S3-Class3 [Stack-3]

Stack Permutation :-

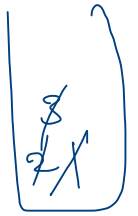
total cp ⇒ 5 valid

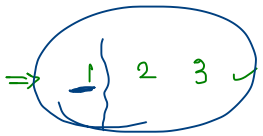
↳ stack per-

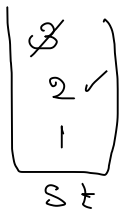
General permutations

i/p :- 1 2 3 ✓

✓ 1 2 3	push(1), pop(1), push(2), pop(2), push(3), pop(3) ⇒ 1 2 3 ✓
✓ 1 3 2	push(1), pop(1) push(2), push(3), pop(3), pop(2) ⇒ 1, 3, 2 ✓
✓ 2 1 3	push(1), push(2), pop(2), pop(1), push(3), pop(3)
⇒ 2 3 1	H/W
? 3 1 2	push(1), ~~push(2)~~, push(3), pop(3), X invalid.
→ 3 2 1	valid







push(3), pop(), push(1), pop(), push(2), pop()

GATE CSE 1994 | Question: 1.14

Stack

push(x)

pop(x) ⇐ X

asked in DS Oct 4, 2014 • recategorized Apr 25, 2021 by Lakshman Bhaiya

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Which of the following permutations can be obtained in the output (in the same order) using a stack assuming that the input is the sequence 1, 2, 3, 4, 5 in that order?

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A. 3, 4, 5, 1, 2

B. 3, 4, 5, 2, 1

C. 1, 5, 2, 3, 4

D. 5, 4, 3, 1, 2

H/W

A) 3, 4, 5, 1, 2

P(1)

→ P(2)

P(3)

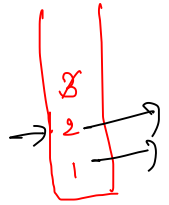
→ P( ) : 3

P(4)

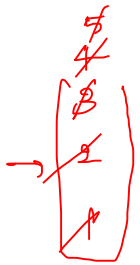
P( ) 4

P(5)

P( )



B) 3 4 5 2 1



$n=5$

General permutations

$5! = 120$

* stack permutations

↳ catalon number

$$\frac{2n C_n}{n+1}$$

$n=3$

$n=3$

$3! = 6$ (GP)

5 ✓ stack permutations.

$${}^{n}C_{r} = \frac{n!}{(n-r)! \times r!}$$

$$\frac{{}^{6}C_{3}}{4} = \frac{1}{4} \times {}^{6}C_{3} = \frac{1}{4} \times \frac{6!}{3! \times 3!}$$

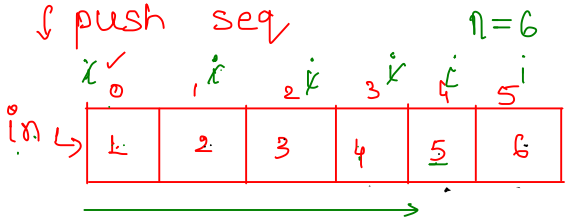
$$= \frac{6 \times 5 \times 4 \times 3!}{4 \times 3! \times 6}$$

$= 5$ ✓

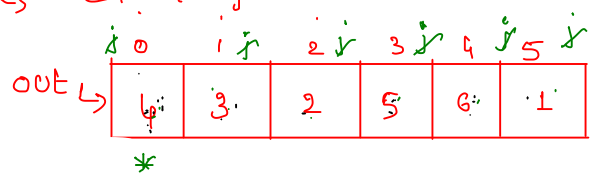
OJ

i/p

↓ push seq



↳ stack permutation.



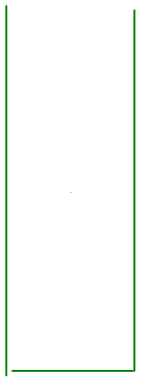
T/F

j

x

6! = 720 ✓

How long pop( )



St ✓ → valid ✓

code ?

O(1): min ele ✓

getmin( )

```
boolean isValid(int push[], int pop[], int n)
{
	Stack<Integer> st=new Stack<>();
	int j=0;
	for(int i=0;i<n;i++)
	{
		st.push(in[i]);
		while(!st.isEmpty() && j<n && st.peek()== out[j])
		{
			st.pop();
			j++;
		}


	}
	return st.isEmpty;

}
```

3) Get minimum Element of stack in O(1) time :-

push(5)

push(20)

push(15)

push(3)

push(14)

pop()

GetMin()

push(2)

GetMin()

3) Get minimum Element of stack in O(1) time :-

push(5)

push(20)

push(15)

push(3)

push(2)

pop()

GetMin()

push(2)

GetMin()

C1

push(5), push(7), push(8), getMin()

push(5), push(3), getMin(), pop(), getMin()

push(5), push(3), getMin(), pop(), getMin()

push(3), push(5), push(2), push(7) , push(8), pop(), getMin(), pop(), push(1), getMin(), pop(), getMin()

```
void push(int x)
{
        if(st.size()==0)
        {
                st.push(x);
                minElement=x;
        }
        else
        {
                if(x>=minElement)
                {
                        st.push(x);
                }
                else
                {
                        st.push(2*x-minElement);
                        minElement=x;
                }
        }
}
```

```
int pop()
{
        if(st.size()==0)
        {
                return -1; // UnderFlow
        }
        else
        {
                if(st.peek>=minElement)
                {
                        st.pop();
                }
                else
                {
                        minElement=2*minElement-st.peek();
                        st.pop();
                }
        }
}
```

```
int getMin()
{
	if(st.size()==0)
		return -1;
	else
	{
		if(st.peek()>=minElement)
			return st.peek();
		else
			return minElement;
	}
}
```