Problem Solving and Programming CSE1001

Prof. Ramesh Ragala

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Problem

Class Average

Given marks secured in CSE1001 by the students in a class, design an algorithm and write a Python code to determine the class average. Print only two decimal digits in average

Class Average

Input	Processing	Output
Number of students in class, mark scored by each student	Determine total of marks secured by students. Find average of marks	Class average of marks

Algorithm

Average marks scored by N number of Students

Step 1: Start
Step 2 : Read Number Of Students
Step 3 : Initialize counter as 0
Step 4 : Input mark
Step 5 : Add the mark with total
Step 6 : Increment the counter by 1
Step 7: Repeat Step 4 to Step 6 until counter less than number of students
Step 7: Divide the total by number of students and store it in average
Step 8: Display the average
Step 9: Stop

Test Cases

Input

5

90 85 70 50 60

Output

71.00

Processing Involved

Introduction to Loops:

Already Know

- To read values from user
- To check if a condition is satisfied
- Print characters

Yet to learn

Introduction to Loops:

Already Know

- To read values from user
- To check if a condition is satisfied
- Print characters

Yet to learn

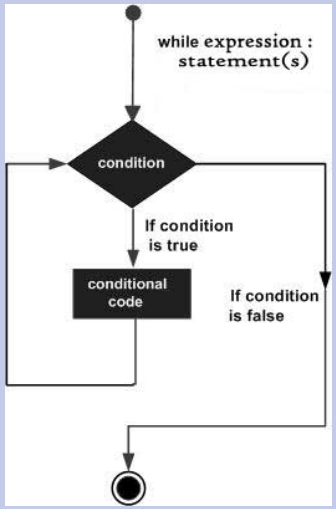
- Repeatedly execute a set of statements

Introduction to Loops

- Repeated execution of set of statements can be handled by iterative control structure.
- An **iterative control statement** is a control statement providing the repeated execution of a set of instructions.
- An iterative control structure is made up of set of instructions and the iterative control statement(s) controlling their execution.
- Because of their repeated execution, iterative control structures are commonly referred to as **loops**.

Introduction to While Loop

- A while statement is an iterative control statement that repeatedly executes a set of statements based on a provided Boolean expression (condition).
- The while statement does not perform a series of tasks a set number of times $\rightarrow$ creating an **endless loop** is possible, $\rightarrow$ the loop never ends. $\rightarrow$ variable used in test condition is manipulated in body of the while loop
- All iterative control needed in a program can be achieved by use of the while statement.



Introduction to While Loop

- **While Loop Syntax**

Syntax

```
while (testcondition):          →loop test
   statements                   → loop body
else:                           → Optional else
   statements
```

While Loop Example

```
p = int(input("Enter a value"))
while (p>5):
      print("R")
      p=p-1;
else:
      print("Q")
print("Program")
```

Problem-1

Mr.x is playing with ABACO digital Device. After entering a number, it produce the sum of the number upto that number.

PYTHON CODE

```
n = int(input('Enter the a Value'))
i = 0;
sum = 0;
while(i <=n):
    sum = sum+i
    i = i + 1
    #print("present value of i is",i)
print("the summation is",sum)
```

Introduction to While loop

Problem

Raju teacher asked him to write numbers from 1 to 50 in sequence. help him.

PYTHON CODE

```
n = int(input('Enter a value'))
i=0
while(i <=n):
    print ( i )
    i +=1
```

Introduction to While loop

Problem

How to display list of number in a specified range

PYTHON CODE

```
n = int(input("Enter starting range"))
m = int(input(" Enter the ending range"))

if((m-n) > 1):
    i=n
    while(i<=m):
        print(i)
        i += 1
else:
    print("invalid input range")
```

Introduction to While loop

Problem

Identify the list of even and odd numbers in a specified range

Python Code

```
n = int(input("Enter starting range"))
m = int(input(" Enter the ending range"))

if((m-n) > 1):
    i=n
    while(i<=m):
        if(i%2==0):
            print(i,"is even")
            i += 1
        else:
            print(i,"is odd")
            i += 1

else:
    print("invalid input range")
```

