Lecture 14: Introduction to Computer Programming Course - CS1010

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Goals for today

- While Loops
- Problems on While Loops
- Random Numbers

Rule to remember

- For all while loops we must:
  - Initialize
  - Give condition (of while)
  - Specify action
  - Increment and/or decrement

Problem 1

- Print numbers in the range 23 to 49 (both inclusive)

Problem 2

- Print even numbers in the range 23 to 49.

Problem 3

- Given a list that contains years from 1950 to 2020, print the years that are leap years. It is given that 1952 is a leap year.

Problem 4

- Print numbers 1 to 10 in descending order and all in one line.

Problem 5

- Print 100 stars with one space between them.

Problem 6

- Given two lists of equal length, return a new list that contains the sum of elements of each list.
- Test Cases
- [1,2,3,4] [4,5,6,7] Result: [5,7,9,11]
- [-1,3,0] [2,-2,5] Result: [1,1,5]

Problem 7

- Print a rectangle as shown:

```
*****
*****
*****
*****
*****
*****
*****
*****
*****
*****
```

Problem 8

- You are given two lists, rat_1 and rat_2, that contain the daily weights of two rats over a period of ten days. Compare the weights of both rats and output the days on which rat 1 is heavier than rat 2.
- Test Cases:
- Rat1=[1,3,2,2,1,3,4,2,1,1]
- Rat2=[2,1,1,3,2,2,2,1,1,2]
- Output: Days=[2,3,6,7,8]

Problem 9

- The following list represents the population of New York State (in hundreds of thousands of people) for the US Census in 1790, 1800, 1810, etc., all the way through 2010.
- census = [340, 589, 959, 1372, 1918, 2428, 3097, 3880, 4382, 5082, \
- 5997, 7268, 9113, 10385, 12588, 13479, 14830, 16782, \
- 8236, 17558, 17990, 18976, 19378]
- Write code to find the average percentage change from one decade to the next, across all decades. For example, the change from 1790 to 1800 is (589 - 340) / 340 * 100 = 73.2% and the change from 1800 to 1810 is (959 - 589) / 589 * 100 = 62.8% so the average across just these two decades is 68.0%.

Problem 10:Example of nested loop

Write a Python program to construct the following pattern, using a nested loop.

```
*
* *
* * *
* * * *
* * * * *
* * * *
* * *
* *
*
```

Solution

- Break the solution into two parts:
  - The upper triangle
  - The lower triangle
- Think of two variables:
  - The lines containing stars
  - The stars themselves
- Loop both the variables
  - Increment for the first(upper) triangle
  - Decrement for the second (lower) triangle

Random Numbers

- Some applications require behavior that appears random.
- Random numbers are useful particularly in games and simulations. For example, many board games use a die (one of a pair of dice) to determine how many places a player is to advance.
- A software representation of a game that involves dice would need a way to simulate the random roll of a die.

Pseudo Random Numbers

- All algorithmic random number generators actually produce pseudo random numbers, not true random numbers.
- A pseudorandom number generator has a particular period, based on the nature of the algorithm used.
- If the generator is used long enough, the pattern of numbers produced repeats itself exactly.
- All practical algorithmic pseudo random number generators have periods that are large enough for most applications

Python module random

- import random
- random.random()
- random.randint(0,5)
- random.choice([1,0,-1])

Problem 11

- Write a Python program to guess a number between 1 to 9.
- Note : User is prompted to enter a guess. If the user guesses wrong then the prompt appears again until the guess is correct, on successful guess, user will get a "Well guessed!" message, and the program will exit.

Problem 10

- Write a Python program to find numbers between 100 and 400 (both included) where each digit of a number is an even number. The numbers obtained should be printed in a comma-separated sequence.

In Class Exercise

- Given in class

Next Class

- For Loops