



**INTRA AUST PROGRAMMING CONTEST**  
**SPRING 2019**

**28<sup>th</sup> August, 2019**

**11 Problems**

**240 Minutes**

**Contest Platform**

**Toph**

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# Problem Setters

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<b>A</b>	<b>Magic Trick</b>	Time Limit: <b>1 sec</b>
	Setter: Md. Samiul Alam	Memory Limit: <b>512 MB</b>

Sometimes programming contest can be boring if you get stuck on a problem for a long period of time but don't get AC. But you won't get bored if you can witness a magic trick right now in the middle of the contest and an AC as a bonus.

To get an AC, you'll have to follow a bunch of instructions. If you can follow the instructions properly, it is guaranteed that you'll get an AC. The instructions are as follows.

1. Think of any non-negative integer number (You may consider your roll number).
2. Subtract **1** from the number you have thought of.
3. Multiply the number you have now by **3**.
4. Add **12** to the number.
5. Divide the number by **3**.
6. Add **5** to the number.
7. Subtract the original number you thought at first from the number you have now.
8. Double the number you have now.
9. Add **6** to the number.
10. Divide that number by **2**.
11. Now subtract the number you had after executing step **7**.
12. Print the number you have now.

## Input

There is no input for this problem.

## Output

Just print the final answer you got, like this,

```
#include <stdio.h>

int main() {
    int X = /*Put your answer here */;
    printf("%d\n", X);
    return 0;
}
```

<b>B</b>	<b>Cunning Comedian</b>	Time Limit: <b>1 sec</b>
	Setter: Md. Musfiqur Rahman Sanim	Memory Limit: <b>512 MB</b>

**Professor Mahir** is developing some AI using some famous sitcom characters' characteristics. The most interesting part is that he has created some robots and filled their brains with those characters. He wants to demonstrate his 1st prototypes. For this, he also invites **Comedian Redoan**. **Dr. Mahir** starts the conversation with the robots,

**Dr. Mahir:** I am always angry! What can you propose?

**Barney Stinson:** Let's go to Area 51 and everybody suits up.

**Chandler Bing:** So, you set up a meeting with aliens. Could you be more stupid?

**Sheldon Cooper:** Penny, Area 51 is the common name of a highly classified United....

**Penny:** I know, I saw 2-hour boring documentation on this with Leonard forcefully.

(Sheldon Cooper bot crashes. Penny should let him finish)

**Jake Harper:** Can we get aliens food also there?

**Dr. Mahir** stops all the robots and starts trying to fix the Sheldon bot. But **Redoan** has another cunning plan. He thinks that if he gets those robots to his house then the bots can help him to prepare his stand-up comedy scripts because his jokes are not funny anymore and he cannot generate new puns. So, he steals the robots without Sheldon bot. Later **Dr. Mahir** notices this and informs this to crazy detective **Shibli**.

Shibli knows when Redoan will go to the stage for his show and come back to his house. So Shibli wants to go to Redoan's house immediately when he leaves the house and want to get those robots before Redoan comes back. **D** is the duration (in minute) between Redoan leaves the house and comes back.

You can imagine Redoan's house as a 2d grid with **N x M** cells. **(0, 0)** is the top left corner and **(N-1, M-1)** is the bottom right. Each cell is either empty or contains Redoan's clothes or the robots. You cannot go to a cell that contains Redoan's clothes. You can assume that all the robots are on the same cell.

Shibli will always enter through the door which is in **(0, 0)** cell. You can assume that **(0, 0)** cell is always empty. He can immediately go to any adjacent cell without wasting any time. He also can jump to an empty cell if the distance between that cell and the current cell is less than or equal to **K** but in order to do that, he will take full **1** minute to prepare and complete his jump. To get the robots he needs to go to any adjacent cell of the robot containing cell.

Two cells are adjacent if they share any corner or side.

## Input:

At first, there will be an integer **T** ( $1 \leq T \leq 3$ ), which is the number of test cases. The first line of each test case contains four integers **N**, **M**, **K** and **D**, separated by spaces, with  $1 \leq N$ ,  $M \leq 100$ ,  $2 \leq K \leq 50$ ,  $1 \leq D \leq 100000$ . The following **N** lines of the each test case will contain one row of the maze. Each of these lines contains exactly **M** characters, and each of these characters is one of the following:

# denotes Redoan's clothes

. (**Dot**) denotes an empty cell

**R** denotes the cell where all the robots are

For better understanding, see the sample I/O.

