Stacks Queues and Appetizers for Parties

by
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Abstract Data Types

They are **collections**

They group related data

Perform different operations

The Three Musketeers

“Moe”	“Larry”	“Curly”

Buffalo Chicken Dip

Ingredients	
Cream Cheese	16oz
Shredded Chicken	20oz
Hot Sauce	¾ cup
Ranch	1 cup
Celery + Chives	Optional

Modified From
https://www.allrecipes.com/recipe/68461/buffalo-chicken-dip/

A Stack

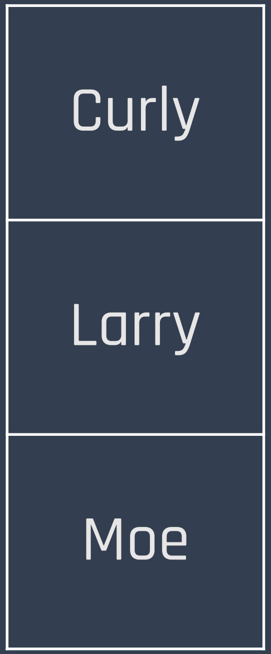
LIFO Access – Last In; First Out

Only operating on *top* of the stack

We **push** (add) and **pop** (remove) items

Pushing and Popping

```
push(“Moe”);
push(“Larry”);
push(“Curly”);
```

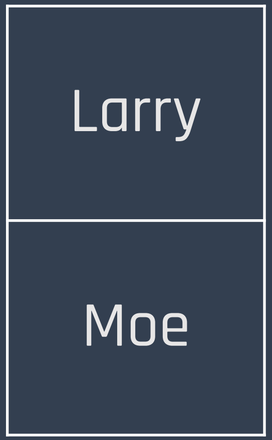


Curly

Larry

Moe

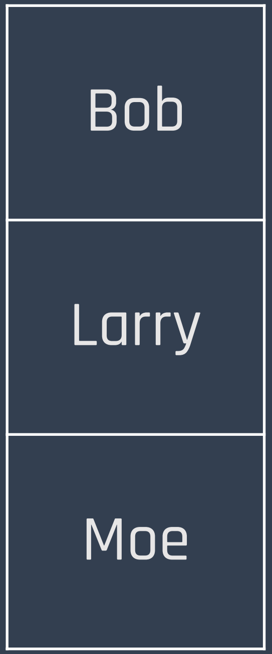
```
pop();
```



Larry

Moe

```
push(“Bob”);
```



Bob

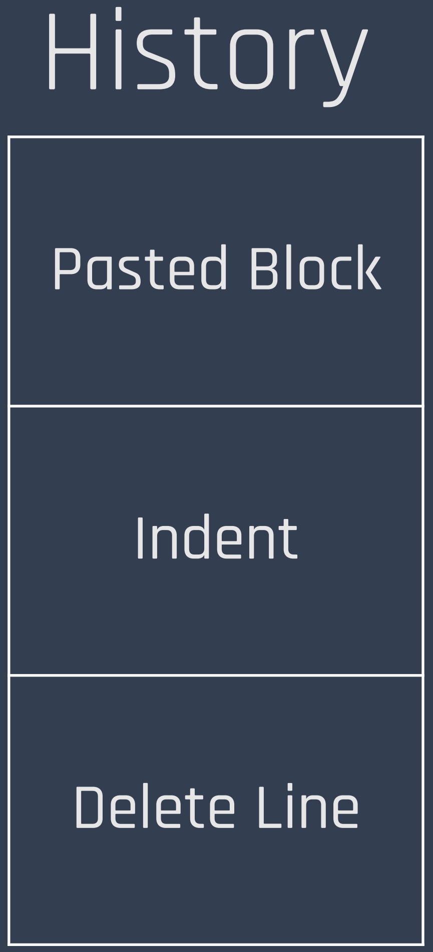
Larry

Moe

Use of A Stack

Store a history of actions in word processing software.

