:



- Go to your Mission Log and write down examples of logical operators.

Mission Activity: Objective #2

What are two logical operators? Give an example of each:

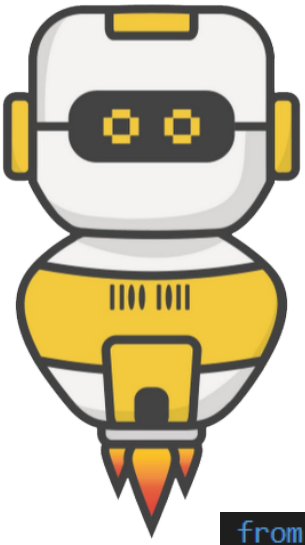
_____

_____

_____

_____

Apply these concepts to make the spinner go



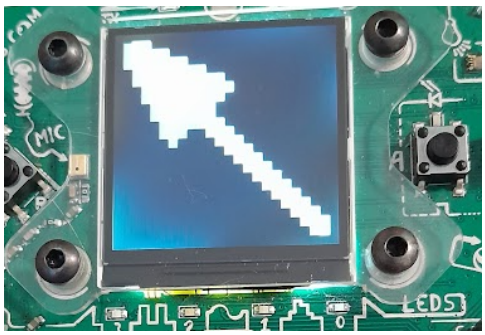
DO THIS:

- Add a while True loop
- Add an if statement using buttons.is_pressed and check for BTN_A or BTN_B.
- Be careful with the indenting!
- Test the code by pressing Button A and Button B at different times.

```
from codex import *
import random

while True:
    if buttons.is_pressed(BTN_A) or buttons.is_pressed(BTN_B):
        num = random.randrange(8)
        display.show(pics.ALL_ARROWS[num])
```

Objective #3: Fun functions



The arrow appears, but it isn't very realistic.

- You want to see some spinning action before the arrow stops.
- You will add some animation
- This could add several lines of code to your program
- Adding several lines of code to your program makes it harder to read
- You have already written programs with several lines of code
  - Mission 3 and 4 are fairly long
  - Your remixes may have a lot of code as well

```
# Mission 4
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)

display.show("Press Button R")
sleep(1)
pressed = buttons.is_pressed(BTN_R)
if pressed:
    pixels.set(3, GREEN)
else:
```

```
# Mission 3
from codex import *
from time import sleep

delay = 1

color = RED
pixels.set(0, color)
pixels.set(1, color)
pixels.set(2, color)
pixels.set(3, color)
sleep(delay)

color = YELLOW
pixels.set(0, color)
pixels.set(1, color)
pixels.set(2, color)
pixels.set(3, color)
sleep(delay)

color = RED
pixels.set(0, color)
pixels.set(1, color)
pixels.set(2, color)
pixels.set(3, color)
sleep(delay)

color = YELLOW
pixels.set(0, color)
pixels.set(1, color)
pixels.set(2, color)
pixels.set(3, color)
sleep(delay)
```

Objective #3: Fun functions

You can take chunks of code from the main program and make them into functions!

In Python you can **define** a new function like this:

```
def flashLEDs():
    leds.user(0b11111111)
    sleep(0.5)
    leds.user(0b00000000)
    sleep(0.5)
```

Once that's defined, you can call the function whenever you like:

```
while True:
    flashLEDs()
```

Take a look at code from Mission 3

- In this example, some code is repeated
- The boxes of repeated code are places to make functions

Pixels1-1

```
from codex import *
from time import sleep
delay = 1

color = RED
pixels.set(0, color)
pixels.set(1, color)
pixels.set(2, color)
pixels.set(3, color)
sleep(delay)

color = YELLOW
pixels.set(0, color)
pixels.set(1, color)
pixels.set(2, color)
pixels.set(3, color)
sleep(delay)

color = RED
pixels.set(0, color)
pixels.set(1, color)
pixels.set(2, color)
pixels.set(3, color)
sleep(delay)

color = YELLOW
pixels.set(0, color)
pixels.set(1, color)
pixels.set(2, color)
pixels.set(3, color)
sleep(delay)
```

Objective #3: Fun functions

- Create a function for each color
- Delete any extra code
- Call the functions in the order you want to run them

Do you see how much easier the code is to read? And it is shorter!

```
from codex import *
from time import sleep
delay = 1

def turn_red():
    color = RED
    pixels.set(0, color)
    pixels.set(1, color)
    pixels.set(2, color)
    pixels.set(3, color)
    sleep(delay)

def turn_yellow():
    color = YELLOW
    pixels.set(0, color)
    pixels.set(1, color)
    pixels.set(2, color)
    pixels.set(3, color)
    sleep(delay)

# Main program
turn_red()
turn_yellow()
turn_red()
turn_yellow()
```

Objective #3: Fun functions

You can create a function any time you want to keep the code easy to read.

