

## ITU COMPUTER ENGINEERING DEPARTMENT

### BLG 233E DATA STRUCTURES

#### HOMEWORK -3 : Fortune-telling Application



**Due Date: 21.12.2015 23:59:59 ...**

In this assignment, you will implement a fortune-telling application. You, as a fortune-teller, will have a deck/pack of playing cards. There are four types of cards, namely Hearts, Diamonds, Clubs and Spades. Each card type has 13 cards, which are A, 2, 3, 4, 5, 6, 7, 8, 9, 10, J, Q, K. Thus, a deck of cards consists of 52 cards from 4 types of cards with 13 cards from each group as shown in the Fig. 1.

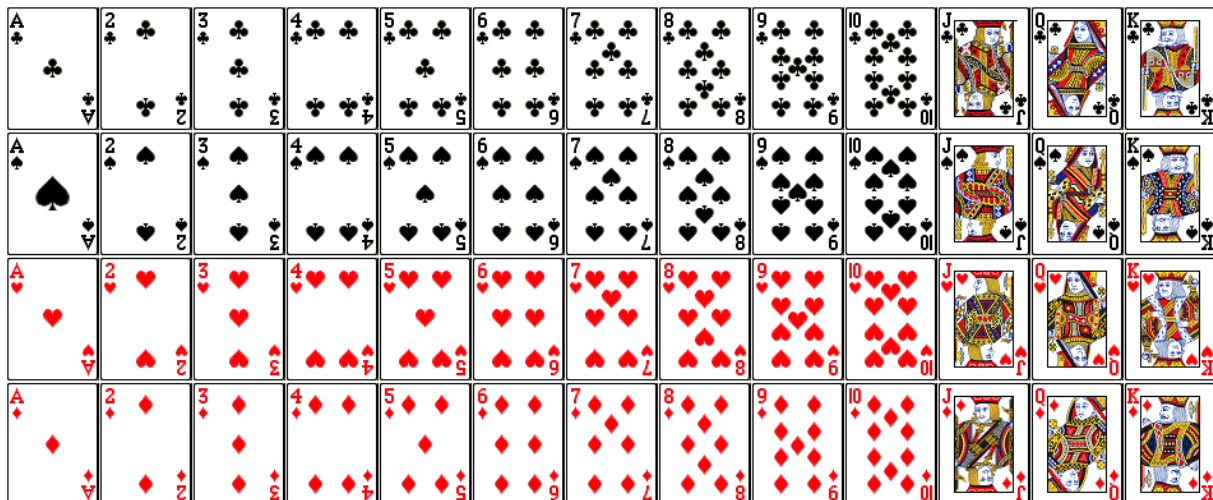


Figure 1: Playing Cards

Fortune-telling works as follows: Firstly the fortune teller ask you to think of a wish. Then all of the cards within the deck are **shuffled**. After shuffling the cards, fortune teller takes the card which is in front of all of the cards and at the same time starts counting from 1. If the number on the card matches the number fortune-teller says (matching rule: 1=A, 2=2, ..., 10=10, 11=J, 12=Q and 13=K), then that card is placed on a special place. If the number displayed on the card does not match the number fortune teller says, then that card is placed down on a temporary place. Assume that the previous card and the number did not match, then after placing that card to the temporary place, the fortune-teller takes another card which is in front of all of the cards now and increments the number he/she said previously and checks if the number on the card and the number he/she said matches. This process goes on until either a matching is found or fortune teller reaches to 13 while counting. After 13 trials with no match, the fortune teller takes these 13 cards stacked on each other on the

temporary space and removes them from the game. Then he/she starts taking the cards from the deck and starts counting and checking. When a match occurs, as mentioned previously, the fortune teller places the matching card to the special place and then he/she takes the cards (if any) that is stacked on top of each other in the temporary space and places these cards to the back of the deck. The fortune-teller stops checking when he/she counts and checks all of the cards within the deck and cannot find a card that matches the number he/she says.

An example fortune-telling is shown below.

After shuffling the deck, assume that the deck is formed as follows starting from the front to the back:

**D-K, D-Q, S-3, S-9, D-8, H-4, C-10, H-8, H-5, C-8, H-6, S-A, S-2, D-A, S-5, C-4, D-9, D-3, H-A, H-3, S-K, S-7, H-9, C-5, H-K, C-K, D-J, H-2, C-Q, D-2, C-J, C-7, C-3, D-7, S-Q, C-9, S-8, C-2, C-6, H-10, D-5, S-6, S-J, D-4, H-Q, S-4, D-10, H-7, C-A, D-6, S-10, H-J.**

Where, the first character represents the card type (H for Hearts, D for Diamonds, C for Clubs and S for Spades) and the rest represents the number on the card.