Simple undo feature



History

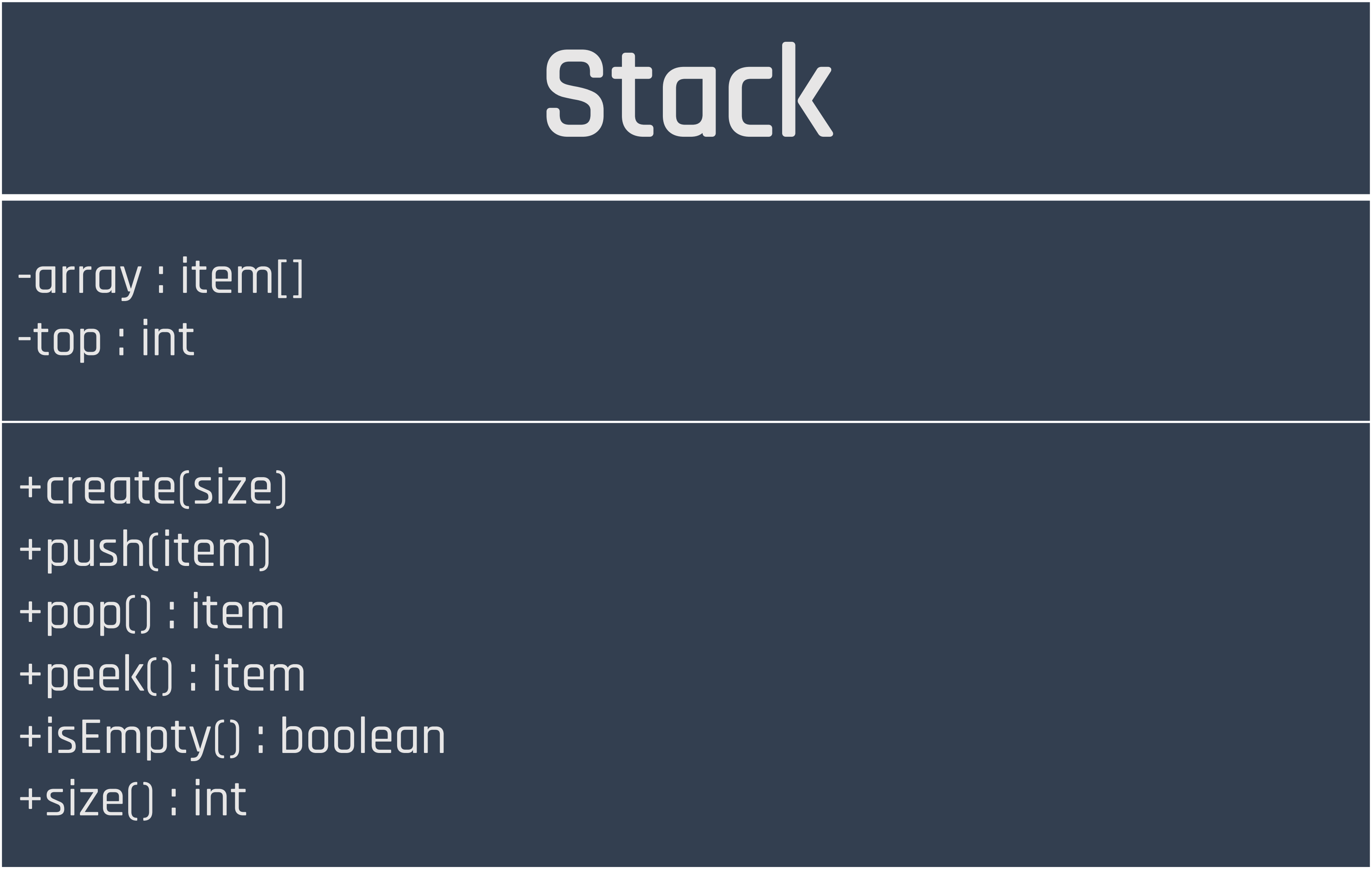
Pasted Block

Indent

Delete Line

Spinach Tomato Pinwheels

Ingredients	
Cream Cheese	8oz
Diced Tomatoes	¾ cup
Chopped Spinach	½ cup
Salt + Pepper	
Basil	
Oregano	
Olive Oil	



Stack

-array : item[]
-top : int

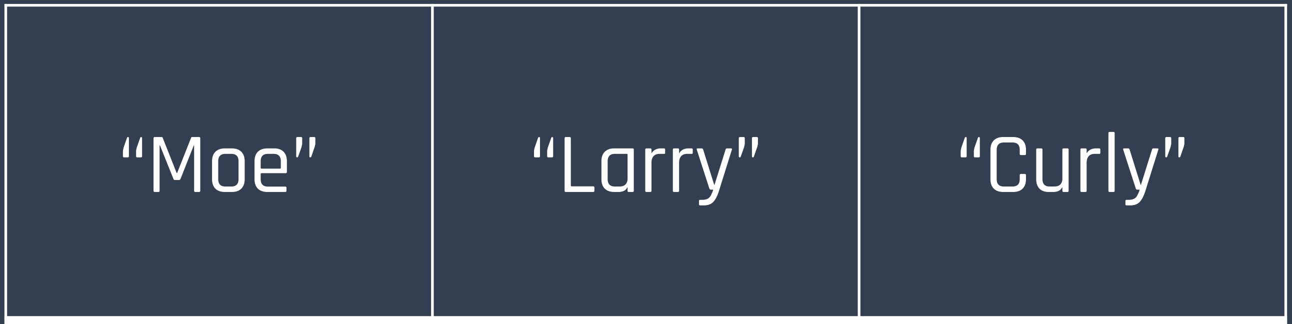
+create(size)
+push(item)
+pop() : item
+peek() : item
+isEmpty() : boolean
+size() : int

