

Statistics 300 : Spring 2010

Instructor : L. C. Larsen

Student name & ID#:

Student signature:

Exam : Unit 2

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**
- == > Instructor at 916-346-6324**

Resources not allowed:

- == > Consultants other than the instructor**

Answers to confidence interval problems and sample size problems must include the expression (the formula) in symbolic form and the expression with all of the values inserted in the proper places. Then, the final answer can be calculated by any method or device.

Answers to hypothesis test problems must include all four parts of the traditional approach to hypothesis tests, including the expression (the formula) for the test statistic in symbolic form and the expression with the values in the right places. The result can then be calculated by whatever method you like (TI-83, laptop computer, etc.).

If more space is needed for a problem, do your work on another page and staple it to the exam.

(6 points : 5 minutes)

1. You have been asked to help determine the sample size for an experiment. The team has decided that the experiment should achieve 90% confidence that the sample average is within 2 units (pounds, minutes, meters, etc.) of the unknown population average. A similar experiment done last year had the sample statistics given in the box below. What sample size should be used for this year's experiment?

Statistics for last
year's experiment

$$\bar{x} = 836$$

$$s = 22$$

$$n = 37$$

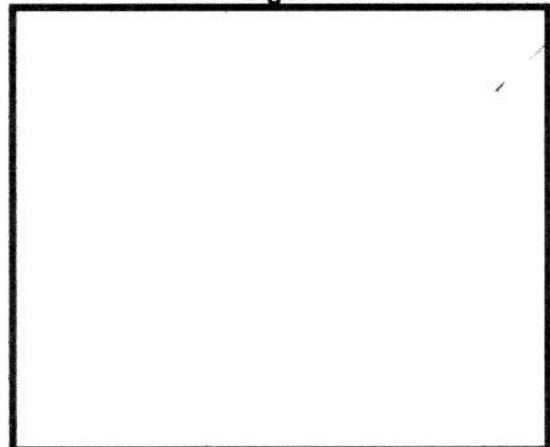
(5 points : 5 minutes)

2. A random variable ("X") is governed by a Uniform distribution starting at 337 and ending at 845.

What is the probability that a random value of X will be greater than 700 ? Draw the picture and calculate the probability.

Answer: _____

Picture goes here



(7 points : 7 minutes)

3. The growth rates of new-born babies form a population with a “bell-shaped” distribution with a mean of 8.27% per month and a standard deviation of 2.02% per month. A random sample of growth rates for babies born to rich people had the sample statistics shown in the box below. Use the sample results to test this idea: “Babies in rich families grow faster on average when compared to the population of all babies together.” (Set the probability of a type 1 error to 0.01).

Sample Statistics
$\bar{x} = 8.56\%$
$s = 1.36\%$
$n = 28$

Claim: _____

H_0 : _____

H_1 : _____

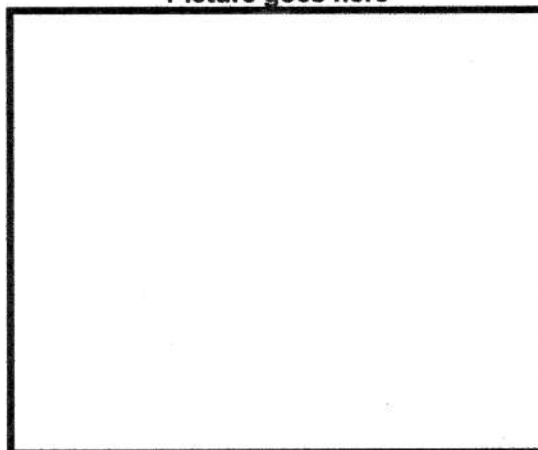
(5 points : 5 minutes)

4. Given: $X \sim N(\mu = 340, \sigma = 60)$

What is the probability that a random “x” will be between 296 and 407 ?

(draw the picture and calculate the probability)

Picture goes here



(8 points : 9 minutes)

5. A random sample of cars registered in California found the distribution of brands shown below. Use these results to make a 98% confidence interval for the proportion of Toyota cars in the population of all cars registered in CA. (Then answer the question at the bottom of this page.)

Brand	Count
GM	137
Chrysler	60
Ford	99
Toyota	152
Nissan	114
Honda	68
Mazda	45
Other	87
Total =	762

Based on your confidence interval, is it reasonable to claim that Toyota's recent problems made their proportion slip to less than 18% ?

