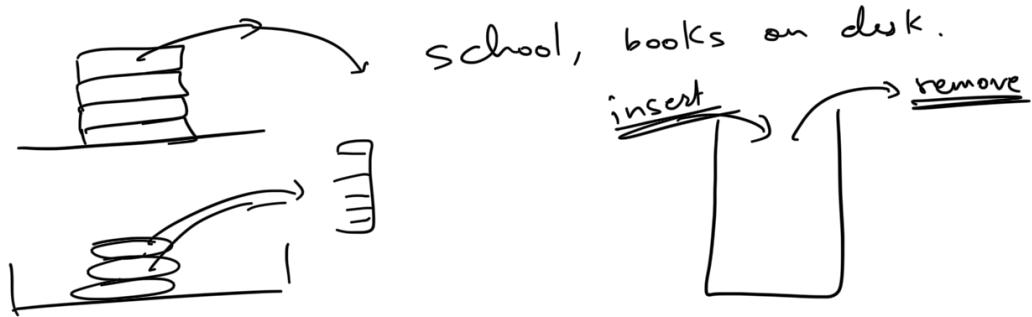


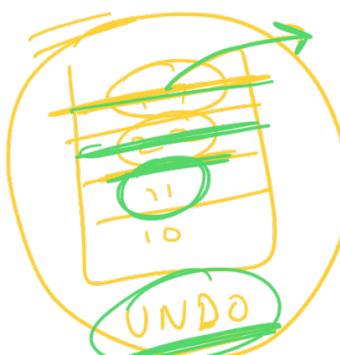
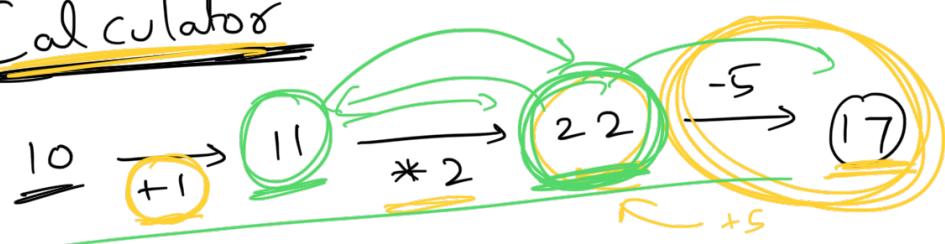
Stacks



Chrome tab → close → reopen
undo/redo

recursion
Array → $O(1)$ random access
stack → access to only topmost element

Calculator



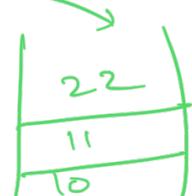
$$22 \wedge 10 \Rightarrow x$$

$$x \wedge 10 \Rightarrow$$

$$10 \wedge 10 \Rightarrow 0$$

$$17 + 5 \rightarrow 22 / 2 \Rightarrow 11 - 10$$

REDO?





stack operations

T.C $\Rightarrow O(1)$

- 1) push(x) \rightarrow insert 'x' at top of stack
- 2) pop() \rightarrow removes the topmost element.
- 3) peek() / top() \rightarrow returns the topmost element
- 4) isEmpty() \rightarrow if stack is empty?

Implement stack using Array?

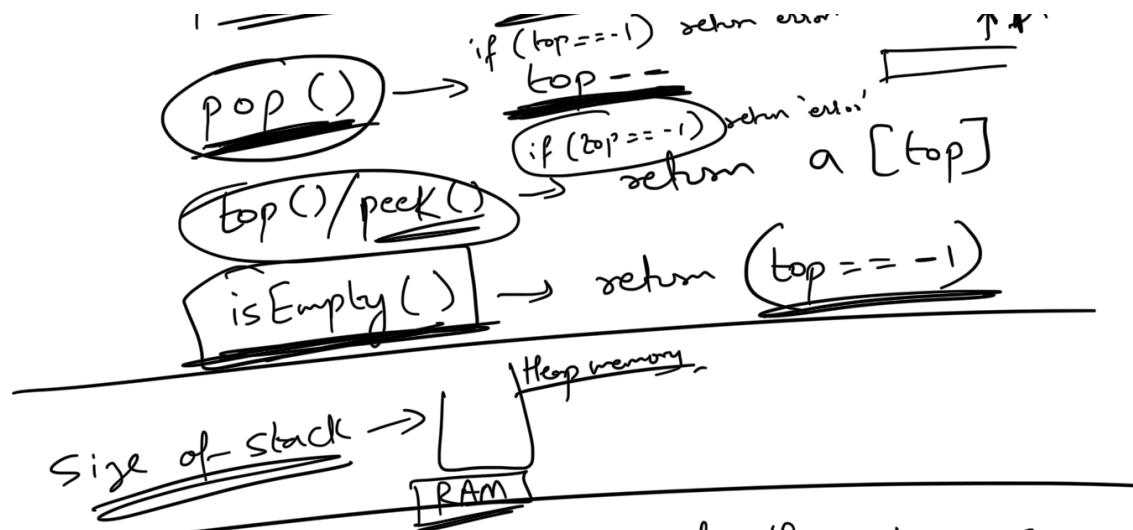
(Wal-Mart,
SAP Labs,
MMT,
VMware)
etc.

