Programming with Python

Lab Exercises

PGDBDA – Aug 2017

Session 1(a) – Introduction to Python and Basics

1. Use the "format" function to display the following floating-point values with three decimal digits of precision.

(a) 4580.5034 (b) 0.00000046004 (c) 5000402.000000000006

2. Give a call to print that is provided one string that displays the following address on three separate lines.

CDAC

Old Madras Road

Bangalore

3. What is the value of variables num1 and num2 after the following instructions are executed?

```
num = 5
k = 5
num1 = num + k * 2
num2 = num + k * 2
```

Are the values id(num1) and id(num2) equal after the last statement is executed?

4. Evaluate the following expressions. (Use operator precedence and associativity).

Let var1 = 10, var2 = 30 and var3 = 2.

(a) var1 - 6 ** 4 * var2 ** 3 (b) var1 // var2 / var3 (c) var1 * var2 / 4 // var3

5. Write a Python program that prompts the user to enter an upper or lower case letter and displays the corresponding Unicode encoding.

6. Develop and test a program that prompts the user for their age and determines approximately how many breaths and how many heartbeats the person has had in their life. The average respiration (breath) rate of people changes during different stages of development. Use the breath rates given below for use in your program:

	Breaths per Minute
Infant	30–60
1–4 years	20–30
5–14 years	15–25
Adults	12–20

For heart rate, use an average of 67.5 beats per second.

Session 1(b) – Control Structures

7. Write a program to implement a simple calculator that can add, subtract, multiply and divide two integers.

Take the required operation as choice from the user.

8. Write a simple python program to print the multiplication table of 5.

9. Write a program to check whether the given number is perfect number or not.

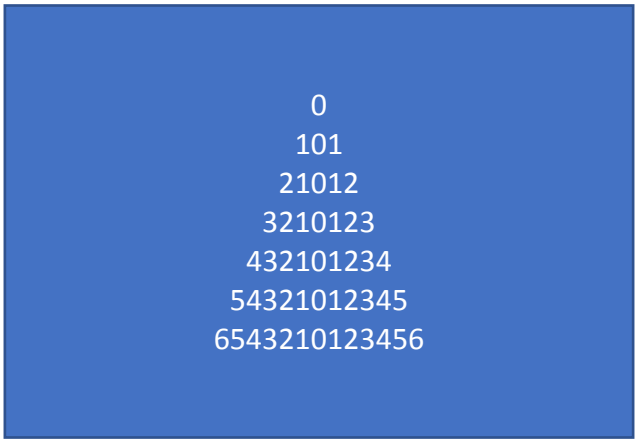
A number is called as a perfect number if the sum of the factors of that number is equal to the same number. Example: 6 = 1 + 2 + 3

10. Write a program to check whether a number can be expanded as the sum of two prime numbers.

For example, the number 9 can be expanded as two prime numbers 2 and 7, 9 = 2 + 7.

11. Write a Python program to create the following triangle.

Take number of rows as an input from the user.



Additional Exercises

a) Write a program which takes three integers and prints a histogram to the screen. For example, if the three integers are 4, 8, 6 then it should print the following:

****

****

******

Session 2 – Strings

12. Write a program to read a multi word string and print all the words in alphabetical order.

You can use string functions.

13. Write a program to remove all the punctuation characters from the given string.

Example Punctuation Characters: !()-[]{};:'"\,<>./?@#$%^&*_~

14. Write a program to check whether a sentence is a pangram or not.

A pangram is a sentence that contains all the letters of the English alphabet at least once. Example: The quick brown fox jumps over the lazy dog

15. Write a program that takes a phrase as a user input and then prints the corresponding acronym.

Additional Exercises

a) Write a program to get a string made of the first 2 and the last 2 chars from a given a string. If the string length is less than 2, return a empty string.

Sample String : 'workshop'
Expected Result : 'woop'
Sample String : 'hi'
Expected Result : 'hihi'
Sample String : 'a'
Expected Result : ''

b) Write a program to find the first appearance of the substring 'not' and 'poor' from a given string, if 'bad' follows the 'poor', replace the whole 'not...poor' substring with 'good'. Return the resulting string.

Sample String : 'The lyrics is not that poor!'
Expected Result : 'The lyrics is good!'

c) Write a program to get a string from a given string where all occurrences of its first char have been changed to '$', except the first char itself.

Sample String : 'restart'
Expected Result : 'resta$t'

Session 3 – Lists

16. For a list of integers named nums,

- Write a while loop that adds up all the values in nums.
- Write a for loop that adds up all the values in nums in which the loop variable is assigned each value in the list.
- Write a for loop that adds up all the elements in nums in which the loop variable is assigned to the index value of each element in the list.
- Write a for loop that displays the elements in nums backwards.
- Write a “for” loop that displays every other element in nums, starting with the first element.

17. A robot moves in a plane starting from the original point (0,0). The robot can move UP, DOWN, LEFT and RIGHT with a given number of steps. The trace of robot movement is shown below:

UP 5

DOWN 3

LEFT 3

RIGHT 2

The numbers after the direction are steps. Write a program to compute the distance from the current position after a sequence of movements. If the distance is a float, then just print the nearest integer.

Example:

If the following tuples are given as input to the program:

UP 5

DOWN 3

LEFT 3

RIGHT 2

Then, the output of the program should be: 2

18. A website requires the users to input username and password to register. Write a program to check the validity of password input by users. Following are the criteria for checking the password:

1. At least 1 letter between [a-z]
2. At least 1 number between [0-9]
3. At least 1 letter between [A-Z]
4. At least 1 character from [$#@]
5. Minimum length of transaction password: 6
6. Maximum length of transaction password: 12

Your program should accept a list of comma separated passwords and will check them according to the above criteria. Passwords that match the criteria are to be printed, each separated by a comma.

