Stream - CSE
Semester - III
Assignment - 1

Topic: Control Statements

1. Write a program that asks the number of years as input, and then prints out the number of days, hours, minutes, and seconds in that number of years. Assume 365 days per year and also check that year for leap year or not.

2. Write a program to calculate the amount payable after simple and compound interest.
Simple Interest = $(P \star t \star r) / 100$
Compound Interest = $P \star ((1 + r / 100)^t - 1)$

3. Write a program to take a 2-digit number and then print the reversed number. That is, if the input given is 25, the program should print 52. Then extend it for 3-digit number and also check for odd and even.

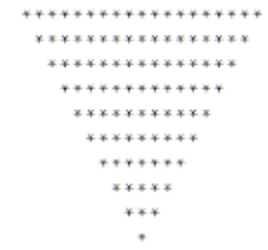
4. Say a box of cookies can hold 24 cookies, and a container can hold 75 boxes of cookies. Write a program that prompts the user to enter the total number of cookies, then outputs the number of boxes and the number of containers to ship the cookies. Note that each box must contain the specified number of cookies, and each container must contain the specified number of boxes. If the last box of cookies contains less than the number of specified cookies, you can discard it and output the number of leftover cookies. Similarly, if the last container contains less than the number of specified boxes, you can discard it and output the number of leftover boxes.
5. Find the grade of a student based on five different subjects and the gradation table is given below:

Average Mark	Grade
91-100	O
81-90	A+
71-80	A
61-70	B
51-60	C
41-50	D
33-40	E
Less than 33	F

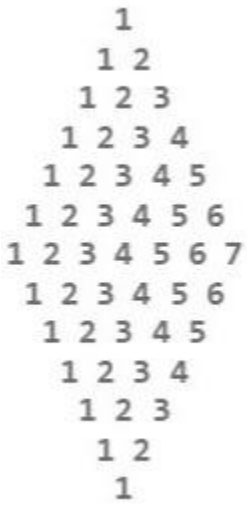
Assignment - 2
Topic - Conditional and Loops

1. I. A store charges Rs120 per item if you buy less than 10 items. If you buy between 10 and 99 items, the cost is Rs100 per item. If you buy 100 or more items, the cost is Rs70 per item. Write a program that asks the user how many items they are buying and prints the total cost.

2. Write a short program to check whether the square root of a number is prime or not.
3. Write a program to input N numbers and then print the second largest number.
4. Write a program that takes the input until ‘q’ and print the palindrome numbers.
5. Write a program to find the factorial of a number using a recursive method and without recursion.
6. Write a program to print a inverted full pyramid of *.



7. Write a program to print the full pyramid of numbers.



8. Write a program that will check if a number is a magic number or not. (A magic number is that number whose repeated sum of its digits till we get a single digit is equal to 1. Ex: 1729 1+7+2+9=19 1+9=10 1+0=1)

Assignment - 3

Topic: String manipulation

1. Reduce a string of lowercase characters in range ascii [‘a’..’z’] by doing a series of operations. In each operation, select a pair of adjacent letters that match, and delete them. Delete as many characters as possible using this method and return the resulting string. If the final string is empty, return Empty String.

a. Input- aaabccddd, output- abd, input- abba output-empty string.

2. Write a Python function that accepts a string and calculates the number of uppercase letters and lowercase letters.

3. Write a Python function to check whether a string is a pangram or not.

Note : Pangrams are words or sentences containing every letter of the alphabet at least once.

For example : “The quick brown fox jumps over the lazy dog”.

4. Write a program to check whether a user input string is palindrome or not.

5. In the Byteland country, a string S is said to super ASCII string if and only if the count of each character in the string is equal to its ASCII value. In the Byteland country ASCII code of ‘a’ is 1, ‘b’ is 2, …, ‘z’ is 26. The task is to find out whether the given string is a super ASCII string or not. If true, then print “Yes” otherwise print “No”.

6. The Caesar cipher is a type of substitution cipher in which each alphabet in the plaintext or messages is shifted by a number of places down the alphabet.
For example,with a shift of 1, P would be replaced by Q, Q would become R, and so on.
To pass an encrypted message from one person to another, it is first necessary that both parties have the ‘Key’ for the cipher, so that the sender may encrypt and the receiver may decrypt it.
Key is the number of OFFSET to shift the cipher alphabet. Key can have basic shifts from 1 to 25 positions as there are 26 total alphabets.
As we are designing a custom Caesar Cipher, in addition to alphabets, we are considering numeric digits from 0 to 9. Digits can also be shifted by key places.
For Example, if a given plain text contains any digit with values 5 and keyy =2, then 5 will be replaced by 7, “-”(minus sign) will remain as it is. Key value less than 0 should result into “INVALID INPUT”
Example 1:
Enter your PlainText: All the best
Enter the Key: 1
The encrypted Text is: Bmm uif Cftu
Write a function CustomCaesarCipher(int key, String message) which will accept plaintext and key as input parameters and returns its cipher text as output.

