

# Code'em POKER

## INTRODUCTION:

***“The commonest mistake in history is underestimating your opponent; it happens at the poker table all the time.”*** - David Shoup

Card games have been one of the most exciting and relishing leisure time activity for one and all. Hearts, Bluff, Black Jack, Poker, Rummy have been all time favorites.

Amongst all, Poker is one such card game which is embellished by mindful tactics, shrewd judgements and thrilling competition.

How amazing would it be when such a remarkable game would be augmented by the tentacles of coding to entrap the money from opponents. Here's the opportunity for top coders all across the world to show their coding skills and lock heads with their opponents to join in the thrill at the Poker table.

## PROBLEM STATEMENT:

The teams have to submit codes. At a time, six codes will play poker.

**Prizes worth INR 36,000 to be won.**

## STRUCTURE:

### Framework

The competition aims to provide an interface for codes of different teams to simultaneously play the famous card game 'POKER' against each other. The codes will be in the following languages :

- C
- C++
- Java
- Pearl
- Ruby
- Python

Note: In the entire documentation, '*user*' refers to the team and '*admin*' refers to the administrator. A part of the code will be submitted by the user and the rest will be created by the admin to help simulate and execute the entire game.

The cards will be represented by an integer. Look at the **Terminology** tab.

## User Task

The user has to make a program named <TeamId>.<file\_extension>. Suppose the Team Id of a particular team is Pr0023, then the program name should be Pr0023.cpp or Pr0023.java as the case may be. This program made by user will represent his decision at a particular stage of the game. Possible decisions are:

1. Call: to match the amount currently bet by any other player higher than spent. If no bet is initially made, call is similar to check.
2. Fold: to cease playing in the current deal. The money bet in the current deal is lost.
3. Raise: to raise the money over the current bet by a particular value which depends on different situations viz. preflop, postflop, post-fourth street, etc and also on previous bets made in the current betting round.
4. Post-showdown: This is not actually a decision, this is just to make out the strategies of fellow players by seeing their cards and comparing with the bids they have made during the game.

## Orientation of Players

- Left : 2 is left to 1 i.e. 6,5,4,3,2,1 from extreme left to extreme right. Since the table is circular, 1 is to the left of 6.
- Right : 1 is right to 2 i.e. 1,2,3,4,5,6 from extreme right to extreme left. Since the table is circular, 6 is to the right of 1.

## Text Files

To help the user know the entire course of game being played, he will be provided with some text files. Below is the description of them :

- **inputf.txt:** this text file stores the information about the following :
  1. card1: the integer representation of one hole card
  2. card2: the integer representation of the other hole card
  3. player: at a time, six teams will be simultaneously playing the game of Poker, so player is the position of the team among the six players. It is a number from 1 to 6. It will remain same in all the deals for a particular table.
  4. spent: its the money which the team has put in the current deal till now.

- **deals\_money.txt:** this text file just stores the number of deals which have been played till now and the money left with the players before the starting of the current deal. One deal is completed after the showdown.
- **deal.txt:** this is the text file representing current deal. This text file gives the complete description of a particular deal.
- **outputf.txt:** the team has to enter its decision in this text file. Possible decisions and their output formats are :

What about  
"Check" ??

1. Call: The *output value* in such a case is the *integer 0*.
2. Fold: The *output value* in such a case is the *integer -10*.
3. Raise: The *output value* is the *amount of money raised in integers*.
4. Post-Showdown: This matters only when the stage of the game is **Show\_Down**. Teams need not output anything in this case. Even if some team outputs anything in the file, it will be neglected.

Besides these, each team is allowed to make at the most **15 more files** for his help. Their names depend on the teams. These files may store anything like the perception of the team about his fellow players evaluated according to the bids made by them during the game play. All files will/should be in the current folder.

So, when the program is executed in the **Show\_Down** stage, teams will update their help files so that they can help them in the next deal.