Additional Exercises

a) Write a program to find the index value(s) of a list(s) in a nested list.

e.g. List1 = [1, 5, 6.72, "Sunday", ['H', 'I'] , 'Good Morning'] Output: 4

b) Pokemon Antakshari

Take the following selection of 70 English Pokemon names in a List and generate a sequence with the highest possible number of Pokemon names where the subsequent name starts with the final letter of the preceding name. No name should be repeated.

```
audino bagon baltoy banette bidoof braviary bronzor carracosta
charmeleoncresselia croagunk darmanitan deino emboar emolga exeggcute
gabitegirafarig gulpin haxorus heatmor heatran ivysaur jellicent
jumpluff kangaskhankricketune landorus ledyba loudred lumineon
lunatone machamp magnezone mamoswinenosepass petilil pidgeotto pikachu
pinsir poliwrath poochyena porygon2porygonz registeel relicanth
remoraid rufflet sableye scolipede scrafty seakingsealeo silcoon
simisear snivy snorlax spoink starly tirtouga trapinch treeckotyrogue
vigoroth vulpix wailord wartortle whismur wingull yamask
```

e.g. If first word is 'bagon' then output should be: nosepass, sableye, emboar…

Session 4 – Tuples

19. Perform the following operations on tuples.

- Create a tuple which contains the names of 4 students.
- Print all the elements of the tuple using a loop.
- Find out the length of the tuple.
- Append/Insert the name of another student. Check whether it is possible or not.
- Remove the name of 3rd student.
- Delete the entire tuple.
- Find out all the possible operations on tuples using “dir”.

20. Three users have rated four books. The following table contains USERID, BOOKID and RATING. Create a tuple which can store the entire data. Find out which book is most popular.

Note: Find out the average rating of all the books and the book which has highest average rating will be treated as the most popular book.

1, 101, 5.0

1, 102, 3.0

1, 103, 2.5

2, 101, 2.0

2, 102, 2.5

2, 103, 5.0

2, 104, 2.0

3, 101, 2.5

3, 102, 4.0

3, 103, 4.5

3, 104, 5.0

Additional Exercises

a) Write a program to find the prime numbers till 100 using tuple comprehension

Session 5 - Dictionaries

21. (a) Write a program to create two dictionaries and merge them into a single dictionary.

(b). Given a dictionary of students and their favorite colors:

people = {'Arham':'Blue','Lisa':'Yellow',''Vinod:'Purple','Jenny':'Pink'}

- Find out how many students are in the dictionary
- Change Lisa's favourite colour
- Remove 'Jenny' and her favourite colour
- Sort and print students and their favourite colours alphabetically by name

22. Write a program that takes a string as input and builds a frequency listing of the characters contained in it. Represent the frequency listing as a Python dictionary.

Example:

Input String: “Leader”

Output Dictionary: {‘a’:2, ‘d’:1, ‘e’:2, ‘r’:1}

23. A simple German to English dictionary is given below. Write a program to translate the German sentence “"vom eise befreit sind strom und baeche"” to English.

German_Dict = {"befreit":"liberated", "baeche":"brooks", "eise":"ice", "sind":"are", "strom":"river", "und":"and", "vom":"from"}

Session 6 – Functions

24. Define a function overlapping() that takes two lists and returns True if they have at least one member in common, False otherwise.

25. Write a function find_longest_word() that takes a list of words and returns the length of the longest one.

26. In English, present participle is formed by adding suffix -ing to infinite form: go going. A simple set of heuristic rules can be given as follows:

If the verb ends in e, drop the e and add ing (if not exception: be, see, flee, knee, etc.)

- If the verb ends in ie, change ie to y and add ing
- For words consisting of consonant-vowel-consonant, double the final letter before adding ing
- By default just add ing

Your task in this exercise is to define a function make_ing_form( ) which given a verb in infinitive form returns its present participle form. Test your function with words such as lie, see, move and hug.

Session 7 – File I/O

27. Write a Python function called reduce whitespace that is given a line read from a text fi le and returns the line with all extra whitespace characters between words removed.

'This line has extra space characters' → 'This line has extra space characters'

28. Write a Python function named "checkQuotes" that is given a line read from a text file and returns True if each quote characters in the line has a matching quote (of the same type), otherwise returns False.

'Today's high temperature will be 75 degrees' → False

29. Case Study: A movie rating data set which provides movie ratings, movie metadata (genres and year), and demographic data about the users (age, zip code, gender, and occupation) is given.

For the questions 'a to e', use the data file 'movies.dat'. To solve the question 'f, use the files 'users.dat' and 'ratings.dat'.

a) List all the movies which are released in 1995.
b) Find the number of movies which were released every year.
c) What is number of animation movies?
d) List all the horror movies with starting letter as either D or J
e) What is the number of action movies which are released during 1991-1995?
f) Find out the most favorite genre of lawyer and scientist.

Session 8 & 9 – OOP using Python

30. Define a class named Rectangle which can be constructed by a length and width. The Rectangle class has a method which can compute the area.

31. Define a class named Shape and its subclass Square. The Square class has an init function which takes a length as argument.

Both classes have an area function which can print the area of the shape where Shape's area is 0 by default.

Session 10 – Exception Handling

32. Write a program to implement a simple calculator that can add, subtract, multiply and divide two integers.

The program should handle two kinds of exceptions, ZeroDivisionError and ValueError.