

Homework 3 (Due October 10)

Grade Distribution (Total=10+10+15+10+5=50).

Please simply answer as much as possible.

1. If A flips $n + 1$ and B flips n fair coins, find the probability that A gets more heads than B . Hint: Condition on which player has more heads after each has flipped n coins. (There are three possibilities.)
2. 51% of the students at a certain college are females. 6% of the students in this college are majoring in computer science. Of all the students at the college, 3% are women majoring in computer science. If a student is selected at random, find the conditional probability that
 - (a) the student is female given that the student is majoring in computer science;
 - (b) this student is majoring in computer science given that the student is female.
3. A coin having probability 0.7 of landing on heads is flipped. Jim observes the result—either heads or tails—and rushes off to tell Mary. However, with probability 0.3, Jim will have forgotten the result by the time he reaches Mary. If Jim has forgotten, then, rather than admitting this to Mary, he is equally likely to tell Mary that the coin landed on heads or that it landed tails. (If he does remember, then he tells Mary the correct result.)
 - (a) What is the probability that Mary is told that the coin landed on heads?
 - (b) What is the probability that Mary is told the correct result?
 - (c) Given that Mary is told that the coin landed on heads, what is the probability that it did in fact land on heads?
4. A bag contains three kinds of dice: seven 4-sided dice, three 6-sided dice, and two 12-sided dice. A die is drawn from the bag and then rolled, producing a number. For example, the 4-sided die could be chosen and rolled, producing the number 1, 2, 3, 4. Assume that each die is equally likely to be drawn from the bag.
 - (a) What is the probability that the roll gave a six?
 - (b) What is the probability that a 6-sided die was chosen, given that the roll gave a six?
5. In answering a question on a multiple-choice test, a student either knows the answer or guesses. Let p be the probability that the student knows the answer and $1 - p$ be the probability that the student guesses. Assume that a student who guesses at the answer will be correct with probability $1/m$, where m is the number of multiple-choice alternatives. What is the conditional probability that a student knew the answer to a question given that he or she answered it correctly?