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Description

Solution

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716. Max Stack

Hard

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Design a max stack data structure that supports the stack operations and supports finding the stack's maximum element.

Implement the `MaxStack` class:

- `MaxStack()` Initializes the stack object.
- `void push(int x)` Pushes element `x` onto the stack.
- `int pop()` Removes the element on top of the stack and returns it.
- `int top()` Gets the element on the top of the stack without removing it.
- `int peekMax()` Retrieves the maximum element in the stack without removing it.
- `int popMax()` Retrieves the maximum element in the stack and removes it. If there is more than one maximum element, only remove the **top-most** one.

You must come up with a solution that supports $O(1)$ for each `top` call and $O(\log n)$ for each other call.

Example 1:

Input

["MaxStack", "push", "push", "push", "top", "popMax", "top", "peekMax", "pop", "top"]

[[], [5], [1], [5], [], [], [], [], [], []]

Output

[null, null, null, null, 5, 5, 1, 5, 1, 5]

Explanation

MaxStack stk = new MaxStack();
stk.push(5); // [5] the top of the stack and the maximum number is 5.
stk.push(1); // [5, 1] the top of the stack is 1, but the maximum is 5.
stk.push(5); // [5, 1, 5] the top of the stack is 5, which is also the maximum, because it is the top most one.
stk.top(); // return 5, [5, 1, 5] the stack did not change.
stk.popMax(); // return 5, [5, 1] the stack is changed now, and the top is different from the max.
stk.top(); // return 1, [5, 1] the stack did not change.
stk.peekMax(); // return 5, [5, 1] the stack did not change.
stk.pop(); // return 1, [5] the top of the stack and the max element is now 5.
stk.top(); // return 5, [5] the stack did not change.

Constraints:

- $-10^7 \leq x \leq 10^7$
- At most 10^5 calls will be made to `push`, `pop`, `top`, `peekMax`, and `popMax`.
- There will be **at least one element** in the stack when `pop`, `top`, `peekMax`, or `popMax` is called.

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```
class MaxStack {  
  
    public MaxStack() {  
    }  
  
    public void push(int x) {  
    }  
  
    public int pop() {  
    }  
  
    public int top() {  
    }  
  
    public int peekMax() {  
    }  
  
    public int popMax() {  
    }  
}  
  
/**  
 * Your MaxStack object will be instantiated and called as such:  
 * MaxStack obj = new MaxStack();  
 * obj.push(x);  
 * int param_2 = obj.pop();  
 * int param_3 = obj.top();  
 * int param_4 = obj.peekMax();  
 */
```

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https://leetcode.com/problems/max-stack/1/1