**The following 12 multiple choice questions are worth 5 points each.**

1. A computer system has a four-letter password. What is the probability that x and y do not appear in a randomly chosen password? Assume that repetition of letters is permitted.

   a. 0.73

   b. 0.71

   c. 0.81

   d. 0.92

2. A random phenomenon consists of rolling a six-sided die and spinning a 38-slot roulette wheel. How many elements are in the sample space of this random phenomenon?

   a. 44

   b. 228

   c. $\left(\frac{1}{6}\right)\left(\frac{1}{38}\right)$

   d. $\frac{1}{6}+\frac{1}{38}$

3. Which of the following is/are true?

   I. The probability of an outcome in a sample space must be a number between 0 and 1.
   II. The sum of the probabilities of all possible outcomes of a probability model must be 1.
   III. An event is a subset of the sample space,

   a. I only

   b. II only

   c. III only

   d. I and III only

   e. I, II and III

**Use the following information for questions 4, 5, and 6.**

A large university with a total enrollment of about 50,000 students has offered Pepsi-Cola an exclusivity agreement that would give Pepsi exclusive rights to sell its products at all university facilities. Under this agreement Pepsi predicts it will sell an average of 88,000 cans per week with a standard deviation of 12,500 cans.

4. Construct a 95% confidence interval for the mean number of cans sold per week.

   a. 75,500 to 100,500
   b. 50,500 to 125,500
   c. 76,125 to 99,875
   d. 63,000 to 113,000
   e. none of the above

5. Below what number does 75% of the number of cans sold per week lie?

   a. 66,000
   b. 100,500
   c. 96,375
   d. 79,625
   e. none of the above

6. Construct an 87% confidence interval for the mean number of cans sold per week.

   a. 69,125 to 106,875
   b. 77,125 to 98,875
   c. 50,250 to 125,750
   d. 66,250 to 109,750
   e. none of the above

7. A survey on ice cream flavors finds that 67% of a sample of 900 people like butter brickle. Find a 95% confidence interval for $p$, the population truth.

   a. $67 \pm 2.23\%$
   b. $67 \pm 3.41\%$
   c. $67 \pm 2.92\%$
   d. $67 \pm 3.13\%$

8. A poll of 90 students was conducted to estimate the amount of money students spend per week on food. The average amount was found to be \$45 per week with a standard deviation of \$7.20. How large a sample would be needed to cut the sample standard deviation to \$3.60?

a. 180
b. 360
c. 45
d. 270
e. 450

9. Which of the following is/are true?

I. The distribution of sample means of a non-normal population will tend to be increasingly normal as the sample size increases.
II. The standard deviation of a distribution of sample means from a given population increases as the sample size increases.
III. The mean of a distribution of sample means is equal to the mean of the original population.

a. I only
b. II only
c. III only
d. I and III only
e. I, II, and III

Use the following information for questions 10 and 11.

A video store sells three different brands of VCR's each of which comes with either two heads or four heads. The accompanying table gives the number of recent purchasers buying each type of VCR.

| | Number of Heads | |
|---|---|---|
| **Brand** | **2** | **4** |
| M | 57 | 95 |
| P | 24 | 82 |
| Q | 43 | 107 |

10. What percent of purchasers bought a 4-head VCR given that brand Q was purchased?

a. 52.8%
b. 37.7%
c. 28.7%
d. 71.3%
e. none of the above

11. Determine the standard deviation of the sample proportion of purchasers of 2-head VCR's, given that brand M was purchased.

a. 49.6%
b. 37.5%
c. 3.9%
d. 24.7%
e. 15.4%

12. Which of the following statements is/are true?

I. a control chart monitors a process over time.

II. a control chart shows the values of all items produced by a company.

III. a control chart displays a five-number summary of a set of quality control data.

a. Only I is correct.

b. Only II is correct.

c. Only III is correct.

d. Only I and III are correct.

e. All are correct.

**Name:**_____ **Section:**_____

**Instructor:**_____

**The following questions are free response. Please show all work in order to receive credit.**

13. Simultaneously, a spinner numbered 1 through 3 is spun and one die is rolled. The results are recorded. ( 10 pts. )

    a. List all outcomes in the sample space.

    b. Find the probability that at least one of the two numbers recorded is a 3.

    c. Suppose the sum of the number spun and the number rolled is recorded. List all outcomes in this sample space.

    d. Find the probability that the sum recorded is at least 8.

14. Suppose a game has four outcomes: A, B, C, and D. The probability of outcomes A and D is 0.3; the probability of each of the remaining outcomes is 0.2. A player receives \$3 if outcome A occurs, \$4 if outcome B occurs, a \$2 if outcome C occurs, and must pay \$5 if outcome D occurs. (12 pts.)

a. Write the probability model for this game.

b. Find the mean of the winnings.

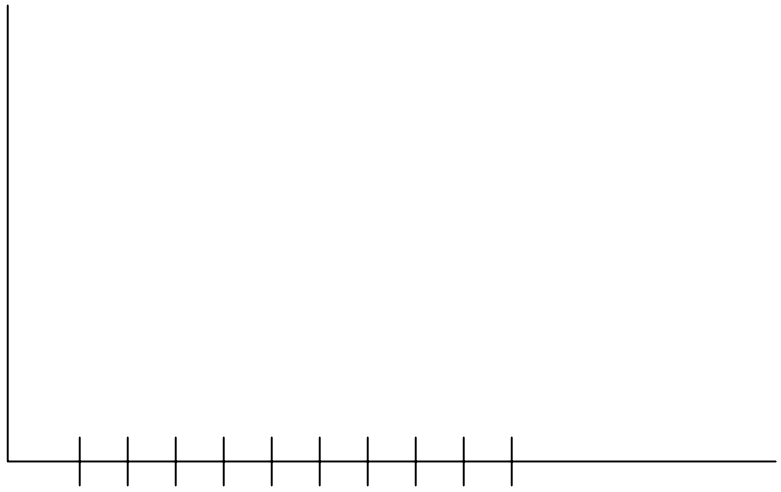
c. Find the standard deviation of the winnings.

15. A sample of 16 fish is taken from a population and weighed. The mean weight is 5 pounds. The standard deviation of the weight of the fish population is 0.4 pounds. Find a 95% confidence interval for $\mu$ , the population mean. ( 6 pts. )

16. A company produces Chinese handcuffs, which are designed to be 5 inches in length. Every hour a sample of 16 is taken from the assembly line and the mean is found for the sample (see the table below). Assume that $\sigma = 0.8$ for the population of handcuffs. ( 12 pts.)

| Sample # | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| $\bar{x}$ | 4.2” | 5.2” | 5.5” | 4.9” | 5” | 4.8” | 5.5” | 4.7” | 4.6” |

a. Make a statistical process control chart for this process.



b. Is this process out of control or in control? Explain your answer.