

716. Max Stack Premium

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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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YesNo

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