A Queue

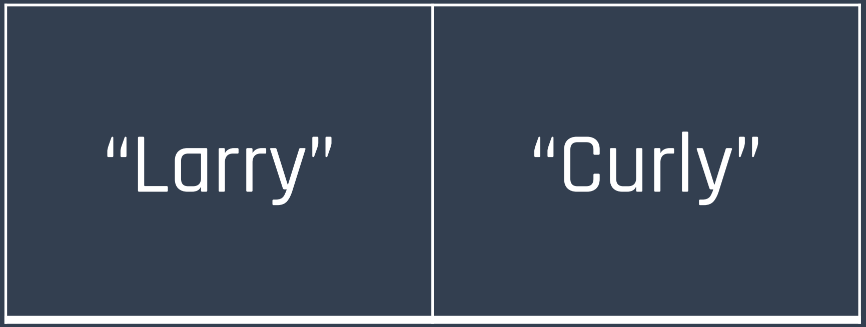
FIFO Access - First In; First Out

Operating on both ends of the queue

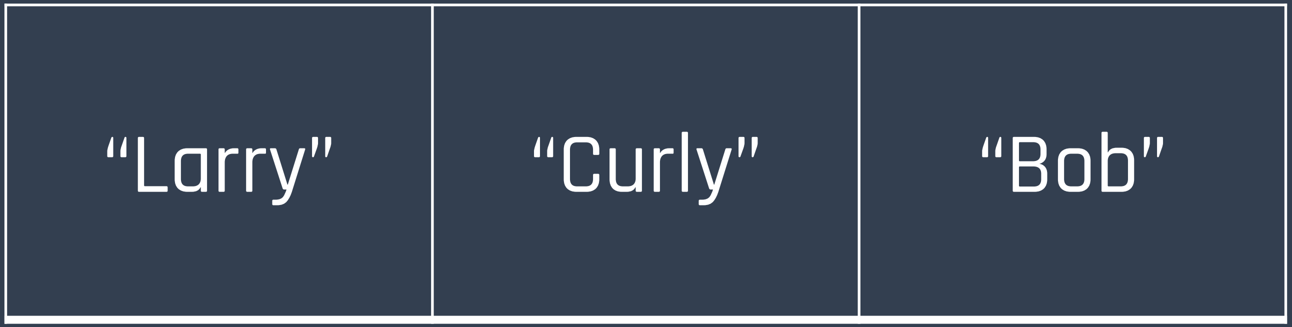
We **enqueue** (add) and **dequeue** (remove)



```
enqueue("Moe");
enqueue("Larry");
enqueue("Curly");
```



```
dequeue();
```



```
enqueue("Bob");
```

