Homework #3

3.1. In how many ways can a hand with 6 cards (from an ordinary deck of 52 cards) be made up of 3 pairs? (Note: a pair means two cards with the same value but different suits. We should assume that the 3 pairs have 3 different ranks).

3.2.

(a) 10 cards are drawn at random one at a time with replacement from an ordinary deck of cards. What is the sample space? What is the probability that no Ace appears on any of the draws? What is the probability that at least one King appears in 10 draws? What is the probability that at least 2 Queens appear in the 10 draws?

(b) What are the corresponding probabilities in (a) if the drawing is done without replacement?

3.3. Let A and B be events with \( P(A) = \frac{3}{7} \), \( P(B) = \frac{1}{2} \) and \( P((A \cup B)^c) = \frac{3}{8} \). What is \( P(A \cap B) \)?

3.4

(a) How many one-to-one (i.e., injective) maps are there from \( \{1, 2, 3, 4\} \) to \( \{a, b, c, d, e, f\} \)?

(b) How many onto (i.e., surjective) maps are there from \( \{a, b, c, d, e, f\} \) to \( \{1, 2, 3, 4\} \)?

3.5 It is desired to form three committees from a group of 3 men and 3 women.

(a) In how many ways can this be done?

(b) Suppose that each of the committees must contain at least one man and at least one woman. Now how many different committees are possible?
3.6 How many ways are there to distribute 10 red jellybeans and 8 blue jellybeans to 4 girls and 3 boys if:

(a) there are no restrictions;
(b) everyone gets at least one red jellybean;
(c) every girl gets exactly two blue jellybeans and at least one red jellybean, and every boy gets at most one red jellybean.