Math 3339
Homework 1 (Chapter 1 & Chapter 3)

Name:_____ PeopleSoft ID:_____

Instructions:
- Homework will NOT be accepted through email or in person. Homework must be submitted through CourseWare BEFORE the deadline.
- Print out this file use or software and complete the problems.
- Write in black ink or dark pencil or type your solutions in the space provided. You must show all work for full credit.
- Submit this assignment at http://www.casa.uh.edu under "Assignments" and choose **hw1**.
- Total possible points: **15**

1. Examine the textbook data set "payroll.csv". Identify the variables and give their types.

2. Nathan, Kelsey, Cindy, Brad, Amy and Maggie want to play a game. This game has three players per team. They wish for the teams to be randomly assigned. List all possible samples (without replacement) of size 3.

    (a) What is the chance of Nathan, Brad and Amy being on the same team?

    (b) What is the chance of Kelsey, Cindy and Amy being on the same team?

    (c) What is the chance that any three players (Nathan, Kelsey, Cindy, Brad, Amy or Maggie) will be on the same team?

[a] *Modern Mathematical Statistics with Applications,* Devore, J. and Berk, K., Thomson (2007), Chapter 2

3. The "mammals" data set is a built-in dataset in the "MASS" library of R. The "mammals" data set contains the result of a study of sleep in mammal species. First, load the "mammals" data set into your R workspace. In Rstudio, you can click on the "Packages" tab and then on the checkbox next to MASS. Without Rstudio, type the following command in R console:

   data(mammals,package="MASS")

   A random experiment is to choose one of the species listed in this data set. All outcomes are equally likely. You can obtain a list of the species in the event "brain > 500" with the command

   subset(mammals,brain>500)

   What is the probability of this event, i.e., what is the probability that you randomly select a species with a brain weight greater than 500g?

   Hint: you can obtain a count of the species with brain weights greater than 500g, by
   sum(mammals$brain>500)

[a] *Modern Mathematical Statistics with Applications,* Devore, J. and Berk, K., Thomson (2007), Chapter 2

4. Answer the following questions:
   a. A hand of 5-card draw poker is a simple random sample from the standard deck of 52 cards. How many 5 draw poker hands are there? In 5-card stud poker, the cards are dealt sequentially and the order of appearance is important. How many 5-stud poker hands are there?
   b. How many hands of 5-draw poker contain the ace of hearts? What is the probability that a 5-card draw hand contains the ace of hearts?

[a] *Modern Mathematical Statistics with Applications,* Devore, J. and Berk, K., Thomson (2007), Chapter 2

5. Answer the following questions:
    a. Everybody in Ourtown is a fool or a knave or possibly both. 55% of the citizens are fools and 70% are knaves. One citizen is randomly selected to be mayor. What is the probability that the mayor is both a fool and a knave?
    b. What is the probability that the mayor is a fool but not a knave?

[a] *Modern Mathematical Statistics with Applications,* Devore, J. and Berk, K., Thomson (2007), Chapter 2

6. [a]A box in a certain supply room contains four 40-watt light bulbs, five 60-watt bulbs, and six 75-watt bulbs. Suppose that three bulbs are randomly selected.
   a. What is the probability that exactly one of the selected bulbs are rated 75-watt?
   b. What is the probability that all three of the elected bulbs have the same rating?
   c. What is the probability that one bulb of each type is selected?
   d. What is the probability that at least two of the selected bulbs are rated 75-watt?

[a] *Modern Mathematical Statistics with Applications,* Devore, J. and Berk, K., Thomson (2007), Chapter 2

7. [a]Consider randomly selecting a student at a certain university, and let A denote the event that the selected individual has a Visa credit card and B be the analogous event for MasterCard. Suppose that $P(A) = 0.5$, $P(B) = 0.4$, and $P(A \cap B) = 0.3$. Calculate and interpret each of the following probabilities.
   a. $P(B \mid A)$
   b. $P(\sim B \mid A)$
   c. $P(A \mid B)$
   d. $P(\sim A \mid B)$
   e. Given that the selected individual has at least one card, what is the probability that he or she has a Visa card?
   f. Is having a Visa credit card and a MasterCard independent? Justify your answer.

[a] *Modern Mathematical Statistics with Applications,* Devore, J. and Berk, K., Thomson (2007), Chapter 2

8. A certain company sends 50% of its overnight mail parcels via express mail service E1. Of these parcels, 1% arrive after the guaranteed delivery time (denote the event late delivery by L). Suppose that 10% of the overnight parcels are sent via express mail service E2 and the remaining 40% are sent via E3. Of those sent via E2 only 2% arrive late, whereas 5% of the parcels handled by E3 arrive late.
    a. Draw a tree diagram for this problem.
    b. If a record of an overnight mailing is randomly selected from the company's file, what is the probability that the parcel went via E2 and was late?
    c. What is the probability that a randomly selected parcel arrived on time?
    d. If a randomly selected parcel has arrived late, what is the probability that is was not sent via E1?

[a] *Modern Mathematical Statistics with Applications,* Devore, J. and Berk, K., Thomson (2007), Chapter 2