## Output:

For each case, print **YES** if Shibli can get the robots without getting caught otherwise **NO**.

## Sample I/O:

Sample Input	Sample Output
2 4 4 4 10 .... ..#. .... ..R. 4 4 4 10 .... ###. #R#. ###.	YES NO

<b>C</b>	<b>K-String</b>	Time Limit: <b>1 sec</b>
	Setter: Simanta Deb Turja	Memory Limit: <b>512 MB</b>

We will call a string **K-String** if it consists of **K** distinct characters. For example, if **K = 3** then “abc”, “aabbcc”, “xyaaaa” are K-String whereas “abcd”, “ddhnnnggs” are not. In one move, you can replace any one character of the given string by any other lower case English alphabet. Your task is to find the minimum number of moves required to make a string K-String.

*It is guaranteed that you can always convert the given string into a K-string by performing zero or more moves.*

### Input:

The first line of the input contains two integers **N** ( $1 \leq N \leq 10^6$ ), denoting the size of the string and **K** ( $1 \leq K \leq 26$ ), denoting the number of distinct characters required.

### Output:

Output the minimum number of moves required to make the given string a K-String.

### Sample I/O:

Sample Input	Sample Output
4 3 abcd	1
5 3 abcdd	1

<b>D</b>	<b>Bad Cook</b>	Time Limit: <b>1 sec</b>
	Setter: Mir Imtiaz Mostafiz Naved	Memory Limit: <b>512 MB</b>

Mr. Meme has recently moved to a foreign country named “Gloryland” for study purpose. There, he has to cook for himself. But he is not even an amateur. He always messes up his recipe. Say, there are **3** steps in a recipe: Boil, Put Spice, and Fry. He will never do it in order: he may put spice first, then fry, then boil things.

But there is an interesting pattern in his messing up of recipe. Let’s say the recipe includes **n** steps. He always messes up in such a way that odd-numbered steps never come consecutively in his cooking. So, if the recipe contains **5** steps: 1, 2, 3, 4, 5 - he will never do things like 2, 1, 3, 5, 4 or 2, 1, 4, 3, 5 - where you can find consecutive odd-numbered steps.

And remember, he always messes up!! Doing 1, 2, 3, 4, 5 is not valid in his case although there are no consecutive odd-numbered steps, because it is the right recipe!

### Input:

The input file will contain **T+1** lines (**1 ≤ T ≤ 2000**). First line will contain **T**, the number of test cases. Each of next **T** line will contain a single integer **N** (**2 ≤ N ≤ 2000**), the number of steps of a recipe.

### Output:

For each **N**, print the number of ways Mr. Meme can mess up the recipe. Print the result modulo **1000000007**.