Fortune teller says 1 and takes the card from the front of the deck, which is a Diamond K. As 1 and K (K=13) does not match, Diamond K is placed onto the temporary place. Then the fortune teller takes D-Q and says 2. As Q and 2 do not match, D-Q is stacked onto D-K, on the temporary place. Then fortune teller says 3 and takes the card at the front of the deck now, which is S-3. 3 and 3 matches, so S-3 is placed to the special place and kept for fortune telling at the end of the game. Now, the cards that were stacked on the temporary place are taken one by one and placed to the back of the deck. The current form of the deck is shown below:

**S-9, D-8, H-4, C-10, H-8, H-5, C-8, H-6, S-A, S-2, D-A, S-5, C-4, D-9, D-3, H-A, H-3, S-K, S-7, H-9, C-5, H-K, C-K, D-J, H-2, C-Q, D-2, C-J, C-7, C-3, D-7, S-Q, C-9, S-8, C-2, C-6, H-10, D-5, S-6, S-J, D-4, H-Q, S-4, D-10, H-7, C-A, D-6, S-10, H-J, D-Q, D-K,**

Pay attention that, the cards on the temporary space are taken in a **last-in-first-out** manner and placed at the back of the queue one by one. Now, fortune teller says 1 and takes S-9, which do not match. Places it on the temporary place. Says 2 and takes D-8, does not match. Places D-8 onto S-9 on the temporary place. Then says 3 and takes H-4, does not match. And keeps on repeating the same process until saying 13 and taking C-4. It does not match again and places it on the temporary place. Now, as the fortune teller checked 13 cards and found no match, he/she takes the cards stacked onto each other on the temporary space and removes them from the application. Now the form of the deck is as follows:

**D-9, D-3, H-A, H-3, S-K, S-7, H-9, C-5, H-K, C-K, D-J, H-2, C-Q, D-2, C-J, C-7, C-3, D-7, S-Q, C-9, S-8, C-2, C-6, H-10, D-5, S-6, S-J, D-4, H-Q, S-4, D-10, H-7, C-A, D-6, S-10, H-J, D-Q, D-K.**

The fortune-teller continues to do these operations over and over until no-match occurs within the deck of cards in his/her hand. Using the deck shown here, this happens when D-J, D-7, S-K, D-3, H-9 are taken from the deck when they match to the number being said and 26 cards are removed and rest of the cards in the deck are:

**H-2, C-Q, D-2, C-J, C-7, C-3, D-9**

Here, no match occurs at all. This means that all of the cards which will tell the fortune to the fortune-teller are determined. Now, fortune teller sums the value of cards and according to the sum of the cards' values fortune-teller says "Your wish will come true!" or "Bad luck! Your wish won't

come true!". The threshold value here is 50. If the sum is smaller than 50, your fortune will not come true and if it is equal to or greater than 50, your fortune will come true, The value of the cards can be calculated as follows: Each of the cards A, J, Q and K count for 10 points and rest of the cards have values equal to their number.

#### Requirements & Grading:

1. You are required to **use recursion** in order to shuffle the cards and create the initial deck. You **must not use any looping structure (i.e., for, while)** for shuffling (20 pts),
2. You are expected to use **Queue** data structure for the deck of the cards and for the cards that are to be stored as fortune-telling cards (10 pts),
3. You are expected to realize the temporary space which is used to stack the cards that do not match during the counting & checking operation using the **Stack** data structure (10 pts),
4. Comparing the card from the beginning of the queue with the counting number and placing the card to the appropriate place (to the temporary space or fortune-telling cards) (10 pts),
5. In case of a match, placing the cards on temporary space to the queue (10 pts),
6. Determining the end of counting when no more cards match with the counting number (10 pts),
7. Summing the points of cards to determine the fortune-telling outcome (10 pts),
8. Your program must print out the shuffled version of the deck and the steps of fortune-telling and the fortune-telling results to **output.txt** file according to a certain format. You can find the example out.txt in Ninova. Note that, your program must create out.txt and print results to the file **exactly in the same format** as the sample output file! Console outputs will **not be accepted!** (20)

Note: If you have any question about the homework, please contact to the research assistant Ahmet Arış via email ([arisahmet@itu.edu.tr](mailto:arisahmet@itu.edu.tr)). You can find an example fortune-telling video at <https://youtu.be/1T-u95h81vU>

#### Submission Procedure:

1. Make sure to write your name and number to all of the files of your project in the following format:

```
/*
```

```
* @Author
```

```
* Student Name: !! enter here !!
```

```
* Student ID : !! enter here !!
```

```
* Date:
```

```
*/
```

2. Briefly explain the main structure of your homework in your REPORT. Also remember to add the screenshots of console outputs to the report.
3. Use comments wherever necessary in your code to explain your aim.

4. Create a README file and briefly explain how your code can be compiled and run using GNU/Linux command line.

**5. Compile the code in SSH before you send your homework.**

6. After you make sure that everything is compiled smoothly, archive all files (codes, report and other necessary files) into a zip file. Submit this file through [www.ninova.itu.edu.tr](http://www.ninova.itu.edu.tr). Ninova enables you to change your submission before the submission deadline. Do not miss submission deadline, the homeworks sent via e-mail will not be graded.

Academic dishonesty including but not limited to cheating, plagiarism and collaboration is unacceptable and subject to disciplinary actions. Any student found guilty will receive F as his/her final grade for the course.