Infosys
Programming Questions

1. **Problem Statement:** While playing an RPG game, you were assigned to complete one of the hardest quests in this game. There are **n** monsters you'll need to defeat in this quest. Each monster **I** is described with two integer numbers – poweri and bonusi. To defeat this monster, you will need at least poweri experience points. If you try fighting this monster without having enough experience points, you lose immediately. You will also gain bonusi experience points if you defeat this monster. You can defeat monsters in any order.
   The quest turned out to be very hard – you try to defeat the monsters but keep losing repeatedly. Your friend told you that this quest is impossible to complete. Knowing that, you are interested, what is the maximum possible number of monsters you can defeat?

   Input Format:
   The first line contains an integer, n, denoting the number of monsters. The next line contains an integer, e, denoting your initial experience.
   Each line I of the n subsequent lines (where 0 ≤ I < n) contains an integer, poweri, which represents power of the corresponding monster.
   Each line I of the n subsequent lines (where 0 ≤ I < n) an integer, bonusi, which represents bonus for defeating the corresponding monster.

   Sample Input and Output:

Input	Output	Output Description
2 123 78 130 10 0	2	• Initial experience level is 123 points. • Defeat the first monster having power of 78 and bonus of 10. Experience level is now 123+10=133. • Defeat the second monster.
3 100 101 100 304 100 1 524	2	• Initial experience level is 100 points. • Defeat the second monster having power of 100 and bonus of 1. Experience level is now 100+1=101. • Defeat the first monster having power of 101 and bonus of 100. Experience level is now 101+100=201. • The third monster can't be defeated.

2. **Problem Statement:** Your birthday is coming soon and one of your friends, Alex, is thinking about a gift for you. He knows that you really like integer arrays with interesting properties
   He selected two numbers, N and K and decided to write down on paper all integer arrays of length K (in form a[1], a[2], …, a[K]), where every number a[i] is in range from 1 to N, and, moreover, a[i+1] is divisible by a[i] (where 1 < I <= K), and give you this paper as a birthday present.
   Alex is very patient, so he managed to do this. Now you're wondering, how many different arrays are written down on this paper?
   Since the answer can be really large, print it modulo 10000.

   Input Format:
   The first line contains an integer, n, denoting the maximum possible value in the arrays.
   The next line contains an integer, k, denoting the length of the arrays.

   Sample Input and Output:

Input	Output	Output Description
2 1	2	The required length is 1, so there are only two possible arrays: [1] and [2].
2 2	3	All possible arrays are [1, 1], [1, 2], [2, 2]. [2, 1] is invalid because 1 is not divisible by 2.
3 2	5	All possible arrays are [1, 1], [1, 2], [1, 3], [2, 2], [3, 3].

3. Problem Statement: You have been given a string S of length N. The given string is a binary string which consists of only 0's and '1's. Ugliness of a string is defined as the decimal number that this binary string represents.
   Example:
   "101" represents 5.
   "0000" represents 0.
   "01010" represents 10.
   There are two types of operations that can be performed on the given string.
   Swap any two characters by paying a cost of A coins.
   Flip any character by paying a cost of B coins
   Flipping a character means converting a '1'to a '0'or converting a '0' to a '1'.
   Initially, you have been given coins equal to the value defined in CASH. Your task is to minimize the ugliness of the string by performing the above-mentioned operations on it. Since the answer can be very large, return the answer modulo 10^9+7.
   Note:
   You can perform an operation only if you have enough number of coins to perform it. After every operation the number of coins get deducted by the cost for that operation.

   Input Format:
   The first line contains an integer, N, denoting the number of characters in the string.
   The next line contains a string, S, denoting the binary string.
   The next line contains an integer, CASH, denoting the total number of coins present initially.
   Next will contains an integer, A, denoting the cost to swap two characters.
   Then the next line contains an integer, B, denoting the cost to flip a character.