Linear D.S.
Static Array / Dynamic array (vector)

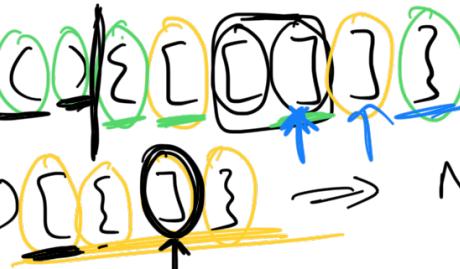


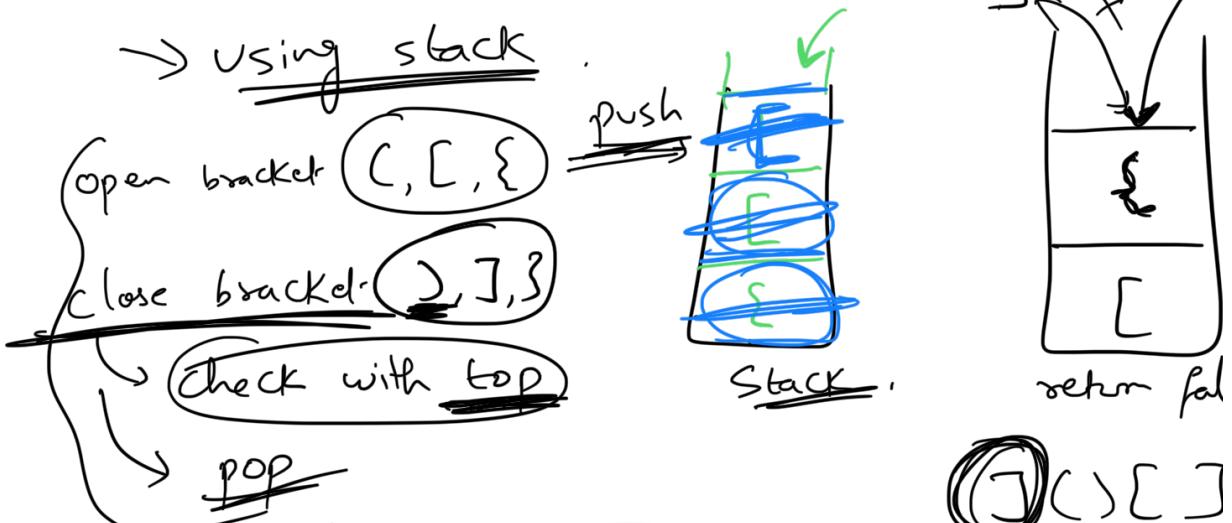
Initially $\text{top} = -1$.
push(3) \rightarrow $a[+\text{top}] = 3$.





Q.1 Balanced Parenthesis → check if the given sequence of characters (,) , {, } , [,] is balanced or not?
 (G.S.)
 (paypal)
 Angga

e.g.  ⇒ True.
 ⇒ No



Also check finally
 stack ⇒ isEmpty() true



() () []

Q.2 Implement stack such that it supports 'min()' currently present in the st.

