

Unit Exam #2

**Statistics 300:
Introduction to Probability and Statistics**

**Fall Semester 2009
Cosumnes College**

Instructor: L.C. Larsen

Instructions

Time: 2 hours & 5 minutes on 10/31, 11/3, or 11/4, 2008

Materials: Open book, notes, homework, etc.

Instruments: Calculator/Laptop of student's choice

**No phones or consultants
Except to call the instructor : 346-6324 or 322-3988**

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, continue your work on the back of the page.

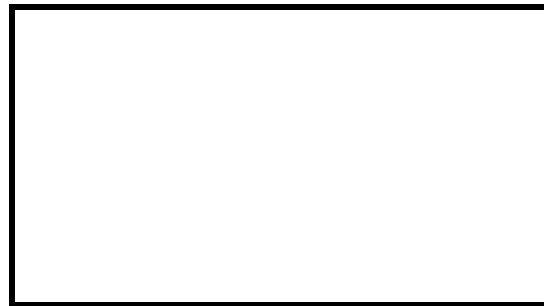
(5 points; 5 minutes)

1. For the Normal distribution with mean = 835 and standard deviation = 66, what is the value that separates the lower 76% of the distribution from the upper 24% ?
The picture is required and is worth 2 points.



(5 points; 5 minutes)

2. What is the 14th percentile (P_{14}) of the uniform distribution on the interval [1019, 3575] ?
The picture is required and is worth 2 points.



(7 points; 7 minutes)

3. NASA (National Aeronautics and Space Administration) is thinking of going to the Moon again. One goal of the trip would be to estimate the amounts of minerals such as Lithium in the rocks on the Moon. On Earth, the variability of Lithium per kg of rock is about 0.45 milligrams. If NASA wants to have 98% confidence that the amount of Lithium per Kg of Moon rocks in their sample will be within 0.1 milligrams of the true amount of Lithium per Kg of all Moon rocks, how many Moon rocks should NASA plan to study?

(7 points; 8 minutes)

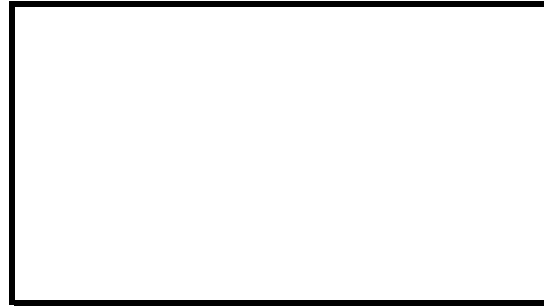
4. Some people think that downwind of a powerplant that uses old tires for fuel there will be high levels of pollutants in the plants that are eaten by dairy cows. Variation in the measurements of pollutants in plant material makes it hard to know whether these concerns are appropriate. Use the data below to make a 90% confidence interval for the variability of Dioxin levels 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	Amount of Dioxin*
1	12
2	18
3	7
4	23
5	19
6	24

* unspecified units

(5 points; 4 minutes)

5. If $X \sim U[12, 85]$, what is the probability that two random values of X will both be greater than 68 ? (The picture is required and is worth 2 points.)



(4 points; 4 minutes)

6. For the uniform distribution between 100 and 400, what is the probability that a random value will be greater than 191 and less than 377 ? (The picture is required and is worth 2 points.)



(7 points; 7 minutes)

7. If the weights of people follow a Normal distribution with a mean of 65 Kg and a standard deviation of 18 Kg. What is the probability that a random sample of 22 people will have an average weight less than 70 Kg ? Draw a picture of the problem; worth 2 points.



(8 points; 7 minutes)

8. A sample of 37 rocks was collected at random on the surface of the planet Mars. The iron content of the rocks had an average of 3.6 g/kg and a standard deviation of 2.9 g/Kg. Use this information to make a 90% confidence interval for the average iron content of all the rocks on the surface of Mars.

Based on you confidence interval, is it reasonable to tell people that the iron content of rocks on Mars is the same as it is on Earth, where the average iron content of rocks is 4.6 g/Kg ?

