**Statistics 300 : Fall 2012**

**Instructor : L. C. Larsen**

**Student name & ID#:**

**Student signature:**

**Exam : Unit 1**

**Time allowed : 2 hours and 5 minutes**

**Resources allowed:**

**== >      Textbook (Author: Triola)**
**== >      Notes/helps written by the student**
**== >      Quiz and exam solutions written by instructor**
**== >      Quiz and exam solutions written by the student**
**== >      Calculator/laptop of choice (no outside messages)**
**== >      Instructor at 916-346-6324**

**Resources not allowed:**

**== >      Consultants other than the instructor**
**== >      No phones, unless used as a calculator only**

(3 points; 3 minutes)

**16. Circle the correct sampling plan for each situation,**

**A store manager wants to survey customers, so a bell is installed that will ring at a random time in each hour. When the bell sounds, each cashier records the next customer's gender and the total cost of the items purchased.**

| Simple Random | Systemmatic |
|---|---|
| Stratified Random | Cluster |
| Convenience | Census |

**A store manager wants to survey customers in a representative way. The survey is designed to make it easy for all customers to take part, so a questionaire is given to every customer along with their receipt. Questionaires can be returned on the customer's next visit.**

| Simple Random | Systemmatic |
|---|---|
| Stratified Random | Cluster |
| Convenience | Census |

**A store manager wants to survey customers in a representative way. The survey is designed to have 25 days selected randomly next year. On each of the 25 days, all customers will answer three questions and receive $5 in store credit.**

| Simple Random | Systemmatic |
|---|---|
| Stratified Random | Cluster |
| Convenience | Census |

(5 points; 5 minutes)

**17. A random variable has a bell-shaped distribution. The mean of the distribution is 80, and the standard deviation of the distribution is 13. What percent of the data do you expect to be found between 67 and 106?**

(6 points; 5 minutes)

1. **An experiment consists of picking one of the four aces in a deck of cards, and rolling a die one time. List the possible outcomes in the sample space for this experiment.**

**If an outcome is selected at random from your sample space, what is the probability of getting the ace of spades for the card and an odd number (1, 3, or 5) for the die?**

(4 points; 4 minutes)

2. **The rules for making a password say that it must be made of 8 items. The 8 items must start with 2 of the 4 symbols, followed by 3 of the 8 letters, and end with 3 of the 6 digits shown below. Each item can only be used once, and each arrangement is a different password. How many different passwords could be formed?**

| The symbols are: & * % $ | Example 1: | & * D E F 2 3 6 |
| The letters are: A B C D E F G and H | | |
| The digits are: 1 2 3 4 5 and 6 | Example 2: | * & E D F 6 2 3 |

(3 points; 3 minutes)

3. **If the 10 digits (0, 1, 2, 3, 4, 5, 6, 7, 8, and 9) are written on one ping pong ball each and four of the 10 balls are selected, how many different sets of four digits could be formed? Example: the sets {0 1 7 2} and {7 2 0 1} are the same.**

(5 points; 6 minutes)

**4.** The Army wants to know the 95th percentile ($P_{95}$) of the scores of ALL its soldiers in a test of physical endurance that simulates combat.  Because ti would be too expensive to put all the soldiers through the test, the Army selected 800 soldiers at random to do the test and then they use the 95th percentile of the sample scores as their estimate of the population parameter they want to know.

**Use the information in the "story" to answer the following:**

**(a) What is the population of interest?**

_____

_____

_____

**(c) What parameter was important for the Army to know?**

_____

_____

**(d) What statistic did the Army use instead?**

_____

_____

**(d) If all the 800 test scores were sorted from smallest to largest, at what location in the list would you find the statistic that the Army used?**

(4 points; 4 minutes)

**5. A subway train has three safety systems.  In an emergency, the first safety system will work 90% of the time, the second safety system will work 80% of the time, and the third will work 70% of the time.  What is the probability that the train will handle the next emergency safely?**  (Assume that the three systems operate independently of each other.)