### Editable permissions to files

All the files are not both readable and writable. The permissions goes as follows :

- **inputf.txt:** only readable
- **deals\_money.txt:** only readable
- **deal.txt:** only readable
- **outputf.txt:** readable and writable. The team has to write or return its decision in this file only.

The above files will be made by the administrator and will be in the same folder as the main program of the team. So, the teams can directly use the names of these files in their codes. The help files will be made by the teams only. These files can either be in the current folder or can be inside a new sub-directory created by the team in the current folder.

### Format of Text Files

The text files are in the format so that it is easy and efficient to access the required data from them. Below is the format of the text files :

- **inputf.txt:** represents the input given to a team to extract out its decision. The format is as follows :

```
12          37          2          400
```

- **deals\_money.txt:** represents the current deal in play and the money teams had remaining before the starting of the current deal. The format of the file is:

```
Deal          3
1            1800
2            1500
3             600
4            2100
5            1000
6            2000
```

- **deal.txt:** this is the text file representing the current deal. The format of this text file is :

1. A complete text file deal.txt:

```
Dealer          3
Stage          Show_Down
Main_Pot       550

Pre_Flop
1              2              3              4              5              6
Call 10      Call 10      Rise 25      Rise 5      Rise 10      Call 10
Call 25      Call 25      Call 25      Call 25      Fold 10      Call 25
End

Flop
42           11           38
1              2              3              4              5              6
Call 25      Call 25      Call 25      Call 0      -      Rise 25
Fold 25      Fold 25      Call 25      Call 25      -      Call 25
End

Fourth_Street
12
1              2              3              4              5              6
-              -      Call 50      Rise 50      -      Call 50
-              -      Call 100      Rise 100      -      Call 100
-              -      Call 100      Call 100      -      Call 100
End

Fifth_Street
2
1              2              3              4              5              6
-              -      Call 25      Call 0      -      Rise 250
```

is this right?



```

-          -      Call 400      Fold 0  -      Rise 400
-          -      Call 400  -      -      Call 400
End

Show_Down
1          15    20
2          16    46
3          13    39
4          10    17
5          2     41
6          1     9
Win        6

```

## 2. An incomplete text file deal.txt:

```

Dealer      3
Stage       Fifth_Street
Main_Pot    400

Pre_Flop
1          2          3          4          5          6
Call 10    Call 10    Rise 25    Rise 5     Rise 10    Call 10
Call 25    Call 25    Call 25    Call 25    Fold 10    Call 25
End

Flop
42         11    38
1          2          3          4          5          6
Call 25    Call 25    Call 25    Call 0     - Rise 25
Fold 25    Fold 25    Call 25    Call 25    - Call 25
End

Fourth_Street
12
1          2          3          4          5  6
-          -          Call 50    Rise 50    - Call 50
-          -          Call 100   Rise 100   - Call 100
-          -          Call 100   Call 100   - Call 100
End

Fifth_Street
2
1          2          3          4          5  6
-          -          Call 250   Call 0     - Rise 250

```

- **outfutf.txt:** this will be initially an empty file an the team can enter the data. The team has to just print the integer representing its decision in the first line of the file.

## Explanation of Text Files

Below is the explanation of the text files in the format they are given above :

- **inputf.txt:**

```
12          37          2          400
// FIRST ENTRY (12) : FIRST HOLE CARD
// SECOND ENTRY (37) : SECOND HOLE CARD
// THIRD ENTRY (2) : PLAYER NUMBER OF THE TEAM, FROM 1 TO 6
// FOURTH ENTRY (400) : MONEY SPENT BY THE TEAM IN THE CURRENT ROUND
```

