Lab Two
Computational Probability and Statistics
CIS 2033, Section 002

Due: 11:59 AM, Tuesday, Feb. 10, 2015

Submissions Please copy all your code in one script named as Lab2.m. Submit both of your Lab2.m script and the plotted figure.

Question 1 Plot the figure (Fig. 3.1, p. 29): the probability of $P(B_n)$ of no coincident birthdays for $n = 1, 2, \ldots, 100$. You have to

1. Download CompProb.m[1]. This function has one input parameter n. It outputs the probability of $P(B_n)$, denoting as the probability of no coincident birthdays for the n people.
2. Open Matlab, direct the Current Folder window to where you stored the file.
3. Create an array $\mathbf{ns} = \mathbf{1} : \mathbf{100}$ in Matlab.
4. For each value n in ns call *CompProb(n)*, which calculates the probability for $P(B_n)$, store all the probabilities in a new array, say $\mathbf{P\_Bns}$. (Matlab do not support variable names like $\mathbf{P(Bns)}$)
5. plot the figure of $\mathbf{P\_Bns}$ vs $\mathbf{ns}$, where the x-axis denotes n and the y-axis denotes the computed probability $P(B_n)$, for $n = 1, 2, \ldots, 100$.

Question 2 If we want to choose k different objects out of an unordered list of n objects, how many combinations are there for the choice? We denote the total number of combinations as $C_{n,k}$ or $\begin{pmatrix} n \\ k \end{pmatrix}$, simply means choose k from n. The formula to calculate $\begin{pmatrix} n \\ k \end{pmatrix} = \frac{n!}{k!(n-k)!}$. For Question 2, please do the following:

1. Download nchoosek_byTA.m[2]. This function has two input n, k. It outputs the number of combinations, calculated by the given formula.

[1] http://nymph332088.github.io/CIS2033/2033/Labs/02/Questions/CompProb.m
[2] http://nymph332088.github.io/CIS2033/2033/Labs/02/Questions/nchoosek_byTA.m

2. Open Matlab, direct the Current Folder window to where you stored the file.

3. Create variables $\mathbf{n = 20}$ and $\mathbf{ks = 1 : 20}$ in Matlab.

4. For each value k in ks, call *nchoosek_byTA(n, k)*, store all the outputs in an array **combs_byTA**.

5. For each value k in ks, call the built-in Matlab function *nchoosek(n, k)*, store all the outputs in another array **combs_Matlab**.

6. Check whether **combs_byTA** and **combs_Matlab** are the same.

7. Plot **combs_byTA** vs **ks** and plot **combs_Matlab** vs **ks** in two pictures, where in both pictures x-axis denotes k and the y-axis denotes $\begin{pmatrix} 20 \\ k \end{pmatrix}$, for $k = 1, 2, \ldots, 20$.