

Question 1 (100 Points) (Gambler's Dice)

You are given a n -ary perfect tree with k levels. You need to mark each node of this tree with a number on dice such that resulting tree is Gambler Friendly.

A tree is Gambler Friendly if following holds:

For every node of tree. Let say it is marked with a number p ($1 \leq p \leq 6$) then every adjacent node of this tree is marked with a number q that is adjacent to p on dice (i.e. p and q are adjacent on dice and $p \neq q$)

Note: a number is not adjacent to itself on dice.

You need to calculate number of possible ways to paint tree such that it is Gambler Friendly. Since the number can be very large, print it module $10^9 + 7$.

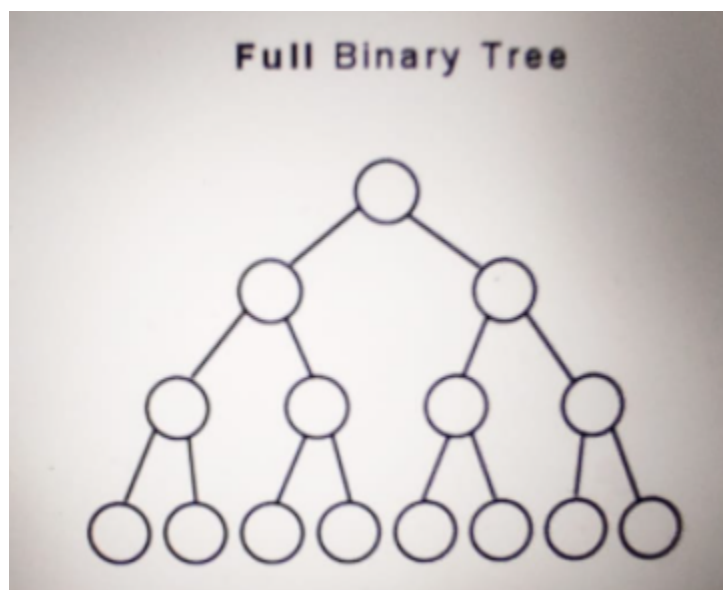
Constraints:

$$2 \leq n \leq 10^5$$

$$1 \leq k \leq 10^5$$

Input format: 2 space separated integers, n and k .

Note for reference: Following is a perfect binary tree with 4 levels.



Sample input:

3 3

Sample output:

100663296

Limits:

Time limit : 2.0 sec(s) for each input file

Memory limit: 15 MB

Source limit: 1024 KB

Question 2 (75 points) (Auto Suggest)

Given a dictionary consisting of N words, and a query word S, auto suggest the best word from the dictionary that is closest to S.

Two words are first compared by their **Levenshtein distance** to the word S. If two words have the same Levenshtein distance, then the lexicographically smaller word is given priority.

Note:

- Levenshtein distance between two strings is defined as the minimum number of edits required to obtain one string from the other. An “edit” is defined by either an insertion of a character, a deletion of a character, or a replacement of a character.
- All the words and the query word S consist of lowercase alphabets only.

Task

Auto suggest the closest word to S from the given dictionary of N words.

Input format:

- The first line contains a single integer N.
- The second line contains N space-separated strings denoting the words in the dictionary.
- The third line contains a single string - the query word S.

Output format:

Print a single line containing the answer.

Constraints

- $1 \leq N \leq 100$
- $1 \leq \text{words}[i].\text{length} \leq 10$
- $1 \leq S.\text{length} \leq 10$

Sample input:

5

tocor torect tocfrrrec tocorre tocofecd

tocorrect

Sample output:

Tocfrrrec

Approach

The strings belonging to the dictionary(represented by list words) and having minimum levenshtein distance of 2 from the given string “tocorrect” are [“tocfrrrec”, “tocorre”].

Among the two. “tocfrrrec” is lexicographically smaller than “tocorre”.

Limits

Time limit : 0.5 sec(s) for each input file

Memory limit: 256 MB

Source limit: 1024 KB

Question 3 (50 points) (Gift Hamper Scam)

You are the organizer of a lucky draw contest where N participants are selected to receive some gift hampers. You have K different type of gifts with atleast 1 gift of each type. You are tasked with distributing all the gifts among the N winners. However, the organizing committee puts a condition that you must distribute these gifts such that each winner has all the gifts (he/she received) of the same type. Lets define Scam Score as the maximum number of gifts received by any winner with the above constraints on distribution.

Print the minimum possible Scam Score for every test case.

Note: Its possible that a winner might not get any gift.

Input

First line of the input contains an integer T denoting the number of test cases. Then test cases follow.

For every test case, the first line contains two space separated integers N and K respectively denoting the total number of winners(N) and the number of different gift hamper types(K)

Second line of every test case contains K space separated integers denoting the quantity of each gift type available.

Output

Print the minimum possible Scam Score in a newline for every testcase.

Constraints

$$1 \leq T \leq 10$$

$$1 \leq N \leq 10^9$$

$$1 \leq K \leq 10^5$$

$$K \leq N$$

$$1 \leq \text{Number of gifts available for any type} \leq 10^9$$

Sample input

1

7 5

7 1 7 4 4

Sample output

4

Limits

Time limit: 1.0 sec(s) for each input file

Memory limit: 256 MB

Source limit: 1024 KB