A - The Number of Even Pairs

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 100 points

Problem Statement

We have $N + M$ balls, each of which has an integer written on it.
It is known that:

- The numbers written on N of the balls are even.
- The numbers written on M of the balls are odd.

Find the number of ways to choose two of the $N + M$ balls (disregarding order) so that the sum of the numbers written on them is even.
It can be shown that this count does not depend on the actual values written on the balls.

Constraints

- $0 \leq N, M \leq 100$
- $2 \leq N + M$
- All values in input are integers.

Input

Input is given from Standard Input in the following format:

$$N \quad M$$

Output

Print the answer.

Sample Input 1

```
2 1
```

Sample Output 1

```
1
```

For example, let us assume that the numbers written on the three balls are $1, 2, 4$.

- If we choose the two balls with 1 and 2, the sum is odd;
- If we choose the two balls with 1 and 4, the sum is odd;
- If we choose the two balls with 2 and 4, the sum is even.

Thus, the answer is 1.

Sample Input 2

```
4 3
```

Sample Output 2

```
9
```

Sample Input 3

```
1 1
```

Sample Output 3

```
0
```

Sample Input 4

```
13 3
```

Sample Output 4

```
81
```

Sample Input 5

```
0 3
```

Sample Output 5

```
3
```

B - String Palindrome

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 200 points

Problem Statement

A string S of an odd length is said to be a *strong palindrome* if and only if all of the following conditions are satisfied:

- S is a palindrome.
- Let N be the length of S. The string formed by the 1-st through $((N-1)/2)$-th characters of S is a palindrome.
- The string consisting of the $(N+3)/2$-st through N-th characters of S is a palindrome.

Determine whether S is a strong palindrome.

Constraints

- S consists of lowercase English letters.
- The length of S is an odd number between 3 and 99 (inclusive).

Input

Input is given from Standard Input in the following format:

$$S$$

Output

If S is a strong palindrome, print `Yes`; otherwise, print `No`.

Sample Input 1

```
akasaka
```

Sample Output 1

```
Yes
```

- S is 'akasaka'.
- The string formed by the 1-st through the 3-rd characters is 'aka'.
- The string formed by the 5-th through the 7-th characters is 'aka'. All of these are palindromes, so S is a strong palindrome.

Sample Input 2

```
level
```

Sample Output 2

```
No
```

Sample Input 3

```
atcoder
```

Sample Output 3

```
No
```

C - Maximum Volume

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 300 points

Problem Statement

Given is a positive integer L. Find the maximum possible volume of a rectangular cuboid whose sum of the dimensions (not necessarily integers) is L.

Constraints

- $1 \leq L \leq 1000$
- L is an integer.

Input

Input is given from Standard Input in the following format:

```
L
```

Output

Print the maximum possible volume of a rectangular cuboid whose sum of the dimensions (not necessarily integers) is L. Your output is considered correct if its absolute or relative error from our answer is at most 10^{-6}.

Sample Input 1

```
3
```

Sample Output 1

```
1.000000000000
```

For example, a rectangular cuboid whose dimensions are 0.8, 1, and 1.2 has a volume of 0.96.

On the other hand, if the dimensions are 1, 1, and 1, the volume of the rectangular cuboid is 1, which is greater.

Sample Input 2

```
999
```

Sample Output 2

```
36926037.000000000000
```

D - Banned K

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 400 points

Problem Statement

We have N balls. The i-th ball has an integer A_i written on it.
For each $k = 1, 2, \ldots, N$, solve the following problem and print the answer.

- Find the number of ways to choose two distinct balls (disregarding order) from the $N - 1$ balls other than the k-th ball so that the integers written on them are equal.

Constraints

- $3 \leq N \leq 2 \times 10^5$
- $1 \leq A_i \leq N$
- All values in input are integers.

Input

Input is given from Standard Input in the following format:

$$N$$
$$A_1 \quad A_2 \quad \ldots \quad A_N$$

Output

For each $k = 1, 2, \ldots, N$, print a line containing the answer.

Sample Input 1

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

Sample Output 1

```
2
2
3
2
3
```

Consider the case $k = 1$ for example. The numbers written on the remaining balls are $1, 2, 1, 2$.
From these balls, there are two ways to choose two distinct balls so that the integers written on them are equal.
Thus, the answer for $k = 1$ is 2.

Sample Input 2

```
4
1 2 3 4
```

Sample Output 2

```
0
0
0
0
```

No two balls have equal numbers written on them.

Sample Input 3

```
5
3 3 3 3 3
```

Sample Output 3

```
6
6
6
6
6
```

Any two balls have equal numbers written on them.

Sample Input 4

```
8
1 2 1 4 2 1 4 1
```

Sample Output 4

```
5
7
5
7
7
5
7
5
```

E - Dividing Chocolate

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 500 points

Problem Statement

We have a chocolate bar partitioned into H horizontal rows and W vertical columns of squares.

The square (i, j) at the i-th row from the top and the j-th column from the left is dark if $S_{i,j}$ is `0`, and white if $S_{i,j}$ is `1`.

We will cut the bar some number of times to divide it into some number of blocks. In each cut, we cut the whole bar by a line running along some boundaries of squares from end to end of the bar.

How many times do we need to cut the bar so that every block after the cuts has K or less white squares?

Constraints

- $1 \leq H \leq 10$
- $1 \leq W \leq 1000$
- $1 \leq K \leq H \times W$
- $S_{i,j}$ is `0` or `1`.