(4 points; 3 minutes)

**6. For the set of 39 values shown at the bottom of the page in sorted order, to what percentile does the value 99 correspond?**

| 23 | 23 | 25 | 29 | 33 | 34 | 34 | 35 | 37 | 40 |
|----|----|----|----|----|----|----|----|----|----|
| 40 | 45 | 50 | 54 | 57 | 61 | 62 | 63 | 63 | 66 |
| 67 | 67 | 68 | 73 | 78 | 79 | 81 | 83 | 87 | 88 |
| 92 | 93 | 98 | 99 | 99 | 99 | 99 | 101 | 106 | |

(5 points; 5 minutes)

7. **All scores of two different tests have bell-shaped distribution.  The scores for Test A have a mean of 110 points and a standard deviation of 42 points.  The scores for Test B have a mean of 330 and a standard deviation of 68 points.  A student takes Test A and earns a score of 91 points.  Another student takes Test B and earns a score of 350 points.  Which of the two test scores is the most unusual?  Circle the answer and explain your choice.**

   **The score on Test A.**            **Why?**

   **The score on Test B.**

(9 points; 7 minutes)

8. **Complete the columns in the "Frequency Distribution" table using the data values given below.**

**Frequency Distribution**

| Class Limits Lower | Class Limits Upper | Tally | Frequency | Relative Frequency | Cumulative Frequency | Cumulative Relative Frequency | Class Midpoint | Class Boundary |
|---|---|---|---|---|---|---|---|---|
| 10 | 50 | | | | | | | |
| 60 | 100 | | | | | | | |
| 110 | 150 | | | | | | | |
| 160 | 200 | | | | | | | |

| Class Width |
|---|
| |

| Data: | 25 | 76 | 25 | 29 | 167 |
|---|---|---|---|---|---|
| | 157 | 139 | 171 | 43 | 133 |
| | 52 | 47 | | | |

  **9.  Give a short definition of statistics** (1 point; 1 minute)**:**

_____

(4 points; 4 minutes)

 **10.  For each situation below, select the appropriate statistical term from the list provided
       and write it in the blank next to the description or situation. Choose the term that is best
       connected to the underlined text in the description or situation.**

| Terms: | 1. randomization | 4. blinding | 7. experimental unit |
|--------|------------------|-------------|----------------------|
|        | 2. replication   | 5. placebo  | 8. treatment         |
|        | 3. confounding   | 6. block    |                      |

_____     Educators studied four different ways of teaching children to read.  All
                 of the second-grade classrooms in the state were grouped according to
                 5 different levels of economic/social status.  <u>Each way of teaching children
                 to read</u> was assigned at random to 20 different classrooms in each status
                 group.  The "status" groups did not take into account whether the classrooms
                 were in urban, suburban, or rural locations.  Teachers and students were
                 not told which way of teaching was assigned to their classrooms, but
                 everyone figured it out after a few weeks.

_____     Educators studied four different ways of teaching children to read.  All
                 of the second-grade classrooms in the state were grouped according to
                 5 different levels of economic/social status.  Each way of teaching children
                 to read was assigned at random to 20 different classrooms in each status
                 group.  The "status" groups did not take into account whether the classrooms
                 were in urban, suburban, or rural locations.  <u>Teachers and students were
                 not told which way of teaching was assigned to their classrooms, but
                 everyone figured it out after a few weeks.</u>

_____     Educators studied four different ways of teaching children to read.  <u>All
                 of the second-grade classrooms in the state were grouped according to
                 5 different levels of economic/social status</u>.  Each way of teaching children
                 to read was assigned at random to 20 different classrooms in each status
                 group.  The "status" groups did not take into account whether the classrooms
                 were in urban, suburban, or rural locations.  Teachers and students were
                 not told which way of teaching was assigned to their classrooms, but
                 everyone figured it out after a few weeks.

_____     Educators studied four different ways of teaching children to read.  All
                 of the second-grade classrooms in the state were grouped according to
                 5 different levels of economic/social status.  Each way of teaching children
                 to read was assigned at random to 20 different classrooms in each status
                 group.  The "status" groups did not take into account whether <u>the classrooms</u>
                 were in urban, suburban, or rural locations.  Teachers and students were
                 not told which way of teaching was assigned to their classrooms, but
                 everyone figured it out after a few weeks.