7. A City Bus is a Ring Route Bus which runs in circular fashion.That is, Bus once starts at the Source Bus Stop, halts at each Bus Stop in its Route and at the end it reaches the Source Bus Stop again.
If there are n number of Stops and if the bus starts at Bus Stop 1, then after nth Bus Stop, the next stop in the Route will be Bus Stop number 1 always.
If there are n stops, there will be n paths.One path connects two stops. Distances (in meters) for all paths in Ring Route is given in array Path[] as given below:
Path = [800, 600, 750, 900, 1400, 1200, 1100, 1500]
Fare is determined based on the distance covered from source to destination stop as Distance between Input Source and Destination Stops can be measured by looking at values in array Path[] and fare can be calculated as per following criteria:

- If d =1000 metres, then fare=5 INR
- (When calculating fare for others, the calculated fare containing any fraction value should be ceiled. For example, for distance 900n when fare initially calculated is 4.5 which must be ceiled to 5)

Path is circular in function. Value at each index indicates distance till current stop from the previous one. And each index position can be mapped with values at same index in BusStops [] array, which is a string array holding abbreviation of names for all stops as-
“THANERAILWAYSTN” = ”TH”, “GAONDEVI” = “GA”, “ICEFACTROY” = “IC”, “HARINIWASCIRCLE” = “HA”, “TEENHATHNAKA” = “TE”, “LUISWADI” = “LU”, “NITINCOMPANYJUNCTION” = “NI”, “CADBURRYJUNCTION” = “CA”
Given, n=8, where n is number of total BusStops.
BusStops = [“TH”, ”GA”, ”IC”, ”HA”, ”TE”, ”LU”, ”NI”,”CA”]
Write a code with function getFare(String Source, String Destination) which take Input as source and destination stops(in the format containing first two characters of the Name of the Bus Stop) and calculate and return travel fare.
Example 1:
Input Values
ca
Ca
Output Values
INVALID OUTPUT
Example 2:
Input Values
NI
HA
Output Values
23.0 INR
Note: Input and Output should be in format given in example.
Input should not be case sensitive and output should be in the format INR

Assignment - 4

Topic: List

1. Create the following lists using a for loop:

The list ['a','bb','ccc','dddd', . . .] that ends with 26 copies of the letter z.

2. Write a program that takes any two lists L and M of the same size and adds their elements together to form a new list N whose elements are sums of the corresponding elements in L and M. For instance, if L = [3, 1, 4] and M = [1, 5, 9], then N should equal [4,6,13].

3. Write programs as per following specifications: "Print the length of the longest string in the list of strings str_list. Precondition : the list will contain at least one element."

4. Write a program to read two lists num and denum which contain the numerators and denominators of the same fractions at the respective indexes. Then display the smallest and largest fraction along with its index.

5. Write a program to display the maximum and minimum values from the specified range of indices of the list.

6. Write a program to move all duplicate values in a list to the end of the list.

7. Write a program to compare two equal sized lists and print the first index where they differ.

8. Write a program to reverse a list without using another list or in-built function.

Hints: swap 1st and last element, 2nd and 2nd last element and so on.

9. Write a function to search a number in a list

10. Write a program to find the arithmetic mean, variance and standard deviation of any values in a list.

$$\text{Mean } (\mu) = \frac{1}{n}\sum_{i=1}^{n} x_i \qquad \text{Varianc}(\vartheta) = \frac{1}{n}\sum_{i=1}^{n}(x_i - \mu)^2$$

$$\text{Standard deviation}(\sigma) = \sqrt{\vartheta}$$

Assignment - 5
Topic: List, Tuple and Dictionary

1. Write a Python function that takes a list and returns a new list with unique elements of the first list.
Sample List : [1,2,3,3,3,3,4,5]
Unique List : [1, 2, 3, 4, 5]

2. Write a python program to show the permutation and combination of an inputted List.

3. Copy element 44 and 55 from the following tuple into a new tuple tuple1 = (11, 22, 33, 44, 55, 66)

4. Modify the first item (22) of a list inside a following tuple to 222 tuple1 = (11, [22, 33], 44, 55)

5. Below are the two lists convert it into the dictionary keys = ['Ten', 'Twenty', 'Thirty'] values = [10, 20, 30]

6.Merge following two Python dictionaries into one dict1 = {'Ten': 10, 'Twenty': 20, 'Thirty': 30} dict2 = {'Thirty': 30, 'Fourty': 40, 'Fifty': 50}

