



## Queues

### Agenda

- o Introduction to queues
- o Queues and Stacks easy problems
- o 2-stack in an array
- o Implementation of queue using stack

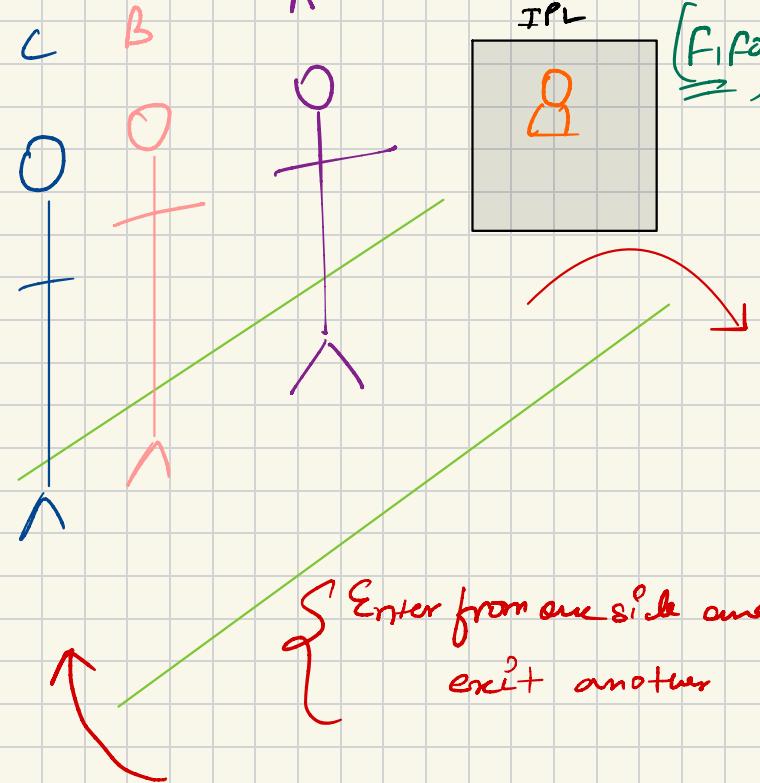
## Queues

first in queue, first

to leave the queue

IPL

(FIFO)



## Stacks

• Linear DS

• follows LIFO } ✓

peek()

TC: O(1) Scaln

push()

