

Problem Set 2
(Lecture 3 & Lecture 4)
Due: 9/11

*****Question numbers and pages based on 7th Edition, please make sure you check and do the proper questions if using a different version*****

1. Consider the random experiment where we roll 2 fair dice.
 - a. Define the sample space S using set notation.
 - b. Consider the event A , that the sum of the two rolls is less than 7, and event B , that the two numbers rolled are the same. Define each of the two events using set notation. Is B a subset of A ?
 - c. Define the event of the intersection of events A and B using set notation
 - d. Define the event of the union of events A and B using set notation
2. A couple is deciding to have children until they have one boy and one girl, but no more than 5 children.
 - a. Define the sample space using proper set notation.
 - b. What is the probability that the couple will have no more than 2 boys?
3. Prove the following:
 - a. If event A is independent of event B , then $P(A|B) = P(A|B^C)$. Does this condition make sense intuitively?
 - b. Suppose event A and event B are mutually exclusive events and $P(B) > 0$, show that $P(A|A \cup B) = \frac{P(A)}{P(A) + P(B)}$.
 - c. Suppose events A and B are mutually exclusive events, with $P(A) > 0$ and $0 < P(B) < 1$. Are event A and event B independent? Prove your answer.
4. Consider the case where we are flipping a coin 8 times. Which of the two scenarios is more likely to occur, HHHHHHHH or HTHTHTHT?
5. We know that the probability of Taylor Swift liking guys with blue eyes is .50. Given that she likes guys with blue eyes there is a 40% chance that she is complaining about an ex-boyfriend. There is a 40% chance that she is complaining about an ex-boyfriend.
 - a. Write down the information given in terms of the probabilities of event C (Taylor Swift likes guys with blue eyes) and event D (she is complaining about an ex-boyfriend).
 - b. What is the probability that Taylor Swift is not complaining about an ex-boyfriend *and* she likes guys with blue eyes (hint: think about using the conditional probability you're given here)?
 - c. What is the probability that Taylor Swift is not complaining about an ex-boyfriend *and* she does not like guys with blue eyes (hint: can you use independence here)?
 - d. Knowing Taylor Swift is not complaining about an ex-boyfriend, what is the probability that she does not like guys with blue eyes?
6. Textbook Exercise 2.75