Lab Two
Computational Probability and Statistics
CIS 2033, Section 002

Due: 9:00 AM, Friday, Feb. 6, 2014

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. implement a function (e.g., *CompProb(n)*) to compute the probability of no coincident birthdays in a group of n arbitrarily chosen people. This function takes one input argument, n and return the computed probability;
2. plot the figure of $P(B_n)$ for $n = 1, 2, \ldots, 100$. You have to call the defined function (e.g., *CompProb*) to compute the probability for different values of n and plot a 2D figure where the x-axis denotes n and the y-axis denotes the computed probability $P(B_n)$.

Please submit both of your MATLAB codes and the plotted figure.

Question 2 If we want to choose k different objects out of an unordered list of n objects, we denote it as $C_{n,k}$ or $\begin{pmatrix} n \\ k \end{pmatrix}$. You have to

1. calculate $\begin{pmatrix} n \\ k \end{pmatrix}$ by
   (a) using $\frac{n!}{k!(n-k)!}$ where ! denotes the factorial computation. You can set $n = 20, k = 1, 2, \ldots, 20$;
   (b) using the MATLAB function *nchoosek*. Similarly, you set $n = 20, k = 1, 2, \ldots, 20$.
2. plot a 2D figure, where x-axis denotes k and the y-axis denotes $\begin{pmatrix} 20 \\ k \end{pmatrix}$, for $k = 1, 2, \ldots, 20$.

Please submit both of your MATLAB codes and figures.

Question 3 Given a dice with six numbers ($\{1, 2, 3, 4, 5, 6\}$), each number comes with the same probability when you roll it. Here is the game. Suppose you have such TWO dices and you simultaneously roll both of them to get the product of the two output numbers. When the product is 1 or 36, we say that you get the magic numbers and you will be rewarded. However, each play will cost you a certain amount of money and you can only afford to play 100 times. Let the random variable X denote the total number of times you will hit those magic numbers and be rewarded. You have to

1. plot the probability mass function $p_X(k) = P(X = k)$ for $k = 1, 2, \ldots, 100$;
2. plot the distribution function $F_X(a)$ for $a \in [0, 100]$.

Please submit both of your MATLAB codes and the plotted figures.

Question 4 Given a dice with six numbers ($\{1, 2, 3, 4, 5, 6\}$), each number comes with the same probability when you roll it. Suppose you have such THREE dices and you simultaneously roll all of them to get the sum of those three output numbers. When the sum is 3 or 18, you win. Otherwise, you lose. You are so addicted to this game and will not stop until win it once (get 3 or 18 in one play). Let the random variable Y denote the number of plays when you stop playing. You have to

1. plot the probability mass function $p_Y(k) = P(Y = k)$ for $k = 1, 2, \ldots, 1000$;
2. plot the distribution function $F_Y(a)$ for $a \in [0, 1000]$.

Please submit both of your MATLAB codes and the plotted figures.