- The keyword `def` means "define function"
- Use a colon (:) at the end of the line, just like a **while loop** and an **if statement** – you are making a block of code
- Indent the lines of code inside the function

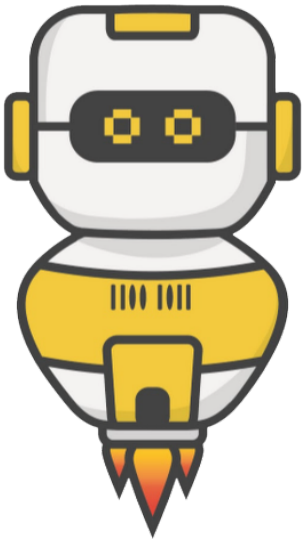
```
def show_random_arrow():
    num = random.randrange(8)
    display.show(pics.ALL_ARROWS[num])
```

A function must be defined before it can be called.

- Define your function above the **while True** loop
- Move the code from the while loop to the function
- Call the function in the while loop
    - NOTE: a function call DOES NOT have the word "def" or a colon (:)

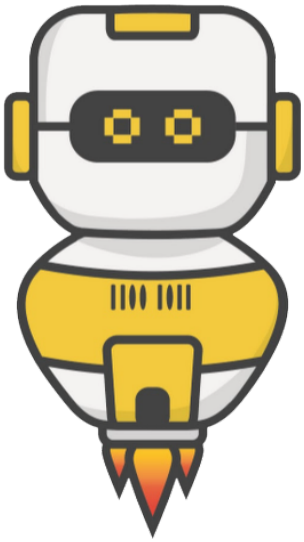
```
while True:
    if buttons.is_pressed(BTN_A) or buttons.is_pressed(BTN_B):
        show_random_arrow()
```

Objective #3: Fun functions



DO THIS:

- Define the function **show_random_arrow()**
- Call the function **show_random_arrow()**
- Follow the steps from the two previous slides, or use CodeTrek for help
- Test your program by pressing both Button A and Button B at different times. It should work just the same as before, but with a function.



DO THIS:

- After objective 3 is completed, the message displayed gives another reason for using functions.
- Go to your Mission Log and answer the question about functions

Mission Activity: Objective #3

What are TWO reasons for using functions in your program?

_____

_____

_____

_____

Objective #4: Animation

You added a function, but your code still does the same thing – displays one arrow.

- You will create an animation by going through the arrows in the list in order – quickly!
- There are 8 arrows in the list
- You could call each arrow with a short delay:

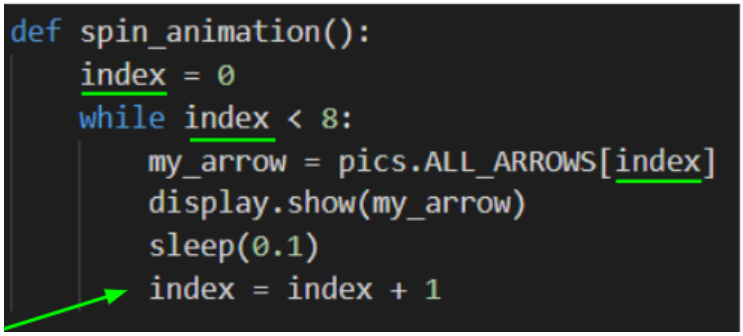
```
display.show(pics.ALL_ARROWS[0])
sleep(0.1)
display.show(pics.ALL_ARROWS[1])
sleep(0.1)
# ...Wait! There has to be a better way.
```

- Or, you can use a loop!
- Not an infinite loop (like while True) but a loop that goes 8 times.

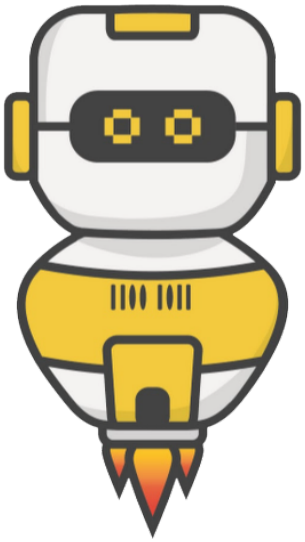
```
def spin_animation():
    index = 0
    while index < 8:
        my_arrow = pics.ALL_ARROWS[index]
        display.show(my_arrow)
        sleep(0.1)
        index = index + 1
```

