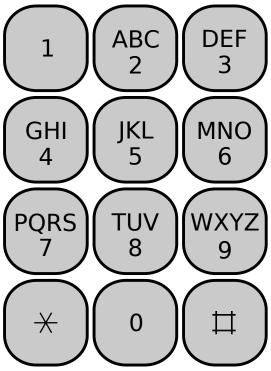
Problem 3 - T9

R-Boy likes old school tech so much that he fell in love with his trusted R-33IO. He started using it, but after many years with a QWERTY keyboard he's having some problems adapting!

This phone has a classical T9 keyboard. You can type text messages using only eight buttons:



- Button 2 for A B C
- Button 3 for D E F
- Button 4 for G H I
- Button 5 for J K L
- Button 6 for M N O
- Button 7 for P Q R S
- Button 8 for T U V
- Button 9 for W X Y Z

The security policy of Reply requires that his phone password is a **L** character long word, composed only of letters, with no spaces. The real struggle is typing a password without seeing the characters: while you type it, you will only see asterisks!

The glorious R-33IO's T9 software has a built-in table **P** that, for each pair of characters (*a*, *b*), defines a score **P**[a][b] that tells "how likely" it is for the character *b* to immediately follow the character *a*. This table is used to map a single button press (i.e. a 5) to a character (i.e. J or K or L). The software chooses the character typed by the button according to those scores (higher scores are preferred).

Knowing which buttons R-Boy has pressed, your task is to help him finding the **K**-th highest scoring password (just choosing the 1st might be a bit too predictable). The score of a password is defined as the sum of the scores of each pair of adjacent characters. If two or more passwords have the same score, the software will put the *lexicographically lowest* first.

Input data

The first line of the input file contains an integer **T**, the number of test cases to solve, followed by **T** testcases, numbered from **1** to **T**.

In each test case the first line contains the two integers **L** and **K**, the number of buttons pressed and which password R-Boy is interested in.

The next 26 lines contains 26 numbers each. In the i-th row (where i=0 is **A**, i=1 is **B**, . . ., i=25 is **Z**), the j-th number is the value of **P**[i][j].

The last line contains **L** integers from 2 to 9, without spaces, representing the buttons pressed by R-Boy.

Output data

The output file must contains **T** lines. For each test case in the input file, the output file must contain a line with the words:

Case #t: S

where *t* is the test case number (from **1** to **T**) followed by the **K**-th highest scoring password *S* (using lexicographic order to break ties) all uppercase.

Constraints

- $1 \leq \mathbf{T} \leq 20$.
- $1 \leq \mathbf{L} \leq 10\,000$.
- $1 \leq \mathbf{K} \leq 100$.
- $1 \leq \mathbf{P}[i][j] \leq 1000$.

Scoring

- **input 1** : $\mathbf{T} = 1$, $\mathbf{L} \leq 3$ and $\mathbf{K} = 1$.
- **input 2** : $\mathbf{T} = 5$, $\mathbf{L} \leq 10$ and $\mathbf{K} = 1$.
- **input 3** : $\mathbf{T} = 10$, $\mathbf{L} \leq 100$ and $\mathbf{K} = 1$.
- **input 4** : $\mathbf{T} = 15$, $\mathbf{L} \leq 1000$ and $\mathbf{K} \leq 10$.
- **input 5** : $\mathbf{T} = 20$, $\mathbf{L} \leq 10\,000$ and $\mathbf{K} \leq 100$.

Examples

input	output

2
3 4
1 1 1 . . . 1 1 1
1 1 1 . . . 1 1 1
. . . . . .
. . . . . .
1 1 1 . . . 1 1 1
1 1 1 . . . 1 1 1
426
4 3
1 2 3 . . . 24 25 26
26 25 24 . . . 3 2 1
1 2 3 . . . 24 25 26
26 25 24 . . . 3 2 1
. . . . . .
. . . . . .
1 2 3 . . . 24 25 26
26 25 24 . . . 3 2 1
1 2 3 . . . 24 25 26
26 25 24 . . . 3 2 1
7952
	Case #1: GBM
	Case #2: QZJB

Explanation

In the first test case all the values of **P**[i][j] are equal to 1 *(note that for space reasons we have omitted all the remaining 1s)*. R-Boy has pressed **4** (G H I), **2** (A B C) and **6** (M N O), and, as all the scores are 1, all the passwords have a total score of 2. Thus the first 4 passwords (in lexigraphical order) are: GAM GAN GAO and **GBM**.

In the second test case each line of **P** will have increasing (from 1 to 26) or decreasing (from 26 to 1) values *(again, some values of the matrix are omitted for space reasons)*. R-Boy has pressed: **7** (P Q R S), **9** (W X Y Z), **5** (J K L) and **2** (A B C). This time the 3 highest scoring passwords are QZJA SZJA (both with score 69) and **QZJB** (with score 68).