

CS161: Introduction to Computer Science
Homework Assignment 8
Due: Monday 11/11 by 11:59pm

Sets of Cards

In this assignment, you will implement a class that stores a set of playing cards. This set of cards could be a player's hand, or a deck of cards, or a discard pile, etc. Each of these examples is fundamentally just a set of cards.

You must use an array, not an `ArrayList`, to store the set of cards. This means that all of the nice built-in behavior of an `ArrayList` – e.g., growing the array, inserting and removing from the middle of the array – you will now implement yourself.

This assignment has 3 classes: `Card`, `CardSet`, and `Controller`. Please use your `Card` class from the previous homework assignment. If your `Card` class does not work, please email me and you can use my `Card` class.

The `Controller` class is a chance for you to actually use the `CardSet` class that you wrote. Inside the `Controller` class, you will use your `CardSet` class to assemble a standard deck of cards.

Designing the `CardSet` class

Imagine that you have a set of cards. What are the different actions you would do with this set of cards in real life? When I sat down and thought about this question, here is what I came up with: add a card to a particular spot in the set, remove a card from a particular spot in the set, shuffle all the cards, and maybe show all of the cards. Each of these actions then becomes a method in the `CardSet` class.

Here is a list of the methods that your `CardSet` class should have:

1. `CardSet()` – A default constructor that creates an empty set of cards.
2. `void add(Card card)` – Adds a card to the “bottom” of the deck (i.e. to the end of the array)
3. `void add(Card card, int index)` – A void method that adds a card to the set at the specified index. If there is already a card at that spot, then you should shift that element and any subsequent elements to the right.
4. `Card remove(int index)` – A method that removes the `Card` at the given index from the set. This method should shift any subsequent elements to the left to fill the gap. This method should also return back the card that was removed.
5. `void shuffle()` – A method that shuffles the cards in the set. There are *lots* of ways to shuffle the elements of an array! Talk with your partner and together come up with an algorithm for shuffling.
6. `String toString()` – A method that returns a string representation of the set. Please put each card on a separate line.

In addition to these methods, there are a few considerations you need to keep in mind. Both the `add` and `remove` methods take an integer index. *You must check that this index is valid.* If it is not valid, then do not carry out the action. Please do not print an error message.

Second, when you add a card to the set, you must make sure there is enough room in the array itself. If not, increase the capacity of the set and then add the card.

The Controller class

When you spend a lot of time coding a class, you want to benefit from all your hard work by actually using it to do something! Ideally, if we had more time, you would use your `CardSet` class to program an actual card game. However, for this assignment, you're just going to create a standard 52 card deck.

Create a Java class named `Controller`. Inside the `Controller` class, add a `main` method that uses a `CardSet` to hold a standard 52 card deck. Please print out the deck of cards, shuffle it, and then print it again. Finally, please remove some cards from your deck to show that your `remove` methods works.

Style Guide

Before you submit your assignment, go through the checklist below and make sure your code conforms to the style guide.

Checklist

- All unused variables are deleted
- All instance variables are used in more than one method (if not, make them local)
- Javadoc comment for all classes
- All methods have Javadoc comments (except for the `main` method)
- All numbers have been replaced with constants (i.e. no magic numbers)
- Proper capitalization of variables, methods, and classes
- Use white space to separate different sections of your code

Read the "Style Guide" (under "Resources" on the course website) for more information.

Submitting your homework assignment

You should submit your `hw8` folder with the `Card`, `CardSet`, and `Controller` class inside. Please rename your folder with both of your names before you zip it.