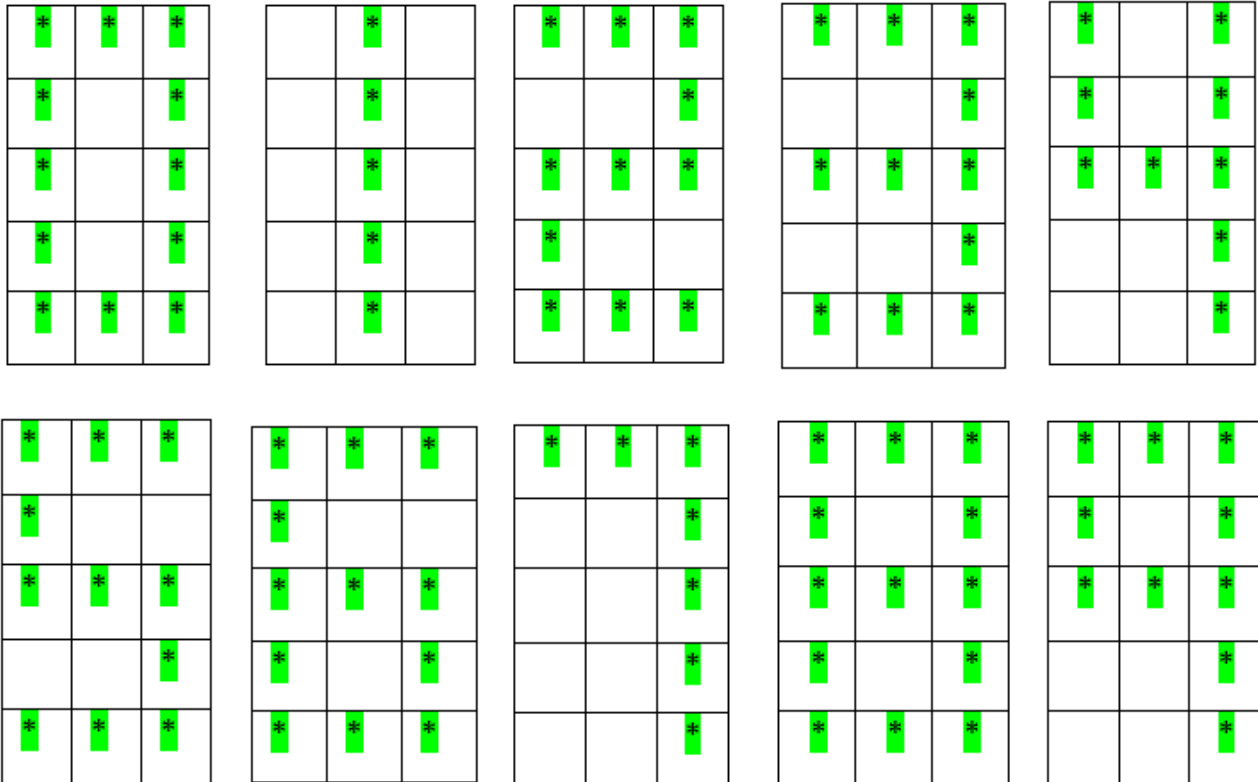
### Sample I/O:

Sample Input	Sample Output
2	11
4	1
3	

**Note:** For the first sample, the valid combinations for **N = 4** are: 1243, 1423, 1432, 2143, 2341, 3214, 3241, 3412, 3421, 4123, 4321. For the second sample, the valid combinations for **N = 3** is 321 only.

<b>E</b>	<b>Digit Printing</b>	Time Limit: <b>1 sec</b>
	Setter: Sifat Siddiqi Shishir	Memory Limit: <b>512 MB</b>

You will be given two numbers and an operation to do with them. You just need to print the output of the numbers after doing the operation.



The digits you need to print are in the above image. Each digit is a **3 × 5** matrix filled with asterisk (\*) sign. Print the final absolute value of your output separated by a space for each digit. See sample I/O for better understanding.

### Input:

First line of input will be **T** the number of test cases (**≤ 15**). Each test case will contain a line having two integers **X** & **Y** and a character **C**, where (**-100000 ≤ X, Y ≤ 100000**) & ('+', '-', '\*') denoting the addition ('+'), subtraction ('-'), multiplication ('\*') operation.



## Output:

Output each case like following format: **Case #x:** where **x** is the number of the case. And in a new line print absolute value of the desired output separated by space for each digit. Print a blank line after each case.

## Sample I/O:

Sample Input	Sample Output
2 5 + 5 9 * 9	Case #1: * *** * * * * * * * * * * ***  Case #2: *** * * * * *** * * * * *** *

<b>F</b>	<b>Convert String to Palindrome</b>	Time Limit: <b>1 sec</b>
	Setter: Rajon Bardhan	Memory Limit: <b>512 MB</b>

A palindrome is a word, number, phrase, or other sequence of characters which reads the same backward as forward, such as “madam” or “racecar” or the number, “10801”. Sentence-length palindromes may be written when allowances are made for adjustments to capital letters, punctuation, and word dividers, such as “A man, a plan, a canal, Panama!”, “Was it a car or a cat I saw?” or “No ‘x’ in Nixon”. In this problem, you will be given a word which contains only lower case alphabets. You need to find out a way to make the word palindrome by deleting minimum number of characters from the string. Let, a word of length  $n$  is “ $A_1 A_2 A_3 \dots A_{n-2} A_{n-1} A_n$ ”. If you delete the  $i$ th character from the word then new word will be “ $A_1 A_2 A_3 \dots A_{i-1} A_{i+1} \dots A_{n-2} A_{n-1} A_n$ ”. Here is an example. Let, a word is “abbea”. Now, if you delete the 4th character ‘e’ from the word, you will get the word “abba”, which is a palindrome.

