ACM-ICPC Malaysia

Al-Khawaizmi 2011 Programming Contest

ACM ICPC Problem Set 2011

This problem set contains 10 questions (A-J) in 14 pages.

Time limit: 10 seconds
Input: Standard Input
Output: Standard Output

ACM ICPC Malaysia Office

Kulliyyah of Information and Communication Technology

International Islamic University Malaysia

Problem A

Sum of Odd Sequence

Given an odd integer N, calculate the sum of all the odd integers between 1 and N inclusive.

Input

First line of the input contains T, the number of test cases. Each test case contains a single integer N. N is between 1 and 100.

Output

For each test case output the value 1+3+….+N.

Sample Input	Sample output
10	1
1	4
3	9
5	16
7	25
9	36
11	49
13	64
15	81
17	100
19	

Problem B

Spiral

Consider all positive integers written in the following manner (you can imagine an infinite spiral).

```
21  22  23  24  25  26
20   7   8   9  10 ...
19   6   1   2  11 ...
18   5   4   3  12 ...
17  16  15  14  13 ...
```

Your task is to determine the position (row,column) of a given number N, assuming that the center (number 1) has position (0,0). Rows are numbered from top to bottom, columns are numbered from left to right (for example, number 3 is at (1,1). Your program should output a string containing the position of N in the form (R,C) where R is the row and C is the column. R and C must not contain any leading zeroes.

Input

The first line of the input gives an integer T, which is the number of test cases. Each test case contains an integer N (1 ≤ N<2^31).

Output

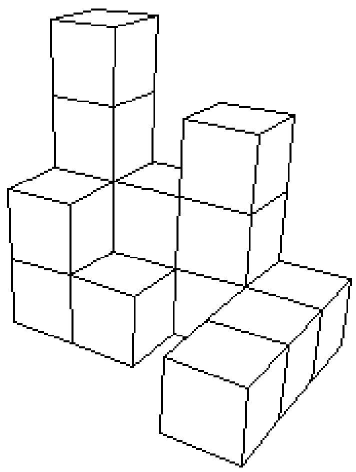
For each test case, output the position as described above. See sample output for further clarification.

Sample Input	Sample output
7 2 3 7 17 24 830 765409	(0,1) (1,1) (-1,-1) (2,-2) (-2,1) (-14,3) (-437,221)

Problem C

Surface Area

The solid in the picture below is made up of 1x1x1 cubes in a 3D grid. In this problem, we'll limit ourselves to solids that are made up of columns rooted on the ground (a column consists of one or several 1x1x1 cubes stacked on top of each other). Such solids can be described as a matrix of digits, where each digit corresponds to the height of a column in the 2D grid that makes up the ground. A zero means there is no column at all in that position.



The corresponding matrix for the above solid will be

```
4231
2101
0001
```

The volume of such a solid is simple enough to calculate, but what we're interested here in the total surface area including the floor (that is, the number of 1x1 "squares" non hidden on the outer surface). You are given the information of the solid as a matrix. Your task is to compute the surface area of the given solid. You can assume that the solid is always connected, i.e the columns will be attached to each other in the four cardinal directions.

Input

First line of the input contains T, the number of test cases. Each test case starts with a line containing R and C denoting the number of rows and columns of the solid. Each of the next R lines contains C digits. Each digits are between 0 to 9 inclusive. R and C will be between 1 and 50 inclusive.

Output

For each test case, output the total surface area of the given solid, including the floor area.

Sample Input	Sample Output
4 1 2 11 3 4 4231 2101 0001 3 3 111 101 111 1 1 5	10 54 32 22

Problem D

Table

Let us consider an array of size n × m filled with **pair wise different** integers. The following operations are allowed on the array:

1. Interchanging two rows,
2. Interchanging two columns.

We call two arrays alike if one of them can be obtained from the other by a sequence of the above two operations. Write a program that for a given set of pairs of arrays tells which pairs are alike.

