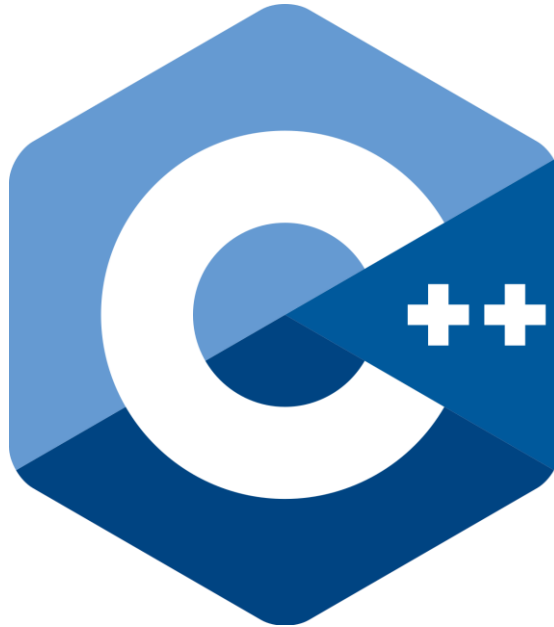




Fundamentals of Programming in C++



Assignment

Q1. Odd Even Sum

Given a number **N**, get the sum of the digits in the even and odd places.

The first line of the input gives the number of test cases, **T**. **T** test cases follow. Each test case contains an integer **N**.

For each test case, output one line containing **x y** (space separated), where **x** is the sum of even places and **y** is the sum of odd places.

Sample Input

```
3
456987
9415547
321123
```

Sample Output

```
21 18
13 22
6 6
```

Assignment

Q2. Alphabet Filter

Given a string **S** consisting of only **lowercase alphabets** [a-z], **output two strings**, one containing **only vowels** and the other containing **only consonants**. The output strings must retain the original order of the characters of the input string.

The first line of the input gives the number of test cases, **T**. **T** test cases follow. Each test case contains a string **S**.

For each test case, output two lines containing **s1** and **s2**, where **s1** is the string containing only consonants and **s2** is the string containing only vowels. In case of an empty string print a blank line.

Sample Input

```
3
onomatopoeia
techimax
programming
```

Sample Output

```
nmtp
ooaooeia
tchmx
eia
prgrmmng
oai
```

Assignment

Q3. Countdown

Given an array of **N** positive integers where the i^{th} integer of the array is A_i .

A contiguous subarray is an *m-countdown* if it is of length m and contains the integers $m, m-1, m-2, \dots, 2, 1$ in that order. For example, $[3, 2, 1]$ is a 3-countdown.

Can count the number of **K**-countdowns in her array?

The first line of the input gives the number of test cases, **T**. **T** test cases follow. Each test case begins with a line containing the integers **N** and **K**. The second line contains **N** integers. The i -th integer is A_i .

For each test case, output one line containing **Case #x: y**, where x is the test case number (starting from 1) and y is the number of **K**-countdowns in her array.

Sample Input

```
3
12 3
1 2 3 7 9 3 2 1 8 3 2 1
4 2
101 100 99 98
9 6
100 7 6 5 4 3 2 1 100
```

Sample Output

```
Case #1: 2
Case #2: 0
Case #3: 1
```

Assignment

Q4. Change Vending Machine

Implement a change vending machine. The machine stocks up change in the denominations of Rs. 100, Rs. 50, Rs. 20, Rs. 10 and Rs. 1. Given any amount **D** between Rs. 1 and Rs. 1000, vend the change such that you end up giving the *least number of notes*. For this problem, assume that all denominations are available in the form of currency notes.

The first line of the input gives the number of test cases, **T**. **T** test cases follow. Each test case contains an amount **D**.

For each test case, output one line showing the number of notes to give for each denomination as given below.

Sample Input

```
3
999
784
542
```

In this case, you gave out nine ($5 + 2 + 2$) notes. Any other way of vending notes would increase this number. For example, $542 * 1$ is a wrong answer. You need to give the highest denomination first wherever possible.

Sample Output

```
9*100, 1*50, 2*20, 0*10, 9*1
7*100, 1*50, 1*20, 1*10, 4*1
5*100, 0*50, 2*20, 0*10, 2*1
```

Assignment

Q5. Min, Max, Avg

Given 5 numbers, write **separate functions** to calculate their **min**, **max** and **average**.

The first line of the input gives the number of test cases, **T**. **T** test cases follow. Each test case contains an array of 5 numbers.

For each test case, output one line containing 3 space separated numbers, the min, max and avg of the given input.