7. Check if a value 200 exists in a dictionary sampleDict = {'a': 100, 'b': 200, 'c': 300}

8. Rename key city to location in the following dictionary
a. sampleDict = { "name": "Kelly", "age":25, "salary": 8000, "city": "New york"}

9. Get the key corresponding to the minimum value from the dictionary above.

10. data_set = [{'a': 'one', 'b': 'two', 'c': 'three', 'd': 'four', 'e': 'five', 'f': 'six'}]

11. Write a program that accepts a different number of arguments and returns the sum of only the positive values passed to it.

12. Write a program to find the median of a list of numbers.

13. RAINWATER HARVESTING

Given n non-negative integers representing an elevation map where the width of each bar is 1, compute how much water it can trap after raining.

Example 1:

Input: height = [0,1,0,2,1,0,1,3,2,1,2,1]

Output: 6

Explanation: The above elevation map (black section) is represented by array [0,1,0,2,1,0,1,3,2,1,2,1]. In this case, 6 units of rain water (blue section) are being trapped.

Example 2:

Input: height = [4,2,0,3,2,5]

Output: 9

Constraints:

- n == height.length
- 1 <= n <= 2 * 104
- 0 <= height[i] <= 105

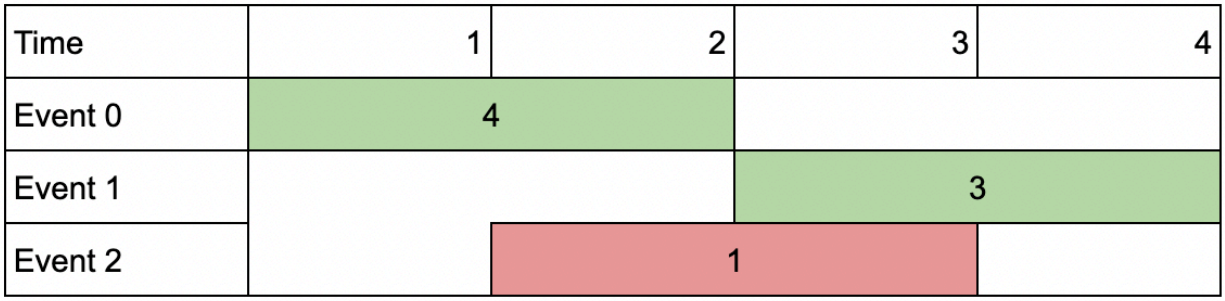
14 MAXIMUM NUMBER OF EVENTS THAT CAN BE ATTENDED

You are given an array of events where events[i] = [startDayi, endDayi, valuei]. The ith event starts at startDayi and ends at endDayi, and if you attend this event, you will receive a value of valuei. You are also given an integer k which represents the maximum number of events you can attend.

You can only attend one event at a time. If you choose to attend an event, you must attend the **entire** event. Note that the end day is **inclusive**: that is, you cannot attend two events where one of them starts and the other ends on the same day.

Return *the **maximum sum** of values that you can receive by attending events.*

Example 1:



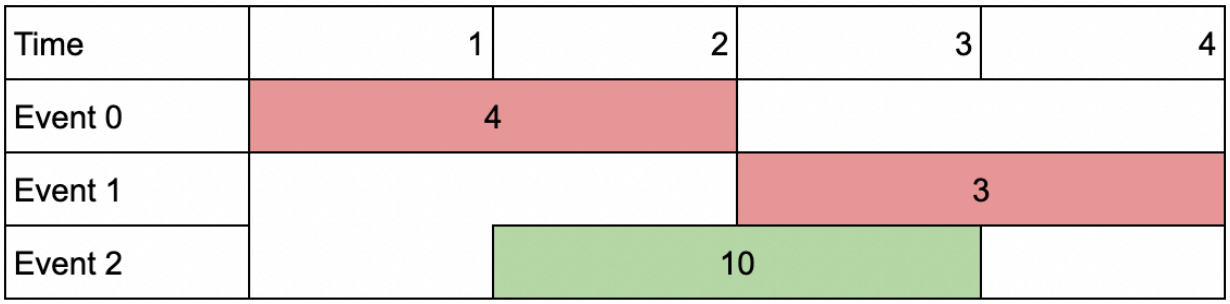
Input: events = [[1,2

,4],[3,4,3],[2,3,1]], k = 2

Output: 7

Explanation: Choose the green events, 0 and 1 (0-indexed) for a total value of 4 + 3 = 7.

