Circular Queues

Tuesday, September 30, 2025   10:34 AM

.add (-1)   .add (-3)   .add (-9)   .add (-3)
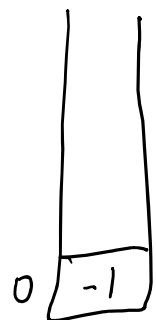
Remove()

Save -1

3	-5
2	-9
1	-3
0	-1
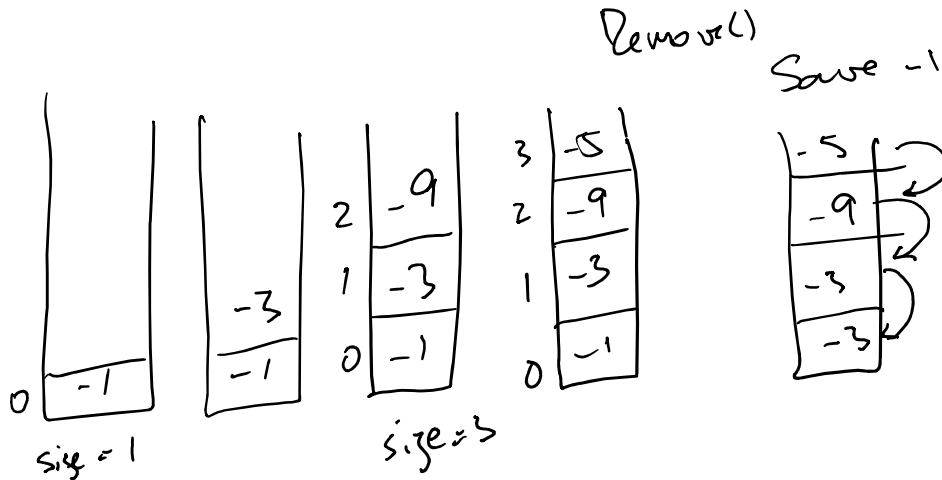
size = 1   size = 3

Circular Queue

.add (-1).
first = -1   last = -1
    size = 0

.add (3)   .add (-9)   .add (-5)   remove()
                                         Save = A [first]
                                                    ↓
                                                  return

0	-1

first = 0
last = 0
size = 1

1	-3
0	-1

first = 0
last = 1
size = 2

2	-9
1	-3
0	-1

first = 0
last = 2
size = 3

3	-5
2	-9
1	-3
0	-1

first = 0
last = 3
size = 4

3	-5
2	-9
1	-3
0	

first = 1
last = 3
size = 3

.add(-7)   1
increment last then A[last] = item.
        last = last+1 = 3+1 = 4
              = (last+1) % A.length
              = (3+1) % 4 = 4 % 4 = 0.

3 | -5 |
2 | -9 |
1 | -3 | .add(-11) no space → resize()
0 | -7 |
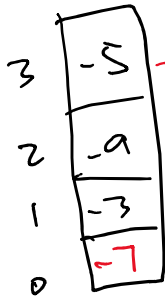
first = 1
last = 0 (3+1)%4
size = 4
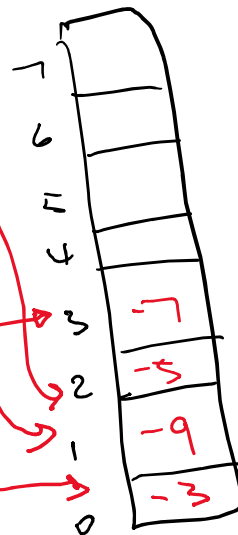
$$Temp[i] = A[(first+i) \% A.length]$$

7 | |
6 | |
5 | |
4 | |
3 | -7 |
2 | -5 |
1 | -9 |
0 | -3 |

· first = 0
  last = 3
  size = 4

Assume you have a Circular Queue with length 4
Show the Content of the Queue (first, last, size) after
each call to the following:

.add(-2)   .add(-1) .add(-3)   .remove()   .add(-4)

.add(-5)   .remove() .add(-7)   .add(-9)

                remove()   ·remove()
                returns -2   returns -7
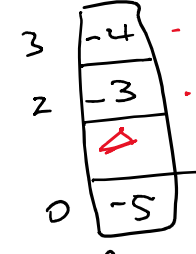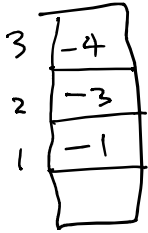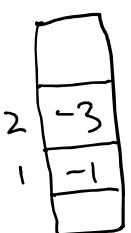
remove(s)
returns -2
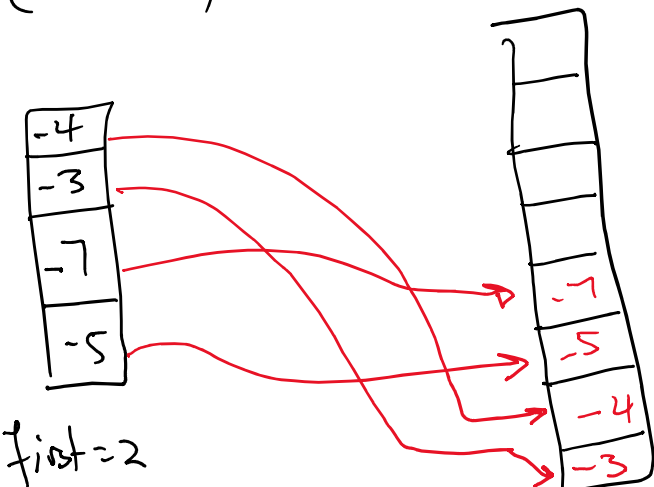
remove()
returns -7
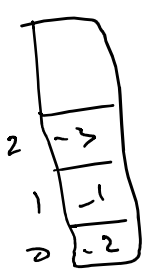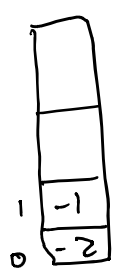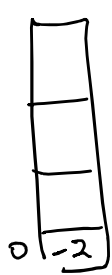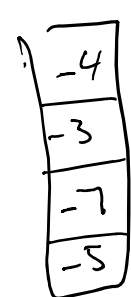
first=0, last=0, size=1
first=0, last=1, size=2
first=0, last=2, size=3
first=1, last=2, size=2
first=1, last=3, size=3
first=1, last=(3+1)%4=0, size=4
first=2, last=0, size=3
first=2, last=1, size=4

$$last = (last + 1) \% A.length.$$

$$first = (first + 1) \% A.length.$$

first=2, last=1, size=4

first=0, last=Size-1=3, size=4

Resize()

$$[-3, -4, -5, -7]$$