Problem E. Expected Distance

Input file:	*standard input*
Output file:	*standard output*
Time limit:	4 seconds
Memory limit:	1024 mebibytes

Given are two integer sequences: $\{a_i\}$ of length $N-1$ and $\{c_i\}$ of length N. Let us build a tree T_N with N vertices in the following way:

- T_1 is a tree made up of only vertex 1.
- For $i > 1$, T_i connects vertex i to one of the vertices of T_{i-1}. The probability that vertex j will be chosen is $\frac{a_j}{a_1 + \cdots + a_{i-1}}$. The length of the added edge is then calculated as $c_i + c_j$.
- When T_N is built, the process stops.

You are given Q queries. Each query is a pair of vertices. For each query (u, v), calculate the expected distance between u and v in T_N.

Input

The first line of input contains two integers N and Q: the number of vertices and the number of queries, respectively ($2 \le N, Q \le 3 \cdot 10^5$).

The second line contains $N-1$ integers $a_1, a_2, \ldots, a_{N-1}$ ($1 \le a_i \le 2000$).

The third line contains N integers $c_1, c_2, \ldots, c_N$ ($1 \le c_i \le 2000$).

Each of the following Q lines describes one query and contains two integers u and v separated by a space: numbers of vertices to find the expected distance ($1 \le u, v \le N$).

Output

It can be proven that each answer is a rational number and can be written in the form $ans_i = \frac{p_i}{q_i}$, where p_i and q_i are coprime non-negative integers and $0 < q_i < 10^9 + 7$. For each query, print the integer $(p_i \cdot q_i^{-1}) \bmod (10^9 + 7)$.

Examples

standard input	standard output
5 7 1 1 1 1 1 2 4 8 16 1 3 2 5 4 3 1 5 3 3 4 5 1 2	7 666666697 15 666666697 0 333333366 3
5 4 17 19 23 29 2 3 5 7 11 1 2 3 4 5 2 3 5	5 927495315 106531441 450222593