CS201 - Assignment 2, Part 2
Due: Wednesday February 26, at the beginning of class

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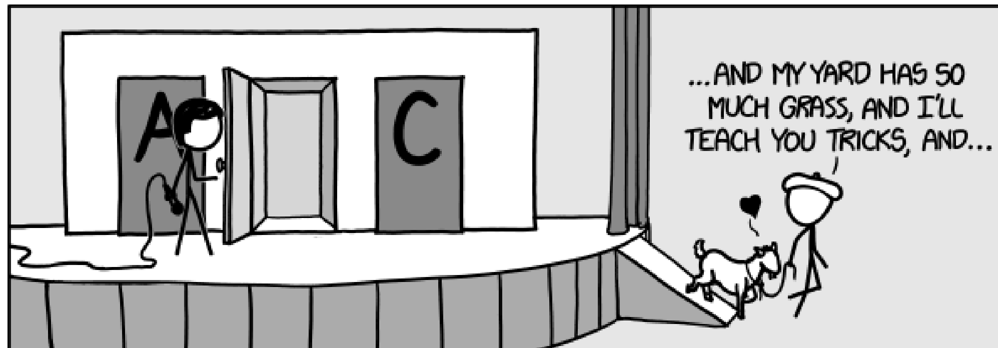

http://www.xkcd.com/1282/

1 Java Practice

To continue to give you practice with the syntax of Java, for the first part of this assignment, you're going to write a few stand-alone methods. Create a new project in Eclipse called `assign2.2` (look at assignment 1, part 1 if you need a refresher on how to do this). Create a new class called `WarmUp`, which you will put your methods into.

Write the following as `public static` methods in your `WarmUp` class:

1. Write a method called `countHearts` that takes an array of `Card`s as a parameter and counts how many of the cards have the suit "hearts".

   For example, if we ran the following code:

```
Card[] cards = new Card[4];

cards[0] = new Card(1, "clubs");
cards[1] = new Card(1, "hearts");
cards[2] = new Card(3, "hearts");
cards[3] = new Card(2, "diamonds");

System.out.println(countHearts(cards));
```

we would get 2.

2. Write a method called `addArraysSameLength` that takes two arrays of `double`s as parameters. The method should make a new array where the ith entry in this array represents the sum of the ith entries of the two input arrays and return this new array. You may assume that the arrays have the same length.

   For example, if we ran the following code:

   ```
   double[] array1 = {1, 2, 3, 4, 5};

   double[] answer = addArrays(array1, array1);
   System.out.println(Arrays.toString(answer));
   ```

   we would get `[2.0, 4.0, 6.0, 8.0, 10.0]`.

3. Write a method called `reverseArray` that takes an array of `String`s as a parameter and reverses the order of the array. It should NOT return a new array. Instead, it should mutate (i.e. change) the array that was input.

   For example, if we ran the following code:

   ```
   String[] words = {"I", "love", "my", "CS", "classes", "!"};

   System.out.println("Before: " + Arrays.toString(words));
   reverseArray(words);
   System.out.println("After: " + Arrays.toString(words));
   ```

   we would see:

   ```
   Before: [I, love, my, CS, classes, !]
   After: [!, classes, CS, my, love, I]
   ```

4. *OPTIONAL:* If you want some extra practice (NOT REQUIRED), try writing another function called `addArrays` that adds two arrays as described above, but removes the requirement that they be the same length. It should produce an array the size of the longest input array. If there isn't a corresponding entry in one of the arrays because the other is longer, then it should just use the value of the longer array.

   For example, if we ran the following code:

   ```
   double[] array1 = {1, 2, 3, 4, 5};
   double[] array2 = {10, 10};

   double[] answer = addArrays(array1, array2);
   System.out.println(Arrays.toString(answer));
   ```

   we would get `[11.0, 12.0, 3.0, 4.0, 5.0]`.

2 Flippy Card: The Game

For the rest of the assignment, we're going to write a game I call "Flippy Card"[1]. When the game starts, you deal five cards face down. Your goal is to achieve as high a score as possible. Your score only includes cards that are *face up*. Red cards (hearts and diamonds) award positive points, while black cards (clubs and spades) award negative points. Cards 2-10 have points worth their face value, Jack, Queen and King 10 and Ace 11.

The game is played by flipping cards (either from face down to face up or from face up to face down). As you play, you are told your total score (i.e. total of the face up cards) AND the total score of the cards that are face down. The challenge is that you only get a fixed number of flips and then the game is over.

Here is an example of the output from playing the game:

```
FACE-DOWN | FACE-DOWN | FACE-DOWN | FACE-DOWN | FACE-DOWN
Face up total: 0
Face down total: -5
Number of flips left: 5
Pick a card to flip between 1 and 5 (-1 to end game): 1

Queen of hearts | FACE-DOWN | FACE-DOWN | FACE-DOWN | FACE-DOWN
Face up total: 10
Face down total: -15
Number of flips left: 4
Pick a card to flip between 1 and 5 (-1 to end game): 2

Queen of hearts | Jack of clubs | FACE-DOWN | FACE-DOWN | FACE-DOWN
Face up total: 0
Face down total: -5
Number of flips left: 3
Pick a card to flip between 1 and 5 (-1 to end game): 2

Queen of hearts | FACE-DOWN | FACE-DOWN | FACE-DOWN | FACE-DOWN
Face up total: 10
Face down total: -15
Number of flips left: 2
Pick a card to flip between 1 and 5 (-1 to end game): 10

10 is not a valid card
Queen of hearts | FACE-DOWN | FACE-DOWN | FACE-DOWN | FACE-DOWN
Face up total: 10
Face down total: -15
Number of flips left: 2
```

[1] If you have a better name, please, please let me know :)

```
Pick a card to flip between 1 and 5 (-1 to end game): 0

0 is not a valid card
Queen of hearts | FACE-DOWN | FACE-DOWN | FACE-DOWN | FACE-DOWN
Face up total: 10
Face down total: -15
Number of flips left: 2
Pick a card to flip between 1 and 5 (-1 to end game): 5

Queen of hearts | FACE-DOWN | FACE-DOWN | FACE-DOWN | 3 of hearts
Face up total: 13
Face down total: -18
Number of flips left: 1
Pick a card to flip between 1 and 5 (-1 to end game): -1


----------------------
Your score: 13
Best possible score: 15
```

At each point where the program asks the user to pick a card, the game waits for user input.

