Hw2: Stat355, F 2016
Due September 21, 2016

Problems 1,2,4 ,6 and 8 will be checked by the grader.

1. [Section 2.4 Problem 56] For any event A and B with $P(B) > 0$, show that $P(A|B) + P(A^c|B) = 1$ where A^c is the complement of A.

2. [Section 2.4 Problem 49] The table below gives information on the type coffee selected by someone purchasing a single cup of coffee at particular kiosk. Consider randomly selecting a

	Small	Medium	Large
Regular	14%	20%	26%
Decaf	20%	10%	10%

   coffee purchaser

   (a) What is the probability that the individual purchased a small cup? A cup of decaf coffee?

   (b) If we learn that the selected individual purchased a small cup, what now is the probability that he/she chose decaf coffee, and how would you interpret this probability?

3. [Section 2.4 Problem 63] For customers purchasing refrigerator at a certain appliance store, let A be the event that the refrigerator was made in the U.S., let B be the event that the refrigerator had an ice-maker, and C be the event that the customer purchased the extended warranty. Relevant probabilities are

$$\begin{aligned} P(A) &= .75 \quad P(B|A) = .9 \quad P(B|A^c) = .8 \\ P(C|A \cap B) &= .8 \quad P(C|A \cap B^c) = .6 \\ P(C|A^c \cap B) &= .7 \quad P(C|A^c \cap B^c) = .3 \end{aligned}$$

   (a) Compute $P(A \cap B \cap C)$

   (b) Compute $P(B \cap C)$

   (c) Compute $P(C)$

   (d) Compute $P(A|B \cap C)$ and describe in words what this probability means

4. [Section 2.4 Problem 64] The *Review* editor for a certain scientific journal decides whether the review for any particular book should be short, medium or long. Data on recent reviews indicate that 60% reviews are short, 30% are medium and the rest are long. Reviews are submitted either in MS Word or LaTex. For short reviews 80% are in Word, for medium reviews 50% are in Word whereas for long reviews 30% are in Word. Suppose a recent review is selected at random.

   (a) What is the probability that the selected review was submitted in Word format?

   (b) If the selected review was submitted in Word, what is the (posterior) probability of it being short? [Bayes Rule]

5. [Section 2.5 Problem 73] If A and B are independent events, show that A^C and B^c are also independent.

6. [Section 2.5 Problem 77]

   An aircraft seam requires 25 rivets. the seam will have to be reworked if any of these rivets is defective. Suppose rivets are defective independently of one another, each with the same probability.

   (a) if 15% of all seams need reworking, what is the probability that a rivet is defective?

   (b) How small should the probability of defective rivet be to ensure that only 10% of all seams need reworking?

7. [Section 3.1 Problem 5] If the sample space $\mathcal{S}$ is an infinite set, does that necessarily imply that any rv X defined from $\mathcal{S}$ will have an infinite set of possible values? If yes, say why. If no, give an example.

8. [Section 3.1 Problem 10] The number of pumps in use at both a six-pump station and a four -pump station will be determined. Give the possible values for each of the following random variables:

   (a) T = the total number of pumps in use

   (b) X = the difference between the numbers in use at stations 1 and 2

   (c) U = the maximum number of pumps in use at either station

   (d) Z = the number of stations having exactly two pumps in use

9. [Section 3.2 Problem 18] Two fair dice are tossed independently. Let M be the maximum of the two tosses. ($M(1,5) = 5$ and $M(3,3) = 3$)

   (a) What is the pmf of M?

   (b) Determine the CDF of M and graph it.