Objective #4: Animation

- This loop counts how many times it is executed
- The variable **index** is used both to count the loops and to display an arrow in the list
- The variable **index** must be incremented inside the loop
    - You learned about this in Mission 7



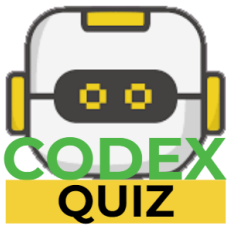
Objective #4: Animation



DO THIS:

- Import **sleep** from the time module
- Define the function **spin_animation**
  - Use the previous slide for help
- Call the function spin_animation just before you call **show_random_arrow()**
- Test your code by pressing both Button A and Button B

```
while True:
    if buttons.is_pressed(BTN_A) or buttons.is_pressed(BTN_B):
        spin_animation()
        show_random_arrow()
```



Mission Quiz: Indented?

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

Objective #5: Style points - physics part 1

The game spinner is nice – but still not very realistic.

- It needs to spin more than one time around
- It needs to gradually slow down before stopping
- Let's start with the first problem – making the spinner go more than one time around

Right now the spinner goes one time because the loop checks for index < 8.

- What if it checked for a number larger than 8?
- You can tell the function how many times to loop
- When you give the function information, it is called a **parameter**

Objective #5: Style points - physics part 1

A Parameter

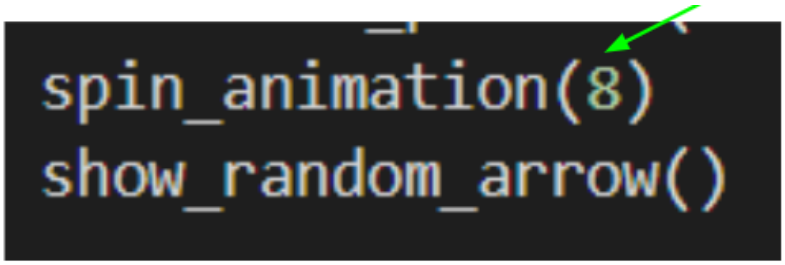
- The parameter is shown in the parenthesis

  The function uses the parameter, or data, to complete its task.

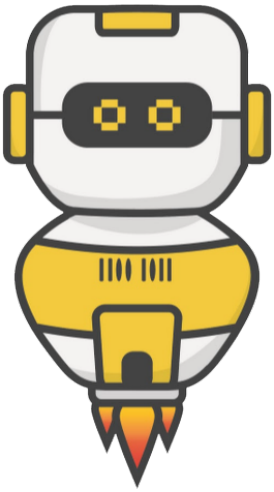
```
def spin_animation(count):
    index = 0
    while index < count:
        my_arrow = pics.ALL_ARROWS[index]
        display.show(my_arrow)
        sleep(0.1)
        index = index + 1
```

An argument

- When you call a function, you can supply values for those parameters.
- Values you pass when calling a function are called arguments.
- An argument can be a variable or a literal value.

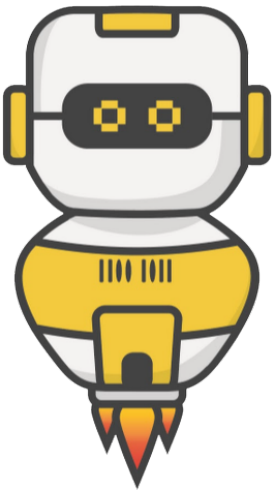


Objective #5: Style points - physics part 1



DO THIS:

- Add the parameter **count** to the **spin_animation()** function
- Use **count** in the while loop
- Call **spin_animation()** with the argument **8**
- Follow the steps from the two previous slides, or use CodeTrek for help



DO THIS:

- Go to your Mission Log and answer the questions about parameters and arguments

Mission Activity: Objective #5

What is a parameter? _____

_____

_____

What is an argument? _____

_____

_____

Objective #6: Unruly index

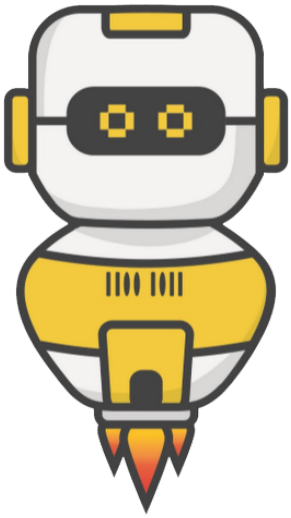
Time to increase the number of spins. Can you make the arrow spin longer than 8 times?