e.g. 6, 5, 6, 2, Pop(), 3, pop(), pop(), getmin(), 3, 7, 8



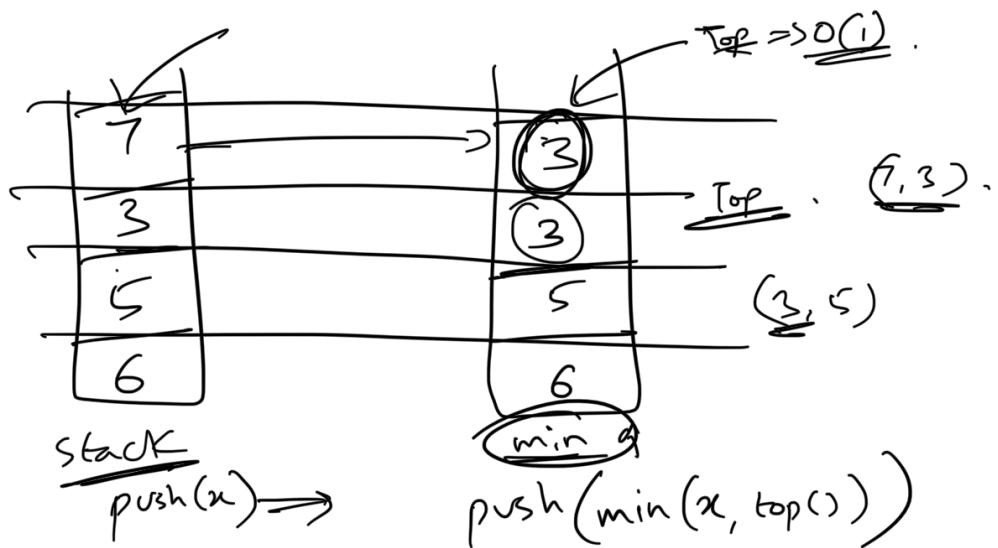
maintain var 'min'

$\text{min} = 3$

min = 3



obs: Using 2 stacks



T.C \Rightarrow each getMin() \Rightarrow O(1).

S.C \Rightarrow O(N)

We can save some memory by not updating if a larger number comes in.

~~6, 5, 9, 3, 10~~



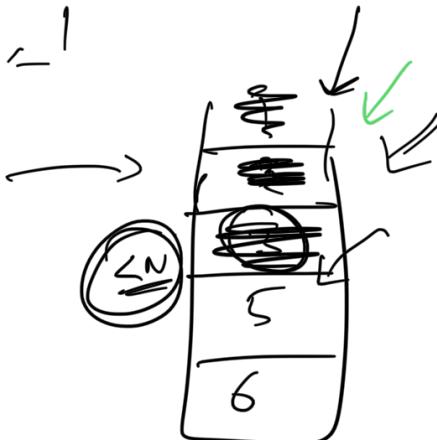
pop(), pop(),
getmin. (5)

if ($x \leq \text{min}$)
wis.push(x)

gbrm in (3)

pop, pop
getmin

~~6, 5, 3, 3, 10, -1~~



popB, getmin()

