A - Hamming Distance

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 100 points

Problem Statement

You are given a positive integer N and two strings S and T, each of length N and consisting of lowercase English letters.

Find the Hamming distance between S and T. That is, find the number of integers i such that $1 \leq i \leq N$ and the i-th character of S is different from the i-th character of T.

Constraints

- $1 \leq N \leq 100$
- N is an integer.
- Each of S and T is a string of length N consisting of lowercase English letters.

Input

The input is given from Standard Input in the following format:

N
S
T

Output

Print the answer.

Sample Input 1

```
6
abcarc
agcahc
```

Sample Output 1

```
2
```

S and T differ in the 2nd and 5th characters, but not in other characters. Thus, the answer is 2.

Sample Input 2

```
7
atcoder
contest
```

Sample Output 2

```
7
```

Sample Input 3

```
8
chokudai
chokudai
```

Sample Output 3

```
0
```

Sample Input 4

```
10
vexknuampx
vzxikuamlx
```

Sample Output 4

```
4
```

B - Ranking with Ties

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 200 points

Problem Statement

N people labeled from 1 to N participated in a certain contest. The **score** of person i ($1 \leq i \leq N$) was P_i.

In this contest, the **rank** of each of the N people is determined by the following procedure:

1. Prepare a variable r, and initialize $r = 1$. Initially, the ranks of the N people are all undetermined.
2. Repeat the following operation until the ranks of all N people are determined:
    - Let x be the maximum score among the people whose ranks are currently undetermined, and let k be the number of people whose score is x. Determine the rank of those k people with score x to be r, and then add k to r.

Print the rank of each of the N people.

Constraints

- $1 \leq N \leq 100$
- $1 \leq P_i \leq 100$
- All input values are integers.

Input

The input is given from Standard Input in the following format:

N
$P_1 \quad P_2 \quad \ldots \quad P_N$

Output

Print N lines. The i-th line ($1 \leq i \leq N$) should contain the rank of person i as an integer.

Sample Input 1

```
4
3 12 9 9
```

Sample Output 1

```
4
1
2
2
```

The ranks of the $N\ (=4)$ people are determined as follows:

1. Prepare a variable r and initialize $r = 1$. At first, the ranks of all 4 people are undetermined.
2. Currently, persons $1, 2, 3, 4$ have undetermined ranks. The maximum score among them is $P_2\ (=12)$. Therefore, determine the rank of person 2 to be $r\ (=1)$, and then add 1 to r, making $r = 2$.
3. Currently, persons $1, 3, 4$ have undetermined ranks. The maximum score among them is $P_3 = P_4\ (=9)$. Therefore, determine the ranks of persons 3 and 4 to be $r\ (=2)$, and then add 2 to r, making $r = 4$.
4. Currently, person 1 has an undetermined rank. The maximum score among them is $P_1\ (=3)$. Therefore, determine the rank of person 1 to be $r\ (=4)$, and then add 1 to r, making $r = 5$.
5. The ranks of all 4 people are now determined, so the process ends.

Sample Input 2

```
3
3 9 6
```

Sample Output 2

```
3
1
2
```

Sample Input 3

```
4
100 100 100 100
```

Sample Output 3

```
1
1
1
1
```

Sample Input 4

```
8
87 87 87 88 41 38 41 38
```

Sample Output 4

```
2
2
2
1
5
7
5
7
```

C - Make it Forest

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 350 points

Problem Statement

You are given a simple undirected graph with N vertices and M edges, where the vertices are labeled 1 to N. The i-th edge connects vertices u_i and v_i.

What is the minimum number of edges that need to be deleted from this graph so that the graph becomes a forest?

▶ What is a forest?

Constraints

- $1 \leq N \leq 2 \times 10^5$
- $0 \leq M \leq \min\left(\frac{N(N-1)}{2}, 2 \times 10^5\right)$
- $1 \leq u_i < v_i \leq N$
- The given graph is simple.
- All input values are integers.

Input

The input is given from Standard Input in the following format:

$$
\begin{array}{ll}
N & M \\
u_1 & v_1 \\
u_2 & v_2 \\
\vdots & \\
u_M & v_M
\end{array}
$$

Output

Print the answer.

Sample Input 1

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

Sample Output 1

```
1
```

For example, if you delete the first edge, the graph becomes a forest.

