MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Department of Electrical Engineering & Computer Science
6.041/6.431: Probabilistic Systems Analysis
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1. Problem 1.2, page 52 of text.

   Let A and B be two sets.

   (a) Show the following two equalities

   $$A^c = (A^c \cap B) \cup (A^c \cap B^c), B^c = (A \cap B^c) \cup (A^c \cap B^c)$$

   (b) Show that
   $$(A \cap B)^c = (A^c \cap B) \cup (A^c \cap B^c) \cup (A \cap B^c)$$

   (c) Consider rolling a six-sided die. Let A be the set of outcomes where the roll is an odd number. Let B be the set of outcomes where the roll is less than 4. Calculate the sets on both sides of the equality in part (b), and verify that the equality holds.

2. Problem 1.5, page 53 of text.

   Out of the students in a class, 60% are geniuses, 70% love chocolate, and 40% fall into both categories. Determine the probability that a randomly selected student is neither a genius nor a chocolate lover.

3. Example 1.5, page 13 of text.

   Romeo and Juliet have a date at a given time, and each will arrive at the meeting place with a delay between 0 and 1 hour, with all pairs of delays being equally likely. The first to arrive will wait for 15 minutes and will leave if the other has not yet arrived. What is the probability that they will meet?