- **deals\_money.txt:**


```
Deal      3      // THE CURRENT DEAL BEING PLAYED
1      1800      // THE MONEY REMAINING WITH PLAYER 1
BEFORE THE STARTING OF DEAL 3
2      1500      // THE MONEY REMAINING WITH PLAYER 2
BEFORE THE STARTING OF DEAL 3
3      600      // THE MONEY REMAINING WITH PLAYER 3
BEFORE THE STARTING OF DEAL 3
4      2100      // THE MONEY REMAINING WITH PLAYER 4
BEFORE THE STARTING OF DEAL 3
5      1000      // THE MONEY REMAINING WITH PLAYER 5
BEFORE THE STARTING OF DEAL 3
6      2000      // THE MONEY REMAINING WITH PLAYER 6
BEFORE THE STARTING OF DEAL 3
```

- **deal<numbers>.txt:**

1. A complete text file deal1.txt:

```
Dealer      3      // THE PLAYER NO. 3 IS THE DEALER
Stage      Show_Down // POSSIBLE STAGES ARE A)Pre_Flop, B)Flop,
// C)Fourth_Street, D)Fifth_Street AND
// E)Show_Down. IF A STAGE IS NOT COMPLETED,
// THERE IS NO End WORD WRITTEN AFTER THE
// STAGE
Main_Pot    550      // ITS THE MONEY IN THE MAIN POT NOW.
```

```
Pre_Flop
1      2      3      4      5      6
Call 10      Call 10      Rise 25      Rise 5      Rise 10      Call 10
Call 25      Call 25      Call 25      Call 25      Fold 10      Call 25
End
```

is it right ?  // THE SUMMARY OF Pre\_Flop IS HERE : WITH SMALL BLIND AS 5 BY  
PLAYER 4 (LEFT TO DEALER I.E. PLAYER 3)AND BIG BLIND AS 10  
BYPLAYER 1 (LEFT TO 4, SMALL BLIND), THE BETTING GOES ON TO  
PLAYER 5 (LEFT TO PLAYER 5) WHICH CALLS FOR 10, THEN PLAYER 1,  
THEN 2 AND THEN TO PLAYER 3 WHICH RAISES THE AMOUNT TO 25. NOW

```

Flop
42      11      38
1        2        3        4        5 6      is it "Check"?
Call 25  Call 25  Call 25  Call 0  - Rise 25
Fold 25  Fold 25  Call 25  Call 25  - Call 25
End

```

```

Fourth_Street
12
1          2          3          4          5 6
-          -          Call 50      Rise 50      -          Call 50
-          -          Call 100     Rise 100     - Call 100
-          -          Call 100     Call 100     - Call 100
End

```

```

Fifth_Street
2
1          2          3          4          5          6
-          -          Call 250      Call 0      -          Rise 250
-          -          Call 400      Fold 0      -          Rise 400
-          -          Call 400      -          -          Call 400
End

```

Show\_Down

1	15	20
---	----	----

2	16	46
3	13	39
4	10	17
5	2	41
6	1	9

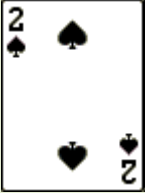
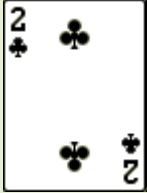
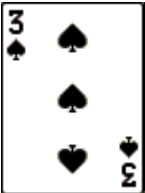
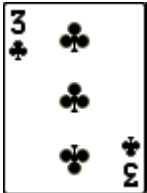

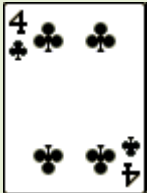
Win 6

// THE SUMMARY OF Show\_Down IS HERE : WHEN ALL PLAYERS SHOW THEIR HOLE CARDS, PLAYER 6 WINS SINCE HE HAS A COMPLETE FLUSH

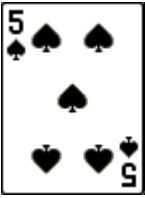
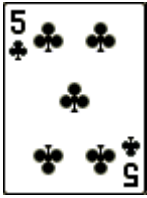

