A. The Child and Toy

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

On Children's Day, the child got a toy from Delayyy as a present. However, the child is so naughty that he can't wait to destroy the toy.

The toy consists of n parts and m ropes. Each rope links two parts, but every pair of parts is linked by at most one rope. To split the toy, the child must remove all its parts. The child can remove a single part at a time, and each remove consume an energy. Let's define an energy value of part i as v_i. The child spend $v_{f_1} + v_{f_2} + ... + v_{f_k}$ energy for removing part i where $f_1, f_2, ..., f_k$ are the parts that are directly connected to the i-th and haven't been removed.

Help the child to find out, what is the minimum total energy he should spend to remove all n parts.

Input

The first line contains two integers n and m ($1 \le n \le 1000$; $0 \le m \le 2000$). The second line contains n integers: $v_1, v_2, ..., v_n$ ($0 \le v_i \le 10^5$). Then followed m lines, each line contains two integers x_i and y_i, representing a rope from part x_i to part y_i ($1 \le x_i, y_i \le n$; $x_i \ne y_i$).

Consider all the parts are numbered from 1 to n.

Output

Output the minimum total energy the child should spend to remove all n parts of the toy.

Sample test(s)

input

```
4 3
10 20 30 40
1 4
1 2
2 3
```

output

```
40
```

input

```
4 4
100 100 100 100
1 2
2 3
2 4
3 4
```

output

```
400
```

input

```
7 10
40 10 20 10 20 80 40
1 5
4 7
4 5
5 2
5 7
6 4
1 6
1 3
4 3
1 4
```

output

```
160
```

Note

One of the optimal sequence of actions in the first sample is:

- First, remove part 3, cost of the action is 20.
- Then, remove part 2, cost of the action is 10.
- Next, remove part 4, cost of the action is 10.

- At last, remove part 1, cost of the action is 0.

So the total energy the child paid is $20+10+10+0=40$, which is the minimum.

In the second sample, the child will spend 400 no matter in what order he will remove the parts.

B. The Child and Zoo

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Of course our child likes walking in a zoo. The zoo has n areas, that are numbered from 1 to n. The i-th area contains a_i animals in it. Also there are m roads in the zoo, and each road connects two distinct areas. Naturally the zoo is connected, so you can reach any area of the zoo from any other area using the roads.

Our child is very smart. Imagine the child want to go from area p to area q. Firstly he considers all the simple routes from p to q. For each route the child writes down the number, that is equal to the minimum number of animals among the route areas. Let's denote the largest of the written numbers as $f(p, q)$. Finally, the child chooses one of the routes for which he writes down the value $f(p, q)$.

After the child has visited the zoo, he thinks about the question: what is the average value of $f(p, q)$ for all pairs p, q $(p \neq q)$? Can you answer his question?

Input

The first line contains two integers n and m $(2 \leq n \leq 10^5;\ 0 \leq m \leq 10^5)$. The second line contains n integers: $a_1, a_2, ..., a_n$ $(0 \leq a_i \leq 10^5)$. Then follow m lines, each line contains two integers x_i and y_i $(1 \leq x_i, y_i \leq n;\ x_i \neq y_i)$, denoting the road between areas x_i and y_i.

All roads are bidirectional, each pair of areas is connected by at most one road.

Output

Output a real number — the value of $\frac{\sum_{p,q,p \neq q} f(p,q)}{n(n-1)}$.

The answer will be considered correct if its relative or absolute error doesn't exceed 10^{-4}.

Sample test(s)

input
```
4 3
10 20 30 40
1 3
2 3
4 3
```
output
```
16.666667
```

input
```
3 3
10 20 30
1 2
2 3
3 1
```
output
```
13.333333
```

input
```
7 8
40 20 10 30 20 50 40
1 2
2 3
3 4
4 5
5 6
6 7
1 4
5 7
```
output
```
18.571429
```

Note

Consider the first sample. There are 12 possible situations:

- $p = 1, q = 3, f(p, q) = 10.$
- $p = 2, q = 3, f(p, q) = 20.$
- $p = 4, q = 3, f(p, q) = 30.$
- $p = 1, q = 2, f(p, q) = 10.$
- $p = 2, q = 4, f(p, q) = 20.$
- $p = 4, q = 1, f(p, q) = 10.$

Another 6 cases are symmetrical to the above. The average is $\frac{(10+20+30+10+20+10)\times 2}{12} \approx 16.666667$.

