Assignment X

Lab MC504

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Send your assignment solution to mc504lab@gmail.com.

Deadline: 31.03.2021, 12 midnight.

Put all files into one folder, create a zip and name it as <RollNo>_<Assignment_<No> and mention the

files name as: Q1.c, Q2.c and so on. In each file please mention your roll number.

Subject of mail should be: <RollNo>_Assignment_<No>. For example: 1911MC04_Assignment_II.

You have to take inputs from the user. Otherwise marks (40%) will be deducted.

Q1.

Suppose you have a mirror cutting business. You have a mirror of length 8, and you want to cut up the mirror and sell the pieces in a way that maximizes the total amount of money you get. Write a program to calculate the maximum total amount of money you earn.

A piece of length i is price p in rupees that is given in the following table:

Length i	1	2	3	4	5	6	7	8
Price p	1	5	8	9	10	17	17	20

Input:

array1=[1,2,3,4,5,6,7,8]

array2=[1,5,8,9,10,17,17,20]

Output: 22

Q2

Let's consider some array A. The following algorithm calculates it's force:

- 1. Find all the continuous blocks where all the elements of A are equal.
- 2. Calculate sum of squared lengths of these blocks.

For example if array $A = \{2, 3, 3, 1, 1, 1, 4, 2, 2\}$ its force will be $1^2 + 2^2 + 3^2 + 1^2 + 2^2 = 19$

We can reorder some elements and get array with greater force. In the example above we can move the first element of A to the end and get array $A = \{3, 3, 1, 1, 1, 4, 2, 2, 2\}$ with force $2^2 + 3^2 + 1^2 + 3^2 = 23$.

You are given an array. What is the maximum force you can get by reordering some of its elements?

Input

The first line contains integer T denoting the number of test cases. The following T lines contain 4 integers each: A[0], A[1], N, MOD.

Array A of N elements is generated by the following way:

- A[0], A[1] are given
- A[i] = (A[i-1] + A[i-2]) modulo MOD for 1 < i < N.

Output

For each test case output one integer on the separate line - answer for the question.

Constraints

- 1 <= T <=100
- $0 \le A[0], A[1] \le 10^6$
- $2 \le N \le 10^6$
- $max(A[0], A[1]) < MOD < 10^6$

Sample Input:-	Sample Output
2	12
0 1 6 4	10

Explanation

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Test case 1: array $A = \{0, 1, 1, 2, 3, 1\}$. The greatest possible force will be with the reordering $\{2, 0, 1, 1, 1, 3\}$

Test case 2: array $A = \{1, 1, 0, 1\}$. The greatest possible force will be with the reordering $\{1, 1, 1, 0\}$