Graded Homework Set #2 – Statistics Math 135

1. a. A binomial probability distribution results from a procedure that meets 4 requirements. What are these requirements? (See page 328/329)

b. A process is to choose 5 people (without replacement) from a group of 37 people, of whom 15 are women, and keeping track of the number of men chosen. Which of the following 4 statements is accurate? (See page 328/329)

A) Procedure results in a binomial distribution.
B) Not binomial because there are too many trials.
C) Not binomial because there are more than two outcomes for each trial.
D) Not binomial because the trials are not independent.

2. Calculate the following binomial probabilities using the binomial table or a calculator:
(See pages 333, 334, 335 for TI84)

a. $P(X = 2)$ if n is 5 and p is 0.1.
b. $P(X = 5)$ if n is 10 and p is 0.8.
c. $P(X = 0)$ if n is 15 and p is 0.2.
d. $P(X \geq 3)$ if n is 4 and p is 0.5.

3. The Annapolis Candy company claims that 60% of the jawbreakers it produces weigh more than 0.4 ounces. Ten jawbreakers are selected from the production line and tested for weight. If the company claim is correct, what is the probability that: (See pages 333,334,335)

a. All 10 will weigh more than 0.4 ounces?
b. Eight of the 10 will weigh more than 0.4 ounces?
c. At least one will weigh more than 0.4 ounces?
d. Fewer than 3 will weigh more than 0.4 ounces?

4. a. Mars, Inc., claims that 10% of its M&M plain candies are blue, and a sample of 100 such candies is randomly selected. Find the mean, μ, and the standard deviation, σ, for this binomial distribution. (See page 335)

b. A gardener plants 1200 new seedling trees. The nursery guarantees that each tree has a 95% chance of survival during the first year of growth. At the end of the year 1129 trees have survived. Should the nursery honor its guarantee and replace the 71 trees that did not survive? Why or why not? Discuss this using the concept of how many standard deviations the 71 trees represent being away from the expected number of surviving trees.
(See page 338, example 8, but use 3σ instead of 2)

5. A machine produced 200 light bulbs in a single day's operation. The probability that any single light bulb produced was without defect was 0.99.

a. What is the probability that all 200 light bulbs were without defect?
b. Would it be an unusual event for all 200 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. Use the normal probability table to find the following probabilities: (This is a very important problem since the remainder of the course requires you to use the normal table) (See pages 371 and 372; ignore the use of the table described in the DVD graphics. You may also use your calculator to find these probabilities, see page 373 and page 393 to do this)

a. $P(z \geq 3.1)$
b. $P(z \leq 3.1)$
c. $P(-1.5 \leq z \leq 2.6)$
d. $P(z \geq 0)$

7. a. If $P(z \leq a) = 0.9292$, what is the value of a? (see page 393 for TI and example 6 page 389)
   b. What is the probability that a normally distributed random variable is within 2.5 standard deviations of its mean? (See example 6 page 389)

8. The mean, μ, of a normally distributed random variable, X, is 137.0. The standard deviation, σ, is 5.3. Calculate: (See page 387 for table use and page 389 for calculator use)

a. $P(X \leq 143)$

b. $P(X \geq 124)$

c. If $P(X \leq k)$ is 0.9500, what is the value of k?

9. IQ scores are normally distributed with a mean of 100 and a standard deviation of 15. (See pages 387 and 389)
   a. What is the probability that a person selected at random has an IQ score greater than 120?
   b. Extreme retardation occurs when an IQ score is less than 40. What percentage of a population will have extreme retardation?
   c. If the cut-off score for admission to MENSA is 135, what percentage of the population is eligible for MENSA?

10. A broad generalization of the Central Limit Theorem may state that sample averages from a sample of size of at least 30 is normally distributed with a mean of the population mean and a standard deviation equal to that of the population standard deviation divided by the square root of the sample size. Assume that men's weight is normally distributed with a mean of 172 pounds and a standard deviation of 29 pounds.

a. If a man is selected, what is the probability that he weighs less than 180 pounds? (See page 387)

b. If a sample of 36 men is obtained, what is the probability that the average weight of this sample is less than 180 pounds? (See page 429)