

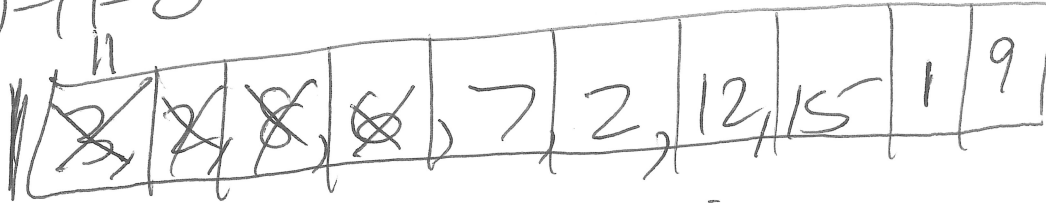
COP 3502 9/29/21

① Queues

② Code Grid // After new prob!

front $\boxed{4}$ array size $\boxed{10}$
numelems $\boxed{5}$
~~7~~
~~8~~

FIFO



③ Array Implementation

$O(1)$ enq

$O(1)$ deq

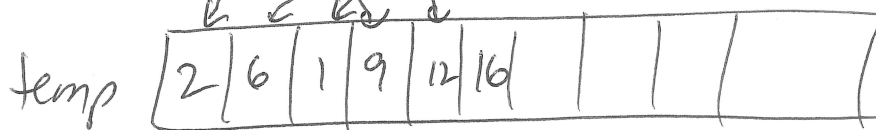
Array, Index front, Size Array

elements in array

INDEX MATCH MOD SIZE

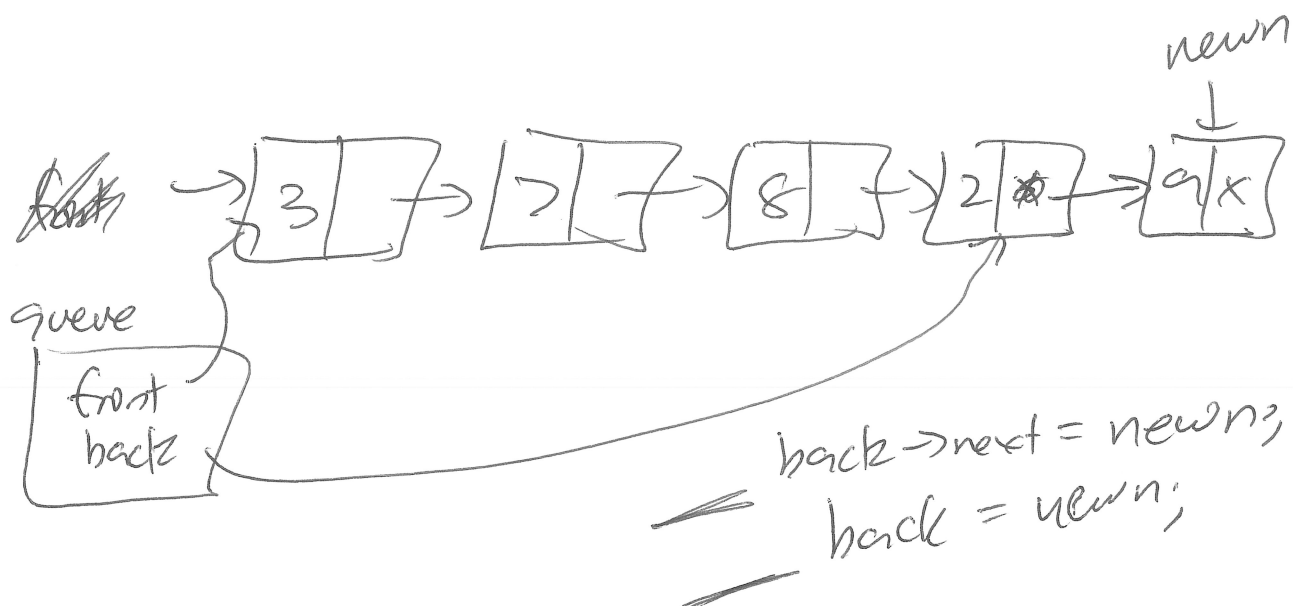
If we fill up, realloc + double size
SLIGHT PROB

