

Review for Test 2 STA 3123

I. What kind of design we should be considering for problems (1 – 18)?

- a. Independent samples z-test
- b. Independent samples t-test
- c. Test for two proportions
- d. Matched pairs t-test

1. A local school district is concerned about the number of school days missed by its teachers due to illness. A random sample of 10 teachers is selected. An incentive program is offered in an attempt to decrease the number of days absent.
2. A sociologist wants to determine whether there is a gender gap between women and men who favor the death penalty. He will randomly select 100 men and 125 women. Each person will be asked whether he/she favors the death penalty.
3. A new insect spray, type A, is to be compared with a spray, type B, that is currently in use. Two rooms of equal size are sprayed with the same amount of spray, one room with A, the other with B. Two hundred insects are released into each room, and after 1 hour the numbers of dead insects are counted."
4. Blood samples from ten subjects taken over 12 hours at two hour intervals were analyzed for plasma citrate concentrations (micromoles/liter). Technically, the plasma levels of each person at different times are correlated, but for the purpose of this exercise, analyze the measurements as though they are independent. What kind of design we should be considering?
5. The effect of caffeine levels on performing a simple finger tapping task was investigated in a double blind study. Twenty male college students were trained in finger tapping and randomly assigned to receive two different doses of caffeine (100 or 200 mg) with 10 students per dose group. Two hours following the caffeine treatment students were asked to finger tap and the number of taps per minute was counted.
6. Researchers published an article that examined toddler's ability to learn from reading picture books. The experiment involved 36 children at each of two different ages: 18 and 24 months. After a book reading session, the children were scored on their ability to reenact the target actions in the book.
7. An extermination firm is testing two brands of pesticide spray, for the effectiveness against ants. Under controlled conditions, each spray is used on 10 randomly selected ants. The measurements are the number of seconds until all 10 ants are dead.
8. Who would you ask to help? A random sample of 100 students at a high school was asked whether they would ask their father or mother for help with a homework assignment in science. A second sample of 100 different students was asked the same question for an assignment in history. Is there a gender gap?
9. A professor in the school of business wants to investigate the prices of new textbooks in the campus bookstore and the competing off-campus store, which is a branch of a national chain. The professor randomly chooses the required texts for 12 business school courses and compares the prices (in dollars) in the two stores.

10. A company has two manufacturing plants, and company officials want to determine whether there is a difference in the average age of workers at the two locations. The ages of 55 randomly selected workers at each plant were recorded.
11. To determine whether there is a difference in monthly transportation costs for families living in two major cities (New York and Chicago), five families were randomly selected from these cities and asked to use their records to estimate a monthly figure for transportation costs (in dollars).
12. Consider a survey conducted to determine U.S. travelers' perception of safety in various motel chains. Suppose, two different national chains were chosen and 30 randomly selected people who had stayed overnight in a motel in each of the two chains were asked to rate each motel chain on a scale from 0 to 100 to indicate how safe he or she felt at that motel.
13. We are interested in determining whether men's and women's attitudes on the environment differ. To do so we sampled 100 men and 100 women and asked: "Do you think the environment is a major concern?"
14. A study at State University was to determine student opinions regarding non-revenue-generating athletics. Specifically, one question in a survey asked students "Do you think that the women's basketball program should be discontinued?" The data collected revealed that 100 of the 1,000 females surveyed responded "Yes" and 400 of the 1,000 males surveyed responded "Yes."
15. The effectiveness of Prilosec for treating heartburn is tested by measuring gastric acid secretion in patients before and after the drug treatment.
16. The newspaper recently ran an article indicating differences in perception of sexual harassment on the job between men and women. The article claimed that women perceived the problem to be much more prevalent than did the men. The question asked of both men and women was "Do you think sexual harassment is a major problem in the American workplace?"
17. The accuracy of verbal responses is tested in an experiment in which 36 subjects report their weight and they are then weighed on a physician's scale. The data consists of the reported weight and the measured weight for each subject.
18. A manufacturer of shock absorbers claims that their shock absorbers last longer than those produced by its competitor. To prove, six of the manufacturer's shocks and six of the competitor's shocks were randomly selected, and one of each brand was installed on the rear wheels of each of six cars. After the cars had been driven 20,000 miles, the strength of each shock absorber was measured.

II. Magnets are often used by people to treat a variety of disorders. Researchers recently treated a group of patients with magnets and another group of patients with a fake magnet treatment. The results are given below. Test the claim that the magnet treatment is more effective at lowering pain in arthritis patients. Use a 5% level of significance.