Input

Input is given from Standard Input in the following format:

$$H \quad W \quad K$$
$$S_{1,1}S_{1,2}\ldots S_{1,W}$$
$$:$$
$$S_{H,1}S_{H,2}\ldots S_{H,W}$$

Output

Print the number of minimum times the bar needs to be cut so that every block after the cuts has K or less white squares.

Sample Input 1

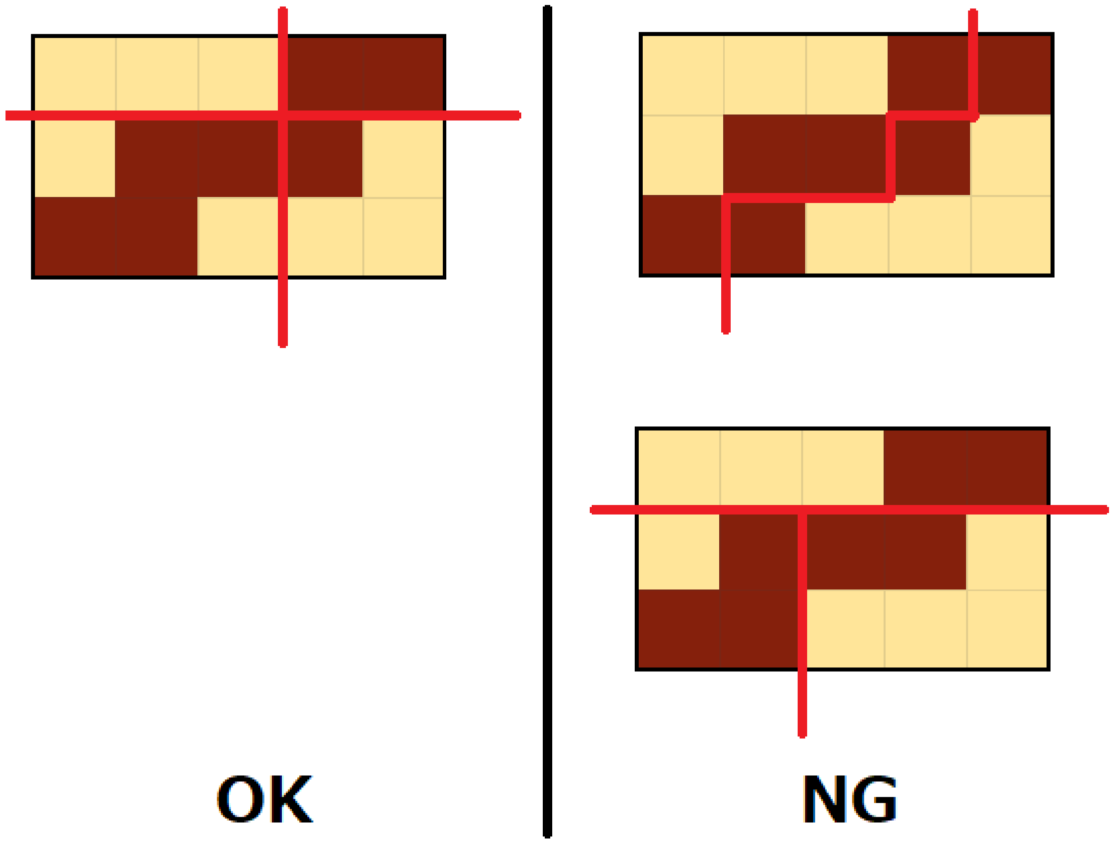
```
3 5 4
11100
10001
00111
```

Sample Output 1

```
2
```

For example, cutting between the 1-st and 2-nd rows and between the 3-rd and 4-th columns - as shown in the figure to the left - works.

Note that we cannot cut the bar in the ways shown in the two figures to the right.



Sample Input 2

```
3 5 8
11100
10001
00111
```

Sample Output 2

```
0
```

No cut is needed.

Sample Input 3

```
4 10 4
1110010010
1000101110
0011101001
1101000111
```

Sample Output 3

```
3
```

F - Knapsack for All Segments

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 600 points

Problem Statement

Given are a sequence of N integers A_1, A_2, $\ldots$, A_N and a positive integer S.
For a pair of integers (L, R) such that $1 \leq L \leq R \leq N$, let us define $f(L, R)$ as follows:

- $f(L, R)$ is the number of sequences of integers $(x_1, x_2, \ldots, x_k)$ such that $L \leq x_1 < x_2 < \cdots < x_k \leq R$ and $A_{x_1} + A_{x_2} + \cdots + A_{x_k} = S$.

Find the sum of $f(L, R)$ over all pairs of integers (L, R) such that $1 \leq L \leq R \leq N$. Since this sum can be enormous, print it modulo 998244353.

Constraints

- All values in input are integers.
- $1 \leq N \leq 3000$
- $1 \leq S \leq 3000$
- $1 \leq A_i \leq 3000$

Input

Input is given from Standard Input in the following format:

$$
\begin{array}{l}
N \quad S \\
A_1 \quad A_2 \quad \ldots \quad A_N
\end{array}
$$

Output

Print the sum of $f(L, R)$, modulo 998244353.

Sample Input 1

```
3 4
2 2 4
```

Sample Output 1

```
5
```

The value of $f(L, R)$ for each pair is as follows, for a total of 5.

- $f(1,1) = 0$
- $f(1,2) = 1$ (for the sequence $(1,2)$)
- $f(1,3) = 2$ (for $(1,2)$ and (3))
- $f(2,2) = 0$
- $f(2,3) = 1$ (for (3))
- $f(3,3) = 1$ (for (3))

Sample Input 2

```
5 8
9 9 9 9 9
```

Sample Output 2

```
0
```

Sample Input 3

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

Sample Output 3

```
152
```