array $\boxed{9 \mid 12 \mid 2 \mid 6 \mid 1}$ front $\boxed{2}$ numelems $\boxed{5}$
Size $\boxed{5}$



enqueue (16)

front 0
Size ~~5~~ 10
numelems $\boxed{5}$



Double Ended Queue

- Insert Front insert Back $\rightarrow$ reg queue
- delete Front delete Back

Prewritten Queue is off INT

$$(\otimes x, y) \quad 0 \leq x < \frac{200}{n}, 0 \leq y < \frac{200}{m} \approx \text{most}$$

$$\text{code} = x * m + y$$

$$3 * 4 + 2 = 14$$

$$n=5 \quad m=4$$

$$(0, 1, 2, 3, 4)$$

$$(0, 1, 2, 3)$$

$$\text{code} / m = x$$

$$\text{code} \% m = y$$

$$(3, 2)$$

0	1	2	3
4	5	6	7
8	9	10	11
12	13	14	15

$$13, 14$$

220 2120
1203
3113
1120
1110

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
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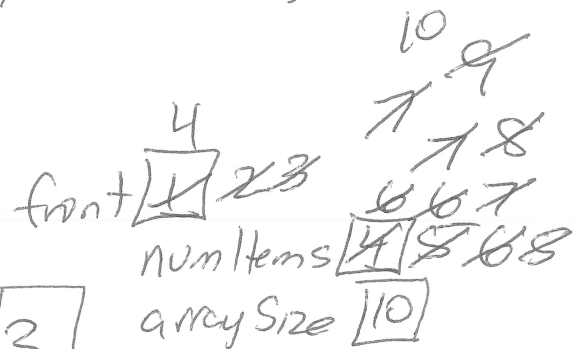
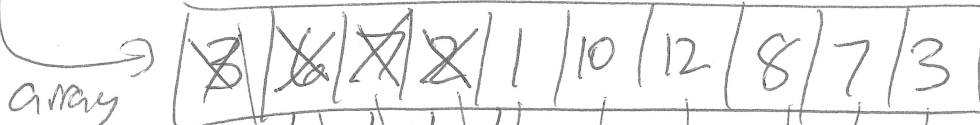
QUEUE

first in first out } enqueue $O(1)$
 } dequeue $O(1)$

(a) Array

(b) Linked List

6 2 9 20

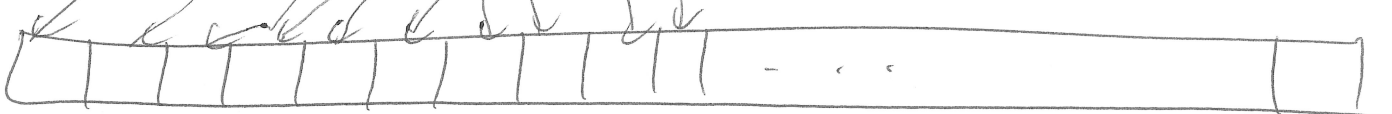


Dequeue 3, if all moved forward $O(n)$, $n = \# \text{ items}$

key math: $(\text{front} + \text{numItems}) \% \text{arraySize}$
 $(\text{front} + 1) \% \text{arraySize}$

REALLOC → bigger

PROBLEM → can't copy value same index



for (int i=0; j=front; i < arraySize; i++, j=(j+1)%arraySize)
 temp[i] = array[j];

Now space ⇒ ~~enqueue~~ free old, move array
 enqueue.

LL implementation tmp



Dequeue $\rightarrow$ front, Enqueue $\rightarrow$ back

$q \rightarrow \text{back} \rightarrow \text{next} = \text{tmp};$

$q \rightarrow \text{back} = \text{tmp};$

