

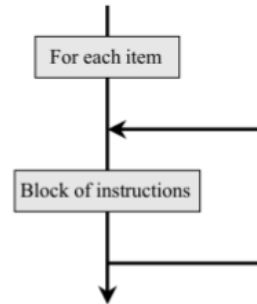
For Loops

A loop allows you to execute the same statements multiple times. `for` loops are used to iterate over the items of a sequence, either by value or by index.

Unit 1 `for` Each Value

A `for` loop executes the same block of code “for each item in a sequence”. Create a new file named `loops.py`, and enter the following code:

```
print("hello")
for x in [2, 7, 1]:
    print("the number is", x)
print("goodbye")
```



Questions

1. Run the `loops.py` program. How many times does the indented line of code execute under the `for` loop?
2. How many times does the line of code NOT indented execute after the `for` loop?
3. Identify the value of `x` each time the indented line of code is executed.
 - a) 1st time:
 - b) 2nd time:
 - c) 3rd time:
4. Modify the list `[2, 7, 1]` in the following ways, and rerun the program each time. Indicate how many times the `for` loop executes.
 - a) non-consecutive numbers: `[5, -7, 0]`
 - b) numbers decreasing in value: `[3, 2, 1, 0]`

c) all have the same value: [4, 4]

d) single value in a list: [8]

5. In general, what determines the number of times that the loop repeats?

6. What determines the value of the variable x? Explain your answer in terms of what is assigned (x = ...) each time the loop runs.

7. Modify the program as follows:

a) Write a statement that assigns [0, 1, 2, 3, 4] to the variable numbers.

b) Rewrite the `for x ...` statement to use the variable numbers instead.

c) Does the assignment need to come before or after the `for` statement?

8. Add the following code at the end of your program:

```
for c in "Hi!":  
    print(c)
```

a) What is the output of this `for` statement?

b) What determined how many times `print(c)` was called?

c) Explain what a `for` statement does with strings.

9. What other data types (besides lists and strings) can a `for` loop handle? Experiment by adding examples to your `loops.py` program. Summarize here what works and what doesn't.

Unit 2 The `range` Type

The `range` type represents a sequence of integers. The `range()` function can be called with one, two, or three arguments.

Python code	Shell output
<code>range(5)</code>	<code>range(0, 5)</code>
<code>list(range(5))</code>	<code>[0, 1, 2, 3, 4]</code>
<code>x = range(3)</code>	
<code>print(x)</code>	<code>range(0, 3)</code>
<code>print(list(x))</code>	<code>[0, 1, 2]</code>
<code>list(range(5, 10))</code>	<code>[5, 6, 7, 8, 9]</code>
<code>list(range(-3, 4))</code>	<code>[-3, -2, -1, 0, 1, 2, 3]</code>
<code>list(range(4, 10, 2))</code>	<code>[4, 6, 8]</code>
<code>for i in range(5): print(i)</code>	<i>prints 0, 1, 2, 3, 4 (on separate lines)</i>

Questions

10. Explain the difference in output between the first two lines of code (with and without the `list` function).

11. If the argument of the `range` function specifies a single number (x):

- What will be the first number listed?
- What will be the last number listed?
- How many numbers will be in the list?
- Use the range function to generate the sequence 0, 1, 2, 3.

12. If the argument of the `range` function specifies two numbers (x, y):

- What will be the first number listed?
- What will be the last number listed?
- How many numbers will be in the list?
- Use the range function to generate the sequence 1, 2, 3, 4.

13. If the argument of the `range` function specifies three numbers (x, y, z) :

- a) What will be the first number listed?
- b) What does the third argument represent?
- c) How many numbers will be in the list?
- d) Use the range function to generate the sequence 1, 3, 5, 7.

14. In your Editor, make a copy of the ?? code. Then modify the `for` statement so that the number of times the loop executes is determined by a variable named `times`.

- a) How did you change the `for` statement?
- b) How would you cause the loop to print the values 0 to 5?

15. Consider the `for` statement used in ?? versus #14.

- a) If you wanted to execute a loop 100 times, which type of `for` statement would you choose and why?
- b) If you wanted to use each item of an existing list inside the loop, which type of `for` statement would you choose and why?

16. (Optional) Write a `for` loop that uses the `range()` function to print the letters A to Z one at a time. *Hint:* In Unicode, 'A' is 65 and 'Z' is 90. Use the `chr()` function inside the loop.