Homework Assignment for Chapter 2 (Due by 3pm on Jan. 21)

Reference Exercise Problems: Text Book, 2.7 Exercises.

Homework problems

Problem 1   Let A and B be two events in a sample space for which $P(A) = 1/5$, $P(B) = 4/6$, and $P(A \cap B) = 2/3$. What is $P(A \cup B)$?

Problem 2   Let E and F be two events for which one knows that the probability that at least one of them occurs is $1/8$. What is the probability that neither E nor F occurs? Hint: use one of DeMorgan's laws: $E^c \cap F^c = (E \cup F)^c$.

Problem 3   We consider events A, B, and C, which can occur in some experiment. Is it true that the probability that only A occurs (and not B or C) is equal to $P(A \cup B \cup C) - P(B) - P(C) + P(B \cap C)$?

Problem 4   We toss a coin three times. For this experiment we choose the sample space $\Omega = \{HHH, THH, HTH, HHT, TTH, THT, HTT, TTT\}$ where T stands for tails and H for heads.

1. Write down the set of outcomes corresponding to each of the following events:

   (a) A : "we had tails exactly two times."

   (b) B : "we throw tails at least one time."

   (c) C : "head did not appear before a tails appeared."

   (d) D : "the first throw results in head."

2. Write down the set of outcomes corresponding to each of the following events: A^c, D^c, $A \cup (C \cap D)$, and $A \cap B^c$.

Problem 5   In some experiment first an arbitrary choice is made out of five possibilities, and then an arbitrary choice is made out of the remaining four possibilities. With a rule that if a was chosen first, only b and c may be chosen next. Likewise, if d is chosen first only a can follow it. One way to describe this is with a product of two sample spaces $\{a, b, c, d, e\}$:

$\Omega = \{a, b, c, d, e\} \times \{a, b, c, d, e\}$.

1. Make a 5×5 table in which you write the probabilities of the outcomes.

2. Describe the event "c is one of the chosen possibilities" and determine its probability.