### Input:

The first line is an integer, **T** ( $T \leq 100$ ), which is the number of test cases. This line is followed by  $T$  lines of  $T$  cases. Each case contains a word. The word contains only lower case alphabets with no special characters. The length of the word is less than **1001**.

### Output:

For each case, print the number of case following by the required result.

### Sample I/O:

Sample Input	Sample Output
2 abxa abdba	Case 1: 1 Case 2: 0

**Note:** Look, for 1st case, if x is deleted from the word, then we will get the palindrome “aba”. For 2nd case, the word is already palindromic word, no character is required to delete.

<b>G</b>	<b>Buildings!</b>	Time Limit: <b>1 sec</b>
	Setter: Sifat Rabbi	Memory Limit: <b>512 MB</b>

There are  $n$  buildings in a row. The height of the  $i$ -th building is  $h_i$ . You have  $k$  taka. With  $1$  taka you can increase the height of a building by  $1$ . So you want to spend  $k$  taka in such a way that after spending  $k$  taka the height of the lowest building will be maximized.

### Input:

First line of the input will consist of two integers -  $n$  the number of buildings and  $k$  the amount of taka you have. The next line will consist of  $n$  integers the height of the buildings. ( $1 \leq n \leq 10^5$  and  $0 \leq k, h_i \leq 10^9$ )

### Output:

Print a single integer the height of the lowest building.

### Sample I/O:

Sample Input	Sample Output
5 10 1 2 3 4 5	5
1 10 10	20

<b>H</b>	<b>Tour</b>	Time Limit: <b>1 sec</b>
	Setter: Shakil Ahmed	Memory Limit: <b>512 MB</b>

Department of CSE students of the Ahsanullah University of Science and Technology loves to tour whenever they get a break from their hectic regular and makeup class schedule. Whenever a couple of friends go for a tour they love to sing songs. Unfortunately, not all the friends know the lyrics to the same song. If there is **M** possible songs and **N** friends are going for a tour can you please find - what is the minimum number of songs need to be performed so that all students can be part of any of one song. Everybody knows at least one for sure. It is guaranteed that you can always select the minimum number of songs.

### Input:

The first line contains an integer **T** ( $1 \leq T \leq 50$ ) i.e. the number of Test cases. T test cases follow. There is an integer **N** ( $1 \leq N \leq 100$ ) number of students going for a tour in first line of every test case. Then N lines follow. Each of the N lines contain an **M** ( $1 \leq M \leq 15$ ) characters string and M is same for each of the N lines. The **j<sup>th</sup>** character of the **i-th** element of string is '**Y**' if the **i-th** student knows the **j<sup>th</sup>** song, and '**N**' if he doesn't.

### Output:

For each test case, print a line "**Case x: y**" where **x** is replaced by the test case number and **y** is the minimum number of songs need to be selected so that all students can perform at least one song.

### Sample I/O:

Sample Input	Sample Output
3	Case 1: 2
3	Case 2: 2
YN	Case 3: 1
NY	
NY	
4	
NNYYY	
YYYNY	
NNNYN	
YNNNN	
3	
NY	
YY	
NY	

<b>I</b>	<b>Help!</b>	Time Limit: <b>1 sec</b>
	Setter: Fahim Ferdous Neerjhor	Memory Limit: <b>1 GB</b>

I want to solve a simple enough problem, but I am so so busy that I don't have enough time. So, could you please do it for me???

I have some trees in a forest and I have a human to catch! I have to create an enclosed area using the trees as the vertices of a polygon in such a way that the human is trapped strictly inside the polygon (strictly inside means that if the human is on the boundary of the polygon, it's not inside). Your job is to minimize the polygon's perimeter.

### Input:

On the first line there will be an integer **T** ( $\leq 80$ ), number of test cases. Then on the first line of each test case, there will be two integers **X, Y** ( $-10^6 \leq X, Y \leq 10^6$ ), the position of the human. Then on the second line of each case there will be an integer **N** ( $1 \leq N \leq 100$ ), number of trees in the forest. On the next **N** lines there will be two integers **X, Y** ( $-10^6 \leq X, Y \leq 10^6$ ) on each line, the position of the trees.

### Output:

For each test case, you should output the case number and the minimum perimeter of the polygon in a new line. You have to print **6** digits (rounded) after the decimal point. If it's impossible, print **-1**. See sample test cases for clarity.

