

**Stat 311 Written Assignment 2 (Group Assignment)**

**Due uploaded to Canvas by 11:45 PM on Monday 24 April 2017**

1. Your local grocery store sells 5 lb bags of potatoes. However, the 5 lb bags don't weight exactly 5 lbs. If we let  $X_i$  be the weight of a randomly selected 5 lb bag of potatoes, historical data indicates that  $X_i \sim N(5.36, 0.14)$ . The local warehouse store sells 10 lb bags of potatoes, which also do not weight exactly 10 lbs. If  $Y$  is the weight of a randomly selected 10 lb bag, historical data indicates that  $Y \sim N(10.22, 0.18)$ . If we randomly select two 5 lb bags of potatoes and one 10 lb bag of potatoes, what is the probability that the sum of the weights of the two 5 lb bags exceeds the weight of one 10 lb bag?
2. The number of injury accidents at a dangerous intersection is modeled by a Poisson distribution with  $\mu = 0.4$  per month. Calculate the probability that there is at least 1 accident at the intersection in eight of the next 12 months. Hint: this problem requires using two discrete probability distributions to get the final answer.
3. One way to get out of jail in MONOPOLY is to roll a double.
  - a. What is the probability that you get out of jail within 3 rolls of the dice?
  - b. What is the expected number of rolls before the roll for getting out of jail?
4. Let  $X$  be a random variable that denotes the number of heads in a set of 6 tosses.
  - a) What is the sample space for  $X$ ?
  - b) Assuming a fair coin and independent toss outcomes, what is the theoretical distribution of  $X$ ? Make sure to name the distribution and the values of any parameters.
  - c) What are  $E(X) = \mu_X$  and  $\sigma_X$  based on the distribution named in part (iii) above
  - d) What is the probability that  $X > 2$  in any given case?
  - e) Assume that the tossed coin was an unfair coin with  $P(\text{Heads}) = 0.525$  and that it was tossed 1200 times. Define  $Y \sim \text{Binomial}(1200, 0.525)$ . Use normal approximation to the binomial distribution to find the probability of observing **no more than** 595 heads in 1200 tosses of the coin.
5. You believe that there is a 20% chance that you will earn an A in your English class, a 10% chance that you will earn an A in your Chemistry class, and a 5% chance that you will earn an A in both classes. Let  $E = A$  in English,  $C = A$  in Chemistry, and  $B = A$  in both. **Use the defined events and proper notation** to complete parts A through C below. Justify your answers to parts B and C with an appropriate equation (not just words).
  - a) Find the probability that you do not get an A in either English or Chemistry.
  - b) Are "earning an A in English" and "earning an A in Chemistry" disjoint events? Explain.
  - c) Are "earning an A in English" and "earning an A in Chemistry" independent events? Explain.

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6. It is thought that there are 1100 moose in the Yellowstone Park moose population. Last year 50 moose were captured and tagged. Six months later 200 moose are captured. Define the RV,  $X$ , to be the number of tagged moose in the group of 200 most recently captured moose. We will assume that all moose are still living and that the population total has not changed.

a) Name the probability distribution that can be appropriately used to find probabilities of  $X$ .

b) What is the probability that 25 of the most recently captured moose are tagged?

7. City crime records show that 17% of all crimes are violent and 83% are nonviolent, involving theft, forgery, and so on. Eighty-eight percent of violent crimes are reported versus 62% of nonviolent crimes.

Let  $V$  = a crime is violent

Let  $R$  = a crime is reported

a) What is the overall reporting rate for crimes in the city?

b) If a crime is reported to the police, what is the probability that the crime is nonviolent?