Introduction to While loop

Problem

find the average, total, min and max of even numbers and odd numbers in specified range

PYHTON CODE

```
n = int(input("Enter starting range"))
m = int(input(" Enter the ending range"))
total_even=0
total_odd=0

if((m-n) > 1):
    i=n
    while(i<=m):
        if(i%2==0):
            total_even += i
            print(i,"is even")
            i += 1
        else:
            total_odd += i
            print(i,"is odd")
            i += 1
    print((format(float(total_odd),'.3f')),"is the sum of odd numbers")
    print((format(float(total_even),'.3f')),"is the sum of even number")

else:
    print("invalid input range")
```

Introduction to While Loop

Problem

Printing the natural numbers in a horizontal way in Python

Python Code

```
a = 10
b = 20
while(a < b):
      print(a  ,end=' ')
      a +=1
```

- end in the print statement is used to suppress default move to new line

Introduction to While Loop

Problem

Calculate the average mark obtained by a student in CSE1001 Course

Python Code

```
count = 0
total = 0
n = int(input("Enter How many marks you want to read"))
while(count < n):
    mark = int(input("Enter mark"))
    total += mark
    count +=1
avg = total/n
print(avg," is the average mark of the student")
```

Introduction to While Loop

- **break**
  - It is used to jumps out of the closest enclosing loop.
  - **Example**

Python Program

```
while True:
    name = input('Enter ur name')
    if (name == 'ramesh'):
        break
    age = input("enter age")
print('hello', name, '=>', int(age)**2)
```

Introduction to While Loop

- **continue:**
  - It is used to jumps to the top of the closest enclosing loop

Example

```
i =0;
n = 10;
while ( n ):
    n -= 1;
    if(n % 2 == 0):
        continue;
    print(n,end=' ')
```

Introduction to While Loop

- **pass:**
  - It does not do anything.
  - It is an empty statement placeholder

Example

```
print('␣Chennai␣Campus') # what happens with this stat
while True:
    pass
print("VIT␣University")
```

- **loop else:**
  - It will be executed iff the loop exited normally (with out breaks)

Example

```
y = int(input("enter a value"))
x = y//2
while (x >1):
    if(y%x == 0):
        print(y, "is not prime")
        break
    x -=1
else:
    print(y, "is prime")
```

Problem - Pattern Generation

Your teacher has given you the task to draw the structure of a staircase. Being an expert programmer, you decided to make a program for the same. You are given the height of the staircase. Given the height of the staircase, write a program to print a staircase as shown in the example.
For example, Staircase of height 6:

```
#
##
###
####
#####
######
```

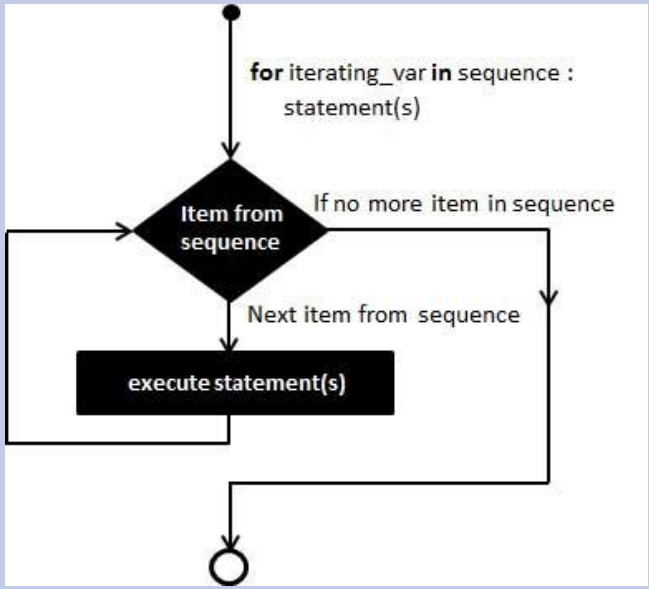
- Observation after Ist step of problem solving: **pattern is repeated**

Introduction to Loops:

- **Pseudo Code:**
  - READ stairheight
  - FOR x = 1 to stairheight
  - FOR y = 1 to x
  - print #
  - END FOR
  - END FOR
- So we need to study about loops. How looping statements are used in python.

