4 Extending stack interface

Problem Introduction

Stack is an abstract data type supporting the operations `Push()` and `Pop()`. It is not difficult to implement it in a way that both these operations work in constant time. In this problem, you goal will be to implement a stack that also supports finding the maximum value and to ensure that all operations still work in constant time.

Problem Description

Task. Implement a stack supporting the operations `Push()`, `Pop()`, and `Max()`.

Input Format. The first line of the input contains the number q of queries. Each of the following q lines specifies a query of one of the following formats: `push v`, `pop`, or max.

Constraints. $1 \le q \le 400\,000$, $0 \le v \le 10^5$.

Output Format. For each `max` query, output (on a separate line) the maximum value of the stack.

Time Limits.

language	C	C++	Java	Python	C#	Haskell	JavaScript	Ruby	Scala
time (sec)	1	1	1.5	5	1.5	2	5	5	3

Memory Limit. 512MB.

Sample 1.

Input:

```
5
push 2
push 1
max
pop
max
```

Output:

```
2
2
```

Explanation:
After the first two `push` queries, the stack contains elements 1 and 2. After the `pop` query, the element 1 is removed.

Sample 2.

Input:

```
5
push 1
push 2
max
pop
max
```

Output:

```
2
1
```

Sample 3.

Input:

```
10
push 2
push 3
push 9
push 7
push 2
max
max
max
pop
max
```

Output:

```
9
9
9
9
```

Sample 4.

Input:

```
3
push 1
push 7
pop
```

Output:

```

```

Explanation:
The output is empty since there are no `max` queries.

Sample 5.

Input:

```
6
push 7
push 1
push 7
max
pop
max
```

Output:

```
7
7
```

Starter Files

The starter solutions in `C++`, `Java`, and `Python3` process the queries naively: for each `max` query they scan the current contents of the stack to find the maximum value. Hence the `max` query has running time proportional to the size of the stack. Your goal is to modify it so that its running time becomes constant. For other programming languages, you need to implement a solution from scratch.

What to Do

Think about using an auxiliary stack.

Need Help?

Ask a question or see the questions asked by other learners at this forum thread.