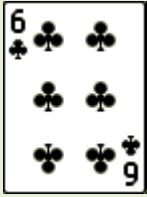

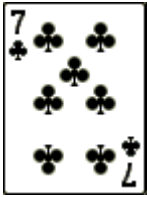
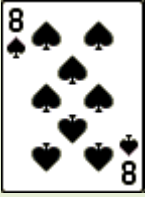
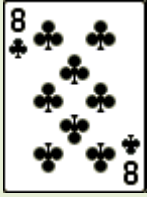
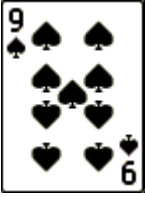
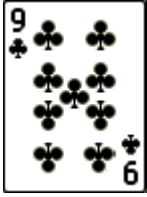

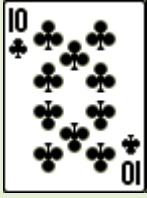


## Game simulation

The admin will call team programs and provide them the required information in the text files. The teams have to access the input files, deal files and their help files and based on the data in those files, they have to decide their next move which will be given back to the admin in the text file outputf.txt. The admin will update the other text files using this data and so the game goes on. Whenever the code of a particular team is called, the only information team has is in the files, be it the input and deal files or his helper files.

## CARDS TERMINOLOGY:

Image	Card	Representation	Image	Card	Representation
	Two of Spade	1		Two of Club	14
	Three of Spade	2		Three of Club	15
	Four of Spade	3		Four of Club	16



	Five of Spade	4		Five of Club	17
	Six of Spade	5		Six of Club	18
	Seven of Spade	6		Seven of Club	19
	Eight of Spade	7		Eight of Club	20
	Nine of Spade	8		Nine of Club	21
	Ten of Spade	9		Ten of Club	22
	Jack of Spade	10		Jack of Club	23






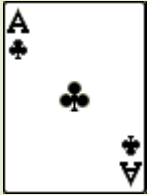

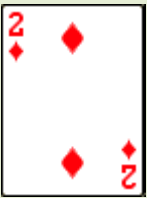

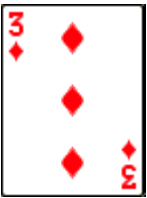




















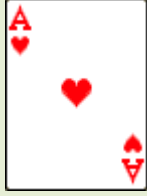

	Queen of Spade	11		Queen of Club	24
	King of Spade	12		King of Club	25
	Ace of Spade	13		Ace of Club	26

Image	Card	Representation	Image	Card	Representation
	Two of Heart	27		Two of Diamond	40
	Three of Heart	28		Three of Diamond	41

	Four of Heart	29		Four of Diamond	42
	Five of Heart	30		Five of Diamond	43
	Six of Heart	31		Six of Diamond	44
	Seven of Heart	32		Seven of Diamond	45
	Eight of Heart	33		Eight of Diamond	46
	Nine of Heart	34		Nine of Diamond	47
	Ten of Heart	35		Ten of Diamond	48

	Jack of Heart	36		Jack of Diamond	49
	Queen of Heart	37		Queen of Diamond	50
	King of Heart	38		King of Diamond	51
	Ace of Heart	39		Ace of Diamond	52

## INSTRUCTIONS:

### Rules, Tips and Instructions

- The competition is open to all (students, researchers, professionals, national as well as international).
- The codes should be in following languages only :
  - C
  - C++
  - Java
  - Pearl
  - Ruby
  - Python