Introduction to for loop

- We can not predict how many time the loop will be executed in while loop statement
- The Iteration number in while loop depends upon the condition or input only
- So while loop is good choice for Infinite loop.
- The for loop statement can be used to solve the above problem.



Introduction to for loop

Syntax of for loop

```
for target in object:
        statements
        if test:
                break
        if test:
                continue
else:
        statements
```

For and Strings

for iterating_var in sequence or range:

    statement(s)

Example:

```
for letter in 'Python':
   print 'Current Letter :', letter
```

When the above code is executed:

We Get Output

```
Current Letter : P
Current Letter : y
Current Letter : t
Current Letter : h
Current Letter : o
Current Letter : n
```

For and Range

```
for n in range(1, 6):
    print(n)
```

When the above code is executed:

We Get Output

1
2
3
4
5

Python code for Staircase pattern problem

```
n = int(input("Enter the number of levels"))

for stcnt in range(0,n):
    for lncnt in range(0,stcnt+1):
        print('#',end='')
    print()
```

Example

```
for i in 'Python':
    print ('Current Letter is',i)
```

Introduction to Range

- **The Syntax of range :**

General form of range function is

range(begin,end,step)

- **begin:**
  - It is a first value in the range.
  - Default value is 0, if it is omitted
- **end:**
  - it specifies the end of the range.
  - it should not be omitted.
- **step:**
  - It specifies the amount to be decremented or incremented in each iteration.
  - Default values is 1
- begin, end and step are integers only.

Example for Range

- range(10) → 0,1,2,3,4,5,6,7,8,9
- range(1, 10) → 1,2,3,4,5,6,7,8,9
- range(1, 10, 2) → 1,3,5,7,9
- range(10, 0, -1) → 10,9,8,7,6,5,4,3,2,1
- range(10, 0, -2) → 10,8,6,4,2
- range(2, 11, 2) → 2,4,6,8,10
- range(-5, 5) → -5,-4,-3,-2,-1,0,1,2,3,4
- range(1, 2) → 1
- range(1, -1, -1) → 1,0

Introduction to for loop

- Python code to print even number using range

Python code

```
for i in range(2,10,2):
    print(i)
```

- Summation of n numbers

PYTHON CODE

```
sum = 0
n = int(input("Enter n value"))
for i in range(1,n+1):
    sum += i
print("summation of first",n)
print("natural number is",sum)
```

Exercise Problem

Problems

1. Write a python code to check whether a given number is odd or even?
2. Write a python code to check whether a given year is leap year or not?
3. Write a python code in finding the roots of a quadratic equation?
4. Write a python program to segregate student based on their CGPA. The details are as follows:
   <=9 CGPA <=10 - outstanding
   $<= 8 CGPA < 9$ - excellent
   $<= 7 CGPA < 8$ - good
   $<= 6 CGPA < 7$ - average
   $<= 5 CGPA < 6$ - better
   $CGPA < 5$ - poor

Exercise Problem

Problems

1. Write a program that read a group 'g' of five numbers and another number 'n' and print a number in 'g' if it is a factor for a given number n?
2. Write a program to find the factorial of a number n?
3. Write a menu driven program which get user choice to perform add/sub/mul/div with the obtained two input?
4. Write a program to display few odd multiples of a odd number n ?
5. The Head Librarian at a library wants you to make a program that calculates the fine for returning the book after the return date. You are given the actual and the expected return dates. Calculate the fine as follows:
   A. If the book is returned on or before the expected return date, no fine will be charged, in other words fine is 0.
   B. If the book is returned in the same month as the expected return date, Fine = 15 Rupees Number of late days
   C. If the book is not returned in the same month but in the same year as the expected return date, Fine = 500 Rupees Number of late months
   D. If the book is not returned in the same year, the fine is fixed at 10000 Rupees