Problem B. Sequences Generator

Input file:	`standard input`
Output file:	`standard output`
Feedback:	`special judge`

The RBM Second Generation of Dual Core Microprocessor Chip, also known as RBM2gDCMC, can generate a digital sequence of length n. Each digit in a sequence provided by RBM2gDCMC is regarded as an integer between 1 and n in this problem.

Now I will show you the passcode for the email belonging to Gini Romety, which is a sequence of length m with integers between 1 and n. You are asked to calculate the probabilities of the coincidence with Gini Romety's passcode for all consecutive subsequence of length m in a sequence generated by RBM2gDCMC.

Input

The input contains several test cases, and the first line contains a positive integer T indicating the number of test cases which is up to 5000.

For each test case, the first line contains two integers n and m, satisfying $1 \le m \le n \le 3 \times 10^5$, which are described as above.

The following n lines describe the generating logic for all digits in a sequence built by RBM2gDCMC. The i-th line of them contains two integers l_i and r_i, satisfying $1 \le l_i \le r_i \le n$ and $r_i - l_i \le 9$, and $(r_i - l_i + 1)$ following integers, denoted by $w_{i,l_i}, w_{i,l_i+1}, \cdots, w_{i,r_i}$, where $0 \le w_{i,j} \le 10^9$ and $\sum_j w_{i,j} = 10^9$. These data indicate that for the i-th digit the probability of being an integer j in $[1, l_i) \cup (r_i, n]$ is zero, and the probability of being an integer j in $[l_i, r_i]$ is $\frac{w_{i,j}}{10^9}$.

The next line contains m integers, denoted by $b_1, b_2, \cdots, b_m$, describing the passcode for Gini Romety's email, where $1 \le b_1, b_2, \cdots, b_m \le n$.

We guarantee that the sum of n in all test cases is no larger than 2×10^6.

Output

For each test case, output a line containing "`Case #x:`" (without quotes) at first, where `x` is the test case number starting from 1.

After that, output $(n - m + 1)$ lines such that the i-th of them contains a real number indicating the probability of the coincidence for the passcode of Gini Romety's email and the subsequence of a sequence produced by RBM2gDCMC from the i-th digit to the $(i + m - 1)$-th one with an absolute error of at most 10^{-9}. Precisely speaking, assume that your answer is a and the jury's answer is b, your answer will be considered correct if $|a - b| \le 10^{-9}$, where $|x|$ means the absolute value of x.

Example

standard input	standard output
1 5 3 1 3 100000000 200000000 700000000 1 3 600000000 150000000 250000000 1 3 333333333 333333334 333333333 3 4 450000000 550000000 1 3 999999998 1 1 1 2 3	Case #1: 0.004999999995000 0.090000000180000 0.000000000000000

Note

In the sample case, the probability matrix $\mathbf{P} = (p_{i,j})$ is

$$\begin{bmatrix} 0.100000000 & 0.200000000 & 0.700000000 & 0.000000000 & 0.000000000 \\ 0.600000000 & 0.150000000 & 0.250000000 & 0.000000000 & 0.000000000 \\ 0.333333333 & 0.333333334 & 0.333333333 & 0.000000000 & 0.000000000 \\ 0.000000000 & 0.000000000 & 0.450000000 & 0.550000000 & 0.000000000 \\ 0.999999998 & 0.000000001 & 0.000000001 & 0.000000000 & 0.000000000 \end{bmatrix}$$

and thus the answers in the output are

- $p_{1,1}p_{2,2}p_{3,3} = 0.100000000 \times 0.150000000 \times 0.333333333 = 0.004999999995000$,
- $p_{2,1}p_{3,2}p_{4,3} = 0.600000000 \times 0.333333334 \times 0.450000000 = 0.090000000180000$,
- $p_{3,1}p_{4,2}p_{5,3} = 0.333333333 \times 0.000000000 \times 0.000000001 = 0.000000000000000$

respectively.