



**TASK**

# **Beginner Control Structures - For Loop**

Visit our website

# Introduction

## Welcome to The Control Structures - For Loop Task!

In this task, you will be exposed to loop statements to understand how they can be used in reducing lengthy code, preventing coding errors, as well as paving the way towards code reusability. The next statement you'll be exposed to is the for loop, which is essentially a different variation of the while loop.



Get in touch  
**Connect for support**

Remember that with our courses, you're not alone! You can contact your mentor to get support on any aspect of your course.

The best way to get help is to login to [www.hyperiondev.com/portal](https://www.hyperiondev.com/portal) to start a chat with your mentor. You can also schedule a call or get support via email.

Your mentor is happy to offer you support that is tailored to your individual career or education needs. Do not hesitate to ask a question or for additional support!





## A note from the **Hyperion Team**

Python is a high-level language, meaning it is closer to human languages than machine languages. Therefore, it is easier to understand and write. It is also more or less independent of a particular type of computer.

Fortran was the first high-level language. Fortran was invented in 1954 by IBM's John Backus. The name Fortran is derived from "Formula Translation." The language is best suited to numeric computation and scientific computing. Fortran is still used in computationally intensive areas such as numerical weather prediction, finite element analysis, computational fluid dynamics, computational physics, crystallography and computational chemistry.

---

### **What is a for Loop?**

A for loop is similar to a while loop. Either a for loop or a while loop can be used to repeat instructions. However, unlike a while loop, the number of repetitions in a for loop is known ahead of time. A for loop is a counter-controlled loop. It starts with a start value and counts up to an end value. A for loop allows for counter-controlled repetition to be written more compactly and clearly. Therefore, a for loop is easier to read.

In Python, a for loop has the following syntax:

```
for indexVariable in sequence:  
    statements
```

As you can see, the Python for loop starts with the keyword 'for' followed by a variable that will hold each of the values of the sequence, as we move through it. The indexVariable can tell you what iteration the loop is on.

In each iteration (or repetition) of the for loop the code indented inside the for loop is repeated.

The Python `range()` function generates a sequence of numbers, which are used to iterate through a for loop. The `range()` function needs two integer values, a start number and a stop number. For the function `range(start index: end index)`, the **start index is included** and the **end index is not included**.

In the for loop below, while the variable `i` (which is an integer) is in the range of 1 to 10 (i.e. either 1, 2, 3, 4, 5, 6 ... or 9), the indented code in the body of the for loop will execute. `range(1, 10)` specifies that `i = 1` in the first iteration of the loop. So 1 will be printed in the first iteration of this code. Then the code will run again, this time with `i=2`, and 2 will be printed out...etc. until `i=10`. Now `i` is not in the range (1,10), so the code will stop executing.

`i` is known as the index variable as it can tell you what iteration or repetition the loop is on. In each iteration of the for loop, the code indented inside the for loop is repeated.

```
for i in range(1, 10):  
    print(i)
```

This for loop in the example above, prints the numbers 1 to 9. Again, note the indentation and the colon, just like in the if statement.

You can use an if statement within a for loop!

```
for i in range(1,10):  
    if i > 5:  
        print(i)
```

The code in the example above will only print the numbers 6, 7, 8 and 9 because numbers less than or equal to 5 are filtered out.

For a for loop to function properly, the following things must happen:

- **Initialise Loop:** The loop needs to use a variable as its counter variable. This variable will tell the computer how many times to execute the loop.
- **Loop Test:** The loop test is a boolean expression. The loop test is a Python expression that evaluates to either true or false. The loop test expression is evaluated before any iteration of the for loop. If the condition is true, then the program control is passed to the loop body; if false, control passes to the first statement after the loop body.
- **Update Statement:** Update statements assign new values to the loop control variables. The statement typically uses the increment `i+=1` to update the control variable. An update statement is always executed *after* the body

has been executed. After the update statement has been executed, control passes to the loop test to mark the beginning of the next iteration.

A loop could also contain a **break statement**. Within a loop body, a break statement causes an immediate exit from the loop to the first statement after the loop body. The break allows for an exit at any intermediate statement in the loop.