Yes

No

Why?

(8 points; 7 minutes)

9. The Department of Fish and Game monitors the health of fish populations in the Pacific Ocean. In the past, the average weight of salmon fish has been 8.37 pounds. Recently, a sample (consider it to be effectively "random") of 41 salmon had the statistics given in the box below. Use this information to test the claim that the mean weight of salmon is now less than 7.8 pounds. (Use a 5% significance level for this test.)

Statistics for Salmon Sample	
n =	41
\bar{x} =	7.72 pounds
s =	3.2 pounds

H₀: _____

H₁: _____

(8 points; 8 minutes)

10. Use the random sample of Basketball fans from Arizona to make an 82% confidence interval for the proportion of all AZ basketball fans whose favorite team is the Sacramento Kings.

Favorite Basketball Team	Home State			Total
	AZ	CA	WA	
Phoenix Suns	140	60	30	230
Sacramento Kings	40	270	10	320
Seattle Sonics	20	70	160	250
Total	200	400	200	800

Based on your confidence interval, is it reasonable to claim that less than 30% of AZ basketball fans prefer the Kings?

Yes

No

Why? _____

(6 points; 6 minutes)

11. Roaches are insect pests often found in homes. Like other insects, roaches can become resistant to insect poisons used to control them. Samples of insects were tested for resistance in 1972 (the results are shown in the box). A business plans to test a random sample of roaches today to see if how resistant roaches are now to the poisons they sell. If the company wants to be 90% confident that their sample percentage will be within 0.03 of the true population percentage, how many roaches should they plan to test?

Data from 1972	
Insect	% resistant
Spiders	3%
Roaches	8%
Ants	2%

(8 points; 8 minutes)

12. A random sample of rocks from the surface of Earth's Moon found that 58 had measurable amounts of Lithium in them and 280 did not. On Earth, 15% of rocks have measurable amounts of lithium in them. Use the data for the Moon rocks to test the claim that the proportion of Moon rocks containing Lithium is greater than the proportion of Earth rocks containing Lithium. (Use a 1% significance level for the test.)

H_0 : _____

H_1 : _____

Based on your confidence interval, is it reasonable to claim that the percentage of rocks on the Moon that contain lithium is different from the percentage of rocks on Earth that contain lithium?

Yes No Why? _____

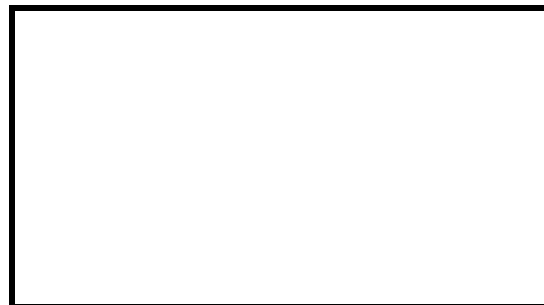
(5 points; 4 minutes)

13. 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.)



(5 points; 4 minutes)

14. For the standard normal distribution, what is the probability that a random value of " Z " will be less than 0.88 or greater than 1.37 ? (The picture is required and is worth 2 points.)



(8 points; 7 minutes)

15. The Department of Fish and Game monitors the health of fish populations in the Pacific Ocean. In the past, the average weight of salmon fish has been 8.37 pounds. Recently, a sample (consider it to be effectively "random") of 41 salmon had the statistics given in the box below. Use this information to test the claim that the standard deviation of salmon weights is more than 3 pounds.

(Use a 5% significance level for this test.)

(Assume the weight distribution is bell-shaped.)

H_0 : _____

H_1 : _____

Statistics for Salmon Sample

$$n = 41$$

$$\bar{x} = 7.72 \text{ pounds}$$

$$s = 3.2 \text{ pounds}$$

4 points extra credit (about 2 minutes for this problem)

16. A random variable, called "X", follows a Normal distribution with mean = 200 and standard deviation = 30. What is the probability a random value of X will be between the 15th percentile and the 90th percentile of that distribution? You must draw the picture to get the credit.