WORKSHEET-2

1. Write a program to perform matrix addition and multiplication. Get number of rows, columns and elements from the user at run time.

2. The CTS in VIT Vellore wants to create email id to all the first-year students. Assume that they get the current email id of the students, separate the username from it and append the new domain as "vit.ac.in" to create the new vit account. Given a personal mail id of student, design a flowchart and write the Python code to automatically generate the new mail id. If the current mail id is deepakshah@gmail.com then the new mail id to be generated is deepakshah@vit.ac.in

Input Format
Current email id

Output Format
New email id

3. Consider an application that allows the user to enter a list of integers of 'n' integers. If the user tends to enter a value which is already in the list, then the user is not allowed to enter the values further and stops execution with a message “Duplicate”. Otherwise after entering all elements, the message “Unique” is displayed. Design a flowchart/ pseudocode and develop the Python code for the application.

Input Format:

The first line will contain the number of integers, N

The next ‘N’ lines will contain the integers

Output Format:

Duplicate or Unique

Boundary Conditions:

Input is a list of integers

4. Given a square matrix of size $N \times N$, devise an algorithm and write the Python code to calculate the absolute difference of the sums across the two main diagonals. For example, given a 3 X 3 matrix as below:

11 2 4
4 5 6
10 8 -12

Sum across the first diagonal = 11+5-12= 4
Sum across the second diagonal = 4+5+10 = 19
Absolute Difference: |4-19| =15

Input format:
read no of rows

read no of columns
read elements of the n*n matrix

Output format:
print the absolute difference between the sum of both the diagonals

Boundary conditions:
rows >0
columns>0
and rows should be equal to columns

5. Write a pseudo code and Python program to create a user defined dictionary to map name of countries to their capital. Further perform swapping of ith and jth key's values in the dictionary.

Input Format:

Number of Elements in a dictionary

Key and value pairs of dictionaries

Value of i

Value of j

Output Format:

Display dictionary after swapping the values

6. A physician wants to check the health status of the patient after performing a few medical tests. Providing the number of tests, get the names of each test, minimum and maximum values corresponding to each one. Further, with the help of the given test name and the observed value of the test of an individual patient, write an algorithm and the subsequent Python program to print if the test result is normal or abnormal. The patient report is normal if the observed value of the test lies in between the maximum and minimum value.

Input Format:

Number of tests

Name of the test

Minimum value of test

Maximum value of test

Name of the observed test

Observed value of the test

Output Format:

Abnormal or Normal

7. An anagram is a word or phrase formed by rearranging the letters in another word or phrase. Take two words or phrase from the user and display if they are "anagram" or "not anagram".

Input Format:

First word or phrase

Second word or phrase

Output Format:

"anagram" or "not anagram"

8. Mr. Bobby is the manager at the *GINGER* hotel. The hotel has an infinite amount of rooms.

   One fine day, a *finite* number of tourists come to stay at the hotel.

   The tourists consist of:

   → A Captain.

   → An unknown group of families consisting of K members per group where $K \neq 1$.

   The Captain was given a separate room, and the rest were given one room per group.

   Mr. Bobby has an unordered list of randomly arranged room entries. The list consists of the room numbers for all of the tourists. The room numbers will appear K times per group except for the Captain's room.

   Mr. Bobby needs you to help him find the Captain's room number.

   The total number of tourists or the total number of groups of families is not known to you.

   You only know the value of K and the room number list.

   Input Format

   The first line consists of an integer, K, the size of each group.

   The second line contains the unordered elements of the room number list.

   Constraints

   1<K<1000

   Output Format

   Output the Captain's room number.

   Sample Input

5
1 2 3 6 5 4 4 2 5 3 6 1 6 5 3 2 4 1 2 5 1 4 3 6 8 4 3 1 5 6 2

Sample Output

8

Explanation

The list of room numbers contains 31 elements. Since K is 5, there must be 6 groups of families. In the given list, all of the numbers repeat 5 times except for room number 8.

Hence, 8 is the Captain's room number.

9. Write a Python function that accepts a string and calculate the number of upper-case letters and lower-case letters.
   Input Format:
   A string
   Output Format:
   Number of upper-case letters
   Number of lower-case letters

10. Given details of 'n' students, design a flowchart/algorithm and write the Python code to determine the average marks scored by each student. The details of the student include name, register number, and five marks. Write a function to determine the total marks scored by the student and don't let the function to modify the marks.

    Input Format
    Number of students
    Register number of student1
    Five marks of student1

    ....

    Output Format
    Details of student as a list with name, register number, marks and total

11. Given a string. The task is to replace each character of the minimized string by a character present at index '*IND*' of the original string result in final string. The minimized string is the string obtained by removing all duplicates from the original string keeping the order of elements same. Obtain new string by adding the final string and the original string. Write a function to perform the bubble sort of the characters present in new string. Write a Python program to implement the Scenario.

