Problem Set #1

(Due Monday, February 2 at beginning of lecture)

Economics 310 **Spring 2015**

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1. Suppose two fair (six-sided) dice are tossed.
   (a) What is the probability of getting a double six?
   (b) What is the probability of not getting a double six?
   (c) What is the smallest number of times to throw the two dice for which the probability of getting at least one double six exceeds 0.5?

2. An HMO has recently taken over the operation of a large hospital. The new management is studying the costs of maintaining the hospital's emergency room facilities. Patients admitted to the emergency room are classified as being uninsured, insured as a member of the hospital's HMO, or insured with another carrier.
   (a) Define a sample space to model the admission of a new patient into the emergency room.
   (b) Describe the event A, the event in which the new patient has insurance, in terms of your sample space.
   (c) Define the event B, the event in which the new patient is not a member of the hospital's HMO, in terms of your sample space.

   Now suppose that 30% of patients are uninsured, 50% are members of the hospital's HMO, and 20% are insured elsewhere. Compute

   (d) $P(A)$
   (e) $P(B)$
   (f) $P(A \cap B)$
   (g) $P(A \cup B)$

   True or False?

   (h) A and B are independent
   (i) A and B are disjoint
   (j) A and B are exhaustive
   (k) $A \subseteq B$
   (l) $B \subseteq A$

3. VS Chap. 2, Exercise 2.3.1

4. VS Chap. 2, Exercise 2.3.7

5. VS Chap. 2, Exercise 2.4.3

6. Using the three Axioms of Probability show the following:
   (a) $P(A) \leq 1$
   (b) If $A \subset B$, then $P(A) \leq P(B)$.
7. For each of the following statements, if the statement is true, prove it. If the statement is false, provide a counterexample. You may assume that $P(B) > 0$ and $P(B^c) > 0$.
   (a) $P(A|B) + P(A^c|B) = 1$
   (b) $P(A|B) + P(A|B^c) = 1$
   (c) $P(C \cup D|B) = P(C|B) + P(D|B) - P(C \cap D|B)$