3 Requirements

Below are the requirements for your Flippy Card game program:

- The code should be in a class called `FlippyCard`
- The class should have one constant for the number of cards (5).
- You should include a constructor (i.e. a method called `public FlippyCard`) for the game that takes the number of flips for the game as a parameter.
- You should have one `public` method called `playGame`. When called, the game should start playing and continue until the game finishes.
- You must also implement *at least three* `private` methods, although I encourage you to implement more. These methods should help make your code more readable and make it so that all of the code isn't in the `playGame` method. For these methods, make sure to make proper use of the instance variables.
- **None of the above methods should be static!**
- You must have at least one instance variable (and likely will need more).
- You must use the `CardDealer` class from class to get the cards for the game.

- Your game must follow the interaction defined above.
- Your game should handle incorrect input properly (that is numbers that are not -1 or 1-5). This should NOT count towards their tries. You may assume, however, that the user always enters an integer.
- When the game finishes, you should print out the player's score and the best possible score they could have gotten (the sum of all of the red cards).

4 Card Maintenance

To make our lives easier, we're going to add a few extra methods to the `Card` class. You may either use your version from the previous assignment (you'll have to rename it from `MyCard` to `Card`), or you can download a copy that I put together:

`http://www.cs.middlebury.edu/~dkauchak/classes/cs201/assignments/assign2/part2/Card.java`

Add the following methods to the `Card` class:

- A method called `isRedCard` that returns whether or not the card is red (i.e. "hearts" or "diamonds").
- A method called `getCardValue` that gives us the numerical value that the card is worth, that is the face value for 2-10, 10 for jack, queen and king, and 11 for aces.

We could have just implemented this functionality in our game class, however, it's better to put it in the `Card` class. It asks questions about data in the `Card` class, we can reuse it for other applications if we'd like, and it can be more easily implemented in the `Card` class.

5 The Rest

Now that the `Card` class is fixed up, it's time to write the game. I'm going to give you a fair amount of flexibility in how you implement it as long as it meets the requirements specified above. Regardless of how you implement it, though, I **strongly** suggest that you incrementally build up the functionality of your program. *Do NOT try and code it all up at once.* Instead, get some very basic things working, test them, then add the next feature.

Here is my suggestion on how to implement it:

– Before coding, think a bit about the design of your class. What methods do you want to have? How should the flow of the program work? What instance variables do you need, that is, what data do you need to keep track of as the game is played? What parameters should the constructor have? I usually spend 10-15 minutes thinking about this before coding and it can save you a lot of headache down the road.

- Create the `CardDealer` class in Eclipse and copy the source code from the class web page. Make sure you understand how to use this class to get new cards. Look at the static methods in this class if you're unsure.
- Create the `FlippyCard` class in Eclipse.
  - Add the constants and instance variables.
  - Write the constructor.
  - Write a private method that prints the current cards to the screen. If a card is face down, it just displays "FACE-DOWN". If it is face up, then it shows the actual card. You can either do this by generating one string and then printing it out, or you can use the `System.out.print` method, which doesn't print a newline after. Test this method and make sure it works properly.
  - Write a *very* basic version of the `playGame` function that displays the cards, gets a card choice from the user (don't worry about checking for invalid numbers for now), flips that card and then loops for a fixed number of tries. Again, test to make sure it works.
  - Add functionality to print out the totals for the face up and face down cards. (*Hint:* this might be a good place for some more methods.
  - Add code that prints out the the user's score after finishing and the best possible score. The best possible score is just the sum of all of the red cards. (*Hint:* this might be a good place for some methods.
  - Add code to check for valid input. You can still do your looping with a `for` loop, but it may be more natural to tackle this with a `while` loop. Think through this one! There are some very nice ways of solving this that won't require a lot of changes to your code.
  - Add code to handle exiting early when -1 is entered.
  - Test is out some more, make sure your code is commented well, and play the game!

Once you're done, you should be able to run your game as:

```
public static void main(String[] args){
    FlippyCard game = new FlippyCard(5);
    game.playGame();
}
```

6 When You're Done

You should now have four files in your project (`WarmUp`, `Card`, `CardDealer` and `FlippyCard`). Put comments at the top of each of these files *that you wrote* with your name and the assignment number.

To group these files into a single file, you need to export your project. To do this:

1. Right-click on the project (on Mac, ctrl+click) and select `Export`.
2. You'll see a number of options. Open up the `Java` folder and select `JAR file` and click `Next`.
3. You should just see your project selected. Below, make sure **only** the following two options are checked:
   - "Export Java source files and resources"
   - "Compress the contents of the JAR File"
4. Click on the `Browse...` button and pick a location to save the output file. Give the file a name like "kauchak1.jar", where "kauchak" is your last name and "1" is the assignment number.
5. Click `Finish`.

If all went well this will generate a single `.jar` file wherever you picked to save it.

Submit this JAR file as assignment number "2.2" via the online submission mechanism on the course web page.