

Sta347 Probability I
Homework 3
Nov. 8, 2013
Due Nov. 14, 2013 in class

- You should work out this Homework individually. Group works or discussions are not acceptable.
- No late Homework will be accepted.

- (1) Problem 2 on Page 86 of the Textbook.
- (2) Problem 3 on Page 86 of the Textbook.
- (3) A gambler repeatedly plays a game for which his probabilities of winning a dollar is p and of losing a dollar is $(1 - p)$ each time he plays. The games are independent. He plans to play the game repeatedly until he is ruined (loses all his money) or has 3 dollars. If the gambler begins with 1 dollar, what is the probability that he is ruined?
- (4) A diagnostic test for a certain disease has 95% sensitivity; that is a person with the disease has probability 95% of having positive result for the test. At the same time, the test has 95% specificity; that is, a person without the disease will have 95% probability of having negative result for the test. Suppose only 1% of the population has the disease.
 - (a). If someone has a positive result for the test, what is the probability that the person does, in fact, has the disease?
 - (b). If someone has a negative result for the test, what is the probability that the person does not have the disease?
- (5) Show that for three events A, B and C

$$P[A \cup B|C] = P(A|C) + P(B|C) - P(AB|C).$$

- (6) Suppose that a fair coin is independently tossed two times. Events A, B and C are defined as follows: A : Heads comes up on the first toss. B : Heads comes up on the second toss. C : Both tosses yield the same outcome. Are A, B and C independent? Justify your answer.