- Change the argument in the function call to 30

```
spin_animation(30)
show_random_arrow()
```

- Run the code and press BTN_A
- Do you get an error?
- Let's find out why, and how to fix it

Objective #6: Unruly index



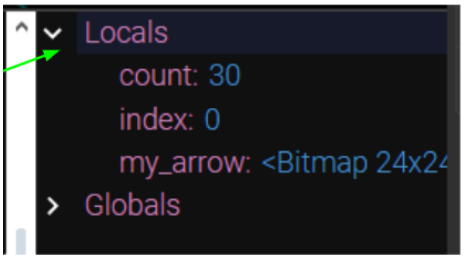
DO THIS:

- Use the debugger 
- Step in the program

- When you see this line, press BTN_A while pressing "Step In" 

```
17  while True:
18      if buttons.is_pressed(BTN_A) or buttons.is_pressed(BTN_B):
19          spin_animation(30)
20          show_random_arrow()
```

- Open the console
- Watch the local variables as you continue to step in the code



- What is the value of **index** when the error occurs?
- Go to your Mission Log and answer the question.

Objective #7: Tame the unruly index

Did you find the error?

- The list has eight arrows
- The index values are 0 through 7
- When the index value is 8, it is past the end of the list

Solve this problem by using another variable for the loop, instead of index.

You will still increment **index** in the loop.

- Do you remember in Mission 7 you scrolled through a list?
- You will use the same wrapping code

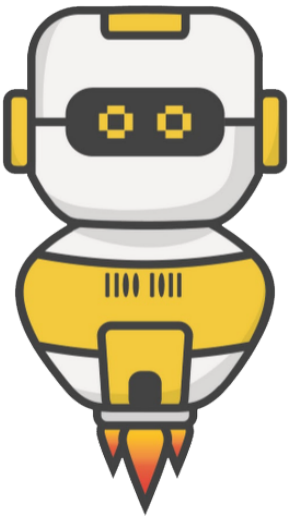
```
index = index + 1
if index == 8:
    index = 0
```

Now you can use a different variable to count the loops.

Remember to increment the **loops** variable inside the loop

```
def spin_animation(count):
    index = 0
    loops = 0
    while loops < count:
        my_arrow = pics.ALL_ARROWS[index]
        display.show(my_arrow)
        sleep(0.1)
        loops = loops + 1
        index = index + 1
        if index == 8:
            index = 0
```

Objective #7: Taming the unruly index



DO THIS:

- Define the **loops** variable
- Compare **loops** to **count** in the while loop
- Increment **loops**
- Write code to wrap **index**
- Follow the steps from the two previous slides, or use CodeTrek for help

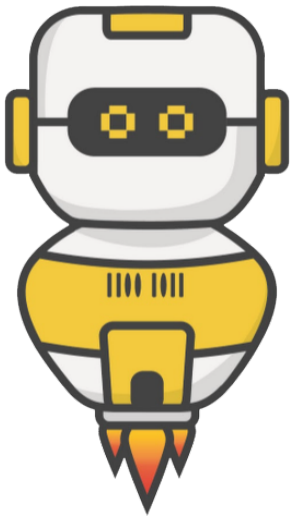
Objective #8: Style points - physics part 2

Spin down. For a more realistic spin, you can make the arrows gradually slow down before stopping.

- Right now the same amount of time is used: **sleep(0.1)**
- Use the variable **delay** instead of a literal value!

Increment **delay** by a little bit

```
while loops < count:
    my_arrow = pics.ALL_ARROWS[index]
    display.show(my_arrow)
    sleep(0.1)
    loops = loops + 1
    index = index + 1
    if index == 8:
        index = 0
```



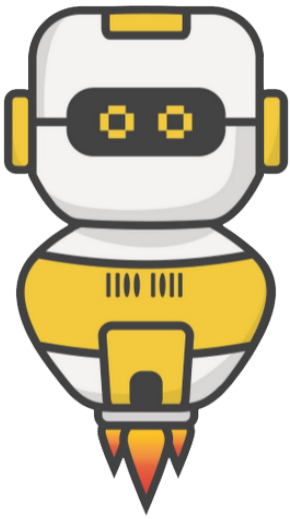
DO THIS:

- Define the **delay** variable
- Use **delay** in sleep()
- Increment **delay**

```
def spin_animation(count):
    delay = 0.05
    index = 0
    loops = 0
    while loops < count:
        my_arrow = pics.ALL_ARROWS[index]
        display.show(my_arrow)
        sleep(delay)
        delay = delay + 0.005
        loops = loops + 1
        index = index + 1
        if index == 8:
            index = 0
```

Mission Complete

You have completed the ninth mission.



Do this:

- Read your “Completed Mission” message
- Complete your Mission 9 Log
    - Post-Mission Reflection
- Get ready for your next mission!

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.