A - 11/22 String

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score: 150 points

Problem Statement

The definition of an 11/22 string in this problem is the same as in Problems C and E.

A string T is called an **11/22 string** when it satisfies all of the following conditions:

- |T| is odd. Here, |T| denotes the length of T.
- The 1-st through $(rac{|T|+1}{2}-1)$ -th characters are all 1.
- The $(\frac{|T|+1}{2})$ -th character is /. The $(\frac{|T|+1}{2}+1)$ -th through |T|-th characters are all 2.

For example, 11/22, 111/222, and / are 11/22 strings, but 1122, 1/22, 11/2222, 22/11, and //2/2/211 are not.

Given a string S of length N consisting of 1, 2, and /, determine whether S is an 11/22 string.

Constraints

- $1 \le N \le 100$
- S is a string of length N consisting of 1, 2, and /.

Input

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

N

S

Output

If S is an 11/22 string, print Yes; otherwise, print No.



Sample Output 1

Yes

11/22 satisfies the conditions for an 11/22 string in the problem statement.

Sample Input 2

1

Sample Output 2

Yes

/ satisfies the conditions for an 11/22 string.

Sample Input 3

4 1/22

Sample Output 3

No

1/22 does not satisfy the conditions for an 11/22 string.

Sample Input 4

5 22/11

Sample Output 4

No

B-1122 String

Time Limit: 2 sec / Memory Limit: 1024 MiB

 $\mathsf{Score} : 150 \, \mathsf{points}$

Problem Statement

A string T is called a **1122 string** if and only if it satisfies all of the following three conditions:

- |T| is even. Here, |T| denotes the length of T.
- ullet For each integer i satisfying $1 \leq i \leq rac{|T|}{2}$, the (2i-1)-th and 2i-th characters of T are equal.
- ullet Each character appears in T exactly zero or two times. That is, every character contained in T appears exactly twice in T.

Given a string S consisting of lowercase English letters, print Yes if S is a 1122 string, and No otherwise.

Constraints

• S is a string of length between 1 and 100, inclusive, consisting of lowercase English letters.

Input

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

S

Output

If S is a 1122 string, print Yes; otherwise, print No.

Sample Input 1

aabbcc

Sample Output 1

Yes

S=aabbcc satisfies all the conditions for a 1122 string, so print Yes.

Sample Input 2

aab

Sample Output 2

No

S=aab has an odd length and does not satisfy the first condition, so print No.

Sample Input 3

ZZZZZZ

Sample Output 3

No

S=zzzzzz contains six zs and does not satisfy the third condition, so print No.

C - 11/22 Substring

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score: 300 points

Problem Statement

The definition of an 11/22 string in this problem is the same as in Problems A and E.

A string T is called an **11/22 string** when it satisfies all of the following conditions:

- |T| is odd. Here, |T| denotes the length of T.
- The 1-st through $(rac{|T|+1}{2}-1)$ -th characters are all 1.
- The $(\frac{|T|+1}{2})$ -th character is /. The $(\frac{|T|+1}{2}+1)$ -th through |T|-th characters are all 2.

For example, 11/22, 111/222, and / are 11/22 strings, but 1122, 1/22, 11/2222, 22/11, and //2/2/211 are not.

You are given a string S of length N consisting of 1, 2, and /, where S contains at least one /.

Find the maximum length of a (contiguous) substring of S that is an 11/22 string.

Constraints

- $1 \le N \le 2 \times 10^5$
- S is a string of length N consisting of 1, 2, and /.
- S contains at least one /.

Input

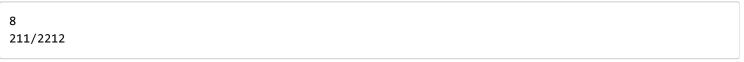
The input is given from Standard Input in the following format:

N

S

Output

Print the maximum length of a (contiguous) substring of S that is an 11/22 string.



Sample Output 1

5

The substring from the 2-nd to 6-th character of S is 11/22, which is an 11/22 string. Among all substrings of S that are 11/22 strings, this is the longest. Therefore, the answer is 5.

Sample Input 2

5 22/11

Sample Output 2

1

Sample Input 3

22 /1211/2///2111/2222/11

Sample Output 3

7

D - 1122 Substring

Time Limit: 2 sec / Memory Limit: 1024 MiB

Score: 425 points

Problem Statement

A sequence $X=(X_1,X_2,\ldots)$ of positive integers (possibly empty) is called a **1122 sequence** if and only if it satisfies all of the following three conditions: (The definition of a 1122 sequence is the same as in Problem F.)

- |X| is even. Here, |X| denotes the length of X.
- For each integer i satisfying $1 \leq i \leq rac{|X|}{2}$, X_{2i-1} and X_{2i} are equal.
- Each positive integer appears in X either not at all or exactly twice. That is, every positive integer contained in X appears exactly twice in X.

Given a sequence $A=(A_1,A_2,\ldots,A_N)$ of length N consisting of positive integers, print the maximum length of a **(contiguous) subarray** of A that is a 1122 sequence.

Constraints

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

Input

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

Output

Print the maximum length of a (contiguous) subarray of A that is a 1122 sequence.

```
8
2 3 1 1 2 2 1 1
```

Sample Output 1

4

For example, taking the subarray from the 3-rd to 6-th elements of A, we get (1,1,2,2), which is a 1122 sequence of length 4.

