Unit 2: for loops with the TI-Innovator™ Hub	Skill Builder 1: Looping the Light

In this lesson, you will be introduced to the concept of a **for** loop in the context of the TI-Innovator Hub.

Objectives:

- Make a **for** loop using the **range()** function
- Input decimal values using **float()**
- Create a custom blinking light

To loop through a set of code a *specified number of times*, we can use a **for** loop with a **range()** function.

The **range()** function returns a sequence of numbers, starting from 0 by default, and increments by 1 (by default), and ends at a specified number.

```
for index in range(size):
    block
```

The function **light.blink()** does not give you enough control over the blink cycle. How long is the light on and how long is it off between blinks? Can you have it blink 3 times in 10 seconds?

This lesson will develop a program that gives you this control and also direct control over the total number of blinks.

1. Start with a New Python Hub Project template.

   Write three input statements:

   - One for the total number of blinks
   - One for the onTime (the time that the LED is on during a blink)
   - One for the offTime (the time between blinks)

   Caution: You may want to have blink times that are not whole numbers. Rather than using **int()** around the **input()** function, you can use **float()**. This allows you to enter numbers with decimals.

   float() and **int()** are found on **menu > Built-ins > Type** (along with others).

```
#=============================
from ti_hub import *
from math import *
from time import sleep
from ti_plotlib import text_at,cls
from ti_system import get_key
#=============================
blinks = int( input("Number of blinks? ") )
onTime = float(  #complete this...
offTime = float(  #complete this...
```

2. Insert the statement

   ## for index in range(size):
   ### block

   selected from the **menu > Built-ins > Control**.

   The inline prompts 'index', 'size', and 'block' must be replaced next.

```
from time import sleep
from ti_plotlib import text_at,cls
from ti_system import get_key
#=============================
blinks = int( input("Number of blinks? ") )
onTime = float(  #complete this...
offTime = float(  #complete this...
for index in range(size):
    block
```

3. Replace 'index' with any variable (**i** is commonly used). Press the **tab** key to move to the next field.

    Replace 'size' with the variable **blinks** that was used in the first input statement. Press **tab** again to highlight 'block'.

4. The **for** loop 'block' is the set of statements that operate the light (the red LED on the TI-Innovator Hub). Use **light.on()**, **light.off()** and **sleep()** statements. Try it yourself now. Remember to use the variables for timing that you used in the input statements.

    You can use decimal values for all the input statements, but the number of blinks will be converted to an integer. You cannot make ½ of a blink!

    The next step shows the completed program.

5. Your program should resemble this:

    ```
    blinks = int( input("Number of blinks? ") )
    onTime = float(  #complete this...
    offTime = float(  #complete this...
    for i in range(blinks):
        light.on()
        sleep(onTime)
        light.off()
        sleep(offTime)
    ```

6. When you run the program, enter your values, and then watch the LED. When the program ends, is the light on or off?
    The LED blinks but nothing happens on the TI-Nspire CX II screen. Add a print statement *inside* the **for** loop to *display* the current blink number:

    ## print(i)

    print() is found on **menu > Built-ins > I/O**.

    Running the program now shows the value of the index variable **i** on the Shell screen as the program makes the LED blink to your specifications. Do you notice anything unusual about the numbers on the screen?

7. Instead of the standard Python **print()** function you could use a special Texas Instruments developed **text_at()** function that the Hub Project template imports. See the import statements at the top of your program.

   From **menu > TI Hub > Commands**, select **text_at(…)**.

   > **text_at(row , "text" , "align")**

   Use row **6**.

   In place of "text", use the expression **str(i)** which is found on **Menu > Built-ins > Type** and converts the integer value of **i** into a string.

   From "align", select one of the three pop-up choices: left, **center**, or right.

   On the **print(i)** statement, press **ctrl+t** to turn it into a comment.

   Your code should resemble this:

   > **# print(i)**
   > **text_at(6, str(i), "center")**

8. Run the program again. What values do you need to enter to get the light to blink 3 times in 10 seconds? Try this:

   > blinks = 3
   >
   > onTime = 2
   >
   > offTime = 2

   The 3rd blink *ends* at the start of second 10 but the program does not end for another two seconds. Are there other options?

   Remember to save your work.