Unit Exam #3

Statistics 300:
Introduction to Probability and Statistics

Spring 2018 Saturdays : 9:00 am - 1:05 pm
Cosumnes College - Main Campus

Instructor: L.C. Larsen

Instructions

Time: **2 hours on Saturday, April 14, 2018**

Materials: **Open book, notes, homework, quizzes, and solutions.**

Calculaions: **EXCEL**

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

If more space is needed for a problem, continue your work on the back of the page.

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(11 points; 8 minutes)

1. **A random sample of 34 melons was selected from a large field, and the sugar concentration of each melon was measured (as percent). Use the sample statistics given in the box below to test the claim that the mean sugar concentration of all the melons is less than 30%, which means that the melons are not yet ripe.** (Use $\alpha = 0.02$ for this test.)

Statistics for the random sample	
average =	**27.1%**
standard deviation =	**6.2%**
n =	**34**

Claim: _____

H_0: _____

H_1: _____

Symbolic test statistic

Critical Region Picture

Test statistic: values in place

How did you get the critical value(s)?

Value of test statistic

Final conclusion

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(8 points; 7 minutes)

2. A "mass flow controller" is a piece of equipment that tries to keep the flow of material at a steady amount, with as little variation as possible. A manufacturer of mass flow controllers says that their product limits the variability in mass flow from second-to-second to a standard deviation less than or equal to two grams.

(a) Use the data below for 68 seconds to construct a 90% confidence interval for the standard deviation in mass flow for one of these controllers recently installed by a customer. The distribution of the 68 values is bell-shaped.

Sample Statistics	
$\bar{X}$ =	245.1 grams
S =	2.18 grams
n =	68 seconds

Symbolic expression

Expression with values in place

How did you get the critical values?

Final interval.

(b) Based on your confidence interval, is it reasonable for a competing company to claim that these mass flow controllers really have a standard deviation of second-to-second flows that is greater than 2 grams?

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

_____

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(9 points; 8 minutes)

3. A random sample of 871 earth worms was collected. Use the data in the table below to make an 86% confidence interval for the proportion of earthworms that are "short and skinny" in the population of all earthworms. This problem calls for one confidence interval, not two.

	Long	Short
Fat	83	196
Skinny	102	490

Symbolic expression

Expression with values in place

How did you get the critical value?

Final interval.

Based on your confidence interval, is it reasonable to claim that less than half of all earthworms are "short and skinny" ?

Yes **No** **Why?** _____

_____

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(8 points; 8 minutes)

4. **A random sample of 460 Starbucks customers included 198 men and 262 women. Use these results to test the claim that less than 50% of all Starbucks customers are men.**
(Let significance level = 0.05 for this test)

Claim : _____

H_0: _____

H_1: _____

Symbolic test statistic

Critical Region Picture

Test statistic: values in place

How did you get the critical value(s)?

Value of test statistic

Final conclusion

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(6 points; 6 minutes)

5. **The United States' Department of Education wants to estimate the proportion of parents of young kids that want a "voucher" system that would allow them to choose a public or private school for their children. Studies in recent years have had proportions around 65% that say "yes". If the Department of Education wants to be 90% confident that the proportion in their new study will be within 1 percentage point of the true proportion for all familes in the USA with young children, how many such families should they include in their study this year?**

Symbolic expression

Expression with values in place

How did you get the value that carries the "confidence"?

Final answer.

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(10 points; 10 minutes)

6. Cancer cells from patients were treated with two anti-cancer drugs: Drug A and Drug B. From each patient, a sample of 40 grams of cancer cells was taken. Drug A was applied to half of the sample (20 grams) and Drug B was applied to the other half (20 grams). After the drugs were applied, the samples were weighed again. Use the data given below to make a 95% confidence interval for the difference between μ_A and μ_B. This a "matched pairs" problem.

Weight of Cancer Cells After Drug is Applied.		
A	B	Difference
12.6	12.3	
12.7	13.3	
8.4	13.6	you
9.2	13.8	do
7.4	17.5	not
7.3	12.0	need
7.9	10.3	to
14.0	14.6	show
9.8	15.3	these
6.9	13.8	values
6.0	9.9	on
3.6	10.1	these
12.5	4.4	paper
6.7	14.0	exam
12.4	13.3	you
10.5	15.8	turn
11.9	17.4	in
15.4	6.6	
13.0	13.9	
9.0	11.3	
9.6	11.8	
9.0	11.7	
6.0	12.5	
12.9	14.6	
12.7	12.4	
11.0	10.6	

Statistics for the Differences

Average =
Std. Deviation =
n =

Symbolic expression for Confidence Interval

Expression for CI with values in their places

How did you determine the critical value?

Final Confidence Interval

Based on your confidence interval, is it reasonable for the maker of Drug B to claim that it is just as effective as Drug A? Circle "Yes" or "No" and then explain why.

Yes **No** **Why?** _____

_____

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(11 points; 11 minutes)

7. Pollutants in the water from the City water treatment plant are measured in samples taken during the Spring (May) and Summer (August). Use the statistics given here to test the claim that the average amount of the pollutant measured in August (μ_{AUG}) is more than 5 units greater than the average amount of the pollutant measured in May (μ_{MAY}). Let P(Type I Error) = 0.025 for this test.

Amount of Pollutant		
Sample Statistics	Month	
	April	August
N =	15	18
Mean =	67	76
Std. Deviation =	6	10

Hypotheses

claim:

H_0: _____

H_1: _____

alpha = **tails?**

Symbolic form of Test Statistic

Critical region picture

Test Statistic with the values in place

How did you determine the critical value(s)?

Final value of the test statistic

Conclusion of your test