Worksheet 04

1. Draw a Venn-Diagram with one circle representing Females (F) and the other representing Smokers (S). Using the sets Males (M) and Non-smokers (N), label the four areas as the intersections of two sets.

2. The workers in a particular factory are 65% male, 70% married, and 45% married male. If a worker is selected at random from this factory, find the probability that the worker is (a) a married female, (b) a single female, (c) married or male or both.

3. Let A and B be two events. Identify the conditions on A and B that must hold in order to guarantee the validity of the identity: $P(B - A) = P(B) - P(A)$. Prove this identity.

4. Formally prove that the third axiom implies the two set case (it explicitly applies only a countable infinite collection of sets). That is, show that if $A_1 \cap A_2 = \emptyset$ then $\mathbb{P}(A_1 \cup A_2)$ must be equal to $\mathbb{P}A_1 + \mathbb{P}A_2$.

5. Psychology majors are required to take two particular courses: Psychology 100 and Psychology 200. It is a rare student indeed who does outstanding work in both courses. It is known that the chances of getting an A in PSY 100 is .4 and the chances of getting an A in PSY 200 is .3, while the chances of getting an A in both courses are .05. What are the chances that a randomly selected student will get at least one A in the two courses?

6. Let A and B be two events in a random experiment. Prove that the probability that exactly one of the events occurs (that is, the event $(A \cap B^c) \cup (A^c \cap B)$ occurs) in a given trial of this experiment is equal to $\mathbb{P}(A) + \mathbb{P}(B) - 2 \cdot \mathbb{P}(A \cap B)$.