

## Assignment 1, CSL100, Summer 2013-14

Due Date: June 8, 2014, Midnight

1. Sakshi likes to play tennis on weekends based on the weather condition. She makes her decision depending on the following three factors.

- Outlook (which can be 'sunny', 'rainy' or 'overcast')
- Wind (which can be 'strong' or 'weak')
- Humidity (which can be 'high' or 'normal')

She decides to play tennis if i) outlook is 'overcast' OR ii) outlook is 'rainy' and wind is 'weak' OR iii) outlook is 'sunny' and humidity is 'normal'.

We would like to automate her decision about playing tennis by creating a program which would take as input current weather condition i.e. outlook, wind and humidity, and output 'yes' or 'no' depending on whether Sakshi would like to play tennis in these weather conditions.

- (a) Write a Python program with flat if-else structure (i.e. no nesting of if-else constructs) to achieve the above functionality. **(2 points)**
- (b) Write a Python program with nested if-else structure to achieve the above functionality. **(2 points)**

Note: You can use '==' operator to compare two strings. For instance, if outlook='sunny' then outlook=='sunny' will return *True* and outlook=='overcast' will return *False*. Similarly, to input a string on the command line, you should put the desired string in single quotes.

2. The value of  $\pi$  can be calculated using the following series:

$$\pi = 4 * (1 - 1/3 + 1/5 - 1/7 + 1/9 - 1/11 + 1/13 \dots)$$

Write a Python program which takes as input a threshold  $th$  ( $th > 0$ ) and calculates *using a while loop* the value of  $\pi$  correctly within the given threshold i.e. if  $v_\pi$  is the value that your function returns, then  $|v_\pi - \pi| \leq th$ . **(4 points)**

Hint: If  $s_n$  denotes the value of above expression evaluated upto  $n$  terms, then, for even  $n$ ,  $s_n \leq \pi \leq s_{n+1}$

3. **(4 points)** Write a Python program that prints a diamond structure, given the width at the center (maximum width). The width must be an odd number. For example, if the maximum width is given as 5, the diamond structure obtained is as follows:

```
  X
 XXX
XXXXX
  XXX
   X
```

4. Write a Python program to calculate the roots of a quadratic polynomial given as  $ax^2 + bx + c$ . Your program should input the coefficients  $a$ ,  $b$  and  $c$  from the user and then output the two roots. **(2 points)**

Note: Remember that roots of a quadratic polynomial can possibly be complex. To calculate the square root of a number, you need to import the *cmath* library in the beginning of your program. Then, call the function *cmath.sqrt(m)* to calculate the square root of  $m$ .

**Note: You should upload your code on the moodle website following the instructions on the course web page:**

<http://www.cse.iitd.ernet.in/~parags/teaching/csl100/#Assignments>