MATH/STAT 414
Homework 3

Due 2.4.2011

1. In the game of craps, two dice are rolled. If the sum is 2, 3, 7, 11, or 12, the game is over and the player either wins (in the case of 7 or 11) or loses (in the case of 2, 3, or 12). In any other case, the sum obtained becomes the players point and the game changes: Now, the player continues to roll two dice until the sum equals either 7 or the point. In the case of 7, the player loses; in the case of the point, the player wins; and in any other case, the player simply rolls again and nothing changes. Find:
   (a) P (player wins — the point equals 4) [same as P (win — point equals 10)]
   (b) P (player wins — the point equals 5) [same as P (win — point equals 9)]
   (c) P (player wins — the point equals 6) [same as P (win — point equals 8)]
   (d) Finally, show that the probability that a player wins a game of craps is exactly 244/495.
2. Problems 3.14 (p. 102)
3. Problems 3.21 (p. 103)
4. Problems 3.44 (p. 105)
5. Problems 3.47 (p. 105)
6. Theoretical Exercises 3.8 (p. 111)

7. An insurance company believes that drivers can be divided into two classes, high-risk and low-risk. According to past data, a high-risk driver has an accident with probability 0.3 during a typical year. On the other hand, a low-risk driver has an accident with probability 0.1 during a typical year. Fur- thermore, 20% of policyholders are high-risk.

   (a) What is the probability that a new policyholder will have an accident within a year of purchasing a policy?

   (b) Suppose that a new policyholder has an accident within a year of purchasing a policy. What is the probability that that driver is high-risk?

   (c) Suppose that a new policyholder has an accident in year one. What is the probability that the policyholder will have an accident in year two? (You may assume that for a given individual, the occurrence of an accident in one year is independent of the occurrence of an accident in another year.)

8. An actuary is studying the prevalence of three health risk factors, denoted by A, B, and C, within a population of women. For each of the three factors, the probability is 0.1 that a woman in the population has only this risk factor (and no others). For any two of the three factors, the probability is 0.12 that she has exactly these two risk factors (but not the other). The probability that a woman has all three risk factors, given that she has A and B, is 1/3. Supposing there is a medical test that conclusively determines that a woman from this population does not have risk factor A. What is the probability, given this information, that she does not have any of the three risk factors?