Order statistic set

English Vietnamese

In this problem, you have to maintain a dynamic set of numbers which support the two fundamental operations

- INSERT(S,x): if x is not in S, insert x into S
- DELETE(S,x): if x is in S, delete x from S

and the two type of queries

- K-TH(S) : return the k-th smallest element of S
- COUNT(S,x): return the number of elements of S smaller than x

Input

- Line 1: Q ($1 \le Q \le 200000$), the number of operations
- In the next Q lines, the first token of each line is a character I, D, K or C meaning that the corresponding operation is INSERT, DELETE, K-TH or COUNT, respectively, following by a whitespace and an integer which is the parameter for that operation.

If the parameter is a value x, it is guaranteed that $0 \le |x| \le 10^9$. If the parameter is an index k, it is guaranteed that $1 \le k \le 10^9$.

Output

For each query, print the corresponding result in a single line. In particular, for the queries K-TH, if k is larger than the number of elements in S, print the word 'invalid'.

Example

Input

```
8
I -1
I -1
I 2
C 0
K 2
D -1
K 1
K 2
```

Output

```
1
2
2
invalid
```