Example 2:



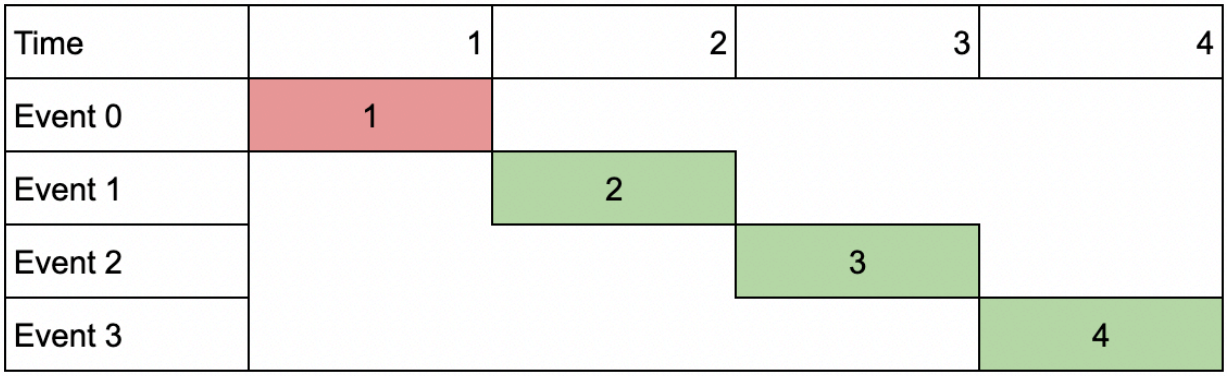
Input: events = [[1,2,4],[3,4,3],[2,3,10]], k = 2

Output: 10

Explanation: Choose event 2 for a total value of 10.

Notice that you cannot attend any other event as they overlap, and that you do **not** have to attend k events.

Example 3:



Input: events = [[1,1,1],[2,2,2],[3,3,3],[4,4,4]], k = 3

Output: 9

Explanation: Although the events do not overlap, you can only attend 3 events. Pick the highest valued three.

Constraints:

- 1 <= k <= events.length
- 1 <= k * events.length <= 106
- 1 <= startDayi <= endDayi <= 109
- 1 <= valuei <= 106

How to extract key-value pairs in bold from a dictionary in a list?
How to add these extracted key-value pairs to new dictionary
How to convert a new dictionary to a list?

Assignment - 6
Topic: Functions and Methods

1. Write a menu driven program to find out the area of circle, square, rectangle and triangle.
2. Write a function to return a list of ten consecutive integers.
3. Write a single function to return maximum and minimum value from a list along with the indices.
4. Write a function to implement Bubble sort.
5. Write a function to implement Binary search.
6. Write a function to print the prime numbers that can be expressed as the sum of some other prime numbers. Ex: 5=2+3, 17=2+3+5+7
7. Write a program to implement the Tower of Hanoi problem.
8. A positive integer d is said to be a factor of another positive integer N if when N is divided by d, the remainder obtained is zero. For example, for number 12, there are 6 factors 1, 2, 3, 4, 6, 12. Every positive integer k has at least two factors, 1 and the number k itself.Given two positive integers N and k, write a program to print the kth largest factor of N.

9. The Caesar cipher is a type of substitution cipher in which each alphabet in the plaintext or messages is shifted by a number of places down the alphabet.

   For example,with a shift of 1, P would be replaced by Q, Q would become R, and so on.

   To pass an encrypted message from one person to another, it is first necessary that both parties have the ‘Key’ for the cipher, so that the sender may encrypt and the receiver may decrypt it.

   Key is the number of OFFSET to shift the cipher alphabet. Key can have basic shifts from 1 to 25 positions as there are 26 total alphabets.

   As we are designing custom Caesar Cipher, in addition to alphabets, we are considering numeric digits from 0 to 9. Digits can also be shifted by key places.

   For Example, if a given plain text contains any digit with values 5 and keyy =2, then 5 will be replaced by 7, “-”(minus sign) will remain as it is. Key value less than 0 should result into “INVALID INPUT”

Example 1:

Enter your PlainText: All the best

Enter the Key: 1

The encrypted Text is: Bmm uif Cftu

Write a function CustomCaesarCipher(int key, String message) which will accept plaintext and key as input parameters and returns its cipher text as output.

