



# School of Applied Sciences And Technology

## Department of IST

### Program: CNT

#### CMPE 1666-ICA06- Fisher-Yates Shuffling Algorithm

In this ICA, you will use the fisher Yates algorithm to shuffle a deck of 52 cards, deal a hand to each of 10 players and find a winner.

Create an application with the UI shown below.

In the form class, declare a struct to store attributes for a card. The struct will have 4 members, namely suit and rank, points and Symbol. The suits will be from :Heart, Diamonds, Club and Spade. Declare an **enum** type for the suit.

The ranks will be: the numbers 2..14, with 11, 12, 13 and 14 representing respectively Jack, Queen, King and Ace.

At the form level, declare and initialize a card deck as an array of 52 cards and a 2D array of 10x5 of cards. The 2D array will store the cards for each player in a row (This will be performed by the method **DealHands()**, below). Also, declare and initialize an int array of size 10, called **playerPoints**, to store the total points for each player.

Create a method called **createCard()**. It has as parameter a suit and a rank. It creates and returns a struct of type Card. It calculates the points for each card by assigning a weight to each of the suit as per the table below, and the points for each card is obtained from **weight x the rank**

Suit	Weight
Heart	4
Diamond	3
Club	2
Spade	1

The Symbol for a card will be assigned as the rank if the value is in the range 2..10. Otherwise it will be the symbol for the rank, i.e J, Q, K or A.

In the form constructor, use the method **createCard()** to assign a card with a unique suit-rank combination to each element of the deck of cards. The card will also be assigned the points and symbol.

Add a method **CardToString()** that returns a string of the form “Card: <suit> <symbol> Points: <points>”, for a card. This returned string will be used for display in the listboxes (see the sample runs).

Add a method **ShuffleCards()**, that shuffles your deck of cards using the Fisher-Yates Algorithm.

Add a method **DealHands()** that has as parameters a deck of cards and a 2D array. It iterates through the deck of cards and distributes the cards among the players. In each round each player is given a card. The total points for each player must also be calculated and assigned to the array **playerPoints**.

Add a method **DetermineWinner()** that iterates through the 2D array, calculates the sum of points in each row and determines the winner row.

Implement the event handlers for the click events of the buttons as follows:

- The button “Load Cards” will cause the current card deck to be displayed in the Listbox with the label “**Starting Deck**”.
- The button “**Shuffle Cards**” will cause the method **ShuffleCards()** to be called. The Shuffled Cards will then be displayed in the “**Shuffled Deck**” listbox.
- The button “**Deal Hands**” will call the method **DealHands()** to distribute the cards among the players. The player hands and total points for each player will be displayed in the **Players Hands** listbox.
- The button “**Determine Winner**” will iterate over the **playerPoints** array, determine the winner and display the winner and total points in the read-only textbox. In case of ties, you need only display the first winner.

Anchoring: Pin the buttons to the top left. The Listboxes must increase in height but not in width.

## Sample Run:

Form1

Load Cards

Shuffle Cards

Deal Hands

Determine Winner

Starting Deck

Card:Heart 2	Points: 8
Card:Heart 3	Points: 12
Card:Heart 4	Points: 16
Card:Heart 5	Points: 20
Card:Heart 6	Points: 24
Card:Heart 7	Points: 28
Card:Heart 8	Points: 32
Card:Heart 9	Points: 36
Card:Heart 10	Points: 40
Card:Heart J	Points: 44
Card:Heart Q	Points: 48
Card:Heart K	Points: 52
Card:Heart A	Points: 56
Card:Diamond 2	Points: 6
Card:Diamond 3	Points: 9
Card:Diamond 4	Points: 12
Card:Diamond 5	Points: 15
Card:Diamond 6	Points: 18
Card:Diamond 7	Points: 21
Card:Diamond 8	Points: 24
Card:Diamond 9	Points: 27
Card:Diamond 10	Points: 30
Card:Diamond J	Points: 33
Card:Diamond Q	Points: 36
Card:Diamond K	Points: 39
Card:Diamond A	Points: 42
Card:Club 2	Points: 4
Card:Club 3	Points: 6
Card:Club 4	Points: 8
Card:Club 5	Points: 10
Card:Club 6	Points: 12
Card:Club 7	Points: 14
Card:Club 8	Points: 16
Card:Club 9	Points: 18
Card:Club 10	Points: 20
Card:Club J	Points: 22
Card:Club Q	Points: 24
Card:Club K	Points: 26
Card:Club A	Points: 28
Card:Spade 2	Points: 2
Card:Spade 3	Points: 3
Card:Spade 4	Points: 4
Card:Spade 5	Points: 5
Card:Spade 6	Points: 6
Card:Spade 7	Points: 7
Card:Spade 8	Points: 8
Card:Spade 9	Points: 9
Card:Spade 10	Points: 10
Card:Spade J	Points: 11
Card:Spade Q	Points: 12
Card:Spade K	Points: 13
Card:Spade A	Points: 14