There is no longer (contiguous) subarray that satisfies the conditions for a 1122 sequence, so the answer is 4.

Sample Input 2

3 1 2 2

Sample Output 2

2

Sample Input 3

1

Sample Output 3

0

Note that a sequence of length $\boldsymbol{0}$ also satisfies the conditions for a 1122 sequence.

E - 11/22 Subsequence

Time Limit: 3 sec / Memory Limit: 1024 MiB

Score: 500 points

Problem Statement

The definition of an 11/22 string in this problem is the same as in Problems A and C.

A string T is called an **11/22 string** when it satisfies all of the following conditions:

- |T| is odd. Here, |T| denotes the length of T.
- The 1-st through $(rac{|T|+1}{2}-1)$ -th characters are all 1.
- The $(\frac{|T|+1}{2})$ -th character is /. The $(\frac{|T|+1}{2}+1)$ -th through |T|-th characters are all 2.

For example, 11/22, 111/222, and / are 11/22 strings, but 1122, 1/22, 11/2222, 22/11, and //2/2/211 are not.

Given a string S of length N consisting of 1, 2, and /, process Q queries.

Each query provides two integers L and R. Let T be the (contiguous) substring of S from the L-th through R-th character. Find the maximum length of a subsequence (not necessarily contiguous) of T that is an 11/22 string. If no such subsequence exists, print 0.

Constraints

- $1 \le N \le 10^5$
- $1 < Q < 10^5$
- S is a string of length N consisting of 1, 2, and /.
- 1 < L < R < N
- N, Q, L, and R are integers.

Input

The input is given from Standard Input in the following format. Here, $query_i$ denotes the i-th query.

Each query is given in the following format:

```
oxed{L} oxed{R}
```

Output

Print Q lines. The i-th line should contain the answer to the i-th query.

Sample Input 1

```
12 5
111/212/1122
1 7
9 12
3 6
4 10
1 12
```

Sample Output 1

```
5

0

3

1

7
```

For the first query, the substring from the 1-st to 7-th character of S is 111/212. This string contains 11/22 as a subsequence, which is the longest subsequence that is an 11/22 string. Therefore, the answer is 5. For the second query, the substring from the 9-th to 12-th character of S is 1122. This string does not contain any subsequence that is an 11/22 string, so the answer is 0.

F - 1122 Subsequence

Time Limit: 3 sec / Memory Limit: 1024 MiB

Score: 525 points

Problem Statement

A sequence $X=(X_1,X_2,\ldots)$ of positive integers (possibly empty) is called a **1122 sequence** if and only if it satisfies all of the following three conditions: (The definition of a 1122 sequence is the same as in Problem D.)

- |X| is even. Here, |X| denotes the length of X.
- For each integer i satisfying $1 \leq i \leq rac{|X|}{2}$, X_{2i-1} and X_{2i} are equal.
- Each positive integer appears in X either not at all or exactly twice. That is, every positive integer contained in X appears exactly twice in X.

Given a sequence $A=(A_1,A_2,\ldots,A_N)$ of length N consisting of positive integers, print the maximum length of a **subsequence** (not necessarily contiguous) of A that is a 1122 sequence.

Constraints

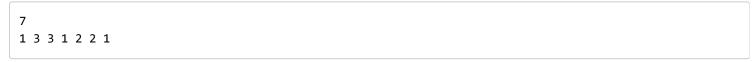
- $1 < N < 2 \times 10^5$
- $1 \le A_i \le 20$
- All input values are integers.

Input

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

Output

Print the maximum length of a (not necessarily contiguous) subsequence of ${\it A}$ that is a 1122 sequence.



Sample Output 1

4

For example, choosing the 1-st, 4-th, 5-th, and 6-th elements of A, we get (1,1,2,2), which is a 1122 sequence of length 4.

There is no longer subsequence that satisfies the conditions for a 1122 sequence, so the answer is 4.

Sample Input 2

1 20

Sample Output 2

0

G - Fibonacci Product

Time Limit: 4 sec / Memory Limit: 1024 MiB

Score: 675 points

Problem Statement

Define a sequence a_1, a_2, a_3, \ldots as follows:

$$a_n = egin{cases} x & (n=1) \ y & (n=2) \ a_{n-1} + a_{n-2} & (n \geq 3) \end{cases}$$

Find
$$(\prod_{i=1}^{N} a_i) \mod 998244353$$
.

You are given T test cases to solve.

Constraints

- $1 \le T \le 5$
- $1 \le N \le 10^{18}$
- $0 \le x \le 998244352$
- $0 \le y \le 998244352$
- All input values are integers.

Input

The input is given from Standard Input in the following format. Here, $case_i$ denotes the i-th test case.

Each test case is given in the following format:

$$N \hspace{0.1cm} x \hspace{0.1cm} y$$

Output

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

Sample Input 1

Sample Output 1

```
30
577322229
726998219
```

For the first test case, the elements of the sequence are $1,1,2,3,5,8,\ldots$. Thus, the answer is $(1\times1\times2\times3\times5)$ mod 998244353=30.