Input

The first line of the standard input contains an integer t (1<=t<=10) denoting the number of test cases which represent the number of pairs of arrays. The first line of each test case holds two integers n and m (1 <= n <= 1000 and 1 <= m <= 1000), separated by a single space. n and m denote the number of rows and columns of the arrays, respectively. The next n lines represent n rows of the first array and the following n lines represent n rows of the second array. Each line holds m array items where each values between -1000000 and 1000000 inclusive. All numbers occurring in either of the arrays are pair wise different.

Output

Your program should print out t lines to the standard output. The k-th of these should hold one word: ”YES” if the arrays of the k-th pair are alike, or ”NO” otherwise (in capital letter only).

Sample Input	Sample output
2 4 3 1 2 3 4 5 6 7 8 9 10 11 12 11 10 12 8 7 9 5 4 6 2 1 3 2 2 1 2 3 4 5 6 7 8	YES NO

Problem E

Huge Knight

You have a chessboard of size N x N. The rows and columns are numbered from 1 to N. In a cell located at row R1 and column C1, a knight is starting his journey. The knight wants to go to the cell located at row R2 and column C2. Move the knight from the starting cell to this destination cell with minimum number of moves.

As a reminder, a knight's jump moves him 2 cells along one of the axes, and 1 cell along the other one. In other words, if a knight is at (A,B), it may move to (A-2,B -1), (A-2, B+1), (A+2, B-1), (A+2, B+1), (A-1, B-2), (A+1,B-2), (A-1, B+2) or (A+1, B+2). Of course, the knight cannot leave the board.

Given N, R1, C1, R2 and C2, determine the minimum number of steps necessary to move the knight from (R1, C1) to (R2, C2).

Input

The first input line contains a positive integer, *T*, indicating the number of test cases. Each case consists of a line containing five integers **N($3 \le N \le 10^{15}$)**, R1, C1, R2 and C2 are between 1 and N inclusive.

Output

For each test case, output the minimum number of steps needed to move the knight from (R1, C1) to (R2, C2). Assume that there will always be a solution, i.e., it's possible to move the knight from its starting cell to its destination cell.

Sample Input	Sample output
2 5 1 1 2 3 5 1 1 2 2	1 4

Problem F

Matrix Transformation

You have an integer matrix A, with R rows and C columns.That means it has R rows with each row containing C integers. Two integers are adjacent if their container cells share an edge. For example, in the following grid

0	1	2
3	4	5
6	7	8

(0,1), (4,5), (1,4), (5,2)are adjacent but (0, 4), (2,6), (5,7) are not adjacent.

You are allowed to do only one kind of operation in the matrix. In each step you will select two adjacent cells and increase or decrease those two adjacent values by 1, i.e., both values are increased by 1 or both values are decreased by 1. Given a matrix, determine whether it is possible to transform it to a zero matrix by applying the allowed operations. A zero matrix is the one where each of its entries is zero.

Input

The first input line contains a positive integer,*n*, indicating the number of matrices (test cases). Each matrix starts with a line containing R(2≤R≤30) and C(2≤C≤30) separated by a single space. Each of the next R lines contains C integers. Each of these integers is between -20 and +20 inclusive. Assume that each input matrix will have at least one non-zero value.

Output

For each test case output “YES” if you can transform it to a zero matrix or “NO” otherwise (capital letter only).

Sample Input	Sample output
6 3 3 -2 2 2 1 1 0 2 -2 -2 3 3 -1 0 1 -2 -1 1 0 1 2 3 3 -1 0 1 0 2 -1 -1 1 2 3 3 -1 2 1 -1 -1 -3 1 1 -1 2 3 0 -2 3 1 3 1 2 3 3 1 1 2 0 1	YES NO NO YES NO YES

Problem G

Bi-coloring

Given a graph determine how many ways you can color the graph with at most two colors. There cannot be an edge containing two vertices of the same color.