YES

Why? _____

NO

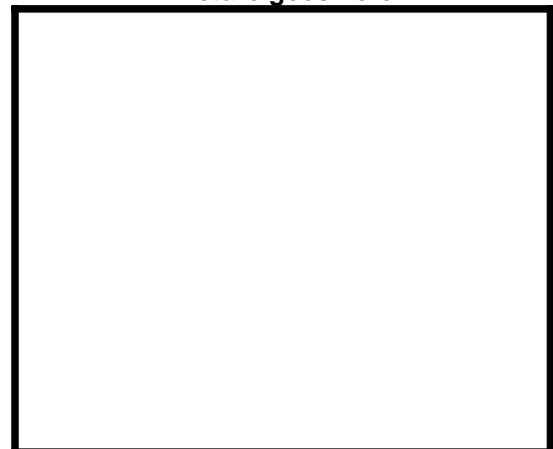
(5 points : 5 minutes)

6. $X \sim U[51.6, 93.5]$. What is the 77th percentile (P_{77}) of the distribution of X ?

(Draw the picture and determine the value of P_{77} .)

Answer: _____

Picture goes here



(7 points : 8 minutes)

7. People training to be welders learn how to make strong connections between pieces of metal.

A good teacher will train all of the students to make equally strong welds. This year, 30 students in the welding program made a standard weld and the strength of the welds were tested. Use the results below to make an interval estimate for the variability in the strengths of all welds done by the teacher's students. You should have 95% confidence that the true standard deviation of the strengths of all such welds is in your interval.

Sample Statistics
$\bar{x} = 854$
$s = 24$
$n = 30$

(6 points : 7 minutes)

8. A company that does opinion polls is planning to ask a "yes or no" question in their next poll. The target population has 10,000,000 people in it. The proportion of "yes" in the population is sure to be between 30% and 70%. If the company wants to be 92% sure that the proportion of "yes" in their poll will be within 3 percentage points of the population proportion, how many people should they include at random in their poll?

(8 points : 8 minutes)

9. A manufacturer and its customers have set a target for the standard deviation of the weights of a part used in fighter aircraft. If the variation is too small it will be too expensive. If the variation is too big, the parts will not fit correctly. The mean weight is to be 7.45 kilograms (kg), with a standard deviation of 0.05 kg. The manufacturer makes a test sample of the parts, which have the sample statistics given in the box. Use the sample results to test the claim that the standard deviation of all the parts that will be manufactured will satisfy the target. (Let $\alpha = 0.10$)

Statistics for the
sample of parts

$$\bar{x} = 7.42$$

$$s = 0.054$$

$$n = 31$$

Claim: _____

 H_0 : _____ H_1 : _____

(6 points : 6 minutes)

10. The amount of pollen and nectar that individual honey bees can carry has a distribution that is “bell-shaped” with a mean of 245 mg and a standard deviation of 30 mg. What is the probability that a random sample of 21 honey bees returning to their hive will be carrying an average amount of pollen and nectar that is greater than 250 mg ?

(6 points : 6 minutes)

11. The air speeds of fully laden swallows (birds) are normally distributed with a mean of 38 km/hour and a standard deviation of 4 km/hour. For this distribution, what is the speed that separates the fastest 20% of swallows from the slowest 80% ?

(8 points : 8 minutes)

12. The (American) roulette wheel has 38 slots numbered 00, 0, and 1-36. The 00 and 0 are green, and the 1-36 are half black and half red. A player who bets on black (or red) has a 47% chance of winning ($18/38 = 0.47$) if the wheel is "fair".

Alfred (a recent graduate with a statistics degree) went to Las Vegas to play roulette. He made 600 bets, all on black, and he wins 264 times. Alfred used these results to test the Casino's claim that the roulette wheel is "fair". Alfred decided to use a 1% significance level for his test.

Show how Alfred did the test and what he concluded.

Claim: _____

H_0 : _____

H_1 : _____

(9 points : 10 minutes)

13. The data in the box are a random sample speeds on the I-5 freeway at Florin Road in Sacramento at 2:00 a.m. The distribution of all speeds at that time and place is "Normal". The posted speed limit is 65 miles per hour. Use the data to make a 95% confidence interval for the mean speed of all the traffic (the population) from which the data were selected. Then answer the question at the bottom of the page.

Speeds
67.5
77.4
71.2
74.2
79.1
82.1
65.4
66.4

The Highway Patrol claims that the mean speed of all the traffic (the population) on I-5 at Florin Road is greater than 5 miles per hour more than the posted speed limit.

Based on your confidence interval, is the Highway Patrol's claim reasonable?

Yes Why? _____

No _____