(8 points; 10 minutes)
 11. **For each discrete probability distribution, calculate the mean, variance, and standard deviation.  Use the columns in the tables as you wish to use them.**

| x | P(x) | | | | |
|---|---|---|---|---|---|
| 16 | 0.263 | | | | |
| 24 | 0.183 | | | | |
| 35 | 0.285 | | | | |
| 46 | 0.269 | | | | |
| | | | | | |

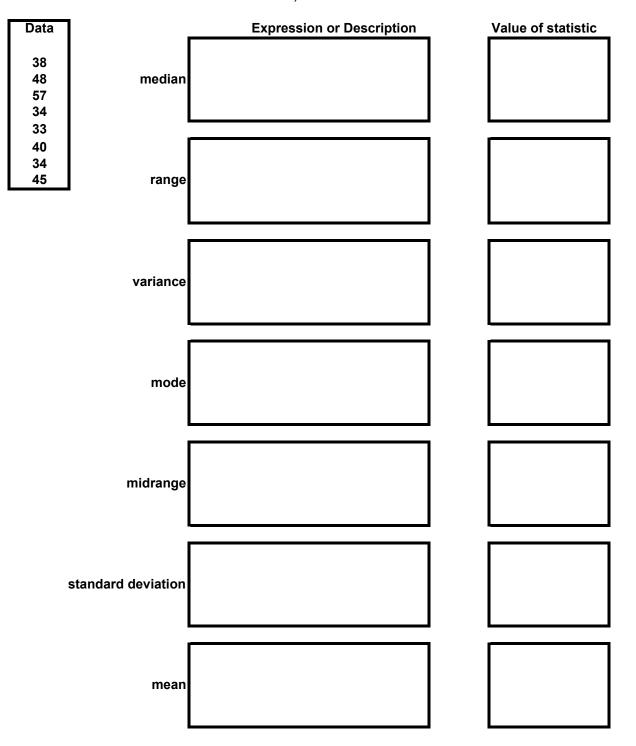| x | P(x) | | | | |
|---|---|---|---|---|---|
| 0 | 0.25 | | | | |
| 1 | 0.05 | | | | |
| 2 | 0.15 | | | | |
| 3 | 0.20 | | | | |
| 4 | 0.13 | | | | |
| 5 | 0.08 | | | | |
| 6 | 0.06 | | | | |
| | | | | | |

**Write the formulas for the mean, the variance, and the standard deviation of a discrete probability distribution.**

$\mu =$ _____

$\sigma^2 =$ _____

$\sigma =$ _____

(14 points; 8 minutes)

**12. Use the data below to determine the value of each statistic. Write an expression for each statistic or describe how it is calculated in principle** (do NOT describe how to use the calculator to determine the result)**.**

| Data | | Expression or Description | Value of statistic |
|------|---|---------------------------|--------------------|
| 38 | | | |
| 48 | **median** | | |
| 57 | | | |
| 34 | | | |
| 33 | | | |
| 40 | **range** | | |
| 34 | | | |
| 45 | | | |
| | **variance** | | |
| | **mode** | | |
| | **midrange** | | |
| | **standard deviation** | | |
| | **mean** | | |

(6 points; 5 minutes)
   **13. An investigative reporter believes that 23% of the high school students in a major city are high on illegal drugs on any given day.  If the reporter is correct and a random sample of 300 high school students from this town are tested for illegal drug use, would it be unusual to find 75 positive tests in the sample of 300?**

(6 points; 6 minutes)
   **14. In another major city, the rate of illicit drug use by high school students is only 17%.  If a random sample of 12 high school students is tested, what is the probability that exactly 3 will test positive for illegal drug use?**

(5 points; 5 minutes)
   **15. Based on many years of experience, an investment advisor tells you that your investments will earn $20,000 with 70% probability, earn $0 with 20% probability, and lose $12,000 with 10% probability.  If your advisor is correct, what is the expected value of your income from investments this year?**

(3 points; 3 minutes)

**16. Circle the correct sampling plan for each situation,**

**A store manager wants to survey customers, so a bell is installed that will ring at a random time in each hour. When the bell sounds, each cashier records the next customer's gender and the total cost of the items purchased.**

| Simple Random | Systemmatic |
|---|---|
| Stratified Random | Cluster |
| Convenience | Census |

**A store manager wants to survey customers in a representative way. The survey is designed to make it easy for all customers to take part, so a questionaire is given to every customer along with their receipt. Questionaires can be returned on the customer's next visit.**

| Simple Random | Systemmatic |
|---|---|
| Stratified Random | Cluster |
| Convenience | Census |

**A store manager wants to survey customers in a representative way. The survey is designed to have 25 days selected randomly next year. On each of the 25 days, all customers will answer three questions and receive $5 in store credit.**

| Simple Random | Systemmatic |
|---|---|
| Stratified Random | Cluster |
| Convenience | Census |

(5 points; 5 minutes)

**17. A random variable has a bell-shaped distribution. The mean of the distribution is 80, and the standard deviation of the distribution is 13. What percent of the data do you expect to be found between 67 and 106?**