Probability and Statistics

Test 1 (February 17, 2010)   Calculators are not allowed

Name:………………………………………………………………..

16+10+8+12+12+15+12+8+8=101

1. Let $P(A \cap B') = 0.32$, $P(A \cup B') = 0.85$, and $P(A \cup B) = 0.63$. Find the
    following:
    a. $P(A \cap B)$

    b. $P(A' \cup B')$

    c. $P(A' \cap B')$

    d. $P(A|B)$

2. Let A_1, A_2, ….. be an infinite sequence of mutually exclusive events such that
    $P(A_i) = \dfrac{1}{3^{2i-1}}$. Evaluate $P\left(\bigcup_{i=1}^{\infty} A_i\right)$.

3. If a Pizza should be made according to the following rules, in how many different ways can you make a pizza?
   a. Use only one kind of crust among two crusts
   b. Two different kinds of meat, from which you can select 0 to 2.
   c. Three different kinds of cheese- number of kinds of cheese has to be one more than the number of kinds of meat

4. An urn contains 4 balls marked LOSE and 3 balls marked WIN. You and an opponent take turns selecting a single ball at random from the urn WITHOUT REPLACEMENT. The person who selects the **third** WIN ball wins the game. It does not matter who selected the first two WIN balls.
   a. If you draw first, find the probability that you win the game on your second draw.
   b. If you draw first, what is the probability that you win?

5. A small grocery store had 10 cartons of milk, **three** of which were sour. If you are going to buy the sixth carton of milk sold that day at random, compute the probability of selecting a carton of sour milk sold that day.

6. Answer the following parts.
   a. If $P(A) = 0.5$, $P(B) = 0.6$ and A and B are **independent**, find $P(A \cup B)$.

   b. If $P(A) = 0.5$, $P(B) = 0.3$ and A and B are **mutually exclusive**, find $P(A \cap B')$ and $P(A' \cup B')$.

   c. If $P(A) = 0.5$, $P(B) = 0.8$ and $A \subset B$, find $P(A \cap B')$ and $P(A' \cup B')$.

7. Bean seed from supplier A have a 90% germination rate and those from supplier B have an 80% germination rate. A seed packing company purchases 45% of their bean seeds from supplier A and 55% from supplier B and mixes these seeds together.

    a. Find the probability that a seed selected at random from the mixed seeds will germinate, say $P(G)$.

    b. Given that a seed germinates, find the probability that the seed was purchased from supplier B.

8. If A and B are independent events, then show that A and B' are also independent.

9. The probability of surviving a certain transplant operation is 0.55. If a patient survives the operation, the probability that his or her body will reject the transplant within a month is 0.20. What is the probability of surviving both of these critical stages?