CS240

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Queue ADT

Queue ADT

- `q.enqueue(item)` - Adds the item to the back of the queue.
- `q.dequeue()` - Removes and returns the item from the front of the queue.
- `q.first()` - Returns a reference to the item at the front of the queue.
- `is_empty()` - Returns a boolean value.
- `len(q)` - Returns number of items in the queue.

Exercise

```
1  q = Queue()
2  q.enqueue("A")
3  q.enqueue("B")
4  q.enqueue("C")
5  q.dequeue()
6  q.enqueue("D")
7
8  while not q.is_empty():
9      print(q.dequeue())
```

1: A B C
2: B C D
3: D B C

Exercise

```
1  q1 = Queue()
2  q2 = Queue()
3  q1.enqueue("A")
4  q1.enqueue("B")
5  q1.enqueue("C")
6
7  while not q1.is_empty():
8        q2.enqueue(q1.dequeue())
9
10 while not q2.is_empty():
11       print(q2.dequeue())
```

1: A B C
2: C B A
3: CRASH!

Python List Implementation

Python List Queue Performance

`enqueue()`	O(1)*
`dequeue()`	O(n)
`first`	O(1)
`is_empty()`	O(1)
`len(q)`	O(1)

- Amortized

Dynamic Array Implementation

Dynamic Array Queue Performance

`enqueue()`	O(1)*
`dequeue()`	O(1)*
`first`	O(1)
`is_empty()`	O(1)
`len(q)`	O(1)