40  
30  
20  
10

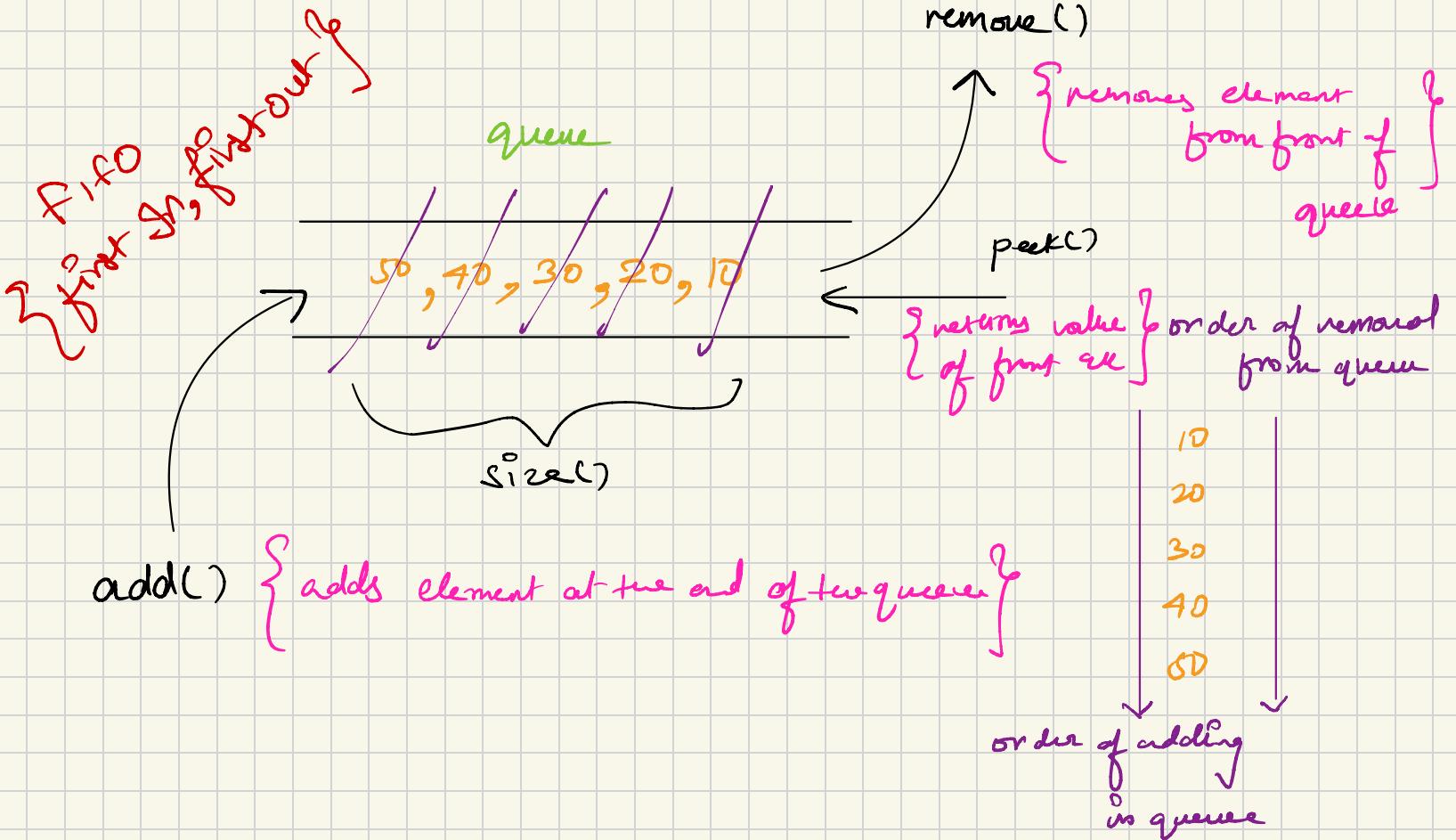
pop()

10  
20  
30  
70

Order of pop()

st

order of push()



Queue

↳ interface in Java.

① Queue<E> que\_name = new ArrayDeque();

② Queue<E> que\_name = new LinkedList();

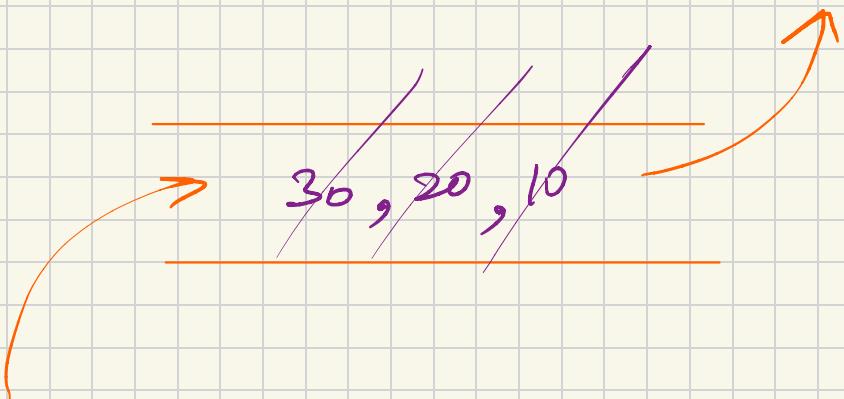
Methods

- ① add() / offer()
  - ② remove() / poll()
  - ③ peek()
  - ④ size()
- } Tc(O(n)), Sc(O(1))

\* Enqueue → { Enter in queue } add() / offer()

\* Dequeue → { Delete in queue } remove() / poll()

Dequeue



Enqueue

Deque

} Doubly Ended Queue}

Linear DS  
=

addFirst()

TC(O1)

getFirst()



removeFirst()

TC(O1)

addLast()