- The decision of the organizing team shall be regarded as final in case of any discrepancy.
- A single file has to be submitted containing the source code. Text files will be created only during the game play.
- Text files are an aid to the teams as the teams can guess the tactics of their opponents by judging their moves, exactly what we do while playing any card game.
- The maximum number of text files a team can make is 15.
- Time the code of a particular team should take should be realistic, mostly less than **1 second. Codes taking a lot of time will be disqualified.**
- Small blind and Big blind are fixed to 5 and 10 units respectively. These will be added in the file by admin only before the beginning of the deal. The initial amount given to each team is equal to **1500 units**.
- In a total, there will be 1000 deals on a single table. Say, deal 1 is going on. Teams have to decode the information from deal.txt during deal 1 in their help files. When deal 2 starts, initial deal file having statistics of deal 1 is lost and during deal 2, teams have to rectify the information in their help files using the statistics of deal 2. So, teams have to continuously improve the information in their help files during the successive deals.
- **No actual money is involved in the game.** Prize money will be finally given to the winner and is independent of the virtual money involved in the game.
- Teams including bluff and other clever programming will surely have an upper edge over others.
- To quickly check whether a card is a high card or not, the integral representation of the card when modulo 13 will give a high value. To check whether two cards are of same suit, the quotient on dividing by 13 is same.
- Note that at any point of time the latest information will be that which is on the site. The information provided in the pdf downloaded earlier may not be the latest. However, registered participants will be informed through mail about any changes on the site.

## Certificate Policy

Top 6 teams will be given the certificate of excellence.

Teams whose codes will run without errors for the entire course of the game will be given the certificate of participation.

## Team Specifications

The participating entries must be in a team of a maximum of 3 [three] people. If the participating team feels that they require more participants, they can forward their request, with suitable reasons, to [codempoker\[at\]techfest\[dot\]org](mailto:codempoker@techfest.org) with the subject "Code'em Poker team number increase".

# RULES OF POKER:

## Type

The game we will be playing is No Limit Texas Hold'em Poker.

## Quick Glossary

- **Blinds:** Short for "blind bets," these are the forced bets made before the cards are dealt.
- **Burn Card:** The card dealt facedown before any community card is dealt.
- **Button:** Nickname for the player acting as the dealer in current hand.
- **Check:** Similar to a call, but no money is bet. If there is no raise preflop, the big blind may check.
- **Fifth Street:** or River.
- **Hole Cards:** The two cards given to each player before the flop.
- **Flop:** The first three community cards dealt.
- **Fourth Street:** or Turn.
- **Preflop:** Anything that occurs before the flop is dealt is preflop.
- **River:** The final (5th) community card dealt; also known as fifth street.
- **Showdown:** When players reveal their hands to discover the pot's winner.
- **Turn:** The fourth community card dealt; also known as fourth street.

## Setup

The first thing is picking the player who will start with the dealer button. The game will be played with what's known as a rotating dealer, meaning a player will act as the dealer for one hand, handing the role of dealer to the player on their left when the hand is completed. The dealer for the first hand will be chosen at random or by number of victories in previous games (chosen by admin).

## Putting Out the Blinds

Now that we have a dealer, we need to put out the blinds. There are two blinds - a small blind and a big blind. The player directly to the left of the dealer puts out the small blind. The big blind (exactly, or conveniently close to, double that of the small blind) is placed by the player to the left of the small blind. The size of the blinds will dictate the stakes of the game we're about to play.

Note : In our game, we have small blind as 5 units and big blind as 10 units and each player is given a **total money of 1500 units** in the play.

## Game Play and Betting Rounds

The person dealing the cards deals to the left of the player with the dealer button first, rotating around the table in a clockwise manner, giving each player one card at a time until each player

has two cards. These cards are called **hole cards**. A hand or round consists of a minimum of one and a maximum of four betting rounds. A hand ends when all players but one have folded, or the fourth and final betting round completes with multiple players still in the hand - whichever comes first. At that point, players enter into the showdown (to be explained in the next section).

## Pre Flop

When all players receive their hole cards, we are now in the preflop betting round. Each player must look at their cards and decide what action they would like to take. Only one player can act at a time. The preflop betting round starts with the player to the left of the big blind. This player has three options:

- Fold: They pay nothing to the pot and throw away their hand, waiting for the next deal to play again.
- Call: They match the amount of the big blind.
- Raise: They raise the bet by doubling the amount of the big blind.