Onigiri

Ingredients	
Japanese Rice	2 cups
Nori Sheets	12
Salt	¾ cup
Water	2 ½ cup

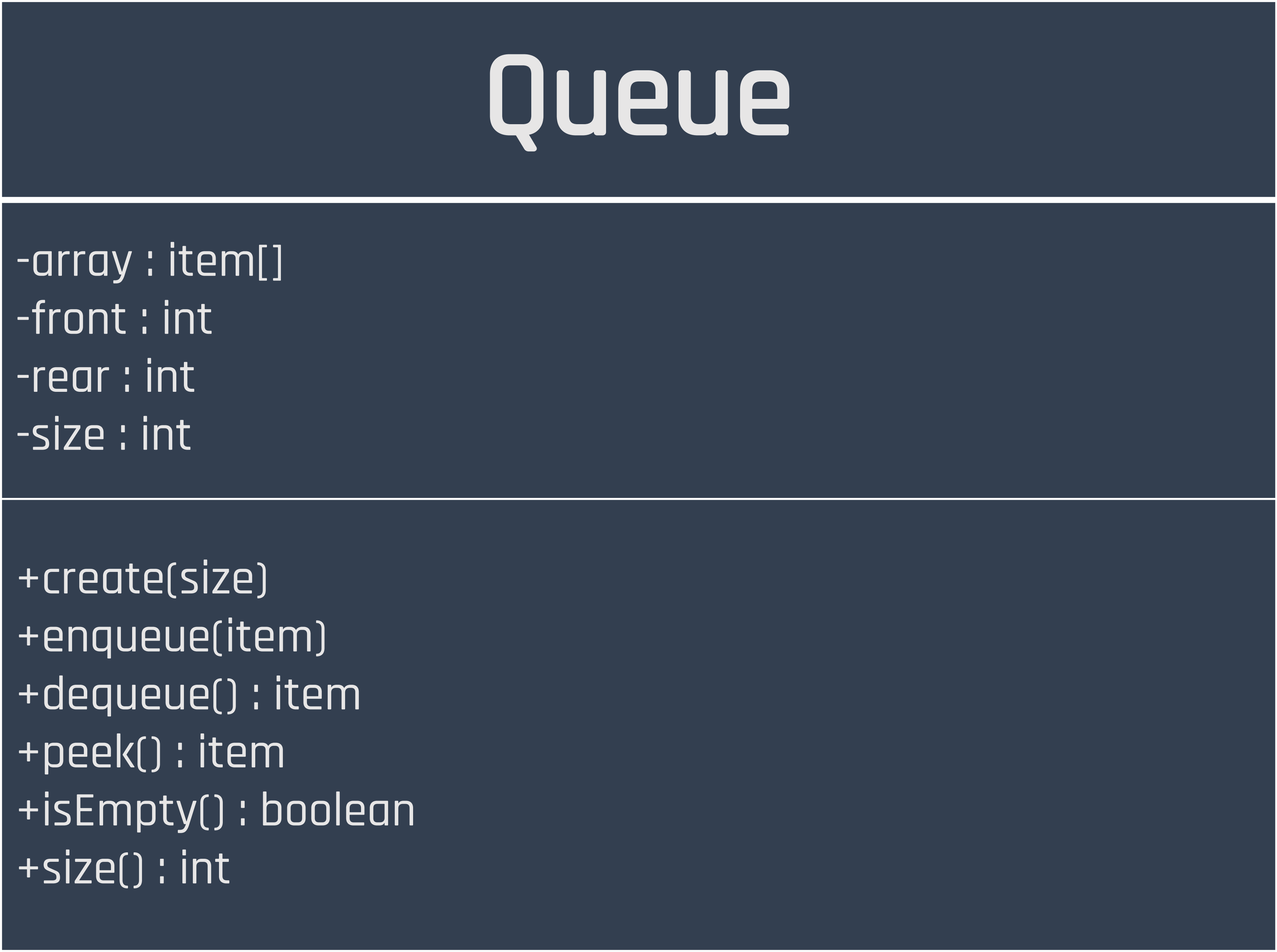
Modified From
https://www.justonecookbook.com/onigiri-rice-balls/

Uses of a Queue

Serving files from a website to users

Processing documents on a printer

Anywhere where “first come; first serve” applies



Queue

-array : item[]
-front : int
-rear : int
-size : int

+create(size)
+enqueue(item)
+dequeue() : item
+peek() : item
+isEmpty() : boolean
+size() : int

Cost of Stacks and Queues

All operations are O(1).

How? We are only operating on the ends!

We never traverse through the middle.

Stuffed Jalapeno Poppers

Ingredients	
Jalapenos	1lb.
Ground Pork Sausage	1lb.
Cream Cheese	8oz
Bacon Slices	12 slices
Blood Pressure Meds	Contact your doctor for info.

Modified From
https://www.allrecipes.com/recipe/83500/sausage-stuffed-jalapenos/

Implementing a Stack

Array	Linked List
Keep track of the index of the top of the stack and its size.	The head already acts as the top of the stack. Easy!

Implementing a Queue

Array	Linked List
Keep track of the index of the front and rear of the queue, and its size	The head and tail already act as the front and the rear!

Why Even Bother?

Arrays give us access to everything; why restrict ourselves??

Stacks/Queues give us **structure** we can organize our data with

Prevents potential error

Homemade Ranch

Ingredients	
Mayonnaise	¾ cup
Buttermilk	¼ cup
Fresh Garlic	
Cayenne Pepper	
Salt/Pepper	
Dill Weed	

Modified From
https://www.thedailymeal.com/api-driven/web_recipe/755573

Stacks	Queues
LIFO	FIFO
Operate only on top	Operate on both ends
Push/Pop	Enqueue/Dequeue

O(1) for all!