Consider the second sample. There are 6 possible situations:

- $p = 1, q = 2, f(p, q) = 10$.
- $p = 2, q = 3, f(p, q) = 20$.
- $p = 1, q = 3, f(p, q) = 10$.

Another 3 cases are symmetrical to the above. The average is $\frac{(10+20+10)\times 2}{6} \approx 13.333333$.

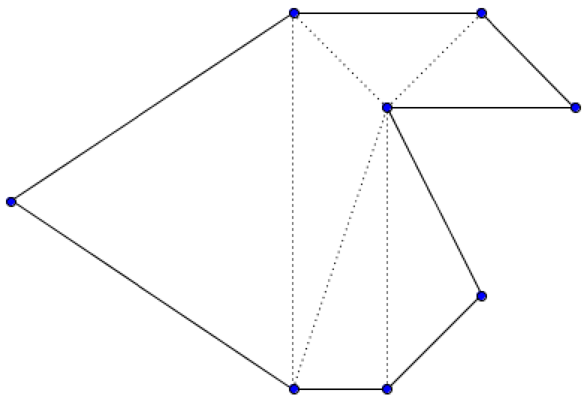
C. The Child and Polygon

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

This time our child has a simple polygon. He has to find the number of ways to split the polygon into non-degenerate triangles, each way must satisfy the following requirements:

- each vertex of each triangle is one of the polygon vertex;
- each side of the polygon must be the side of exactly one triangle;
- the area of intersection of every two triangles equals to zero, and the sum of all areas of triangles equals to the area of the polygon;
- each triangle must be completely inside the polygon;
- **each side of each triangle must contain exactly two vertices of the polygon**.

The picture below depicts an example of a correct splitting.



Please, help the child. Calculate the described number of ways modulo 1000000007 $(10^9 + 7)$ for him.

Input

The first line contains one integer n $(3 \le n \le 200)$ — the number of vertices of the polygon. Then follow n lines, each line containing two integers. The i-th line contains x_i, y_i $(|x_i|, |y_i| \le 10^7)$ — the i-th vertex of the polygon in clockwise or counterclockwise order.

It's guaranteed that the polygon is simple.

Output

Output the number of ways modulo 1000000007 $(10^9 + 7)$.

Sample test(s)

input

```
4
0 0
0 1
1 1
1 0
```

output

```
2
```

input

```
4
0 0
1 0
0 1
-1 0
```

output

```
1
```

input

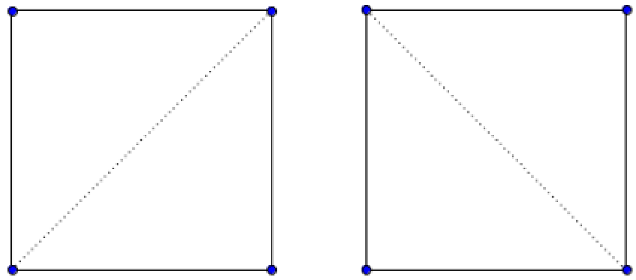
```
5
0 0
1 0
1 1
0 1
-2 -1
```

output

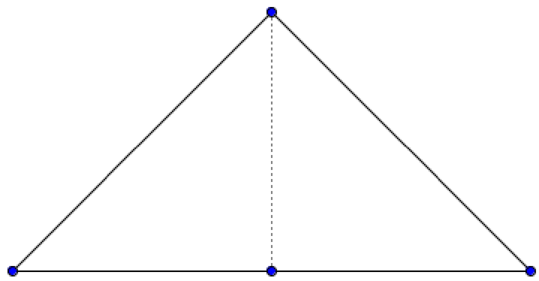
```
3
```

Note

In the first sample, there are two possible splittings:



In the second sample, there are only one possible splitting:



D. The Child and Sequence

time limit per test: 4 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

At the children's day, the child came to Picks's house, and messed his house up. Picks was angry at him. A lot of important things were lost, in particular the favorite sequence of Picks.