Once a player has made their action, the player to the left of them gets their turn to act. Each player is given the same options: fold, call the bet of the player to their right (if the previous player raised, that is the amount you must call) or raise. A raise is always the amount of one bet in addition to the amount of the previous bet, for example: if the big blind is 25¢, and the first player to act would like to raise, they put in a total of 50¢ (the big blind + one additional bet). If the next player would like to reraise, they would put in a total of 75¢ (the previous bet + one additional bet).

A betting round ends when two conditions are met:

1. All players have had a chance to act.
2. All players who haven't folded have bet the same amount of money for the round.

### Example Betting Round 1

There are five players at the table:

Player 1 - Button

Player 2 - Small blind (10¢)

Player 3 - Big blind (25¢)

Start of betting round

Player 4 - Calls the big blind (25¢)

Player 5 - folds

Player 1 - Calls the big blind (25¢)

Player 2 - Calls the big blind (since they already have 10¢ bet, they only have to add another 15¢, for a total of 25¢)

Player 3 - Checks (since they already have the bet matched, they do not need to add more money to call; this is called checking)

End of betting round

When Player 2 calls the big blind, all players now have the same amount of money in front of them, but Player 3 (the big blind) has not had a chance to act, so the betting round is not over. Once Player 3 checks, both conditions are met, and the betting round is over.

### Example Betting Round 2

There are five players at the table:

Player 1 - Button

Player 2 - Small blind (10¢)

Player 3 - Big blind (25¢)

Start of betting round

Player 4 - Calls the big blind (25¢)

Player 5 - Raises (50¢)

Player 1 - Folds

Player 2 - Folds

Player 3 - Reraises (they already have 25¢ in as the big blind. They complete the bet of 50¢, and add one additional bet for a total of 75¢)

Player 4 - Folds (their previous call of 25¢ is now in the pot)

Player 5 - Calls (matches the bet of Player 3 for a total of 75¢)

End of betting round

In this scenario all players had had a chance to act when Player 3 made the reraise. But all players did not have the same amount of money bet. Once Player 4 folds, only Player 3 and Player 5 are left in the pot. When Player 5 calls, both conditions are met, and the betting round ends.

## The Flop

Once the preflop betting round ends, the flop is dealt. This is done by dealing the top card in the deck facedown on the table (it becomes the burn card), followed by three cards faceup. Once this has been dealt, the first post-flop betting round begins. The rules of a post-flop betting round are the same as a preflop, with two small exceptions: The first player to act is the next player with a hand to the left of the dealer, and the first player to act can check or bet; as there has been no bet made, calling is free. A bet on the flop is the amount of the big blind initially. After this, a raise is always by the amount atleast of the previous raise (*say, for example, small blind is 5 units and big blind is 10 units, and among six players player 3 is dealer, player 2 is small blind and player 1 is big blind. Now, say player 6 rises by 30 to raise to 40 units. Now, if player 5 has to raise, he has to raise by a minimum of 30 i.e. he has to bet atleast 70 if he wants to raise otherwise he has to call. This rule applies for every betting round, whether pre-flop, flop, turn or river. At the start of each round, the minimum raise is of big blind only*).

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## The Turn

Once the betting round on the flop completes, the dealer deals one card facedown followed by a single card faceup, also known as the "burn and turn." Once the turn has been dealt, the third betting round starts. The third betting round is identical to the flop betting round with one single exception: The size of a bet for this round, and the final betting round, is doubled, meaning that to make a bet in our game will now cost a player twice of the big blind.



## The River

Assuming more than one player is left, having not folded on one of the previous streets, the river is now dealt. Dealing the river is identical as dealing the turn, with one card being dealt facedown, followed by a single card faceup. This is the final street, and no more cards will be dealt in this hand. The betting round is identical to the betting round on the turn.

