Codeforces Round #250 (Div. 2)

A. The Child and Homework

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

Once upon a time a child got a test consisting of multiple-choice questions as homework. A multiple-choice question consists of four choices: `A`, `B`, `C` and `D`. Each choice has a description, and the child should find out the only one that is correct.

Fortunately the child knows how to solve such complicated test. The child will follow the algorithm:

- If there is some choice whose description at least twice shorter than all other descriptions, or at least twice longer than all other descriptions, then the child thinks the choice is great.
- If there is exactly one great choice then the child chooses it. Otherwise the child chooses `C` (the child think it is the luckiest choice).

You are given a multiple-choice questions, can you predict child's choose?

Input

The first line starts with "`A.`" (without quotes), then followed the description of choice `A`. The next three lines contains the descriptions of the other choices in the same format. They are given in order: `B`, `C`, `D`. **Please note**, that the description goes after prefix "`X.`", so the prefix mustn't be counted in description's length.

Each description is non-empty and consists of at most 100 characters. Each character can be either uppercase English letter or lowercase English letter, or "`_`".

Output

Print a single line with the child's choice: "`A`", "`B`", "`C`" or "`D`" (without quotes).

Sample test(s)

input

```
A.VFleaKing_is_the_author_of_this_problem
B.Picks_is_the_author_of_this_problem
C.Picking_is_the_author_of_this_problem
D.Ftiasch_is_cute
```

output

```
D
```

input

```
A.ab
B.abcde
C.ab
D.abc
```

output

```
C
```

input

```
A.c
B.cc
C.c
D.c
```

output

```
B
```

Note

In the first sample, the first choice has length 39, the second one has length 35, the third one has length 37, and the last one has length 15. The choice `D` (length 15) is twice shorter than all other choices', so it is great choice. There is no other great choices so the child will choose `D`.

In the second sample, no choice is great, so the child will choose the luckiest choice `C`.

In the third sample, the choice `B` (length 2) is twice longer than all other choices', so it is great choice. There is no other great choices so the child will choose `B`.

B. The Child and Set

time limit per test: 1 second
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 set of Picks.

Fortunately, Picks remembers something about his set S:

- its elements were distinct integers from 1 to $limit$;
- the value of $\sum_{x \in S} lowbit(x)$ was equal to sum; here $lowbit(x)$ equals 2^k where k is the position of the first one in the binary representation of x. For example, $lowbit(10010_2) = 10_2, lowbit(10001_2) = 1_2, lowbit(10000_2) = 10000_2$ (binary representation).

Can you help Picks and find any set S, that satisfies all the above conditions?

Input

The first line contains two integers: $sum, limit$ $(1 \le sum, limit \le 10^5)$.

Output

In the first line print an integer n $(1 \le n \le 10^5)$, denoting the size of S. Then print the elements of set S in any order. If there are multiple answers, print any of them.

If it's impossible to find a suitable set, print `-1`.

Sample test(s)

input
5 5
output
2 4 5

input
4 3
output
3 2 3 1

input
5 1
output
-1

Note

In sample test 1: $lowbit(4) = 4, lowbit(5) = 1, 4 + 1 = 5$.

In sample test 2: $lowbit(1) = 1, lowbit(2) = 2, lowbit(3) = 1, 1 + 2 + 1 = 4$.

C. 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.

D. 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 $(2 \le n \le 10^5; 0 \le m \le 10^5)$. The second line contains n integers: $a_1, a_2, ..., a_n$ $(0 \le a_i \le 10^5)$. Then follow m lines, each line contains two integers x_i and y_i $(1 \le x_i, y_i \le n; x_i \neq y_i)$, 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 $\frac{(10+20+10)\times 2}{6} \approx 13.333333$.

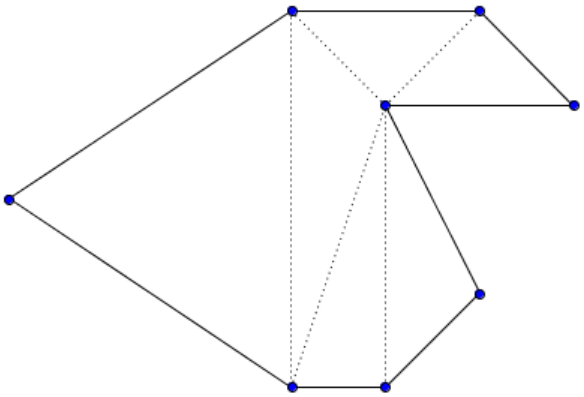
E. The Child and Polygon

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
```

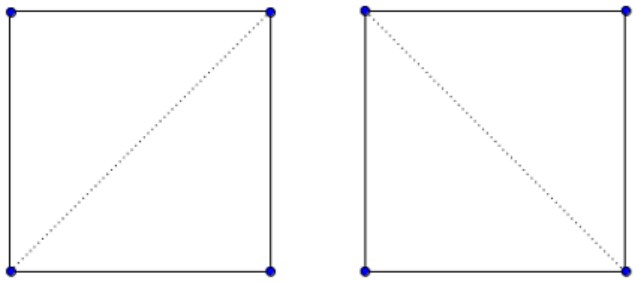
input
```
4
0 0
1 0
0 1
-1 0
```
output
```
1
```

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: