

Python Repetitive Processing – While Loop

A loop is a construct that causes a section of a program to be repeated a certain number of times. The repetition continues while the condition set for the loop remains true. When the condition becomes false, the loop ends and the program control is passed to the statement following the loop.

Repetitive Processing – While Statement

The **while** loop is one of the looping constructs available in Python. The **while** loop continues until the expression becomes false. The expression has to be a logical expression and must return either a **true** or a **false** value.

The syntax of the while loop is:

```
while expression:  
    statement(s)
```

The expression statement is evaluated first. If the expression is true then the statement(s) block is executed repeatedly until the expression becomes false. Otherwise, the next statement following the statement(s) block is executed.

Example:

```
count = 0  
while count < 9:  
    print ('The count is:', count)  
    count = count + 1  
print ("Good bye!")
```

This will produce following result:

```
The count is: 0  
The count is: 1  
The count is: 2  
The count is: 3  
The count is: 4  
The count is: 5  
The count is: 6  
The count is: 7  
The count is: 8  
Good bye!
```

Notice in the example above the final print statement is not indented which indicates it is outside of the loop and will be run after the loop is complete. Every time through the loop the variable count ,which is initialized or set to an initial value of 0 before the loop, is increased by 1. The loop checks each time through to make sure it's still less than 9 and if it is it does another pass through the loop.

Using a While Loop to Re-run the Code in a Program

```
from math import pi

print ("Volume Calculator")
print ("-----")
print ("")

#initializing the variable again
again = "Y"

#creating a loop to continue as long as the user replies with a Y
while again == "Y":
    #asking for radius and calculating volume
    r = int(input("What is the radius of the planet in Km"))
    v = 4/3 * pi * r ** 3

    print("The volume of that planet is", v)

    #asking the user if they'd like to go again, .upper() converts answer to uppercase
    again = input("Would you like to determine another volume? (Y/N)").upper()
```

Exercise – write a program that uses a while loop to calculate the gravitational force between two objects given their masses m_1 and m_2 in Kg, their distance r from each other in metres, and the gravitational constant $G = 6.67 * 10^{-11}$. The loop should continue as many times as the user would like to by using a variable such as again.

Any two objects, even you and your friend, will have a gravitational pull on each other. The gravitational pull between you and your friend will be insignificant when compared to that of the Earth or Sun but it does exist. The formula used to calculate the Gravitational Force is:

$F_g = (G * m_1 * m_2) / r^2$ and the final units are N for Newtons which is what all forces are measured in. Display your answer afterwards to say:

The force between the two objects is [answer] N.

Don't forget to ask the user if they would like to repeat the code while still inside the loop.

Once you have a working loop you can see the value of programming. It may take a bit of extra work upfront, but once it's done you can complete infinite calculations in a fraction of the time.