## Show Down

Once the river betting round has been completed, the players now enter into the showdown. At this point, the best hand wins the pot. Best hand is the best five cards among the 7 (2 hole and 5 cards on the deck). Order of rankings is :

1. **Royal Flush:** A straight from a ten to an ace with all five cards of the same suit. In poker all suits are ranked equally.
2. **Straight Flush:** Any straight with all five cards of the same suit.
3. **Four of a Kind:** Any four cards of the same rank. If two players share the same Four of a Kind, the bigger fifth card (known as the kicker) decides who wins the pot.
4. **Full House:** Any three cards of the same rank together with any two cards of the same rank.
5. **Flush:** Any five cards of the same suit (not consecutive). The highest card of the five determines the rank of the flush. Ace-high flush is the highest possible.
6. **Straight:** Any five consecutive cards of different suits. Aces can count as either a high or a low card. For example, Ace, Two, Three, Four and Five of different suits : a five-high straight, which is the lowest possible straight.
7. **Three of a Kind:** Any three cards of the same rank. Fur example three-of-a-kind Aces, with a King and a Queen as side cards - the best possible three of a kind.
8. **Two Pair:** Any two cards of the same rank together with another two cards of the same rank. Fur example the best possible two-pair, Aces and Kings. The highest pair of the two determines the rank of the two-pair.
9. **One Pair:** Any two cards of the same rank. The best possible one-pair hand is two Aces.
10. **High Card:** Any hand not in the above-mentioned hands. The best possible high-card hand is Ace.

## No Limit Texas Holdem Poker

In No-Limit a minimum raise is equal to the size of the big blind or the previous raise while a maximum bet is the total amount of all of your chips.

If at some point of time, a team has insufficient money to call, it can put all his money and still continue in the game. In such a case the main pot will be having the money equal to the bet by the player who has done all in and the rest will be collected in a side pot. If the player who has done all in wins the final hand, he is liable to get only the main pot and the side pot will be given to the winner among other players.

## **TIMELINE:**

The teams (maximum of three members) have to start preparing the code and they will have to submit the final code in proper format on **5th December, 2011**.

The codes will be checked for errors (not compilation errors for the teams have to submit their codes devoid of such errors) and the teams will be informed about them till **15th December, 2011**.

Again, after working on the errors, teams have to submit their final codes till **30th December, 2011**. These will be regarded as final.

Now, atleast one member from each team should be present at the time of simulation of the team's code during the festival i.e. **6th to 8th January, 2012**. For international participants, it is not necessary though preferred. Also, if some national team is unable to come, they have to explain their reason and send a mail to [codempoker\[at\]techfest\[dot\]org](mailto:codempoker[at]techfest[dot]org) with the subject "Code'em Poker arrival pains".

All the entries obtained will be grouped in teams of six and matches will be played amongst them. Care will be taken to ensure that every team plays with every other team though it is subjectible to change as per time limitations. After a series of matches, top 6 teams will be shortlisted. Now, the competition goes as follows :

Each of the 6 teams will be revealed the player number of their opponents in the final game. They will be shown the winning statistics and game play (the text files i.e. deal.txt of all the games played till now) of the rest of the teams. It will be a single folder having many subfolders, each subfolder corresponding to every opponent. A single subfolder will have many sub-subfolders, each sub-subfolder representing one game (table) of the particular opponent. This will contain a text file named **number.txt** which will have a single entry representing the player number of the particular opponent in that game and then all the 1000 deal files of that game in the same format as were available during game play. Now using all this data, teams have to analyze their opponents' strategies so far and they are liable to put this information in their help files or even their codes. If for some reason, after changes, the codes do not work, initial codes will be considered. Also, **it is only for the final table that help text files can be made before the game play**. (The maximum limit is still 15).

Teams can make programs for analyzing the above text files as well. Teams will be given **three hours** for doing this.

This game will finally be displayed on a graphical Poker interface.

