CS239

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Stacks and Queues

- Two new collection interfaces...
- We have seem some very flexible collection types: e.g. List.
- Sometimes it's good to have a collection that sharply *limits* the way way can interact with data.
  - No danger of interacting with the data in the "wrong" way.
  - Possible to develop a more efficient implementation if we know in advance that only a limited set of operations may be performed.

Stacks

- Stack is a LIFO collection:
  - Last In First Out
- Two main operations:
  - push - places an item on the “top” of the stack.
  - pop - removes the item from the “top” of the stack.
- Sometimes:
  - peek - look at the top item without returning it.

Sample interface:
Stack.java ↗

Clicker Question

```java
        stack.push("A");
        stack.push("B");
        stack.push("C");
        stack.pop();
        stack.push("D");
        while (!stack.isEmpty())
        {
            System.out.print(stack.pop() + " ");
        }
```

1. A B C D
2. D B A
3. A B D
4. B C D

Queue

- Queue is a FIFO collection:
  - First In First Out
- Two main operations:
  - enqueue - places an item at the back of the queue.
  - dequeue - removes the item from the front of the queue.
- Sometimes:
  - peek - look at the front item without returning it.

Sample interface:
Queue.java ↗

Clicker Question

```java
        queue.enqueue("A");
        queue.enqueue("B");
        queue.enqueue("C");
        queue.dequeue();
        queue.enqueue("D");

        while (!queue.isEmpty())
        {
            System.out.print(queue.dequeue() + " ");
        }
```

1. A B C D
2. A B C
3. B C D
4. D B A

Implementing a Stack (1)

- Contiguous (Array-based) implementation:
  - ArrayStack.java ↗

Implementing a Stack (2)

- Linked implementation:
  - Node.java↗
  - LinkedStack.java↗

Implementing a Queue (1)

- Linked implementation:
  - LinkedQueue.java ↗

Implementing a Queue (2)

- Contiguous (Array-based) implementation:
  - ArrayQueue.java ↗

Implementing a Queue (3)

- Circular Array:
  - CircularArrayQueue.java ↗