

## PROBLEM 5

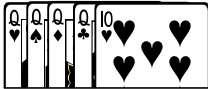
### Poker Hands / Combinatorics

Many games are based on the rules of Poker, a game in which five cards are dealt from a shuffled standard deck of 52 cards and different hands are assigned different values. The value of a specific hand is related to the number of ways in which that combination can appear. For example, there are only four ways to obtain a Royal Flush. This is the top-rated hand consisting of a 10, Jack, Queen, King, and Ace, all of one suit (i.e., all clubs, all diamonds, all hearts or all spades).

- a) How many ways are there to obtain the other three highly-rated combinations described below?

#### Four of a Kind

Four cards of the same rank and one other card.



#### Full House

Three cards of the same rank and two cards both of another rank.  
(A triple, or three of a kind, and a pair.)



#### Two Pairs

Two pairs of cards of two distinct ranks and a fifth card of another rank.



- b) Suppose you play a game in which only three cards are dealt. How many ways are there to obtain one pair?
- c) Suppose four cards are dealt. How many ways are there to obtain one pair?