

Name: _____

Per: _____

Activity 6: Playing Elevens

Introduction:

In this activity, the game Elevens will be explained, and you will play an interactive version of the game.

Exploration:

The solitaire game of Elevens uses a deck of 52 cards, with ranks A (ace), 2, 3, 4, 5, 6, 7, 8, 9, 10, J (jack), Q (queen), and K (king), and suits ♣ (clubs), ♦ (diamonds), ♥ (hearts), and ♠ (spades). Here is how it is played.

1. The deck is shuffled, and nine cards are dealt “face up” from the deck to the board.
2. Then the following sequence of steps is repeated:
 - a. The player removes each pair of cards (A, 2, ..., 10) that total 11, e.g., an 8 and a 3, or a 10 and an A. An ace is worth 1, and suits are ignored when determining cards to remove.
 - b. Any triplet consisting of a J, a Q, and a K is also removed by the player. Suits are also ignored when determining which cards to remove.
 - c. Cards are dealt from the deck if possible to replace the cards just removed.

The game is won when the deck is empty and no cards remain on the table. Here's a sample game, in

Cards on the Table	Explanation
K♠ 10♦ J♣ 2♣ 2♥ 9♦ 3♥ 5♠ 5♦	initial deal
K♠ 10♦ J♣ <u>7♦</u> 2♥ <u>Q♠</u> 3♥ 5♠ 5♦	remove 2♣ (either 2 would work) and 9♦
<u>A♠</u> 10♦ <u>9♣</u> 7♦ 2♥ <u>7♣</u> 3♥ 5♠ 5♦	remove J♣ Q♠ K♠
A♠ 10♦ <u>10♠</u> 7♦ <u>3♣</u> 7♣ 3♥ 5♠ 5♦	remove 9♣ and 2♥ (removing A♠ and 10♦ would have been legal here too)
<u>2♠</u> 10♦ <u>9♠</u> 7♦ 3♣ 7♣ 3♥ 5♠ 5♦	remove A♠ and 10♠ (10♦ could have been removed instead)
<u>A♣</u> 10♦ <u>K♦</u> 7♦ 3♣ 7♣ 3♥ 5♠ 5♦	remove 2♠ and 9♠
<u>6♦</u> <u>K♣</u> K♦ 7♦ 3♣ 7♣ 3♥ 5♠ 5♦	remove A♣ and 10♦
<u>2♦</u> K♣ K♦ 7♦ 3♣ 7♣ 3♥ 5♠ <u>Q♦</u>	remove 6♦ and one of the 5s; no further plays are possible; game is lost.

A link to an interactive GUI version of Elevens is on Google Classroom. Play a few games of Elevens and then answer the questions below.

Questions:

1. List all possible plays for the board $5\spadesuit 4\heartsuit 2\diamondsuit 6\clubsuit A\spadesuit J\heartsuit K\diamondsuit 5\clubsuit 2\spadesuit$
2. If the deck is empty and the board has three cards left, must they be J, Q, and K? Why or why not?
3. Does the game involve any strategy? That is, when more than one play is possible, does it matter which one is chosen? Briefly explain your answer.

Activity 7: Elevens Board Class Design

Introduction:

Now that the `Card` and `Deck` classes are completed, the next class to design is `ElevensBoard`. This class will contain the state (instance variables) and behavior (methods) necessary to play the game of Elevens.

Questions:

1. What items would be necessary if you were playing a game of Elevens at your desk (not on the computer)? List the private instance variables needed for the `ElevensBoard` class.

2. `ElevenBoard.java` contains three helper methods. These helper methods are `private` because they are only called from the `ElevenBoard` class.
- Where is the `dealMyCards` method called in `ElevenBoard`?
 - Which `public` methods should call the `containsPairSum11` and `containsJQK` methods?
 - It's important to understand how the `cardIndexes` method works, and how the list that it returns is used. Suppose that `cards` contains the elements shown below. Complete the diagram below by filling in the elements of the returned list, and by showing how those values index `cards`. Note that the returned list may have less than 9 elements.

`cards ->`

0	1	2	3	4	5	6	7	8
J♥	6♣	null	2♠	null	null	A♠	4♥	null

`returned ->`
`list`

0	1	2	3	4	5	6	7	8

- d. Complete the following `printCards` method to print all of the elements of `cards` that are indexed by `cIndexes`.

[illegible]

- e. Which one of the methods that you identified in question 3b above needs to call the `cardIndexes` method before calling the `containsPairSum11` and `containsJQK` methods? Why?