Question 1: Light Bulbs

There are N light bulbs in a straight line numbered from 1 to N. You are standing at light bulb numbered 1. All bulbs are initially off. Now, you want to brighten the room. You go to the highest numbered off light bulb and turn it on. Then you walk back to lowest numbered off bulb and turn it on. Again you walk to the highest numbered light bulb which is off and turn it on. You repeat this process until all light bulbs are on. The distance between consecutive light bulbs is 1 unit. Find the distance you need to walk.

Input

The first line contains T, the number of test cases. The next T lines contain a single number N, the number of light bulbs.

Output

Find the distance you need to travel.

Constraints

1<=T<=10
1 <= N <= 10^5

Sample Input
2
3
4

Sample Output
5
9

Explanation
In the first test case, you are at bulb number 1 initially. You go to bulb number 3 and turn it on. Then, you come back to bulb number 1 to turn it on. Then, you go to bulb number 2, and turn it on. You have to travel 5 unit of distance for this.

In the second test case, you are at bulb number 1 initially. You go to bulb number 4 and turn it on. Then, you come back to bulb number 1 to turn it on. Then, you go to bulb number 3, and turn it on and then to bulb number 2. You have to travel 9 unit of distance for this.

Question 2: Dude and Dice

Dude rolls a **N** faced die **M** times. He adds all the numbers he gets on all throws. What is the probability that he has a sum of **K**.

A **N** faced die has all numbers from **1** to **N** written on it and each has equal probability of arriving when dice is thrown.

Input
First line **T**, the number of testcases. Each testcase consists of **M**, **N** and **K** in one line.

Output
For each testcase, print required probability in scientific notation as defined follows:
Output should be of the form "**x y**" where **x** is a floating point integer less than **10** and greater than or equal to **1**and **y** is a integer. This notation is equivalent to **x * 10**$^{-y}$. **x** should be rounded and output till 3 decimal digits.
However, if probability is **0**, output "**0.000 0**".

Examples: If output is supposed to be 0.0034567, output should be "3.457 3".
If output is supposed to be 0.3034567, output should be "3.034 1".

Constraints
$1 \le T \le 10$
$1 \le N, M \le 50$
$1 \le K \le 10000$

Sample Input
2
1 5 2
2 3 2

Sample Output
2.000 1
1.111 1

Question 3: Ice Cave

You play a computer game. Your character stands on some level of a multilevel ice cave. In order to move on forward, you need to descend one level lower and the only way to do this is to fall

through the ice. The level of the cave where you are is a rectangular square grid of n rows and m columns. Each cell consists either from intact or from cracked ice. From each cell you can move to cells that are side-adjacent with yours (due to some limitations of the game engine you cannot make jumps on the same place, i.e. jump from a cell to itself). If you move to the cell with cracked ice, then your character falls down through it and if you move to the cell with intact ice, then the ice on this cell becomes cracked.

Let's number the rows with integers from 1 to n from top to bottom and the columns with integers from 1 to m from left to right. Let's denote a cell on the intersection of the r-th row and the c-th column as (r, c).

You are staying in the cell (r_1, c_1) and this cell is cracked because you've just fallen here from a higher level. You need to fall down through the cell (r_2, c_2) since the exit to the next level is there. Can you do this?

Input
The first line contains two integers, n and m ($1 \le n, m \le 500$) — the number of rows and columns in the cave description.
Each of the next n lines describes the initial state of the level of the cave, each line consists of m characters "." (that is, intact ice) and "X" (cracked ice).
The next line contains two integers, r_1 and c_1 ($1 \le r_1 \le n$, $1 \le c_1 \le m$) — your initial coordinates. It is guaranteed that the description of the cave contains character 'X' in cell (r_1, c_1), that is, the ice on the starting cell is initially cracked.
The next line contains two integers r_2 and c_2 ($1 \le r_2 \le n$, $1 \le c_2 \le m$) — the coordinates of the cell through which you need to fall. The final cell may coincide with the starting one.

Output
If you can reach the destination, print 'YES', otherwise print 'NO'.

Sample Input
4 6
X…XX
…XX.
.X..X.
……
1 6
2 2

Sample Output
YES

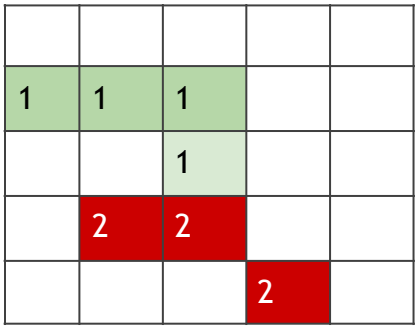
Question 4: Dude and Matrix

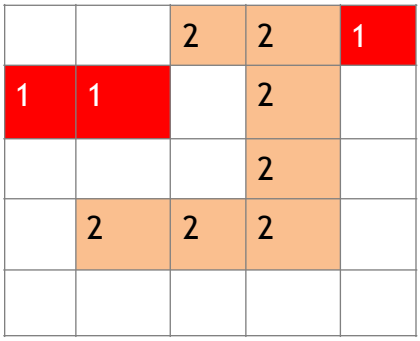
Dude has to travel 20 hours long journey in train to reach at Chennai. So he decided to annoy his team mates.

He Made **N x N** Matrix and asked his team mates Kala and Aakash to fill this matrix with below constraints.

1. Use numbers from 1 to N and each no. must present at least once.
2. The frequency of all numbers must be distinct and odd.
3. All the same numbers must be contiguous in sequence. (Think like snake in Matrix)
4. Sum of all N*N elements must be minimum possible.

Example : Here green sequence is valid while red is not.





Input

Input starts with one line containing T, the number of test cases.

For each test case, only one line is given which represents N.

Output

Print minimum possible sum and matrix.

Sample Input

1

3

Sample output

5

1 1 1 1 1

2 2 2 2 2

2 2 2 3 3

4 4 4 4 4

(Clearly, this is not valid output, just for reference)

Input	Output
1 2 3 4 5 6 7 8 9 10	1 7 22 50 95 161 252 372 525 715

Question 5: The Sum of the k-th Powers

There are well-known formulas: $\sum_{i=1}^{n} i = 1 + 2 + \ldots + n = \frac{n(n+1)}{2}$, $\sum_{i=1}^{n} i^2 = 1^2 + 2^2 + \ldots + n^2 = \frac{n(2n+1)(n+1)}{6}$, $\sum_{i=1}^{n} i^3 = 1^3 + 2^3 + \ldots + n^3 = \left(\frac{n(n+1)}{2}\right)^2$.

Also mathematicians found similar formulas for higher degrees.

Find the value of the sum $\sum_{i=1}^{n} i^k = 1^k + 2^k + \ldots + n^k$ modulo $10^9 + 7$ (so you should find the remainder after dividing the answer by the value $10^9 + 7$).

Input
The only line contains two integers n, k ($1 \le n \le 10^9$, $0 \le k \le 10^6$).

Output
Print the only integer a — the remainder after dividing the value of the sum by the value $10^9 + 7$.

Sample test(s)
i/p: 4 1
o/p: 10

i/p: 4 2
o/p: 30

i/p: 4 3
o/p: 100

i/p: 4 0
o/p: 4