### Sample I/O:

Sample Input	Sample Output
2	Case 1: 12.000000
2 1	Case 2: -1
3	
4 0	
0 3	
0 0	
5 0	
2	
0 0	
10 0	

<b>J</b>	<b>Interesting Pile Game</b>	Time Limit: <b>2 sec</b>
	Setter: Ibnul Tahsin Bhuiyan	Memory Limit: <b>512 MB</b>

Turja and Akash are playing an interesting game. Initially a pile of **N** stones is given to them. Each of them will make their move alternatively. In each move one should remove some stones from the pile and give the pile to other person. Let **X** be the number of stones in the pile when a move starts (**Initially X = N**), **Y** be the number of stones removed in a move by any player and **K** is a given constant. One has to remove at least one and at most **X** stones in a move. That means  $1 \leq Y \leq X$  should hold for every move. To make this game interesting another constraint on choosing **Y** is given. **Y** should be a co-prime with **K** and bitwise **AND** between **Y** and **K** should be a non-zero value. So,  $\text{GCD}(Y, K) = 1$  and  $(Y \& K) > 0$  should hold in every move to remove **Y** stones. After removing **Y** stones pile size (number of stones in the pile) will be decremented by **Y**. The player who can't make any move first loses.

Since Turja is senior he will always make the first move. If both of them play optimally, can Turja use the advantage of being senior and win the game? Or Akash will surprise him by winning the game?

### Input:

At first, you are given an integer **T** ( $T \leq 150$ ), which is the number of test cases. For each case, you will be given two positive integers **N** & **K** that are the number of initial stones at pile and a constant ( $1 \leq N, K \leq 500$ ).

### Output:

For each test case print **Turja** if Turja wins the game or **Akash** if Akash wins the game. See sample I/O for better understanding.

### Sample I/O:

Sample Input	Sample Output
2 3 5 2 2	Turja Akash

<b>K</b>	<b>Phi Numbers in Range!</b>	Time Limit: <b>10 sec</b>
	Setter: G. M. Shahariar Shibli	Memory Limit: <b>1 GB</b>

In number theory, Euler's phi function, denoted as  $\phi(n)$ , is an arithmetic function which counts the positive integers less than or equal to **P** that are relatively prime to **P**. A number **X** is relatively prime to **P** if **GCD(X, P) = 1**. For example, if **P = 10**, then there are **4** numbers, namely **1, 3, 7, 9** which are relatively prime to **10**. Therefore,  $\phi(10) = 4$ .

In this problem, you have to answer **M** number of queries of the form **L R K**. To answer the queries, at first you have to generate an array **A** consisting of first **N** phi numbers. For example if **N = 11**, then array **A** will look like,  $A = \{1, 1, 2, 2, 4, 2, 6, 4, 6, 4, 10\}$ . For clarity,  $\phi(1) = 1, \phi(2) = 1, \phi(3) = 2, \phi(4) = 2, \phi(5) = 4, \phi(6) = 2, \phi(7) = 6, \phi(8) = 4, \phi(9) = 6, \phi(10) = 4, \phi(11) = 10$ .

For each query, you have to print the **smallest K-th distinct phi number in the range L to R**. Say **L = 6, R = 11, K = 2**. Let **S** denote the set of elements of array **A** with its indices between 6 and 11. Then  $S = \{2, 6, 4, 6, 4, 10\}$ . The smallest 2nd distinct phi number = 4. What if **K = 3**? Answer is 6.

Notice that if **K = 5** then there is no smallest k-th distinct phi number in that range. In such case, you have to print **No Distinct Phi Number**.

### Input:

At first, there will be an integer **T** ( $1 \leq T \leq 10$ ), which is the number of test cases. For each case, you will be given two positive integers **N** and **M** that are the number of phi numbers to be generated at first and the number of queries ( $1 \leq N, M \leq 10^5$ ). Then there will be **M** lines each containing three numbers **L R K** ( $1 \leq L \leq R \leq N, 1 \leq K \leq N$ )

### Output:

For each case print the case number in the first line like **Case x:** where **x** is the number of the test case. Then output the smallest K-th distinct phi number or **No Distinct Phi Number** for each query in a new line. See the sample I/O for better understanding.

*The sample I/O is in the next page.*

### Sample I/O:

Sample Input	Sample Output
1 11 4 4 6 1 6 11 2 2 7 3 4 6 4	Case 1: 2 4 4 No Distinct Phi Number