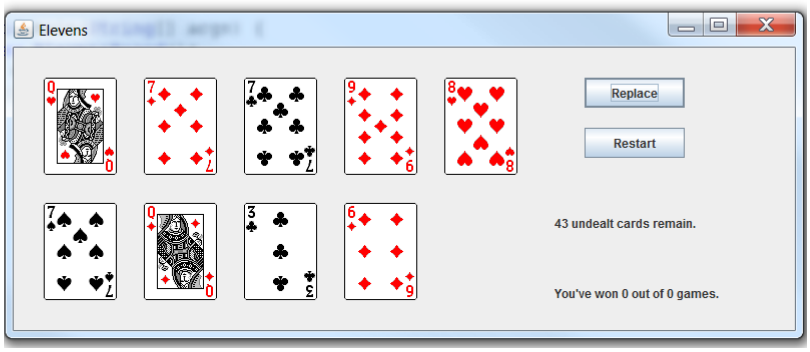
APCS Lab: Elevens Lab Student Handouts

Description

The Elevens Lab walks you through creating a simple solitaire game. Included in the classes is the code to create a GUI (Graphical User Interface) for the game, which will look like:



At the end of the activities you will have a working card game, and will be able to use the framework to create your own games.

Structure

The Elevens Lab has eleven activities that walk you through building the Elevens Solitaire game. Collegeboard has a Student Activity Guide available to help you to work through the lab at this link:

http://2014-15.s3.amazonaws.com/Labs/Elevens/ElevensLabStudentGuide.pdf

The Collegeboard Student Guide is broken into eleven activities:

- Activity 1 - Build the Card class.
- Activity 2 - Build a Deck class to hold Cards.
- Activity 3 - How shuffling works.
- Activity 4 - Adding a shuffle method to the Deck class.
- Activity 5 - Testing with assertions.
- Activity 6 - How to play Elevens.
- Activity 7 - Designing the ElevensBoard class.
- Activity 8 - Using an abstract board to create different games
- Activity 9 - Complete the ElevensBoard class.
- Activity 10 - Implementing a new game: Thirteens.
- Activity 11 - Testing the games using simulation.

For this Lab we are skipping Activities 3 and 4 since they are very similar to the Shuffle assignment you will do in Unit 7. We are also skipping Activity 5, but you are welcome to do it to learn more about testing and debugging techniques. Also Activities 10 and 11 are optional, but would help you in using the lab framework to build new card games.

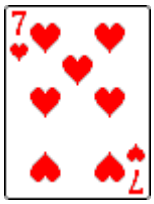
Term 2 – Week 9 Name: _____

Elevens Lab: Worksheet 1 – Activity 1 – Cards Class

Overview – Cards Class

This class implements a single playing card. This is where we will store the rank and suit of a card.

In the card shown here, the Seven of Hearts the rank is seven and the suit is hearts.



1. Open the **`Card.java`** file provided for Activity 1. What variables are included in the class? What data types are being used?

2. Copy the header for the constructor here:

3. What accessor methods are included in the class?

4. Why do you think no mutator methods are included?

5. Complete the Activity 1 guide on page 6. This will guide you through finishing the Card class.

6. Describe how you tested to see if your Card class works correctly.

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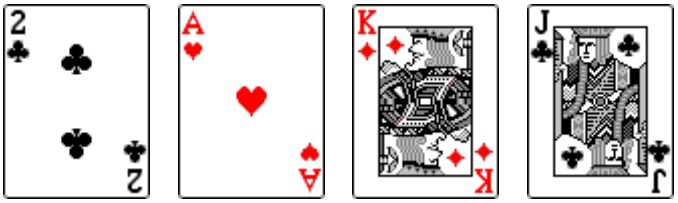
Elevens Lab: Worksheet 2 – Activity 2 - The Deck Class

Overview – Deck Class

This class implements a deck of playing cards. As you work through this activity pay careful attention to the data structure used to store the cards.



1. Open the **`Deck.java`** file provided for Activity. What variables are included in the class? What data types are being used?

2. Copy the header for the constructor here:

   What data types are being passed in?

3. Complete the Deck class as described on page 7 of the Elevens Student Guide.

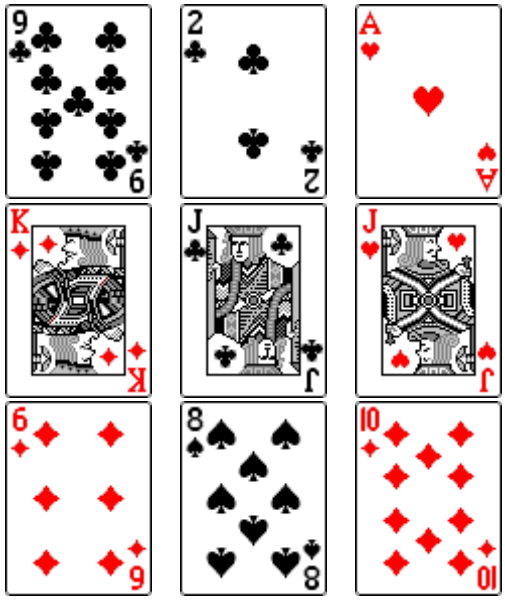
1.