Shuffled Deck

Card:Club 7	Points: 14
Card:Diamond K	Points: 39
Card:Diamond 2	Points: 6
Card:Club 10	Points: 20
Card:Club 3	Points: 6
Card:Club Q	Points: 24
Card:Club A	Points: 28
Card:Diamond J	Points: 33
Card:Spade 7	Points: 7
Card:Diamond 9	Points: 27
Card:Heart 4	Points: 16
Card:Club 2	Points: 4
Card:Spade 4	Points: 4
Card:Heart 5	Points: 20
Card:Heart J	Points: 44
Card:Diamond Q	Points: 36
Card:Heart 3	Points: 12
Card:Diamond 4	Points: 12
Card:Club J	Points: 22
Card:Heart 10	Points: 40
Card:Heart 9	Points: 36
Card:Club 9	Points: 18
Card:Diamond 10	Points: 30
Card:Spade 5	Points: 5
Card:Spade 10	Points: 10
Card:Diamond 3	Points: 9
Card:Club K	Points: 26
Card:Diamond A	Points: 42
Card:Heart 6	Points: 24
Card:Club 4	Points: 8
Card:Spade A	Points: 14
Card:Spade Q	Points: 12
Card:Spade 3	Points: 3
Card:Heart 7	Points: 28
Card:Diamond 6	Points: 18
Card:Diamond 5	Points: 15
Card:Heart 8	Points: 32
Card:Spade 8	Points: 8
Card:Heart K	Points: 52
Card:Club 8	Points: 16
Card:Diamond 7	Points: 21
Card:Heart 2	Points: 8
Card:Spade 2	Points: 2
Card:Spade 9	Points: 9
Card:Heart Q	Points: 48
Card:Spade K	Points: 13
Card:Diamond 8	Points: 24
Card:Club 5	Points: 10
Card:Spade 6	Points: 6
Card:Spade J	Points: 11
Card:Club 6	Points: 12
Card:Heart A	Points: 56

Players Hands

Player 1

Card:Club 7

Points: 14

Card:Heart 4

Points: 16

Card:Heart 9

Points: 36

Card:Spade A

Points: 14

Card:Diamond 7

Points: 21

Total: 101

Player 2

Card:Diamond K

Points: 39

Card:Club 2

Points: 4

Card:Club 9

Points: 18

Card:Spade Q

Points: 12

Card:Heart 2

Points: 8

Total: 81

Player 3

Card:Diamond 2

Points: 6

Card:Spade 4

Points: 4

Card:Diamond 10

Points: 30

Card:Spade 3

Points: 3

Card:Spade 2

Points: 2

Total: 45

Player 4

Card:Club 10

Points: 20

Card:Heart 5

Points: 20

Card:Spade 5

Points: 5

Card:Heart 7

Points: 28

Card:Spade 9

Points: 9

Total: 82

Player 5

Card:Club 3

Points: 6

Card:Heart J

Points: 44

Card:Spade 10

Points: 10

Card:Diamond 6

Points: 18

Card:Heart Q

Points: 48

Total: 126

Player 6

Card:Club Q

Points: 24

Card:Diamond Q

Points: 36

Card:Diamond 3

Points: 9

Card:Diamond 5

Points: 15

Card:Spade K

Points: 13

Total: 97

Player 7

Winner

Player5- Points:126

## Rubric

Item	Marks	Penalties
<b>UI Design (40%)</b> <ul style="list-style-type: none"><li>• UI is as directed.</li><li>• Tab Order is Correct.</li><li>• Display Format correct.</li><li>• Anchoring as required</li></ul>	12	
<b>Code Design and Implementation (60%)</b> <ul style="list-style-type: none"><li>• All buttons working as required</li><li>• Shuffling Algorithm working</li><li>• DealHands Working</li><li>• Winner properly designated</li><li>• All displays happening as required</li></ul>	18	
<b>Documentation:</b> <ul style="list-style-type: none"><li>• Programmer Block</li><li>• Well commented code</li><li>• Appropriate Variable Names</li><li>• Proper spacing between blocks of code</li><li>• Control names are consistent and appropriate.</li></ul>		Penalties: -1 to -6 based on instructor's judgement