Sample Input 2

```
5 0
```

Sample Output 2

```
0
```

Sample Input 3

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

Sample Output 3

```
2
```

D - Switch Seats

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 400 points

Problem Statement

> N couples are seated in a line.
> Count the number of pairs of couples such that neither couple was originally sitting next to each other, and both couples can end up sitting next to each other by swapping seats among those four people.

There is a sequence $A = (A_1, A_2, \ldots, A_{2N})$ of length $2N$. Each of the integers $1, 2, \ldots, N$ appears exactly twice in A.

Find the number of integer pairs (a, b) satisfying $1 \leq a < b \leq N$ and all of the following conditions:

- The two occurrences of a in A are not adjacent.
- The two occurrences of b in A are not adjacent.
- By performing the following operation one or more times in any order, it is possible to reach a state where the two occurrences of a in A are adjacent and the two occurrences of b in A are also adjacent.
  - Choose an integer pair (i, j) $(1 \leq i \leq 2N, 1 \leq j \leq 2N)$ such that $A_i = a$ and $A_j = b$, and swap A_i with A_j.

You are given T test cases; solve each of them.

Constraints

- $1 \leq T \leq 2 \times 10^5$
- $1 \leq N \leq 2 \times 10^5$
- $1 \leq A_i \leq N$
- Each of $1, 2, \ldots, N$ appears exactly twice in A.
- The sum of N over all test cases is at most 2×10^5.
- All input values are integers.

Input

The input is given from Standard Input in the following format, where case_i denotes the i-th test case:

$$
\begin{aligned}
&T\\
&\mathrm{case}_1\\
&\mathrm{case}_2\\
&\vdots\\
&\mathrm{case}_T
\end{aligned}
$$

Each test case is given in the following format:

$$
\begin{aligned}
&N\\
&A_1 \quad A_2 \quad \ldots \quad A_{2N}
\end{aligned}
$$

Output

Print T lines. The i-th line should contain the answer for the i-th test case.

Sample Input 1

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

Sample Output 1

```
1
0
4
```

Consider the first test case.

$(a, b) = (1, 2)$ satisfies the conditions in the problem statement, for the following reasons:

- The two occurrences of 1 in A are not adjacent.
- The two occurrences of 2 in A are not adjacent.
- By performing the operation where $(i, j) = (1, 6)$ and swapping A_1 with A_6, you can reach a state where the two occurrences of 1 are adjacent and the two occurrences of 2 are also adjacent.

$(1, 2)$ is the only pair (a, b) that satisfies the conditions.

E - Replace

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 500 points

Problem Statement

You are given a positive integer N and two strings S and T, each of length N and consisting of lowercase English letters.

Determine whether it is possible to make S identical to T by repeating the operation below any number of times (possibly zero). If it is possible, also find the minimum number of operations required.

- Choose two lowercase English letters x, y and replace **every** occurrence of x in S with y.

Constraints

- $1 \leq N \leq 2 \times 10^5$
- N is an integer.
- Each of S and T is a string of length N, consisting of lowercase English letters.

Input

The input is given from Standard Input in the following format:

N
S
T

Output

If it is possible to make S identical to T, print the minimum number of operations required. Otherwise, print -1.

Sample Input 1

```
6
afbfda
bkckbb
```

Sample Output 1

```
4
```

By performing the operation four times in the following way, you can make S identical to T:

1. Choose $x =$ `b` and $y =$ `c`. S becomes `afcfda`.
2. Choose $x =$ `a` and $y =$ `b`. S becomes `bfcfdb`.
3. Choose $x =$ `f` and $y =$ `k`. S becomes `bkckdb`.
4. Choose $x =$ `d` and $y =$ `b`. S becomes `bkckbb`, which is identical to T.

It cannot be done with fewer than four operations, so the minimum number of operations required is 4.

Sample Input 2

```
4
abac
abac
```

Sample Output 2

```
0
```

S and T are already identical, so no operations are required.

Sample Input 3

```
4
abac
abrc
```

Sample Output 3

```
-1
```

No matter how you repeat the operation, it is impossible to make S identical to T.