Input

First line of the input contains T the number of test cases. Each test case starts with a line containing two integers V(1≤V≤30) and E(0≤E≤1000). Each of the next E line contains two integers a, b (0≤a≤V-1, 0≤b≤V-1) denoting that there is a bidirectional edge between a and b. There will not be any self loop or duplicate edges. The last line of the input will be a blank.

Output

For each test case, output the number of ways you can color the graph with only two colors. If you cannot color the graph with at most two colors output -1.

Sample Input	Sample output
4 5 5 0 1 0 4 1 2 2 3 3 0 3 3 0 1 1 2 2 0 6 7 0 1 1 2 2 3 3 0 4 0 4 5 5 1 2 0	2 -1 2 4

Problem H

Sorting

We have an array and we want to sort it in non-decreasing order. The only allowable operation is to move one element of the array into any other place (before all elements, after all elements or between any two adjacent elements). The cost of the single operation is equal to the value of the moved element. We want to minimize the total cost of sorting the array. You are to write a program that will find the minimum cost to sort such an array.

Input

First line of the input contains T the number of test cases. For each test case the first line contains an integer N (1 ≤ N ≤ 100). The second line contains N positive integers separated by spaces. These integers denote the array. Each of these integers is between 1 and 1000 inclusive.

Output

For each case, the output contains an integer denoting the minimum cost to sort the array.

Sample Input	Sample output
3 4 7 1 2 3 4 7 1 2 5 6 8 2 6 5 1 4	6 7 18

Problem I

Sum of Powers Version I

Given N and K, compute$\left(\sum_{i=1}^{i=N} i^k\right) \bmod 1000000007$.

Input

The first line of the input gives an integer T, which is the number of test cases. Each test case consists of a line containing N (1≤N≤1,000,000,000) and K (1≤K≤4).

Output

For each test case output$\left(\sum_{i=1}^{i=N} i^k\right) \bmod 1000000007$.

Sample Input	Sample output
5 5 1 4 2 1000000000 1 1000000000 2 1000000000 3	15 30 21 999999916 441

Problem J

Qurban 2011

Qurban is an Islamic practice that involves the sacrifice of certain livestock. Qurban is done only on the 10-13 Zulhijjah, which is the last month in the Islamic calendar. Livestockto be slaughtered (and sacrificed) are limited to camels, cattle, buffaloes, sheep or goats. The meat from each slaughtered camel, cattle, or buffalo can be divided into 7 equal parts to be shared by 7 persons. Since goats and sheep are small in size compared to the other livestock, therefore one goat or sheep is equivalent to one part of the previous three previous livestock. A person can register to sacrifice more than one part.

In order to get the correct number of livestock to be slaughtered, one has to ensure that all 7 parts is accounted for in order to slaughter one buffalo. If not, there will be a cost liability to the person incharged. In a situation when a person registers for more than 7 parts, for example 8 parts of a buffalo, the remainder of one part has to be combined with parts sacrificed by other persons.

Normally, the buffaloesand sheep are supplied by farmer, and the location for slaughtering is done at different placesdepending on the customers. There is only one truck that can transport either the buffaloesor the sheep. The truck can transport a maximum of 3 buffaloesor 6 sheep at one time.

Given a list of orders for qurban, calculate the minimum number of trip to transport the buffaloesand sheep to be slaughtered.

Input

The input consists of a few lines of data. The first line is an integer `T`, which represents thenumber of test data. It is followed by `T` lines of data. Each of these lines begins with an integer `m`, which represents the number of order, followed by a single space and a set of orders. The orders are in the following format: two characters where the first is either character `'b'` (represents parts of a buffalo) or `'s'` (represents a sheep). This is followed by an integer that represents the number of orders for the respective parts of cow or sheep. Each order is separated by a single space.

Output

The output is the minimum number of trip to transport the buffaloesand sheep to be slaughtered.

Sample Input	**Sample Output**
3 4 b3 s1 b9 b4 2 s3 b7 5 b1 b1 b2 b2 b1	2 2 1