IND for any index in the minimized string is calculated as:
IND = (square of ascii value of minimized string character) % (length of original string)

Input Format:

String

Output Format:

List of minimized string's characters

New string

Character sorting in a new string

Examples:
Input : geeks
Output :
['g', 'e', 'k', 's']
sesggeeks
['s', 's', 's', 'k', 'g', 'g', 'e', 'e', 'e']

Explanation : minimized string = geks
length of original string = 5
ascii value of g = 103
IND for g = (103*103) % 5 = 4
replacement character for g = s
character 's' present at index 4 of original string
Similarly,
replacement character for e = e
replacement character for k = s
replacement character for s = g

New String=sesg+geeks

12. Radha has many toys and she has a weird obsession of arranging all the toys in a line such that their heights are in non-decreasing order. If the order is messed then she gets angry. You know the number of toys and their current arrangement; can you tell if she is angry or not?

Input Format:

First line will contain **n** the number of toys Monica has.
Next line contains **n** integers, denoting the heights of the toys in line.

Output Format:

If Radha is angry print **"Angry"** (without quotes) else print **"Happy"**.

13. Write an program to perform binary search. Get the total number of elements from the user. Binary search can be applied only in sorted numbers so get the input numbers n sorted order from the user.

We basically ignore half of the elements just after one comparison.

(i)Compare x(search element) with the middle element.

(ii)If x matches with middle element, we return the mid index and print "Search successful".

(iii)Else If x is greater than the mid element, then x can only lie in right half subarray after the mid element. So we recur for right half.

(iv)Else (x is smaller) recur for the left half.

If the element is not found then print "Search unsuccessful"

Use function to perform this search.

14. Write a python program to read the numbers from the file name "numbers.txt" and perform bubble sort and display the numbers in list format.

Input Format:

File name

Output Format:

Sorted list

15. A pangram is a sentence containing every letter of the alphabet. Consider a file contains a sentence. Your task is to create a function which checks for the sentence in a file and find whether the given sentence is pangram or not.

Input Format:

A text file

Output Format:

Pangram

Not pangram

16. You are given the word in a file. Some characters in a word may repeat. For each character in a word, output its number of occurrences. The output order should correspond with the input order of appearance of the character in a word. See the sample input/output for clarification.

Input Format

Text file contains the word

Output Format

Output the number of distinct characters from the input.

Output the number of occurrences for each distinct character according to their appearance in the input word.

17. Vowgrams are words or sentences that has every vowel of the English alphabet occurring at least once. Write an algorithm and a subsequent Python code to check whether a string is a vowgram or not. Write a function to check if a given string is a vowgram. For example, "The quick brown fox jumps over the lazy dog" is a vowgram.

Input format

First line contains the string to be checked

Output Format

Print Vowgram or Not vowgram

18. The point (x1, y1) lies on a line with equation ax+by+c=0 if zero is obtained when x1 is substituted for x and y1 is substituted for y in the equation of the line. Two points (x1, y1) and (x2, y2) lie on the opposite sides of a line with equation ax+by+c=0, when one point gives a positive value and the other gives negative value when substituted in the equation. Given a list of points, and the values of (a, b, c) of a line equation, form a cluster 'C1' of points that lie on the line, form a cluster 'C2' of points that lie on side 1 of the line, form a cluster 'C3' of points that lie on side2 of the line. Write an algorithm and write the Python code to print the outliers on both the sides, in a sorted order. Centroid of the points (x1, y1), (x2, y2), ..., (xn, yn) is the point whose x-coordinate is the average of x1,x2, ... xn, and the y-coordinate is the average of y1,y2, ...yn. Let the average distance of all the points in C2 to centroid of C2 be 'A2'. A point 'p' in C2 is said to be an outlier if the distance between the centroid of C2 and P is greater than 'A2'. Similarly, we define the outlier in C3, as those points whose distance with the centroid of C2 is greater than the average distance of all the points in C3 to its centroid. Round all values to two decimal places.

For example, consider a line with equation 3*x+2*y -8 = 0, and 17 points (4, -2), (2, 1), (5, 3), (-5, 3), (10, 30), (-11, 10), (1, 2), (2, 2), (2, 3), (3, 2), (2, 4), (3, 4), (-3, 2), (-1, 1), (-1, 2), (-4,-2), (4,2).

Points on the line: (4, -2), (2, 1)

Points on one side1 of line: (-5, 3), (-11, 10), (1, 2), (-3, 2), (-1, 1), (-1, 2), (-4, -2)

Points on another side2 of line: (5, 3), (10, 30), (2, 2), (2, 3), (3, 2), (2, 4), (3, 4), (4, 2)

Centroid for Side1: (-3.43, 2.57)

Centroid for Side2: (3.88, 6.25)

Average length of line from centroid to all points on side1: 3.92

Average length of line from centroid to all points on side2: 6.29

Outliers on side1: [(-11, 10), (-4, -2), (1, 2)]

Outliers on side2: [(10, 30)]

Input Format

Value of 'a'

Value of 'b'

Value of 'c'

Number of points

x coordinate of point1

y coordinate of point1

x coordinate of point2

y coordinate of point2

....

Output Format

Outliers of side1 in sorted order

Outliers of side2 in sorted order