Here is a chance to improve your grade in MAE10. If you are working on the extra credit problem, you must let me know by Week 9 and discuss your approach with me. No partial credit will be given. However, by attempting to solve the problem you will gain valuable programming experience that likely will benefit you on the exams.

**Winter 2011 EXTRA CREDIT**

Difficulty: Easy-Moderate

**Build a Texas Hold'em odds calculator**  
  
+3.0% to whomever successfully completes all parts of the assignment  
+1.0% to whomever writes the program with the fewest lines of code.  
  
The program is due by 1pm on the day of the Final Examination, Tuesday, March 15th. You must discuss how your code works with me before the end of finals week (Friday, March 18th).  
  
In Texas Hold'em (often called "Hold'em"), each player receives two cards face down ("hole cards") that only the player may view and use. "Community cards" are placed face up on the table after each round of betting. The first three community cards are called the "flop," the fourth card is called the "turn," and the fifth card is called the "river." The player makes the best 5-card hand using a combination of his/her hole cards and the community cards.  
  
Here is a [guide to Texas Hold'em](http://en.wikipedia.org/wiki/Texas_hold_%27em).  
  
Here is a [guide to the ranking of poker hands](http://en.wikipedia.org/wiki/List_of_poker_hands).  
  
As each community card is revealed, the strength of the players' hands can change dramatically (which is part of the game's appeal). For example, assume there are three players:  
  
Player A has hole cards Ac, As  
Player B has hole cards Kd, Kh  
Player C has hole cards Jh, Th  
  
where A = Ace, K = King, J = Jack, T = Ten, c = club, s = spade, d = diamond, h = heart.  
  
Player A starts with the best possible hand - a pair of Aces. According to this [poker odds calculator](http://www.cardplayer.com/poker-tools/odds-calculator/texas-holdem), if all five community cards are dealt randomly the odds of each player winning the hand are,  
  
(Odds of winning pre-flop)  
Player A: 64.77%   
Player B: 16.90%   
Player C: 18.05%   
  
Let's say the flop is Kc Qs 2s. Each player combines his hole cards with the community cards,  
  
Player A still has a pair of Aces, Ac As Kc Qs 2s  
Player B now has three-of-a-kind and is in the lead, Kd Kh Kc Qs 2s  
Player C has nothing at the moment, Kc Qs Jh Th 2s  
  
Three of the five community cards have been dealt. The odds of each player winning the hand once the remaining two cards are revealed have changed.  
  
(Odds of winning after the flop)  
Player A: 6.31%   
Player B: 73.75%   
Player C: 19.93%   
  
Let's say the turn card is 9s. Each player tries to make the best 5-card hand of the six cards available to them (four community cards and their own two hole cards).  
  
Player A still has a pair of Aces, Ac As Kc Qs 9s  
Player B still has a three-of-a-kind, Kd Kh Kc Qs 9s  
Player C now has a straight and is in the lead, Kc Qs Jh Th 9s  
  
Four of the five community cards have been dealt. The odds of each player winning the hand once the remaining card is revealed has changed.  
  
(Odds of winning after the turn)  
Player A: 19.05%   
Player B: 23.81%   
Player C: 57.14%   
  
Let's say the river is 3s. Each player tries to make the best 5-card hand of the seven cards available to them (five community cards and their own two hole cards).  
  
Player A still now has a flush and wins the hand, As Qs 9s 3s 2s  
Player B still has a three-of-a-kind, Kd Kh Kc Qs 9s  
Player C still has a straight, Kc Qs Jh Th 9s   
  
Your task:  
Build a Texas Hold'em odds calculator similar to the one found [here](http://www.cardplayer.com/poker-tools/odds-calculator/texas-holdem). Your program should do the following,  
  
- Allow the user to select the number of players (2-10) and the hole cards for each player. Calculate the odds of each player winning the hand if all five community cards are dealt randomly.  
  
- Allow the user to select the three flop cards. Calculate the odds of each player winning the hand if the remaining two community cards are dealt.  
  
- Allow the user to select the turn card. Calculate the odds of each player winning the hand if the remaining community card is dealt.  
  
- Allow the user to select the river card. Tell the user which player won the hand.