

## MATH 425 Homework 2 (due Friday, Sep. 26)

**Problem 1.** There are 5 hotels in a certain town. If 3 people check into hotels in a day, what is the probability that they each check into a different hotel?

**Problem 2.** A pair of fair dice, one of them red and the other blue, is rolled. Calculate the probability that the blue die lands on a higher value than does the red one. (The dice are fair.)

**Problem 3.** Two dice are thrown  $n$  times in succession. Determine the probability that double 2 appears at least once.

**Problem 4.** An urn contains  $n > 0$  red and  $m > 0$  black balls.

- (a) If two balls are randomly withdrawn, what is the probability that they are the same color?
- (b) If a ball is randomly withdrawn and then returned to the urn before the second one is drawn, what is the probability that the withdrawn balls are the same color?
- (c) Show that the probability in part (b) is always larger than the one in part (a).

**Problem 5.** A small village consists of 20 families, of which 4 have one child, 8 have two children, 5 have three children, 2 have four children, and 1 has five children.

- (a) If one of these families is chosen at random, what is the probability that it has  $i$  children, for  $i = 1, 2, 3, 4, 5$ ?
- (b) If one of the children is randomly chosen, what is the probability that this child comes from a family having  $i$  children, for  $i = 1, 2, 3, 4, 5$ ?

**Problem 6.** An urn contains 5 red and 6 black balls. Players A and B withdraw balls from the urn consecutively (A draws first, then B, then A, then B, etc.) without replacement until a red ball is selected. The player who selects the red ball wins the game. Find the probability that player A wins.

**Problem 7.** A forest contains 20 deers, of which 5 are captured, tagged, and released. A month later, 4 of the 20 deers are captured. What is the probability that exactly 2 of these 4 have been tagged?

**Problem 8.** If it is assumed that all  $\binom{52}{5}$  poker hands are equally likely, what is the probability of being dealt two pairs? (This occurs when the cards have values  $a, a, b, b, c$ , where  $a, b, c$  are all distinct.)

**Problem 9.** There are 30 physicists and 25 chemists attending a certain conference. Three of these 55 people are randomly chosen to take part in a panel discussion. What is the probability that at least one chemist is chosen?

**Problem 10.**

- (a) If  $n$  people, including A and B, are randomly arranged in a line, what is the probability that A and B are next to each other?
- (b) What would the probability be if the people were randomly arranged in a circle?