STAT 598Z: Homework 1

Due: 29th January 2013

1. This homework will contribute 10 points towards your final score.
2. Attempt as many problems as possible.
3. Only neatly handwritten solutions will be accepted. Alternatively you may use LaTeX to typeset your solutions.
4. Hand in your HW (including print outs of your source code) at the beginning of the class on 29th January 2013. Additionally source code (if any) should be emailed to `stat598z@gmail.com` **before** the assignments are submitted in the class. No late submissions will be accepted!
5. Program files should be named after the problem (e.g. solution to problem 1 should be problem1.py etc).

Problem 1 (2 pt) In this problem we will do some simple text manipulation using UNIX commands. Below when I use the phrase "a UNIX command", it either means a single command or a series of commands chained via pipe. Note: Do **not** use awk, sed or other tools we have not learned in the class. Also, do **not** specialize your code for the input below. It should be able to work with arbitrary sized inputs.

- Assume that a $n \times n$ matrix is stored in the following format in a text file on disk:

```
| a11 | a12 |  a13 | ... | a1n |
| a21 | a22 |  a23 | ... | a2n |
   .     .      .            .
   .     .      .            .
   .     .      .            .
| an1 | an2 |  an3 | ... | ann |
```

  with each line representing a row of a matrix. Use your favorite text editor (e.g., emacs) to create a file named `dummy.txt`, and encode the following matrix in the above format:

$$\begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \\ 13 & 14 & 15 & 16 \end{bmatrix}$$

- Write a UNIX command to count the number of rows in the matrix.
- Write a UNIX command to count the number of columns in the matrix.
- Write a UNIX command to count the total number of entries in the matrix.
- Write a UNIX command to display the element `a11`.
- **Bonus (no points):** Write a UNIX command to display the element `ann`.

Problem 2 (4 pt) In this problem, you are asked to write a Python program which converts volume from liters to gallons.

- Write a program which takes as input the volume in gallons and outputs the volume in liters. Note that the input has to be non-negative, otherwise your program must display an error message.
- Write a program which converts every integer in the range 0 to 10 from gallons to liters.
- Write a program which can convert from gallons to liters or vice versa. Your program should first take as input a string. If the string is `gtol` then it should convert the input from gallons to liters and if the string is `ltog` then it should convert the input from gallons to liters. It should only accept inputs which are larger or equal to 0. It should continue receiving user input until the user signals the intention to stop by inputting a `q`. A typical session using your program should look like this:

```
Please input gallons to liters(gtol) or liters to gallons(ltog): gtol
Converting from gallons to liters
Please enter volume in gallons: 10
10 gallons is 37.8541178 liters
Please enter volume in gallons: -5
Error: Input distance has to be non-negative
Please enter volume in gallons: q
Bye Bye
```

Problem 3 (4 pt) We will write a very simple card game in python. For this problem we will assume that a deck of cards has 52 unique cards. Each card consists of a number between 1 to 13 and a sign which is a number between 1 to 4. For example, a card could have number 6 and sign 2. Your program must generate a random card from the deck and let the user guess the card. First you should help the user guess the sign and then the number. The game is best described by a user session (suppose the random card you generated has number 6 and sign 2):

```
I have a card in mind. Let us see if you can guess it.
```

```
Enter your guess for the sign: 1
Sorry your guess is too low
Enter your guess for the sign: 3
Sorry your guess is too high
Enter your guess for the sign: 2
Bingo!
Now guess the number.
Enter your guess for the number: 12
Sorry your guess is too high
Enter your guess for the number: 3
Sorry your guess is too low
Enter your guess for the number: 6
Bingo!
```