PHYSICS 101
ASSIGNMENT #3

1. On the first day of kindergarten, the teacher randomly selects 1 of his 25 students and records the student's gender, as well as whether or not that student had gone to preschool.

a. Construct a tree diagram for this experiment. How many simple events are there?

b. The table below shows the distribution of the 25 students according to gender and preschool experience. Use the table to assign probabilities to the simple events in part b.

	Male	**Female**
Preschool	8	9
No preschool	6	2

c. What is the probability that the randomly selected student is male? What is the probability that the student is a female and did not go to preschool?

d. What is the probability that the student is male given that the student did not attend preschool?

e. Go back to your tree diagram and mark on it the respective probabilities for each branch.

2. Five cards are selected from a 52-card deck for a poker hand.

a. How many possible poker hands can be dealt?

b. In how many ways can you receive four cards of the same face value *and* one card from the other 48 available cards?

c. What is the probability of being dealt four of a kind (i.e., the hand described in part b)?

3. An experiment can result in one or both of events A and B with the probabilities shown in this probability table:

	A	A^C
B	.34	.46
B^C	.15	.05

Find the following probabilities:

a. $P(A)$ **b.** $P(B)$ **c.** $P(A \cap B)$

d. $P(A \cup B)$ **e.** $P(A \mid B)$ **f.** $P(B \mid A)$

4. Two people enter a room and their birthdays (ignoring years) are recorded.

a. Identify the nature of the simple events in $\{S\}$.

b. What is the probability that the two people have a specific pair of birthdates?

c. Identify the simple events in event A: Both people have the same birthday.

d. Find $P(A)$.

e. Find $P(A^C)$.

5. A survey of people in a given region showed that 20% were smokers. The probability of death due to lung cancer, given that a person smoked, was roughly 10 times the probability of death due to lung cancer, given that a person did not smoke. If the probability of death due to lung cancer in the region is .006, what is the probability of death due to lung cancer given that a person is a smoker?

6. Two tennis professionals, *A* and *B*, are scheduled to play a match; the winner is the first player to win three sets in a total that cannot exceed five sets. The event that *A* wins any one set is independent of the event that *A* wins any other, and the probability that *A* wins any one set is equal to 0.6. Let *x* equal the total number of sets in the match; that is, *x* = 3, 4, or 5. Find *p(x)*.

7. A rental truck agency services its vehicles on a regular basis, routinely checking for mechanical problems. Suppose that the agency has six moving vans, two of which need to have new brakes. During a routine check, the vans are tested one at a time.

a. What is the probability that the second (i.e, last) van with brake problems is the fourth van tested?

b. What is the probability that no more than four vans need to be tested before both brake problems are detected?

c. Given that one van with bad brakes is detected in the first two tests, what is the probability that the remaining van is found on the third or fourth test?

8. A department of 30 people is to select a committee of 5 persons. How many different committees are possible if the committee is composed of:

a. a chairperson, a secretary, and three others?

b. two co-chairs and three others?

c. two co-chairs, a secretary, and two others?

9. Imagine that everyone in the world decided to enter a Wimbledon-like tennis tournament. Have you ever wondered how long it would take to declare a winner?

Tennis tournaments are run on a "knock-out" basis (i.e., the loser of a match is eliminated and the winner advances to the next round). Suppose that you were given the responsibility of organizing a tournament for the entire world with the first matches starting on July1, 2008. Now imagine that there are 4,294,967,296 able-bodied entrants and that they ALL start playing each other on July 1st (you will need many tennis courts!). Assuming that the winners continue to play on consecutive days (i.e., there are no rest days and they only play one match per day), on what day will you be presenting the trophy to the top player in the world? Assume that men and women can play each other.