Statistics 300 : Spring 2016

Instructor : L. C. Larsen

Name (print): _____

Los Rios ID#: _____

Signature: _____

Exam : Unit 1

Time allowed : 2 hours and 5 minutes

Resources allowed:

== > **Exam is "open notes" and "open book"**
== > **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/tablet 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**

1. **Use the data for the sample represented in the following table to answer parts (a) through (e).**

(1 point, 1 minute)

(a) What is the probability that a randomly selected person from this sample will have visited movie theaters more than 10 times in 2014?

Age Group (in years)	Visits to Movie Theaters in 2014				Total
	0	1 to 5	6 to 10	> 10	
< 15	93	49	17	10	169
15 to < 18	39	76	38	3	156
18 to < 30	11	14	45	17	87
30 to < 50	17	21	12	3	53
50+	38	28	1	9	76
Total	198	188	113	42	541

(3 points, 3 minutes)

(b) What is the probability that a person randomly selected from this sample will be 15 to <18 years old given that the person visited movie theaters 1 to 5 times in 2014?

(3 points, 3 minutes)

(c) What is the probability that a person randomly selected from this sample will not be a person that is 50+ years old who also visited movie theaters 0 times in 2014?

(3 points, 3 minutes)

(d) What is the probability that a person randomly selected from this sample will have visited movie theater > 10 times in 2014 or be in the "18 to < 30" age group?

(5 points; 5 minutes)

2. If birth weights of all babies in the USA have a bell-shaped distribution with a mean of 7.13 pounds and a standard deviation of 1.08 pounds, approximately <u>what percent</u> of the babies born last year had birth weights between 4.97 pounds and 9.29 pounds? To get any points for this problem, you must show how you got your answer!

Answer:

(10 points; 8 minutes)

3. Complete the columns in the "Frequency Distribution" table using the data values given below, and answer the two questions beoow the table.

Frequency Distribution

Class Limits Lower	Class Limits Upper	Tally	Frequency	Relative Frequency	Cumulative Frequency	Cumulative Relative Frequency	Class Midpoint	Class Boundary
0	50							
> 50	100							
> 100	150							

Class Width

Data:	83	4	43	96	103
	91	118	26	102	74

What is the frequency for Class #2 ?   _____

What is the upper limit for Class #1 ?   _____

(5 points; 5 minutes)

4. **For each of the <u>underlined</u> segments in the situations below, select the appropriate 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	5. placebo	9. parameter
2. replication	6. block	10. statistic
3. confounding	7. experimental units	11. population
4. blinding	8. treatments	

(a.) An experiment was done to estimate the average of the responses
of all autistic children to large doses of vitamins. The study involved **<u>3000 autistic children</u>**, 600 in each of 5 age groups. In each age group, 200 children were given a pill with no vitamins, 200 a pill with the standard dose, and 200 a pill with a large dose. The children stayed in their family homes, and each family believed their child was receiving the "large dose". Cameras in each home recorded the behavior of each child which was scored on a "20 point scale" for "severity of autism". Conclusions were based on the difference between the average score of the large dose group and the average score of the standard dose group. The study could not control for the possible effects of unique factors in each household that may also affect autism.

(b.) An experiment was done to estimate the average of the responses
of all autistic children to large doses of vitamins. The study involved 3000 autistic children, 600 in each of 5 age groups. In each age group, 200 children were given a pill with no vitamins, 200 a pill with the standard dose, and 200 a pill with a large dose. The children stayed in their family homes, and **<u>each family believed their child was receiving the "large dose".</u>** Cameras in each home recorded the behavior of each child which was scored on a "20 point scale" for "severity of autism". Conclusions were based on the difference between the average score of the large dose group and the average score of the standard dose group. The study could not control for the possible effects of unique factors in each household that may also affect autism.

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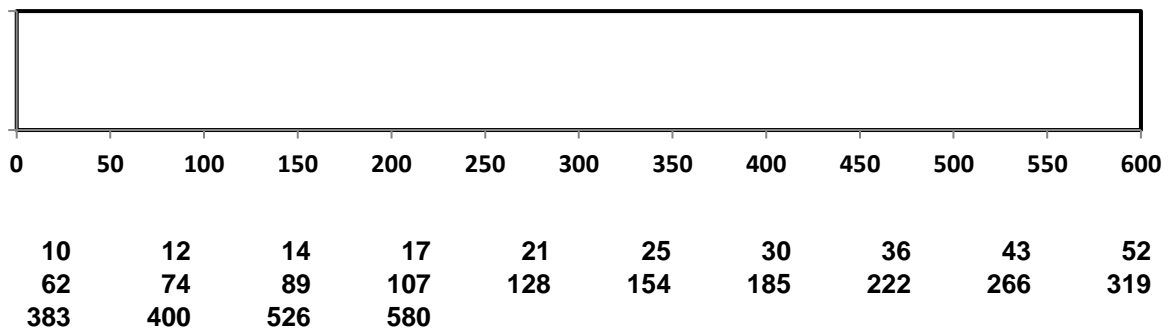
(d.) An experiment was done to estimate the average of the responses
of all autistic children to large doses of vitamins. The study involved 3000 autistic children, 600 in each of 5 age groups. In each age group, 200 children were given **<u>a pill with no vitamins</u>**, 200 **<u>a pill with the standard dose</u>**, and 200 **<u>a pill with a large dose</u>**. The children stayed in their family homes, and each family believed their child was receiving the "large dose". Cameras in each home recorded the behavior of each child which was scored on a "20 point scale" for "severity of autism". Conclusions were based on the difference between the average score of the large dose group and the average score of the standard dose group. The study could not control for the possible effects of unique factors in each household that may also affect autism.

