Due Wednesday Jan 18

1. Six awards are to be given out among 40 students. How many ways can the awards be given out if
   (a) one student will win five awards.
   (b) one student will win four awards.
   (c) no student can win more than three awards.

2. A bridge hand consists of 13 cards from a standard 52 card deck. How many bridge hands are there with
   (a) 5 spades?
   (b) 5 cards if one suit, three cards of two suits and two cards of the fourth suit?
   (c) 10 cards of one suit?

and from chapter 2 of Ross problems 3,5,6,9,12,17 and 37 (which are copied below.)

3. Two dice are thrown. Let $E$ be the event that the sum of the dice is odd; let $F$ be the event that at least one of the dice lands on 1; and let $G$ be the event that the sum is five. Describe the events $EF$, $E \cup F$, $FG$, $EF^C$ and $EFG$.

5. A system is composed of 5 components, each of which is either working or failed. Consider an experiment that consists of observing the status of each component, and let the outcome of the experiment be given by the vector $(x_1, x_2, x_3, x_4, x_5)$, where $x_i$ is equal to 1 if component $i$ is working and is equal to 0 if component $i$ is failed.
   (a) How many outcomes are in the sample space.
(b) Suppose that the system will work if components 1 and 2 are both working, or if components 3 and 4 are both working, or if components 1, 3 and 5 are all working. Let \( W \) be the event that the system will work. Specify all the outcomes in \( W \).

(c) Let \( A \) be the event that components 4 and 5 are both failed. How many outcomes are contained in the event \( A \)?

(d) Write out all the outcomes in the event \( AW \).

6. A hospital administrator codes incoming patients suffering gunshot wounds according to whether they have insurance (coding 1 if they do and 0 if they do not) and according to their condition, which is rated as good (g), fair (f) or serious (s). Consider an experiment that consists of determining the type of the coding of such a patient.

(a) Give the sample space of the experiment.

(b) Let \( A \) be the event that the patient is in serious condition. Specify the outcomes in \( A \).

(c) Let \( B \) be the event that the patient is uninsured. Specify the outcomes in \( B \).

(d) Give all the outcomes in the event \( B^C \cap A \).

9. A retail establishment accepts either the American Express or the VISA credit card. A total of 24 percent of its customers carry an American Express card, 61 percent carry a VISA card, and 11 percent carry both. What percent of its customers carry a credit card the establishment will accept?

12. An elementary school is offering 3 language classes: one in Spanish, one in French and one in German. These classes are open to any of the 100 students in the school. There are 28 students in the Spanish class, 26 in the French class, and 16 in the German class. There are 12 students in both Spanish and French, 4 that are in both Spanish and German, and 6 that are in both French and German. In addition, there are 2 students taking all 3 classes.

(a) If a student is chosen randomly, what is the probability that he or she is not in any of these classes?

(b) If a student is chosen randomly, what is the probability that he or she is taking exactly one language class?
(c) If 2 students are chosen randomly, what is the probability that at least one is taking a language class.

17. If eight castles (that is rooks) are randomly placed on a chessboard compute the probability that none of the rooks can capture any of the others. That is, compute the probability that no row or file contains more than one rook.

37. An instructor gives her class a set of 10 problems with the information that the final exam will consist of a random selection of 5 of them. If a student has figured out how to do 7 of the problems, what is the probability that he or she will answer correctly

(a) all five problems;
(b) at least four of the problems?