TC(O1)

getLast()

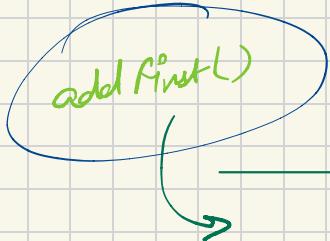
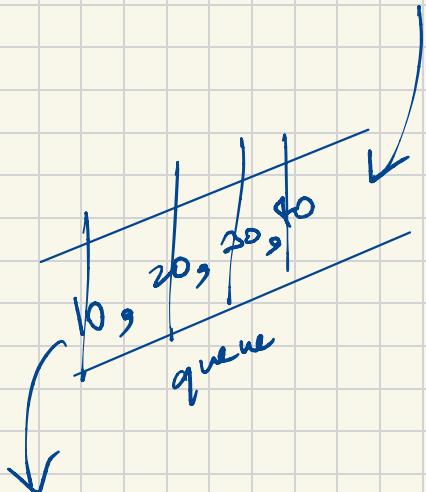
TC(O1)

removeLast()

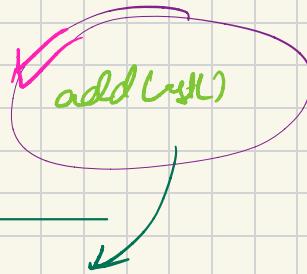
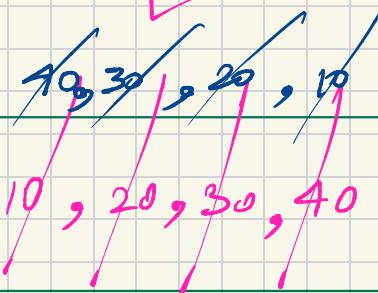
Deque<E> dq\_name = new ArrayDeque<E>;

Q

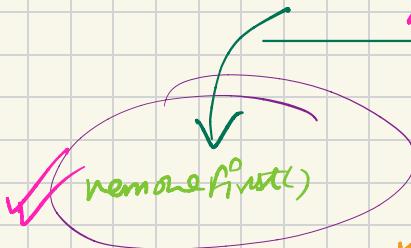
Can you Implement - a Queue using Deque



FIFO



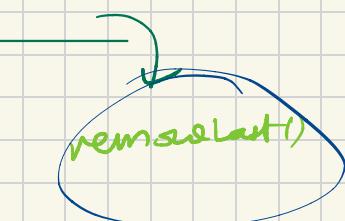
dq



✓ addFirst()  
removeFirst()