(4 points; 4 minutes)

5. In the United States, 6.3% of all people have some form of diabetes (a condition in which blood sugar levels are not well-controlled). If a random sample of 10 Americans is selected, what is the probability that exactly 2 of them will have some form of diabetes?

(5 points and 4 points; 8 minutes)

6. (a) For the set of 24 values shown below in sorted order, prepare a Boxplot <u>inside</u> the rectangle and <u>above</u> the number line.

```
0    50   100  150  200  250  300  350  400  450  500  550  600
```

10	12	14	17	21	25	30	36	43	52
62	74	89	107	128	154	185	222	266	319
383	400	526	580						

(b) For the set of 24 values shown above in sorted order, what percentile is represented by the value 222?

(8 points; 10 minutes)
7. Answer parts (a), (b), and (c).
   Use the columns in the table in any way you wish to use them.

    (a)   **Is this distribution "proper" (circle "YES" or "NO")?**   **YES**   **NO**

            Why? _____

x	P(x)				
10	0.4				
20	0.3				
30	0.2				
40	0.1				

    (b)   **Write the <u>formulas</u> for the mean, the variance, and the standard deviation of a discrete probability distribution.**

            $\mu =$ _____

            $\sigma^2 =$ _____

            $\sigma =$ _____

    (c)   **Write the <u>values</u> for the mean, the variance, and the standard deviation of <u>this</u> discrete probability distribution. The work above must show how you determined these values. If you used an advance calculator, describe what you did.**

            $\mu =$ _____

            $\sigma^2 =$ _____

            $\sigma =$ _____

(4 points and 2 points; 5 minutes)

8. You have four aces: the spade (S), the heart (H), the diamond (D), and the club (C). Two of the cards will be picked <u>without replacement</u>. List the sample space for this procedure.

If the two cards are picked at random in the procedure (without replacement), what is the probability that the Club will <u>not</u> be picked?

(4 points; 4 minutes)

9. At the local thrift store, there are three dishwashers, four stoves, and five refregerators and eight microwaves. How many different ways are there to pick a combination of one dishwasher, one stove, one refrigerator, and one microwave.

(3 points and 2 points; 5 minutes)

10. A person has four dogs: a terrier (T), a collie (C), a boxer (B), and a dachshund (D). The person prepares a web page to show the dogs, one at a time. In how many different sequences could the dogs be shown? Example: {DCTB}.

What is the probability that the dachshund will be the last dog in the sequence on the web page?

(5 points; 6 minutes)

11. A factory produces 16-ounce bottles of iced tea. The manager is considering buying a new bottle-filling machine that would fill the bottles twice as fast. But, the manager wants to estimate the standard deviation of the of the amounts (ounces) of tea that all future bottles will contain. The current machine has a standard deviation of 0.082 ounces. The manager visits another factory that uses the new machine and carefully measures the amounts of tea in a random sample of 60 bottles. The standard deviation of the 60 values is 0.086 ounces.

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

(a) What is the population of interest to the manager of the iced tea bottling factory?

(b) The manager is interested in the value of what population parameter?

(c) The manager determined the value of what statistic?

(d) What was the value of the statistic that the manager determined?

(e) Did the manager use a sample or a census to determine the value of the statistic?

(14 points; 8 minutes)

12. Use the data below to determine the value of each statistic. Write an expression (formula) 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
56	**median**		
60			
60			
51			
52			
59	**variance**		
58			
58			
54			
	mode		
	range		
	mean		
	midrange		
	standard deviation		

(6 points; 5 minutes)

13. In the United States, 6.3% of all people have some form of diabetes (a condition in which blood sugar levels are not well-controlled). If a random sample of 500 Americans is selected, would it be unusual to find that 40 of them have some form of diabetes? America currently has more than 300 miliion people. (Show your work.)

(4 points; 4 minutes)

14. In a bag of 100 batteries, 18 are bad and 82 are good. What is the probability that a random sample of four of the batteries (without replacement) will include at least one bad battery?

(6 points; 8 minutes for problems 15 and 16 together)

15. Circle the best answer for each situation.

A random sample of 3,420 people is selected from the millions of low-income Californians that used "Medi-Cal" in the last 10 years. Each person is asked if they know that their estate must repay the costs when they die. Those surveyed must answer, by law.

Simple Random	Systematic
Stratified Random	Cluster
Convenience	Census

At a factory that makes toasters, a computer sets a random time during each hour of production. When a horn sounds at each random time, the next toaster that comes of the line will be checked for 24 different aspects of its quality.

Simple Random	Systematic
Stratified Random	Cluster
Convenience	Census

A printed survey is sent to 10,000 homes selected at random from all homes in the state. All residents in the 10,000 homes are asked about their level of education. Most often the survey is thrown away and not answered.

Simple Random	Systematic
Stratified Random	Cluster
Convenience	Census

16. Circle the best answer for each situation.

The Department of Corrections (Prisons) selects a group of 800 prisoners released in 2015 and follows their lives for the next 30 years to find out what types of decisions decrease the percent that return to prison at a later time.

observational retrospective	observational cross-sectional
observational prospective	experiment

The Department of Corrections randomly selects 5000 prisoners in 2015 and conducts a detailed examination of their lives before they went to prison, to learn about factors that may lead to criminal behavior and imprisonment.

observational retrospective	observational cross-sectional
observational prospective	experiment

The Department of Corrections releases 10 groups of 40 prisoners. In each group, the prisoners are as much alike as possible (age, gender, criminal record, ethnicity, religion, etc.). In each group, half go into the army and the other half does not, so the effect of army service on post-release life can be evaluated.

observational retrospective	observational cross-sectional
observational prospective	experiment