Statistics 300 **Name:** _____ **Fall 2010**
Instructor: Lawrence C. Larsen **Tu/Th 7:30 – 9:35 pm**

Exam #2

(8 points; 8 minutes)

1. **A sample of 17 fish was collected at random from the Sacramento River. The amounts of mercury in the fish averaged 0.032 ng/kg and a standard deviation of 0.019 ng/Kg. Use this information to make a 90% confidence interval for the average mercury content of all the fish in the river.**

Based on your confidence interval, is it reasonable to claim that mercury can be found in fish in the Sacramento River?

YES **NO** **Why?** _____

(8 points; 9 minutes) ***[This is a tricky question.]***

2. **Some people think that downwind of a power plant that burns old tires for fuel there will be high levels of "Dioxin" in the plants that are eaten by dairy cows. Variation in the measurements of pollutants in plant material makes it hard to know whether these concerns are appropriate. Use the data below to make a 90% confidence interval for the standard deviation of Dioxin in plant material downwind of a power plant that burns old tires. Assume the values represent a random sample, and that the population of Dioxin levels is bell-shaped.**

Sample	Units of Dioxin*
1	4.5
2	17.9
3	6.6
4	3.2
5	12.8
6	14.3

* unspecified units

<u>Based on your confidence interval</u>, is it reasonable to claim that the power plant makes Dioxin in the plants too high <u>on average</u>? (An <u>average Dioxin level</u> in plants eaten by dairy cows is "OK" if it is 4.2 units or less.)

YES **NO** **Why?** _____

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(7 points; 7 minutes)

3. The weights of people follow a Normal distribution with a mean of 56 Kg and a standard deviation of 11 Kg. What is the probability that a random sample of 12 people will have an average weight less than 60 Kg ? The required picture is worth 2 of the 7 points.

(8 points; 8 minutes)

4. (a) For the uniform distribution between 133 and 936, what is the probability that a random value will be greater than 291 and less than 737 ? (The picture is required and is worth 2 points.)

(b) What is the probability that two random values from this uniform distribution will both be between 291 and 737 ?

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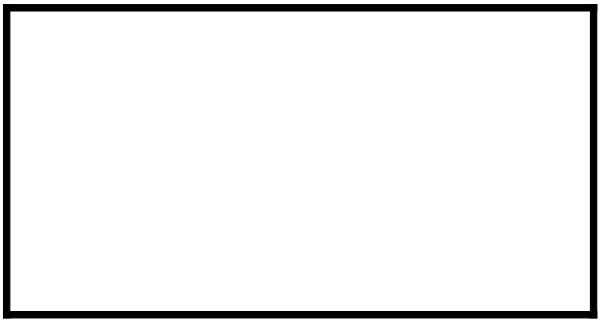
(5 points; 5 minutes)

5. What is the 94th percentile (P_{94}) of the uniform distribution on the interval [109, 355] ?
The picture is required and is worth 2 points.



(6 points; 6 minutes)

6. You have been asked to help design a survey. The data will be used to estimate the average amount of money Americans plan to spend on Christmas gifts this year. You are told that the data should provide 86% confidence that the sample mean will be within $20 of the true mean for all Americans. Data from a similar study last year had a standard deviation of $334. Based on this information, how many Americans should be selected at random for this year's survey?

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(8 points; 8 minutes)

7. **A new law** (not really) **is designed to make health care expenditures about the same for all Americans. If the law is effective, the standard deviation of the health care expenditures of all Americans should be smaller than in previous years. Last year, the standard deviation of individual health care expenditures was $2,368. Use the data for a random sample of the health care expenditures for 28 Americans to test the claim that the standard deviation is now less than it was last year.** (Use a 10% significance level for your test.)

n = 28

$\overline{x}$ = $13,407.74

s = $1,989.98

H_0: _____

H_1: _____

8. **You work for a company that makes Flu vaccine each year. To help plan the number of flu vaccines to produce, the company wants to estimate the percentage of people that will want a vaccination this year. Last year, 58% of the people decided to get vaccinated, but this year people seem less worried, so a smaller percentage may want to get vaccinated. If your company wants to be 95% confident that the estimated percentage is within 3 percentage points of the real percentage that will want to get vaccinated, how many people should be included in a random sample of people's vaccination plans ?**

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(7 points; 7 minutes)

9. A random sample of birds in Sacramento found that 28% were infected with the West Nile virus that can make humans sick. The sample of 450 birds included large numbers of crows, doves, mocking birds, and blue jays. Use the sample results to test the accuracy of a newspaper headline saying that the rate of West Nile infections now is less than 10 years ago when a very large study found 35% of birds in Sacramento were infected with the virus. Use a Type I Error rate of 1% for this test.

H_0: _____

H_1: _____

(5 points; 4 minutes)

10. If $X \sim N(\mu = 85.3, \sigma = 12.88)$, what is the probability that a random value of X will be greater than 90.2 ? (The picture is required and is worth 2 points.)

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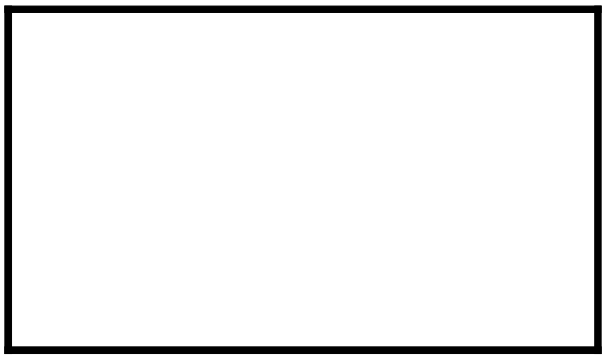
(5 points; 4 minutes)

11. For the Normal distribution with mean = 835 and standard deviation = 66, what is the value that separates the lower 67% of the distribution from the upper 33% ?
The picture is required and is worth 2 points.



(7 points; 7 minutes)

12. The people responsible for installing and maintaining "STOP" signs checked on a random sample of 65 signs. They found that 22 of the signs were defaced with paint, bullet holes, or other types of vandalism that required replacing the signs. Use their data to construct a 92% confidence interval for the proportion of all signs that will need to be replaced.

(8 points; 9 minutes)

13. The Department of Fish and Game monitors the health of fish populations in the Pacific Ocean. A random sample of 51 tuna were captured and weighed. The average weight of the tuna was 64.76 kg with a standard deviation of 25.85 kg. Last year the average weight for all tuna caught by commercial fishing boats was 73.18 kg. Use this information to test a recent claim that the mean weight of all commercial tuna this year will be at least 95% of the mean weight last year.