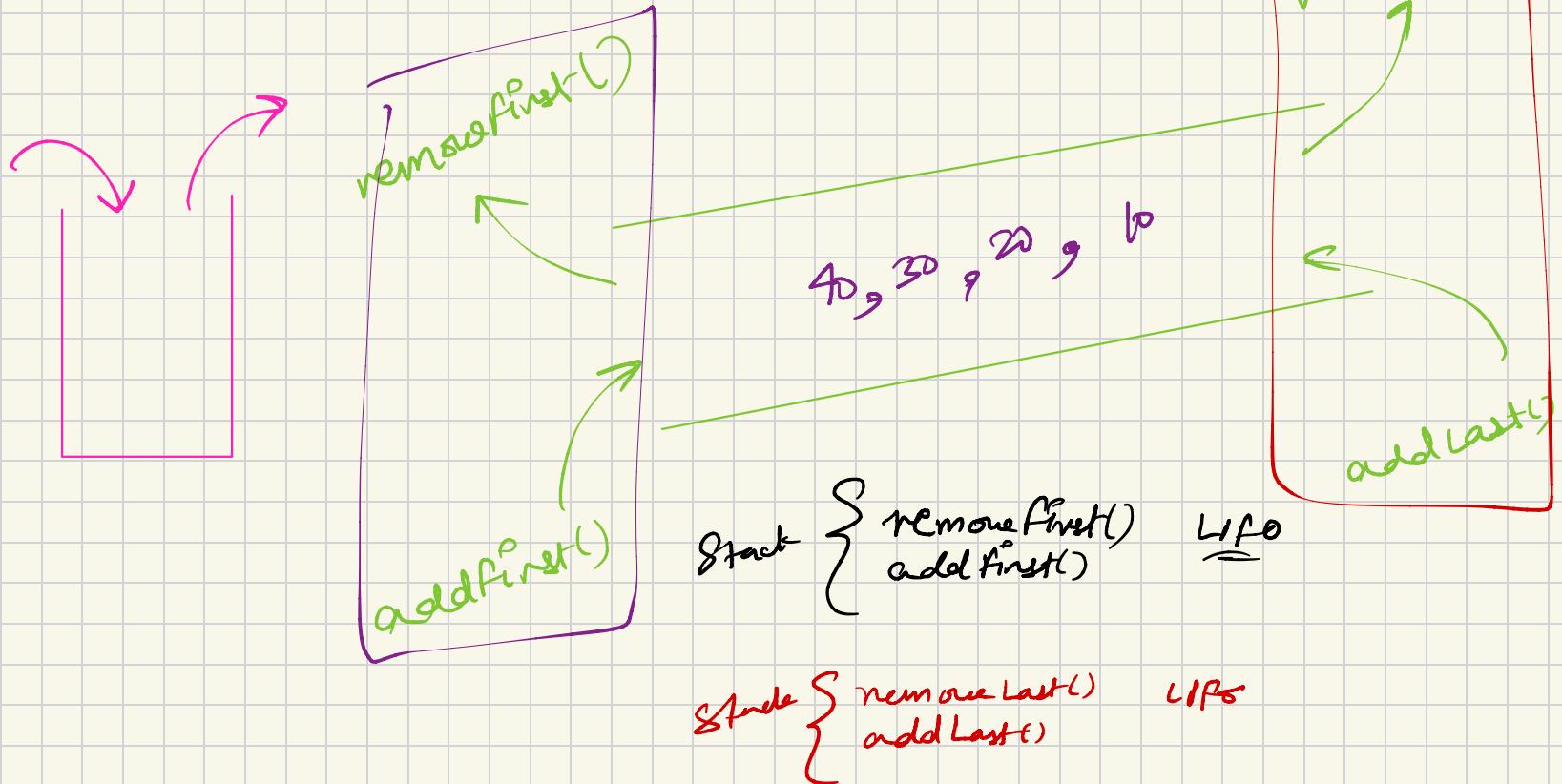
✓ addFirst()  
removeLast()

} FIFO

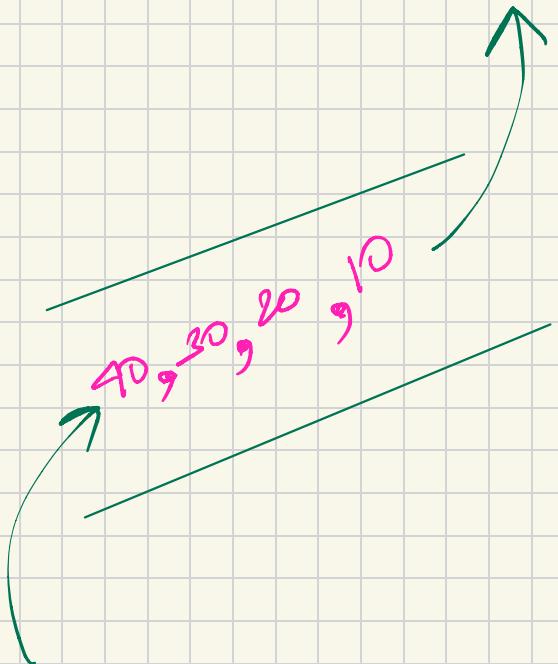


Queue using a deque

Can you implement a stack using a deque



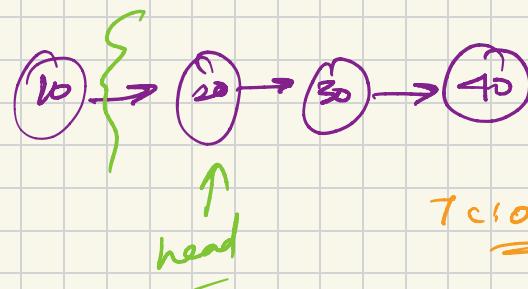
Design a Queue using linkedlist-



linked list

addl) → addlast()