   Constraints
   - 1 <= N <= 10^5
   - 1< len(S)<= 10^5
   - 1<=CASH <=10^5
   - 1<=A<=10^5
   - 1<=B<=10^5

   Sample Input:
   4
   1111
   7
   1
   2
   Sample Output: 1
   Explanation: 3 flips can be used to create "0001" which represents 1.

4. You are given the head of the Singly linked list of arbitrary length K. Your task is to zip the linked list **in-place** (i.e., doesn't create a brand-new linked list) and return its head.
   A linked list is zipped if its nodes are in the following order, where K is the length of the linked list:
   • 1st node -> Kth node -> 2nd node -> (k-1)th node -> 3rd node -> (k-2)th node -> ....

   Note - You can assume that the input linked list will always have at least one node, in other words, the head will never be NULL.

   Input Format
   The first line of input contains a single integer T - denoting the number of test cases.
   Each test case follows:
   - The first line of each test case contains a single integer K, denoting the size of the linked list
   - The second line contains K space-separated integers - denoting the elements of the list.

   Output Format
   The output contains T lines, each line containing the modified list.
   Note - You only need to implement zipLinkedList(), and return the head of the linked list.

   Constraints
   $1 \leq T \leq 1001$
   $1 \leq K \leq 10000$

   Sample Input
   2
   7
   1 2 6 3 4 5 6
   2
   7 8
   Sample Output
   1 6 2 5 6 4 3
   7 8

5. Aman and Raman are friends as well as neighbours. They used to share everything, play together, and like to spend most of the time together. Raman being clever also sometimes take advantage of Aman like give him the homework to complete by making excuses and his projects are also made by Aman. As exams are going on and both are preparing for exams then suddenly Aman realizes that his science book is missing so he asked Raman to give him the book for few hours but being clever Raman puts condition and provided him with the array **A** with **N** integers and twisted the little by adding that he must find the count of the cool subarrays i.e., the subarray which has the sum of all elements in it a perfect square and told Aman to solve this first if he needs the book. So tomorrow they are having the exam, so Aman wants your help in solving it so that he can get the book and can prepare for his exam.

   Input Format
   The first line of the input contains an integer N where N denotes the length of the array. The second line contains N space integers $A_1,A_2,A_3,....A_n$.

   Output Format
   Print the count of the subarray for which the sum of the elements is a perfect square.

   Constraints
   $1 \le T \le 5 * 10^3$
   $2 \le A_i \le 10^6$

   Sample Input
   4
   1 4 3 2
   Sample Output
   3

6. You are given a linked list representing a number such that each individual node acts as a digit of the number. The list HEAD->1->2->3->NULL corresponds to the number 123. Your task is to add 1 to this number.

   Input Format
   The first line contains an integer T, number of test cases. Then follows T test cases. Each test case consists of two lines. The first line contains an integer N representing length of the linked list The second line contains N space separated integers representing nodes of a linked list.

   Output Format
   The output contains T lines, each line containing the modified number as a linked list.

   Note - You only need to implement addOneToList() function, and return the head of the linked list.

   Sample Input
   2
   3
   1 2 3
   4
   9 9 9 9

   Sample Output
   1 2 4
   1 0 0 0 0

7. Program to find the minimum and maximum values of given expression is discussed here.
   Given an algebraic expression with + and *, find the minimum and maximum values.

   Sample Input:
   1+2*3+4*5

   Sample Output:
   27
   105

   Explanation:
   1 + (2 * 3) + (4 * 5) = 27 (Minimum)
   (1 + 2) * (3 + 4) * 5 = 105 (Maximum)

8. Implement Depth First Search (DFS)
9. Implement Breadth First Search (BFS)
10. Number of Islands
11. Subset sum problem
12. Rat in a maze problem
13. Treasure and cities problem
14. 0-1 Knapsack problem
15. Sudoku problem
16. Minimum and maximum values of a given expression
17. Minimum sum partition problem
18. Number of ways to reach the nth stair