10. Write a function named 'format_number' that takes a non-negative number as its only parameter. Your function should convert the number to a string and add commas as a thousand separators. For example, calling format_number(1000000) should return "1,000,000".
11. For a given linked list of N nodes, check if it has a loop (the linked list can contain self-loop).
12. For a given string S, write a function to check if it is a palindrome. Taking a single string as its parameter, your function should return True if the given string is a palindrome, else return False (A string is said to be a palindrome if it is the same when read backward).

Assignment - 7
Using numpy:
(Note: At first do it without numpy. Then do it again with numpy)

1. Write a python program to create a 3X3 Matrix randomly and calculate the sum of the diagonal elements.
2. Write a python program to perform the addition of two 3X3 Matrices.
3. Write a python program to perform the elements-wise multiplication of two 3X3 Matrices.
4. Write a python program to perform the Matrix Multiplication of two 3X3 Matrices.
5. Write a python program to find row wise maximum and column wise minimum element(s).
6. Write a python program to perform addition, subtraction and multiplication of two complex matrices.

Assignment - 8

Using matplotlib:

1. Generate randomly monthly electricity bill of a year then plot the bill using a line, bar and pie chart.
2. Draw Sin and Cos curve
3. Generate 30 random 2-d points and draw it using a scatter plot.

Assignment - 9

Topic: File Handling

1. Read a text file which contains monthly electricity bills of different customers. Draw the electricity consumption using a suitable graph.
2. Generate the marks of different subjects of different students randomly and store them in a“.csv”file then read it and plot average marks of each subject using bar plot and pie plot.
3. Write a program that counts the number of tabs, spaces and newline characters in a file.
4. Write a program that reads a file line by line. Each line read from the file1 is copied to another file with line number specified at the beginning of the line.
5. Write a program that generates a quiz and uses two files - Questions.txt and Answer.txt. The program opens Questions.txt and reads a question and displays the question with options on the screen. The program then opens the Answer.txt file and displays the correct answers.

Assignment - 10

Topic: Miscellaneous

1. Guess game:

Input a series of five letter words in upper case one per line. End of the input is indicated by ###. All of the inputs should be appended into a list except '###'. From the appended list the computer should randomly select a word and the user should guess it.

So, next input line should be a single integer N that represents the number of input guesses the user can make.

However the output should be 2N lines of input

For example if N=2 (guesses), then after each line of user guess a response to the guess should be there.

SAMPLE INPUT

SALTY
THEIR
BAKER
NIGHT
LIGHT
###
2
BAKER

.....

THEIR
th.i.

LIGHT
NIGHT
Explanation:
Inputs all in upper case until ###.
2 is number of guesses.
1st guess BAKER. Response “.....” indicates the neither of the letters from the 'BAKER' are in the hidden word so the user gets to guess again otherwise terminate.
2nd guess THEIR. Response “th.i.” the lower case indicates the letter t,h,i are in the word but in wrong positions.
Thereafter the OUTPUT word(s) from the list in alphabetical order that have letter t,h,i but in a different position.

2. Given an integer N, the task is to obtain N, starting from 1 using a minimum number of operations. The operations that can be performed in one step are as follows:

- Multiply the number by 2.
- Multiply the number by 3.
- Add 1 to the number.

Assignment-10

1. Problem You are given a positive integer X. Your task is to tell whether there exist two positive integers a and b (a > 0, b > 0) such that $2 \cdot a+2 \cdot b+a \cdot b=X$ If there exist positive integers a and b satisfying the above condition print YES, otherwise print NO.

Input Format The first line of input will contain a single integer T, denoting the number of test cases. Each test case consists of a single line containing a positive integer X.
Output Format For each test case, output on a new line YES or NO.

2. There is a grid of size 10^5×10^5, covered completely in railway tracks. Tom is riding in a train, currently in cell (a,b), and Jerry is tied up in a different cell (c,d), unable to move. The train has no breaks. It shall move exactly K steps, and then its fuel will run out and it shall stop. In one step, the train must move to one of its neighboring cells, sharing a side. Tom can’t move without the train, as the grid is covered in tracks. Can Tom reach Jerry’s cell after exactly K steps?

Note: Tom can go back to the same cell multiple times.
###Input

- The first line contains an integer
- T, the number of test cases. Then the test cases follow.
- Each test case contains a single line of input, five integers
- a,b,c,d,K.

###Output For each testcase, output in a single line "YES" if Tom can reach Jerry's cell in exactly
K moves and "NO" if not.
You may print each character of the string in uppercase or lowercase (for example, the strings "yEs", "yes", "Yes" and "YES" will all be treated as identical).

3. Find the square root of a number using binary search.