Term 2 – Week 9 Name: _____

Elevens Lab: Worksheet 3 – Activity 6 – Playing Elevens

Overview – Playing Elevens

In Activity 6 we begin to actually look at how to play the Elevens solitaire game. A hand consists of nine cards:



1. Read the Student Guide page 19 Section labeled **Exploration**. Summarize the rules of the game here:

2. Try the Elevens.jar file (in the Starter Files directory under Activity 6) by double clicking on it. Play a few games. Does it match your understanding of the rules from number 1?

3. Complete Activity 6 in the Elevens Student Guide on page 20.

   Question 1:

   Question 2:

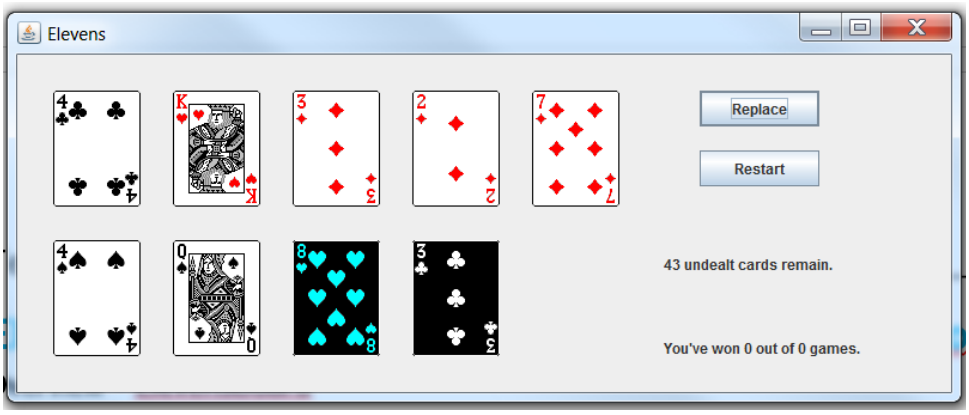
   Question 3:

Term 2 – Week 12 Name: _____

Elevens Lab: Worksheet 4 – Activity 7 - ElevensBoard

Overview – ElevensBoard

This activity brings together the Card and Deck classes you have completed. The ElevensBoard class create the game itself and this is where the rules and behavior of the game are defined. Before coding the final game it is important to understand it's behavior.



1. On page 23 of the Activity Guide answer the questions:

   Question 1:

   Question 2:

   Question 3:

   Question 4:

2. Swap the algorithm you wrote for Question 2 with a classmate. Trace their algorithm – does it work correctly?

3. Make corrections to your own algorithm based on your partner's feedback.

Term 2 – Week 12 Name: _____

Elevens Lab: Worksheet 5 – Activity 8 - Abstract Classes

Overview – Abstract Classes

Activity 8 asks you to think about creating an abstract class to represent a generic Board. This class would allow many games to be created using the Card and Deck classes. This has the added benefit of creating one larger parent class and many smaller game board classes.

1. Look at the description of ElevensBoard on page 21 of the Activity Guide. What behaviors there would be common to other games using a deck of cards?

2. What are the helper methods in ElevensBoard? Which would make sense to include in an abstract parent class?

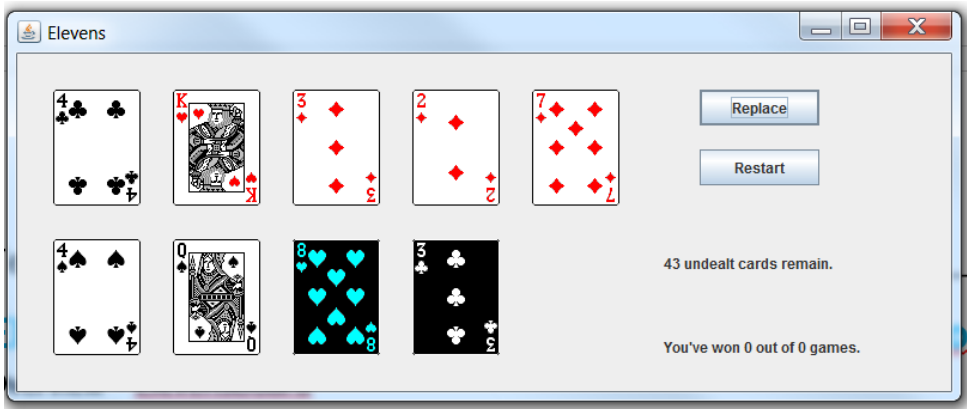
3. Why should the Board class be abstract?

Term 2 – Week 12 Name: _____

Elevens Lab: Worksheet 6 – Activity 9 – Final Game

Overview – Creating the Game

In Activity 9 we finally build a working version of the Elevens game. This final version builds on the abstract Board class from Activity 8.



1. In the Activity Guide follow the directions on pages 29 to 31 to create the working game program.

2. On page 31 answer the questions:

   Question 1:

   Question 2:

   Question 3:

Term 2 – Week 12 Name: _____

Elevens Lab: Worksheet 7 – Activity 11 – Simulation

Overview – Game Simulation

Now that we have a working version of the Elevens game we can investigate some patterns about the game itself. This is called simulation and is used in many areas of computer science. Simulation is used to represent physical processes using software and collect information about the processes. This is used from weather forecasting to supply chain management and is a vital area of computer science in the business world.

In this activity a simulation of playing the Elevens game is built that will allow us to gather information about the Elevens game.

1. In the Activity Guide on page 37-38 do the exercises 1 to 8 to build the simulation.

2. On page 38 answer the questions 1 to 3.

   Question 1:

   Question 2:

   Question 3: