

# Data Structures HOMEWORK 1

## Submission instructions

You don't need to submit this homework. You will demonstrate your programs to the TAs during the lab hours and they will grade your work.

**Deadline:** You must finish the homework by Sunday, April 9. TAs will evaluate it on Monday, April 10 during the lab hours.

## Programming Exercises

1. (Weiss Q. 3.28) A deque is a data structure consisting of a list of items, on which the following operations are possible:

- `push(x)`: Insert item `x` on the front end of the deque.
- `pop()`: Remove the front item from the deque and return it.
- `inject(x)`: Insert item `x` on the rear end of the deque.
- `eject()`: Remove the rear item from the deque and return it.

Each of these operations should execute in  $O(1)$  time.

Name your deque class `MyDeque` and use the exact method names described above. Your class should be generic and may use either the built in Java `ArrayList/LinkedList` classes or the textbook's `MyArrayList/MyLinkedList` implementations. (HINT : you should only need one of these.) Alternatively, you can also build this data structure from scratch, without piggybacking on these other classes. Test your class using the class `MyDequeTester`, which is in the assignment folder.

2. **Palindrome Detector.** A palindrome is a phrase that reads the same forwards as it does backwards. For example, "a man, a plan, a canal, Panama," is a palindrome. Write a program that uses a stack to check for palindromes in each line of a text file. Try your program on the example text file,

`palindromes.txt`

Your program should output the palindromes that it finds in the document. For example:

```
java PalindromeFinder palindromes.txt
"a man, a plan, a canal, Panama" is a
palindrome. "Don't nod" is a palindrome.
"Taco Cat!" is a palindrome.
...
```

You may write a `MyStack` class for this problem, or you may use your `MyDeque` class since it supports the two stack methods. Don't use the built in `Stack`. Feel free to use either a `LinkedList`, `ArrayList` or an array to implement `MyStack`.