	Placebo Group	Treatment Group
Sample size	25	25
Mean Pain Reduction	0.20	0.50
Standard Deviation	0.4	0.6

1. State the null and alternate hypotheses. H_0 : _____ H_a :

2. What is the **name of the distribution** to use to calculate the Test statistic?

3. What is the **critical value** for the test?

4. Under what assumptions, the distribution from part 2 is used?

5. Compute the value of the pooled variance estimator.

6. The **Test Statistic** for this test was reported as equal to **-2.08**, calculate the interval that contains P – value, give a conclusion and explain it in **simple non-technical terms in contest of the problem**.

_____ \leq P-value \leq _____ **Decision:** _____

Conclusion: _____

7. Suppose, a **95% CI** for the difference in Mean Pain Reduction between Treatment Group and Placebo Group patients turns out to be (-0.30 ± 0.29) . Give a **practical interpretation** of this CI in terms of the problem.

III. A new insect spray, type A, is to be compared with a spray, type B, that is currently in use. Two rooms of equal size are sprayed with sprays A and B. Two hundred insects are released into each room, and after 1 hour the numbers of dead insects are counted." There are 120 dead insects in the room sprayed with A and 90 in the room sprayed with B. Do the data provide enough evidence to indicate that spray A is more effective than spray B? Use $\alpha = .05$.

1. State the null and alternate hypotheses. H_0 : _____ H_a : _____

2. Compute the value of the **best estimate of true proportion** of dead insects for both sprays.

3. **Test statistic:** (Provide formula and substitution only, do not calculate!)

4. The **P-value** for this test was **0.0012**, give a conclusion and explain it in **context of the problem**.

5. Suppose, a **95%** confidence interval for the difference between population proportions of dead insects for spray A and B turns out to be (0.15 ± 0.08) . **Interpret this CI in the context of this problem.**

IV. A manufacturer of shock absorbers claims that their shock absorbers last longer than those produced by its biggest competitor. To see if there is support for such a claim, six of the manufacturer's shocks and six of the competitor's shocks were randomly selected, and one of each brand was installed on the rear wheels of each of six cars. After the cars had been driven 20,000 miles, the strength of each shock absorber was measured.

Is there sufficient evidence to conclude that the manufacturer's shocks have a greater mean strength after 20,000 miles of driving than the competitor's? Use a .01 level of significance.

Paired T-Test and CI: Manufacturer, Competitor

Paired T for Manufacturer - Competitor

	N	Mean	StDev	SE Mean
Manufacturer	6	10.717	1.752	0.715
Competitor	6	10.300	1.818	0.742
Difference	6	0.4167	0.1329	0.0543

95% lower bound for mean difference: 0.3073

T-Test of mean difference = 0 (vs > 0): **T-Value = 7.68 P-Value = 0.000**

1. State the hypotheses using the **appropriate symbols**. H_0 : _____ H_a : _____
2. What is the **critical value** for the test? Use $\alpha = 0.01$.
3. What is the **value** of the **point estimator** for the mean difference (Man - Com)? Use **appropriate symbols**
4. Using output, **estimate the mean difference** of mean shock absorbers strength for two brands using 95% level of confidence. **Interpret your result in the context of this problem.**
5. What conditions are required for valid inferences from this experiment?

- V. It is desired to compare the average test scores at the two schools. Suppose that simple random samples of college freshman are selected from two universities - 15 students from school A and 20 students from school B. On a standardized test, the sample from school A has an average score of 1000 with a standard deviation of 100. The sample from school B has an average score of 950 with a standard deviation of 90. Is there the difference in test scores at the two schools, assuming that test scores came from normal distributions?

Two-Sample T-Test and CI

Difference = $\mu_1 - \mu_2$

Estimate for difference: 50.0

95% CI for difference: (-15.6, 115.6)

T-Test of difference = 0 (vs not =): T-Value = 1.55 P-Value = 0.130 DF = 33

Both use Pooled StDev = 94.3719

- a) State the hypotheses using the **appropriate symbols**. H_0 : _____ H_a : _____
- b) Using output, **estimate the difference** in the test scores at the two schools using 95% confidence. **Interpret your result in the context of this problem.**
- c) Using 5% level of significance what would be your inference from the above output?

VI. The newspaper recently ran an article indicating differences in perception of sexual harassment on the job between men and women. The article claimed that women perceived the problem to be much more prevalent than did the men. One question asked of both men and women was "Do you think sexual harassment is a major problem in the American workplace?" 24% of the men and 62% of the women responded "Yes." The newspaper created a 99% confidence interval for the true difference in proportions and reported it to be -.28 to -.48.

- a) What is the **value** of the **point estimator** for the parameter of interest? Use **appropriate symbols**.
- b) What does this CI suggest about perception of sexual harassment on the job between men and women?