## break

Using a break statement to exit a loop has limited, but important applications. Let us describe one of these situations. A program may use a loop to input data from a file. The number of iterations depends on the amount of data in the file. The task of reading from the file is part of the loop body which thus becomes the place where the program discovers that data is exhausted. When the end-of-file condition becomes true, a break statement exits the loop.

In selecting a loop construct (either while loop or for loop) to read from a file, we recognise that the test for end-of-file occurs within the loop body. The loop statement has the form of an **infinite loop**: one that runs forever. The assumption is that we do not know how much data is in the file. Versions of the for loop and the while loop permit a programmer to create an infinite loop. In the for loop each field of the loop is empty. There are no control variables and no loop test. The equivalent while loop uses the constant true as the logical expression.

The syntax of infinite for and while loops are as follows:

```
for(range):  
    loop block
```

```
while(true):  
    loop block
```

## Nesting loops

A nested loop is simply a loop within a loop. Each time the outer loop is executed, the inner loop is executed right from the start. That is, all the iterations of the inner loop is executed with each iteration of the outer loop.

The syntax for a nested for loop in another for loop is as follows:

```
for iterating_var in sequence:
    for iterating_var in sequence:
        statements(s)
    statements(s)
```

The syntax for a nested while loop in another while loop is as follows:

```
while condition:
    while condition:
        statement(s)
    statement(s)
```

You can put any type of loop inside of any other kind of loop. For example, a for loop can be inside a while loop or vice versa.

```
for iterating_var in sequence:
    while condition:
        statement(s)
    statements(s)
```

## Instructions

Before you get started, we strongly suggest you start using Notepad++ or IDLE to open all text files (.txt) and python files (.py). Do not use the normal Windows notepad as it will be much harder to read.

First, read example.py, open it using IDLE (Right click the file and select 'Edit with IDLE').

- example.py should help you understand some simple Python. Every task will have example code to help you get started. Make sure you read all of example.py and try your best to understand.
- You may run example.py to see the output. Feel free to write and run your own example code before doing the Task to become more comfortable with Python.

## Compulsory Task 1

Follow these steps:

- Create a program called "task1.py".
- This program needs to display the timetables for any number.
- For example, say the user enters 6 the program must print:

The 6 times table is:

$$6 \times 1 = 6$$

$$6 \times 2 = 12$$

...

$$6 \times 12 = 72$$

- Compile, save and run your file.

## Compulsory Task 2

Follow these steps:

A simple rule to determine whether a year is a leap year is to test whether it is a multiple of 4.

- Create a program called “task2.py”.
- Write a program to input a year and a number of years.
- Then determine and display which of those years were or will be leap years.

```
What year do you want to start with? 1994
How many years do you want to check? 8
```

```
1994 isn't a leap year
1995 isn't a leap year
1996 is a leap year
1997 isn't a leap year
1998 isn't a leap year
1999 isn't a leap year
2000 is a leap year
2001 isn't a leap year
```

- Compile, save and run your file.

## Compulsory Task 3

Follow these steps:

- Create a new Python file in this folder called “task3.py”
- Now create a while loop that will display count down from 20 to 0..
- Next, create a loop that will display all the even numbers between 1 and 20.
- Create a loop that will produce the following output:  
\*  
\*\*  
\*\*\*



\*\*\*\*  
\*\*\*\*\*

- Write the code to compute the greatest common divisor (GCD) of two positive integers.

## Optional Bonus Task

Follow these steps:

- Create a new Python file in this folder called "Optional\_task.py"
- Get the user to input a number and cast it to an int. Store it in a variable called num.
- Now, if the number is bigger than 10, use a for loop to output it as many times as its value. For example, if a user enters 11, the number 11 will be printed out 11 times.
- If the user enters anything less than or equal to 10, the program should output "Sorry, too small".

### Thing(s) to look out for:

1. Make sure that you have installed and setup all programs correctly. You have setup **Dropbox** correctly if you are reading this, but **Python or Notepad++** may not be installed correctly.
2. If you are not using Windows, please ask your mentor for alternative instructions.



Rate us  
**Share your thoughts**

Hyperion strives to provide internationally-excellent course content that helps you achieve your learning outcomes.

Think the content of this task, or this course as a whole, can be improved or think we've done a good job?

[\*\*Click here\*\*](#) to share your thoughts anonymously.