Sample Input

```
3
4 5 2 -9 6
15 32 48 22 10
-9 -5 -6 -2 1
```

Sample Output

```
-9 6 1.6
10 48 25.4
-9 1 -4.2
```

Assignment

Q6. Upper Triangular Matrix

Given the dimension **N** ($0 < N < 11$) and the elements of a $N \times N$ matrix, print its upper triangular half.

The first line of the input gives the size **N** of a square matrix. **N** lines follow, each containing **N** numbers, the **elements of the matrix**. Each element is an integer in the range $[-9, 9]$.

Sample Input

```
4
1 2 5 4
6 5 4 8
-8 5 6 0
2 1 8 7
```

Print the upper triangular half as shown below.

Sample Output

```
1 2 5 4
  5 4 8
    6 0
      7
```

Assignment

Q7. Reverse an Array using Pointers

Given the size of an array **N** and its elements, write a function the reverse its elements using pointers.

The first line of the input gives the size **N** of the array. Next line contains **N** integers $a_1, a_2, a_3, \dots, a_N$.

Print the elements of the reversed array ie. $a_N, a_{N-1}, \dots, a_2, a_1$.

Sample Input

```
6
1 2 0 5 -8 -9
```

Sample Output

```
-9 -8 5 0 2 1
```


Assignment

Q8. Area of shapes

Write a program to **find area** of square, rectangle, circle and triangle by using **function overloading**

1st line contains the **side of a square**.
2nd line contains the **length and breadth of a rectangle**.
3rd line contains the **radius of a circle**.
4th line contains the **base and height of a triangle**.

Print the respective areas of the shapes as given below.

Sample Input

```
5
4 5
3
6 5
```

Sample Output

```
Area of square is 25
Area of rectangle is 20
Area of circle is 28.26
Area of triangle is 15
```

Assignment

Q9. The Da Vinci Number

Leonardo da Vinci was very amazed by the **Fibonacci numbers** and has used them in each piece of his work.

Given a number **N**, you have to help da Vinci to get the **Nth Fibonacci Number**.

Write functions to get the Nth Fibonacci Number, both with and without using recursion.

The first line of the input gives the number of test cases, **T**. **T** test cases follow. Each test case contains a number **N** ($1 < N < 26$).

For each test case print the Nth Fibonacci Number, using both the methods (with and without recursion)

Sample Input

```
3
25
2
12
```

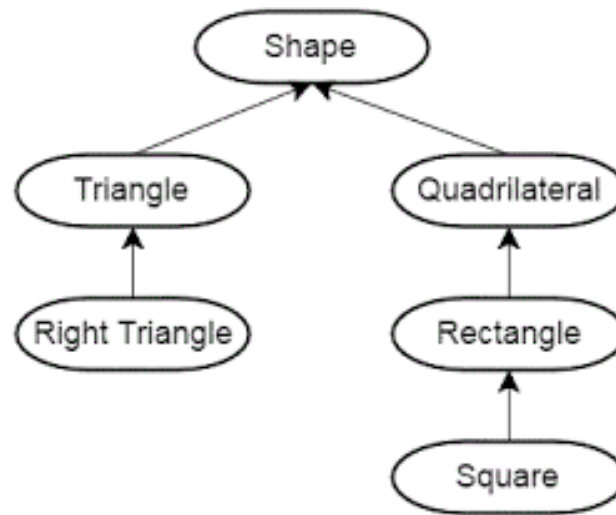
Sample Output

```
75025 75025
1 1
144 144
```

Assignment

Q10. The Shape Tree

Write a **class structure** for the given figure (using OOPs concepts). Similar to Q8, you have to find the area for the given figures.



Take in the input from the user and print output using appropriate methods. You are free to decide your flow of programme here. Try to include methods which print the property of the shape when called.

Eg. Triangle is a polygon with 3 edges,
square is a rectangle with equal edges.

Assignment

Submission

Submit the solutions to these questions each in a separate .cpp file. Please put comments in your code, explaining what each function is doing. Follow the input output format strictly wherever mentioned.

Naming convention : Q1.cpp, Q2.cpp, ... etc.
(You can also name it as Q3_countdown.cpp, Q5_minMaxAvg.cpp, etc. as per your wish)

Mail the files to : ketan@techimax.in

Subject : C++ Assignment Submission

Include your Full Name in the body of the email.

In case of any doubts regarding the assignment or the C++ course, feel free to mail me your query.

Deadline : Wednesday, 27 May 2020, 5pm

“Talk is cheap. Show me the code.” - Linus Torvalds