

Near Pair

Input file: **standard input**
Output file: **standard output**
Time limit: 2 seconds
Memory limit: 1024 megabytes

This is an **interactive problem**, where your program interacts with the judge system via Standard Input and Output.

You are given integers N , K , and Q . The judge holds a hidden permutation (a_1, a_2, \dots, a_N) of $(1, 2, \dots, N)$. You may ask up to Q queries to the judge, where each query is as follows:

- Choose a subset S from $\{1, 2, \dots, N\}$. The judge will return the number of distinct pairs (i, j) such that $i < j$ and $|a_i - a_j| \leq K$ where $i, j \in S$.

Let x be the index t where $a_t = 1$, and y be the index t where $a_t = N$. Your task is to identify the set $\{x, y\}$. (You do not need to distinguish which is x and which is y .)

The judge is non-adaptive, meaning the permutation (a_1, a_2, \dots, a_N) is fixed before any interaction begins.

Input

- All input values are integers.
- $N = 20000$
- $1 \leq K \leq 10$
- $Q = 30(K + 1)$

Interaction Protocol

First, read integers N , K , and Q from the Standard Input:

```
N K Q
```

Then, repeat the following process until you identify the set $\{x, y\}$:

For a query, output the following format to the Standard Output:

```
? s1s2...sN
```

Here, $s_1s_2\dots s_N$ is a binary string of length N representing the subset S , where $s_i = 1$ if $i \in S$, and $s_i = 0$ otherwise.

The response to your query will be provided in the Standard Input in the following format:

```
T
```

Here, T is the answer to the query, representing the number of distinct pairs (i, j) such that $i < j$ and $|a_i - a_j| \leq K$ where $i, j \in S$.

Once you identify the set $\{x, y\}$, output the two elements in the following format (order does not matter) and terminate your program immediately:

```
! x y
```

Note

- Print a newline and flush Standard Output at the end of each message. Otherwise, you may get a Time Limit Exceeded verdict.
- If your query format is invalid or you exceed the number of queries, the judge will respond with $T = -1$. If you receive this response, you should immediately terminate your program. Otherwise, you may get a Time Limit Exceeded verdict.
- Beware that unnecessary newlines are considered as malformed.

Sample Interaction

The following is a sample interaction for $N = 5$, $K = 2$, $Q = 90$. Note that this example does not meet the constraints and will not appear in the test cases.

Input	Output	Explanation
		The judge holds the permutation $(3, 5, 2, 1, 4)$.
5 2 90		First, integers N , K , and Q are provided.
	? 11000	You query with $S = \{1, 2\}$.
1		Only the pair $(1, 2)$ satisfies the condition, so the judge responds with 1.
	? 10011	You query with $S = \{1, 4, 5\}$.
2		The pairs $(1, 4)$ and $(1, 5)$ satisfy the condition, so the judge responds with 2.
	! 2 4	You output $\{2, 4\}$ as the answer. Since $a_4 = 1$ and $a_2 = N$, this output is correct.