ECE 302 Homework 1
Due June 21, 2016

Reading assignment: chapter 1; chapter 2, sections 2.1-2.5

1. Consider the space $S = \{1, 3, 5, 7, 9, 11\}$ and the three subsets $A = \{1, 3, 5\}$, $B = \{7, 9, 11\}$, $C = \{3, 5, 9, 11\}$. Find the following:

   (a) $A \cup B$

   (b) $\overline{A \cap C}$

   (c) $\overline{A} \cup \overline{C}$

   (d) $(A \cap C) \cap B$

   (e) $D = \{1\}$ in terms of A, B, and C

2. For each of the following random experiments find the sample space S and the event of interest A in set notation:

   (a) *Experiment*: A coin is flipped three times and the ordered sequence of tails and heads is observed.
   Event: The number of heads observed is odd.

   (b) *Experiment*: A coin is flipped three times and the number of heads and tails is observed.
   Event: Find the event that the number of heads obseved is odd.

   (c) *Experiment*: A light bulb is turned on and the elapsed time in hours until it burns out is recorded.
   Event: The light bulb burns out in the first 5 hours or after 10 hours.

   (d) *Experiment*: A pair of dice are rolled. The sequence of rolls is recorded.
   Event: The sum of the rolls is even.

3. Consider the random experiment in Problem 2(d). Assume that the outcomes of the experiment are equiprobable. Evaluate the probability of the following events:

   (a) The sum of the rolls is even.

   (b) The first roll is even.

   (c) The sum of the rolls is even or the first roll is even.

4. A shipment of transistors contains devices from manufacturers A, B, and C, and are defective with probabilities 0.05, 0.1, 0.25, respectively. Assume that the proportions of devices from A, B, and C are the same. A transitor is randomly selected and tested.

   (a) Find the probability that the selected transistor is defective.

   (b) Find the probability that the manufacturer of the selected transistor is C given that the chip is **not defective.**

5. Let A, B, and C be events in the space S. Prove the following:

   (a) $\Pr(A \cup B) = \Pr(A) + \Pr(B) - \Pr(A \cap B)$

   (b) $\Pr(A|B) \geq \Pr(A)$ if $A \subset B$

   (c) $\Pr(A \cap B \cap C) = \Pr(A|B \cap C) \Pr(B|C) \Pr(C)$