

LEBANESE AMERICAN UNIVERSITY
School of Arts and Science
Department of Computer Science and Mathematics

CSC 310: Algorithms and Data Structures

Lab VIII

Problem 1: [problem1.in]

By starting at a top of the triangle and moving to adjacent numbers on the row below, the maximum total from top to bottom is 23.

```
    3
   7 4
  2 4 6
 8 5 9 3
```

That is, $3 + 7 + 4 + 9 = 23$.

Given a numerical triangle, find the maximum total from top to bottom.

The first line of input is an integer T representing the number of test cases.

Each test case starts with an integer N representing the height of the triangle. N lines follow, each having the numbers on row i .

For each test case, output the maximum sum possible.

Sample Input:

```
2
4
3
7 4
2 4 6
8 5 9 3
3
2
8 4
1 7 3
```

Sample Output:

```
23
17
```

Problem 2: [problem2.in]

On a positive integer, you can perform anyone of the following three steps:

1. Subtract 1 from it. ($n = n - 1$)
2. If it is divisible by 2, divide it by 2. (if $n \% 2 = 0$, then $n = n / 2$)
3. If it is divisible by 3, divide it by 3. (if $n \% 3 = 0$, then $n = n / 3$)

Given a positive integer n , find the minimum number of steps that take n to 1.

For example, if $n = 7$, it takes 3 steps for it to become 1.

$$7 - 1 = 6$$

$$6 / 3 = 2$$

$$2 / 2 = 1$$

The first line of input is an integer T representing the number of test cases.
Each test case is the integer n .

For each test case, output the minimum number of steps that take n to 1.

Sample Input:

3
5
8
9

Sample Output:

3
3
2

Problem 3: [problem3.in]

Given a sequence of numbers, you are required to find the value of the maximum sum subsequence in it.

A maximum sum subsequence is a strictly increasing subsequence where the sum of numbers in the subsequence is the maximum.

For example, given the sequence $S = 1, 1, 3, 2, 9$, the maximum sum subsequence of S is 1, 3, and 9. The value of the subsequence is 13 which is the maximum sum possible.

The first line of input is an integer T representing the number of test cases.
Each test begins with an integer N representing the number of elements in the sequence. N integers follow representing the elements in the sequence.

For each test case, print value of the maximum sum subsequence.

Sample Input:

3
5 8 1 -5 4 12
4 7 -10 11 2
5 1 1 3 2 9

Sample Output:

20
18
13