Sample Input 4

```
4
abac
bcba
```

Sample Output 4

```
4
```

F - Range Power Sum

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 550 points

Problem Statement

You are given positive integers N, K, and an integer sequence of length N: $A = (A_1, A_2, \ldots, A_N)$.

Find $\displaystyle\sum_{1 \leq l \leq r \leq N} \left(\sum_{l \leq i \leq r} A_i \right)^K$, modulo 998244353.

Constraints

- $1 \leq N \leq 2 \times 10^5$
- $1 \leq K \leq 10$
- $0 \leq A_i < 998244353$
- All input values are integers.

Input

The input is given from Standard Input in the following format:

N K
A_1 A_2 $\ldots$ A_N

Output

Print the answer.

Sample Input 1

```
3 2
3 1 2
```

Sample Output 1

```
75
```

The value is $A_1^2 + A_2^2 + A_3^2 + (A_1 + A_2)^2 + (A_2 + A_3)^2 + (A_1 + A_2 + A_3)^2 = 3^2 + 1^2 + 2^2 + 4^2 + 3^2 + 6^2 = 75$.

Sample Input 2

```
1 10
0
```

Sample Output 2

```
0
```

Sample Input 3

```
10 5
91 59 85 60 57 72 12 3 27 16
```

Sample Output 3

```
428633385
```

Be sure to find the sum modulo 998244353.

G - Colorful Spanning Tree

Time Limit: 6 sec / Memory Limit: 1024 MiB

Score : 675 points

Problem Statement

You are given a connected undirected graph with N vertices and M edges, where the vertices are labeled 1 to N. The graph does not contain self-loops, but it may contain multi-edges. Each edge has a color, and the i-th edge has a color c_i ($1 \leq c_i \leq C$) and connects vertices u_i and v_i. Also, a sequence $A = (A_1, A_2, \ldots, A_C)$ is given.

Among the spanning trees of this graph, those satisfying the following condition are called **colorful spanning trees**:

- For every integer i such that $1 \leq i \leq C$, the number of edges of color i included in the spanning tree is at most A_i.

Find the number of integer pairs (L, R) with $1 \leq L \leq R \leq C$ that satisfy the following condition:

- There exists a colorful spanning tree T such that every edge in T has a color c with $L \leq c \leq R$.

Constraints

- $2 \leq N \leq 150$
- $N - 1 \leq M \leq \min\left(\frac{CN(N-1)}{2}, 5 \times 10^5\right)$
- $1 \leq C \leq 300$
- $1 \leq A_i \leq N - 1$
- $\sum_{i=1}^{C} A_i \leq 300$
- $1 \leq u_i < v_i \leq N$
- $1 \leq c_i \leq C$
- If $i \neq j$, then $(u_i, v_i, c_i) \neq (u_j, v_j, c_j)$
- The given graph is connected.
- All input values are integers.

Input

The input is given from Standard Input in the following format:

$$
\begin{array}{llll}
N & M & C & \\
A_1 & A_2 & \ldots & A_C \\
u_1 & v_1 & c_1 & \\
u_2 & v_2 & c_2 & \\
\vdots & & & \\
u_M & v_M & c_M &
\end{array}
$$

Output

Print the number of integer pairs (L, R) with $1 \leq L \leq R \leq C$ that satisfy the condition in the problem statement.

Sample Input 1

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

Sample Output 1

```
4
```

For example, $(L, R) = (1, 2)$ satisfies the condition, because the spanning tree T formed by the 1st and 4th edges is a colorful spanning tree, and all edges in T have colors c with $1 \leq c \leq 2$.
There are four pairs (L, R) that satisfy the condition: $(1, 2)$, $(1, 3)$, $(2, 2)$, $(2, 3)$.

Sample Input 2

```
5 10 6
2 2 4 1 1 1
1 3 2
1 5 4
2 3 3
1 4 1
4 5 1
4 5 3
2 4 1
1 4 3
1 3 4
1 2 5
```

Sample Output 2

```
11
```

Sample Input 3

```
10 20 5
2 4 4 6 4
5 9 1
4 5 2
2 8 5
8 9 4
1 10 5
8 10 1
8 9 5
4 8 2
4 10 4
5 8 3
5 9 5
6 10 2
3 5 4
4 6 1
3 4 3
7 9 3
5 7 1
1 3 3
1 8 5
5 10 4
```

Sample Output 3

```
2
```