Graded Homework Set #2 – Statistics Math 135

1. Determine which of the following probability experiments represents a binomial experiment. If the probability experiment is not a binomial experiment, state why. (See page 329)

   a. Three cards are selected from a standard 52-card deck with replacement. The number of aces is observed.

   b. Three cards are selected from a standard 52-card deck without replacement. The number of aces is observed.

2. Calculate, using the binomial table, the following binomial probabilities: (See pages 333, 334)
   a. $P(X = 3)$ if n is 7 and p is 0.2.
   b. $P(X = 1)$ if n is 5 and p is 0.8.
   c. $P(X = 8)$ if n is 10 and p is 0.3.
   d. $P(X > 4)$ if n is 6 and p is 0.5.

3. The Annapolis Candy company claims that 15% of the jawbreakers it produces weigh more than 0.4 ounces. Five jawbreakers are selected from the production line and tested for weight. If the company claim is correct, what is the probability that: (See pages 333,334)

   a. All 5 will weigh more than 0.4 ounces?
   b. Two of the 5 will weigh more than 0.4 ounces?
   c. At least one will weigh more than 0.4 ounces?
   d. Fewer than 2 will weigh more than 0.4 ounces?

4. a. Mars, Inc., claims that 5% of its M&M plain candies are brown, and a sample of 100 such candies is randomly selected. Find the mean, μ, and the standard deviation, σ, for this binomial distribution.

   b. A gardener plants 1000 new seedling trees. The nursery guarantees that each tree has an 80% chance of survival during the first year of growth thereby producing a binomial probability function. The guarantee states that if the number of surviving trees is within 3 standard deviations of the mean, the nursery will have met its obligation. What is the minimum number trees that can survive and the nursery will have met its obligation? (See page 335)

5. A machine produced 50 light bulbs in a single hour's operation. The probability that any single light bulb produced was without defect was 0.95.

   a. What is the probability that all 50 light bulbs were without defect?
   b. Would it be a rare event for all 50 light bulbs to be without defect?
      (See pages 277 to 280 for a. and b.)
   c. What is the expected number of light bulbs that would be defective?
      (See page 335)

6. Calculate the normal probabilities for the following values of z:
(This is a very important problem since the remainder of the course requires you to use the normal table or a calculator to obtain normal probabilities) (See pages 371 and 372 for use of the normal table; ignore the use of the table described in the DVD graphics.)

a. $P(z \geq 1.21)$
b. $P(z \leq 2.11)$
c. $P(-1.96 \leq z \leq 1.96)$
d. $P(z \leq - 5)$

7. a. If $P(z \leq a) = 0.9429$, what is the value of a?
b. What is the probability that a normally distributed random variable is within 2.58 standard deviations of its mean? (See page 377)

8. The mean, μ, of a normally distributed random variable, X, is 50. The standard deviation, σ, is 10. Calculate: (See page 387)

a. $P(X \leq 60)$

b. $P(X \geq 65)$

c. If $P(X \leq k)$ is 0.8997, what is the value of k?

9. General Electric manufactures a 60-watt light bulb that is advertised to last 1500 hours. Suppose the lifetimes of the light bulbs is normally distributed with a mean of 1500 hours and a standard deviation of 100 hours. (See pages 387 and 389)

a. What proportion of the light bulbs will last less than the advertised time?
b. What proportion of the light bulbs will last more than 1650 hours?
c. What is the proportion of light bulbs lasts between 1625 and 1725 hours?
d. Beyond what time will only 5% of the bulbs burn?

10. The most famous geyser in the world is Old Faithful in Yellowstone National Park. The time between eruptions is normally distributed with a mean of 85 minutes and a standard deviation of 14 minutes

a. What is the probability that the time between eruptions is at least 95 minutes? (See page 387)

b. If a random sample of 49 time between eruptions is taken, what is the probability that the sample average is at least 95 minutes? (See page 429)