# CHEN3600 – Computer-Aided Chemical Engineering Spring 2012

# Chemical Engineering Department Lab 6

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 **Lab 6 – A Tau Beta Pi Brain Teaser**

### Problem Statement

One of the students in the class recently wrote me about the opportunity to develop critical thinking skills. As you know, the department offers (and I teach) a course (CHEN3410) about such topics… unfortunately, it has not been offered recently due to limited time on my part. Nevertheless, there are many opportunities to improve one’s critical thinking skills. One such opportunity is the Tau Beta Pi Brain Ticklers.

<http://www.tbp.org/pages/publications/Bent/BTs.cfm>

The following problem was inspired from one of these problems and presented to the CHEN 3600 class when they were being instructed in VBA/Excel.

This problem will be due on this Thursday.

### The Problem

A standard deck of playing cards (poker) contains 52 cards which are represented by 13 cards of each suit (suite). The suits are Hearts, Spades, Diamonds, and Clubs.

The history surrounding playing cards is a fascinating study in itself. Several years ago, when I last presented this problem, a student came up after class and told me he was a collector of antique/vintage playing cards. With the popularity of Texas Holdum today, I would expect such a collection to be quite valuable.

The thirteen cards in each suit are Ace(1), 2, 3, 4, 5, 6, 7, 8, 9, 10, Jack(11), Queen(12), and King(13). Thus, there are four face cards and nine number cards in a suit.

### Program Requirement

You will be writing a MATLAB program to implement a Monte Carlo simulation of the following problem:

“What is the expected (average) number of cards that need to be dealt from a standard well shuffled deck before obtaining one card of each suit.” Please note that this is sampling without replacement and therefore, the probabilities change as cards are dealt out. For example, suppose one receives the following cards:

H2, H5, H8, D3, x

At the time “x” is to be received, there are (obviously) still ten hearts and one diamond (and 13 clubs and 13 spades.

### Program Requirements

Your submission for this assignment is to be a pdf file of the script you develop including any external file functions (added as comments as per the exams).

Your solution should display (in the command window) what cards are dealt (using a designation that will be meaningful to anyone and provide a graph showing the developing average.

For example:

|  |
| --- |
| Cards DealtJack-Hearts |
| 7-Hearts |
| 8-Diamonds |
| 3-Clubs |
| 6-Diamonds |
| 3-Diamonds |
| King-Spades7 Cards Dealt |
|  |

The view in the command window will be useful for checking your program’s correct functioning and the graph will represent a running average of the final answer to the “tickler” as well as a numerical answer based on the average. Other graphs might be provided to show other aspects of the problem.