

Homework 8

Due November 21, 2013

CMSC 203

1. Section 7.1, Exercise 16
What's the probability that a 5-card poker hand contains a flush, that is, five cards of the same suit?
2. Section 7.1, Exercise 36 (*show the probability of both events*)
Which is more likely: rolling a total of 8 when two dice are rolled or rolling a total of 8 when three dice are rolled?
3. Section 7.2, Exercise 8a,c,e (*remember n is a variable and may appear in your answer*)
What is the probability of these events when we randomly select a permutation of $\{1, 2, \dots, n\}$ where $n \geq 4$
 - a) 1 precedes 2
 - c) 1 immediately precedes 2
 - e) n precedes 1 and n precedes 2
4. Section 7.2, Exercise 16
Show that if E and F are independent events, then $\overline{E}$ and $\overline{F}$ are also independent events.
5. Section 7.2, Exercise 24 (*modified*)
What is the conditional probability that exactly four heads appear when a fair coin is flipped five times, given that the first flip came up tails? Show whether it the probability of heads appearing 4 times after 5 flips is dependent or independent of the first flip.
6. Section 7.2, Exercise 32
Find the probability that a randomly generated bit string of length 10 begins with a 1 or ends with a 00 for the following conditions:
 - a) a 0 bit and a 1 bit are equally likely
 - b) the probability that a bit is a 1 is 0.6
 - c) the probability that the i th bit is a 1 is $1/2^i$ for $i = 1, 2, 3, \dots, 10$
7. Section 7.3, Exercise 10
Suppose that 4% of the patients tested in a clinic are infected with avian influenza. Furthermore, suppose that when a blood test for avian influenza is given, 97% of the patients infected with avian influenza test positive and that 2% of the patients not infected with avian influenza test positive. What is the probability that
 - a) a patient testing positive for avian influenza with this test is infected with it?
 - b) a patient testing positive for avian influenza with this test is not infected with it?
 - c) a patient testing negative for avian influenza with this test is infected with it?
 - d) a patient testing negative for avian influenza with this test is not infected with it?
8. Section 7.3, Exercise 18
Suppose that a Bayesian spam filter is trained on a set of 500 spam messages and 200 messages that are not spam. The word "exciting" appears in 40 spam messages and in 25 message that are not spam. Would an incoming message be rejected as spam if it contains the word "exciting" and the threshold for rejecting spam is 0.9?
9. Section 7.4, Exercise 6
What is the expected value when a \$1 lottery ticket is bought in which the purchaser wins exactly \$10 million if the ticket contains the six winning numbers chosen from the set $\{1, 2, 3, \dots, 50\}$ and the purchaser wins nothing otherwise?
10. Chapter 7.4, Exercise 10
Suppose that we flip a fair coin until either it comes up tails twice or we have flipped it six times. What is the expected number of times we flip the coin?