**Winning Poker Hand**

**CSC 510 Analysis of Algorithms**

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### Problem Statement:

The key idea is to identify the winnings of each player in a texas hold’em poker game. There can be a maximum of 9 players and a minimum of 2 players. Each player receives 2 cards and bets a particular amount. There are 5 cards on the table. The player with the best 5 cards out of the 7 (2 from the player and 5 on the table) wins.

The total amount bet by all the players is divided into pots. The value of the pot is defined by the bet amount of the pot multiplied by the number of players in the pot. The smallest pot has all the players participating in it while the next pot has one less player and continues until a pot has at least one player remaining. The pot goes as winning to the best hand amongst the participating players. If there arises a situation where more than one player has the same winning hand the pot is equally split between the winners.

The problem consists of two parts:

* Identify the hand of each player
* Identify the winning of each player

For ease the card nomenclature is simplified to two characters. The first character describes the face of the card and second describes the suit. The following pattern is used for naming.

2 – Two, 3 – Three, 4 – Four, 5 – Five, 6 – Six, 7 – Seven, 8 – Eight, 9 – Nine, T – Ten, J – Jack, Q – Queen, K – King

C – Clubs, D – Diamonds, H – Hearts, S – Spades

A card named ‘TS’ means it is Ten of Spades

### Input:

Input is in the form of a csv file. The first row must be of 6 columns. The first column must hold the value ‘Table’. The rest of the columns hold the card names. The other rows have 4 columns. The first column holds the player’s name. The second column holds the player’s bet. The other two columns hold the player’s cards

For example:

Table,AD,TS,AC,9H,JS

Player1,1000,2D,7S

Player2,2000,5S,3D

### Methodology:

**Evaluating the Hand:**

In order to identify the strength of a player’s hand each card has a prime number attached to it.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Card | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | T | J | Q | K | A |
| Prime Value | 3 | 5 | 7 | 11 | 13 | 17 | 19 | 23 | 29 | 31 | 37 | 41 | 43 |

The product of these primes give the strength of the hand. For example the cards set 4S, 9D, KS, KH, 7C has a value of ‘4,600,897’. This method gives a unique value to a set of cards in order of increasing strengths.

Poker game has the following rule for deciding the winner and each rule is assigned a numeric value

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Hand | Straight Flush | Four of a Kind | Full House | Flush | Straight | Three of a Kind | Two Pair | One Pair | High Card |
| Strength | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |

The card product which fall under each rule is generated into a look-up file ‘hands.json’ so that one can easily identify from a card set the strength of the hand.

Each player’s card is combined with the table cards and a combination of 5 cards is picked from the available 7. Each player has 21 such combinations to evaluate. Each of this combination is looked up in the file and the strength of the hand is identified. The final value of the cards set is decided by the formula: which gives a decimal value between 0 – 9. The highest value amongst 21 card combinations is the value of the player’s hand.

**Distributing winnings:**

The unique bet values from all the players are identified and the players are grouped in a way that the lowest bet has all the players involved while the subsequent higher bets have the players who bet equal or greater than that amount. Each of this group is order in decreasing hand value of the player using a modified insertion sort so that the players with same hand values get grouped together.