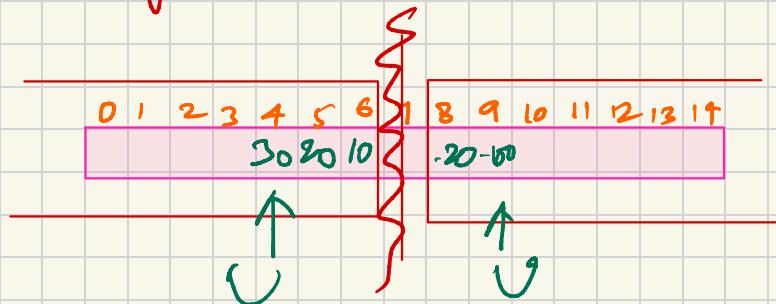
Tc: O(1)



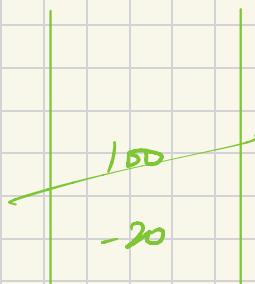
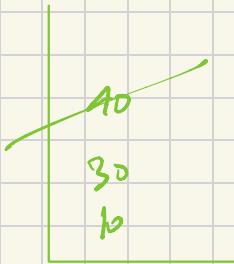
Tc: O(1)

tail

2 stacks in an array

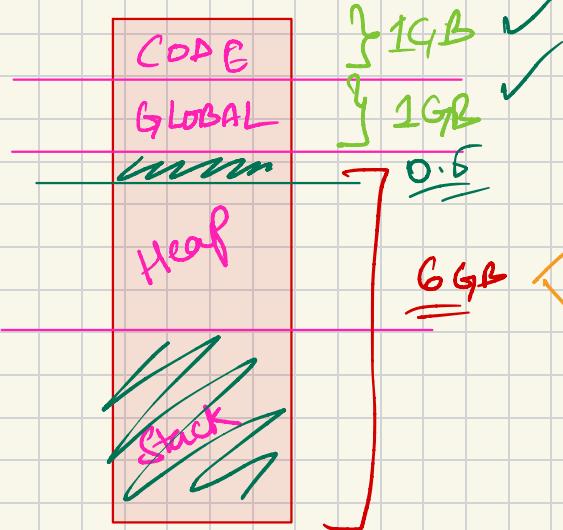


approach?



Qs

RAM



1GB ✓  
1GB ✓  
0.5  
6GB

3GB { Heap }

3GB { Stack }

✓ crash { filled } ✓

statically dividing  
↳ Not good

CODE

GLOBAL

inner

Var

  Z  
  Y  
  X

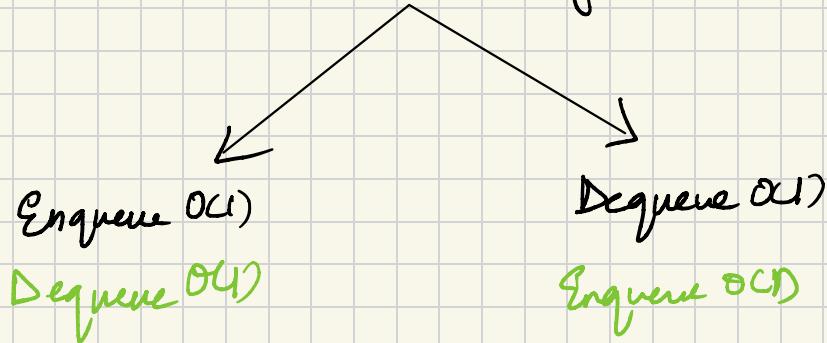


dynamic divider

{ crashing after 8GB }



Implement a queue using 2 stacks



Implement Queue using 2 stacks while Enqueue O(1)

