

Definite Random Walks

Alex has a board game consisting of:

- A *chip* for marking his current location on the board.
- n *fields* numbered from 1 to n . Each position i has a value, f_i , denoting the *next* position for the chip to jump to from that field.
- A *die* with m faces numbered from 0 to $m - 1$. Each face j has a probability, p_j , of being rolled.

Alex then performs the following actions:

- Begins the game by placing the chip at a position in a field randomly and with equiprobability.
- Takes k turns; during each turn he:
 - Rolls the die. We'll denote the number rolled during a turn as d .
 - Jumps the chip d times. Recall that each field contains a value denoting the *next* field number to jump to.
- After completing k turns, the game ends and he must calculate the respective probabilities for each field as to whether the game ended with the chip in that field.

Given n , m , k , the game board, and the probabilities for each *die* face, print n lines where each line i contains the probability that the chip is on field i at the end of the game.

Note: All the probabilities in this task are rational numbers modulo $M = 998244353$. That is, if the probability can be expressed as the irreducible fraction $\frac{p}{q}$ where $q \bmod M \neq 0$, then it corresponds to the number $(p \times q^{-1}) \bmod M$ (or, alternatively, $p \times q^{-1} \equiv x \pmod{M}$). [Click here](#) to learn about *Modular Multiplicative Inverse*.

Input Format

The first line contains three space-separated integers describing the respective values of n (the number of positions), m (the number of die faces), and k (the number of turns).

The second line contains n space-separated integers describing the respective values of each f_i (i.e., the index of the field that field i can transition to).

The third line contains m space-separated integers describing the respective values of each p_j (where $0 \leq p_j < M$) describing the probabilities of the faces of the m -sided die.

Constraints

- $1 \leq n \leq 6 \times 10^4$
- $4 \leq m \leq 10^5$
- $1 \leq k \leq 1000$
- $1 \leq i, f_i \leq n$
- $0 \leq p_j < M$
- The sum of $p_j \bmod M$ is 1

Note: The time limit for this challenge is doubled for *a//* languages. Read more about standard time limits at our [environment](#) page.

Output Format

Print n lines of output in which each line i contains a single integer, x_i (where $0 \leq x_i < M$), denoting the probability that the chip will be on field i after k turns.

Sample Input 0

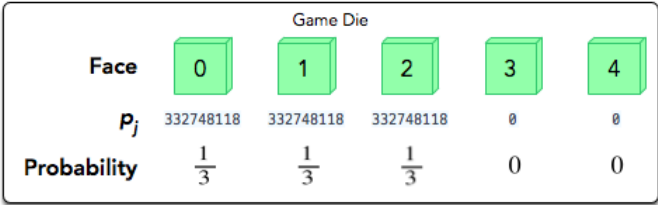
```
4 5 1
2 3 2 4
332748118 332748118 332748118 0 0
```

Sample Output 0

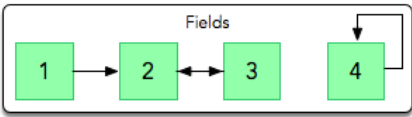
```
582309206
332748118
332748118
748683265
```

Explanation 0

The diagram below depicts the respective probabilities of each *die* face being rolled:



The diagram below depicts each field with an arrow pointing to the *next* field:



There are four equiprobable initial fields, so each field has a $\frac{1}{4}$ probability of being the chip's initial location. Next, we calculate the probability that the chip will end up in each field after $k = 1$ turn:

1. The only way the chip ends up in this field is if it never jumps from the field, which only happens if Alex rolls a 0. So, this field's probability is $\frac{1}{4} \cdot \frac{1}{3} = \frac{1}{12}$. We then calculate and print the result of $\frac{1}{12} \bmod 998244353 = 582309206$ on a new line.
2. The chip can end up in field 2 after one turn in the following scenarios:
 - Start in field 1 and roll a 1, the probability for which is $\frac{1}{4} \cdot \frac{1}{3} = \frac{1}{12}$.
 - Start in field 2 and roll a 0 or a 2, the probability for which is $\frac{1}{4} \cdot \frac{2}{3} = \frac{2}{12}$.
 - Start in field 3 and roll a 1, the probability for which is $\frac{1}{4} \cdot \frac{1}{3} = \frac{1}{12}$.

After summing these probabilities, we get a total probability of $\frac{1}{12} + \frac{2}{12} + \frac{1}{12} = \frac{1}{3}$ for the field. We then calculate and print the result of $\frac{1}{3} \bmod 998244353 = 332748118$ on a new line.

3. The chip can end up in field 3 after one turn in the following scenarios:
 - Start in field 1 and roll a 2, the probability for which is $\frac{1}{4} \cdot \frac{1}{3} = \frac{1}{12}$.
 - Start in field 2 and roll a 1, the probability for which is $\frac{1}{4} \cdot \frac{1}{3} = \frac{1}{12}$.
 - Start in field 3 and roll a 0 or a 2, the probability for which is $\frac{1}{4} \cdot \frac{2}{3} = \frac{2}{12}$.

After summing these probabilities, we get a total probability of $\frac{1}{12} + \frac{1}{12} + \frac{2}{12} = \frac{1}{3}$ for the field. We then calculate and print the result of $\frac{1}{3} \bmod 998244353 = 332748118$ on a new line.

4. If the chip is initially placed in field **4**, it will always end up in field **4** regardless of how many turns are taken (because this field loops back onto itself). Thus, this field's probability is $\frac{1}{4}$. We then calculate and print the result of $\frac{1}{4} \bmod 998244353 = 748683265$ on a new line.