$T.S.C \Rightarrow O(N)$

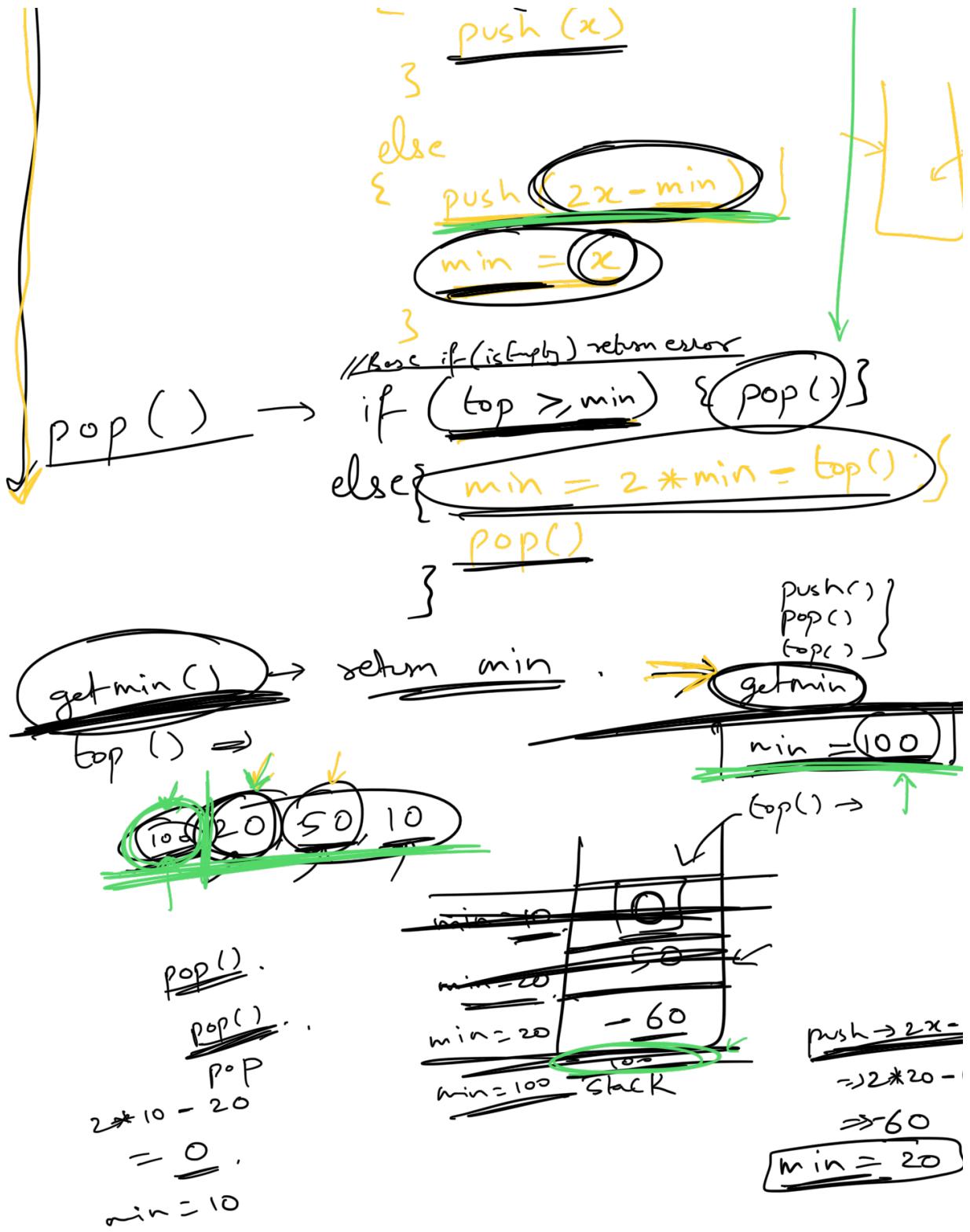
good for all interviews

Method (2) \Rightarrow $O(1)$ space. extra (auxiliary)

var min

push(x)

\rightarrow if ($! \text{IsEmpty}()$ && $x \geq \text{min}$)

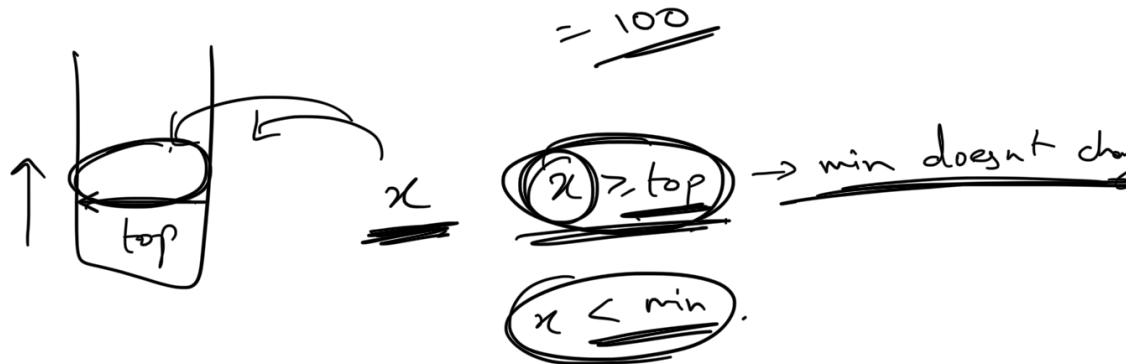


$$\min = 2 * \min - \text{top}$$

$$= 2 * 10 - 0$$

$$\underline{\min = 20}$$

$$\begin{aligned}\min &= 2 * \min - \text{top} \\ &= 2 * 20 - (-60)\end{aligned}$$



$$x - \text{min} < 0$$

$$2x - \text{min} < x$$

Q.3 Max frequency element



Obs: use another H.M.



var max = 3

mop2[3].remove(2)

$\max \dots$

$T.C \Rightarrow O(1)$. \leftarrow 3 op per event.

$S.C \Rightarrow O(N)$.

6, 5, 3, 2, 2, 5, 5, 2, pop, pop().

map1 [int] \rightarrow [int] count

[6] = 1

[5] = 2

[3] = 1

[2] = 2

$x \rightarrow n+1$

$x \rightarrow n-1$

$\max \geq 1$

variable max = 2

$\max = 2$

$\max = 1$

$\max = 2$

$\max = 3$

$\max = 4$

$\max = 5$

$\max = 6$

$\max = 7$

$\max = 8$

$\max = 9$

$\max = 10$

$\max = 11$

$\max = 12$

$\max = 13$

$\max = 14$

$\max = 15$

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$\text{push}(x) \rightarrow \text{map2}[\text{map1}[x]] \cdot \text{erase}$

~~O(1)~~
~~O(n²)~~

~~(map.[x]++)~~
~~map2[map[x]].insert~~
if > m → m

~~get max freq = max~~

~~problems~~

Doubt ↴