Fortunately, Picks remembers how to repair the sequence. Initially he should create an integer array $a[1], a[2], ..., a[n]$. Then he should perform a sequence of m operations. An operation can be one of the following:

1. Print operation l, r. Picks should write down the value of $\sum_{i=l}^{r} a[i]$.
2. Modulo operation l, r, x. Picks should perform assignment $a[i] = a[i]\ mod\ x$ for each i $(l \le i \le r)$.
3. Set operation k, x. Picks should set the value of $a[k]$ to x (in other words perform an assignment $a[k] = x$).

Can you help Picks to perform the whole sequence of operations?

Input

The first line of input contains two integer: n, m $(1 \le n, m \le 10^5)$. The second line contains n integers, separated by space: $a[1], a[2], ..., a[n]$ $(1 \le a[i] \le 10^9)$ — initial value of array elements.

Each of the next m lines begins with a number $type$ $(type \in \{1, 2, 3\})$.

- If $type = 1$, there will be two integers more in the line: l, r $(1 \le l \le r \le n)$, which correspond the operation 1.
- If $type = 2$, there will be three integers more in the line: l, r, x $(1 \le l \le r \le n;\ 1 \le x \le 10^9)$, which correspond the operation 2.
- If $type = 3$, there will be two integers more in the line: k, x $(1 \le k \le n;\ 1 \le x \le 10^9)$, which correspond the operation 3.

Output

For each operation 1, please print a line containing the answer. Notice that the answer may exceed the 32-bit integer.

Sample test(s)

input

```
5 5
1 2 3 4 5
2 3 5 4
3 3 5
1 2 5
2 1 3 3
1 1 3
```

output

```
8
5
```

input

```
10 10
6 9 6 7 6 1 10 10 9 5
1 3 9
2 7 10 9
2 5 10 8
1 4 7
3 3 7
2 7 9 9
1 2 4
1 6 6
1 5 9
3 1 10
```

output

```
49
15
23
1
9
```

Note

Consider the first testcase:

- At first, $a = \{1, 2, 3, 4, 5\}$.
- After operation 1, $a = \{1, 2, 3, 0, 1\}$.
- After operation 2, $a = \{1, 2, 5, 0, 1\}$.
- At operation 3, $2 + 5 + 0 + 1 = 8$.
- After operation 4, $a = \{1, 2, 2, 0, 1\}$.
- At operation 5, $1 + 2 + 2 = 5$.

E. The Child and Binary Tree

time limit per test: 7 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Our child likes computer science very much, especially he likes binary trees.

Consider the sequence of n distinct positive integers: $c_1, c_2, \ldots, c_n$. The child calls a vertex-weighted rooted binary tree *good* if and only if for every vertex v, the weight of v is in the set $\{c_1, c_2, \ldots, c_n\}$. Also our child thinks that the *weight* of a vertex-weighted tree is the sum of all vertices' weights.

Given an integer m, can you for all s $(1 \le s \le m)$ calculate the number of good vertex-weighted rooted binary trees with weight s? Please, check the samples for better understanding what trees are considered different.

We only want to know the answer modulo 998244353 ($7 \times 17 \times 2^{23} + 1$, a prime number).

Input

The first line contains two integers n, m $(1 \le n \le 10^5; 1 \le m \le 10^5)$. The second line contains n space-separated pairwise distinct integers $c_1, c_2, \ldots, c_n$. $(1 \le c_i \le 10^5)$.

Output

Print m lines, each line containing a single integer. The i-th line must contain the number of good vertex-weighted rooted binary trees whose weight exactly equal to i. Print the answers modulo 998244353 ($7 \times 17 \times 2^{23} + 1$, a prime number).

Sample test(s)

input

```
2 3
1 2
```

output

```
1
3
9
```

input

```
3 10
9 4 3
```

output

```
0
0
1
1
0
2
4
2
6
15
```

input

```
5 10
13 10 6 4 15
```

output

```
0
0
0
1
0
1
0
2
0
5
```

Note

In the first example, there are 9 good vertex-weighted rooted binary trees whose weight exactly equal to 3: