

Complete for 5 points on your exam. You must show all work and explain conclusions. Start by finding the section of Triola calculator TEST or command needed for each problem.

Use the degree of confidence and sample data to construct a confidence interval for the population proportion p .

- 1) When 306 college students are randomly selected and surveyed, it is found that 115 own a car. Find the point estimate for the proportion of college students who own a car, and find a 99% confidence interval for the true proportion of all college students who own a car.

What is the point estimate of the population proportion? _____

What is the critical value? _____

What is the margin of error? $E =$ _____

Explain the meaning of the confidence interval.

Use the given degree of confidence and sample data to construct a confidence interval for the population mean μ . Assume that the population has a normal distribution.

- 2) The principal randomly selected six students to take an aptitude test. Their scores were:

76.5 85.2 77.9 83.6 71.9 88.6

Determine a 90% confidence interval for the mean score for all students.

a)) What point estimate of the population mean does this sample give? _____

b) What is the margin of error? (Show work. Include critical value.)

d) Find the confidence interval.

e) Interpret the meaning of this confidence interval. Is the principal reasonable confident that the average of his scores is higher than the national average if the national average for the aptitude test is 70.

Use the given degree of confidence and sample data to find a confidence interval for the population standard deviation σ . Assume that the population has a normal distribution.

- 3) The football coach randomly selected ten players and timed how long each player took to perform a certain drill. The times (in minutes) were:

7 10 14 15 15

5 12 15 11 11

What is the point estimate for the population standard deviation?

Find a 95 percent confidence interval for the population standard deviation σ .

Identify the null hypothesis, alternative hypothesis. Find and graph the point estimate for the population Proportion and test statistic,. Find the P-value. State your conclusion about the null hypothesis, and final conclusion that addresses the original claim.

- 4) According to a recent poll 53% of Santa Rosans would vote for the incumbent president. However a random sample of 100 people results in 45% who would vote for the incumbent, test the claim that the actual percentage is 53%. Use a 0.10 significance level.
- (3 Points) State claim, null and alternate hypothesis.
 - (3 Points) Find the critical value and graph and shade the critical region.
 - (3 Points) Find the point estimate of the population proportion and it's test statistic.
 - (3 points) Label these values on your graph.
 - (5 Points) Clearly state your initial conclusion and your final conclusion so that it is understandable without knowing statistics.
 - (5 Points) Find and explain the meaning of the P-value. Shade a graph showing the area equal to the p-value.

- 5) A poll of 1,068 adult Americans reveals that 513 of the voters surveyed prefer the Democratic candidate for the presidency. At the 0.05 level of significance, test the claim that at least half of all voters prefer the Democrat.
- (3 Points) State claim and the null and alternate hypothesis. (3 Points) Graph and shade the critical region.
 - (3 Points) Find the critical value, point estimate of the population proportion and it's test statistic. (3 points) Label these values on your graph.
 - (5 Points) Clearly state your initial conclusion and your final conclusion so that it is understandable without knowing statistics.

Construct the indicated confidence interval for the difference between population proportions $p_1 - p_2$. Assume that the samples are independent and that they have been randomly selected.

- 6) In a random sample of 500 people aged 20–24, 22% were smokers. In a random sample of 450 people aged 25–29, 14% were smokers. Construct a 95% confidence interval for the difference between the population proportions $p_1 - p_2$. Find the Critical Value z^* , the point estimate of $p_1 - p_2$, and the margin of error. State the meaning of this confidence interval.

Provide an appropriate response.

- 7) Suppose the proportion of sophomores at a particular college who purchased used textbooks in the past year is p_s and the proportion of freshmen at the college who purchased used textbooks in the past year is p_f . A study found a 95% confidence interval for $p_s - p_f$ is (0.235, 0.427). Does this interval suggest that sophomores are more likely than freshmen to buy used textbooks? Explain what this interval says.

Interpret the confidence interval.

- 8) A random sample of clients at a weight loss center were given a dietary supplement to see if it would promote weight loss. The center reported that the 100 clients lost an average of 43 pounds, and that a 95% confidence interval for the mean weight loss this supplement produced has a margin of error of ± 9 pounds.

Use the traditional method to test the given hypothesis. Assume that the samples are independent and that they have been randomly selected

- 9) In a random sample of 500 people aged 20–24, 22% were smokers. In a random sample of 450 people aged 25–29, 14% were smokers. Test the claim that the proportion of smokers in the two age groups is the same. Use a significance level of 0.01.

State the claim, null and alternate hypothesis.

Find the critical value, Graph and shade the critical region.

Find the point estimate of $p_1 - p_2$, and its test statistic.

Label these values on your graph above.

Find and Explain the meaning of the P-value. Shade a graph showing the area equal to the p-value.

Clearly state your initial and final conclusion.

Explain what a Type I Error and a Type II Error would be in this case.

Construct the indicated confidence interval for the difference between the two population means. Assume that the assumptions and conditions for inference have been met.

- 10) A researcher was interested in comparing the number of hours of television watched each day by two-year-olds and three-year-olds. A random sample of 18 two-year-olds and 18 three-year-olds yielded the follow data.

2-year-olds		3-year-olds	
0.5	1.5	2.0	3.0
1.5	2.0	1.5	1.5
1.5	0	1.5	2.0
1.0	1.0	1.0	0
1.0	0	0	1.5
2.0	1.5	1.5	2.0
2.5	2.0	2.5	2.0
0.5	0	3.0	1.0
1.5	2.5	1.5	0.5

Does this data represent independent samples or matched pairs?

Find the point estimate $\mu_2 - \mu_3$.

Find a 95% confidence interval for the difference, $\mu_2 - \mu_3$, between the mean number of hours for two-year-olds and the mean number of hours for three-year-olds.

Explain the meaning of this confidence interval.

Use the traditional method of hypothesis testing to test the given claim about the means of two populations. Assume that two dependent samples have been randomly selected from normally distributed populations.

- 11) A coach uses a new technique to train gymnasts. 7 gymnasts were randomly selected and their competition scores were recorded before and after the training. The results are shown below.

Subject	A	B	C	D	E	F	G
Before	9.4	9.5	9.7	9.4	9.5	9.7	9.6
After	9.5	9.7	9.7	9.3	9.6	10	9.4

Using a 0.01 level of significance, test the claim that the training technique is effective in raising the gymnasts' scores.

a) (3 points) State the claim, null and alternate hypothesis.

b) (7 Points) Graph and shade the critical region. Find the critical value, a point estimate for the mean difference, test statistic. Label these values and areas on your graph above.

c) (5 points) Clearly state your initial and final conclusion.

Decide whether or not the conditions and assumptions for inference with a two-sample t-interval are satisfied. Explain your answer.

- 12) A study was conducted to determine which cab company gives quicker service. Companies A and B were each called at 50 randomly selected times. The response times were recorded. The results were as follows.

	Company A	Company B
Mean response time	7.6 minutes	6.9 minutes
Standard deviation	1.4 minutes	1.7 minutes

Assume that the assumptions and conditions for inference with a two-sample t-test are met. Test the indicated claim about the means of the two populations.

- 13) Researchers wanted to compare the effectiveness of a water softener used with a filtering process with a water softener used without filtering. Ninety locations were randomly divided into two groups of equal size. Group A locations used a water softener and the filtering process, while group B used only the water softener. At the end of three months, a water sample was tested at each location for its level of softness. (Water softness was measured on a scale of 1 to 5, with 5 being the softest water.) The results were as follows.

Group A (water softener and filtering)

$$\bar{x}_1 = 2.1$$

$$s_1 = 0.7$$

Group B (water softener only)

$$\bar{x}_2 = 1.7$$

$$s_2 = 0.4$$

Determine, at the 90% confidence level, whether there is a difference between the two types of treatments.

State the null and alternate hypothesis.

Graph and shade the critical region. Find the critical value, the point estimate for the difference in population means given by these samples, and its test statistic. Label these values and areas on your graph above.

Find and explain the meaning of the P-value. Shade a graph showing the area equal to the p-value.

Clearly state your initial and final conclusion.

Provide an appropriate response.

- 14) (4 Points) A survey investigation whether the proportion of employees who commute by car to work is higher than it was five years ago finds a P-value of 0.011. Is it reasonable to conclude that more employees are commuting by car? Explain the meaning of this P-value.

- 15) A researcher wishes to determine whether listening to music affects students' performance on memory test. He randomly selects 50 students and has each student perform a memory test once while listening to music and once without listening to music. He obtains the mean and standard deviation of the 50 "with music" scores and obtains the mean and standard deviation of the 50 "without music scores". He then performs a hypothesis test for two means assuming large and independent samples. Is this approach appropriate? If not, how would you proceed?
- 16) (4 Points) Hannah selected a simple random sample of all adults in her town and, based on this sample, constructed a confidence interval for the mean salary of all adults in the town. However, the distribution of salaries in the town is not exactly normal. Will the confidence interval still give a good estimate of the mean salary?

Use the computer display to answer the question.

- 17) When testing for a difference between the means of a treatment group and a placebo group, the computer display below is obtained. Using a 0.05 significance level, is there sufficient evidence to support the claim that the treatment group (variable 1) comes from a population with a mean that is less than the mean for the placebo population? Explain.

	t-Test: Two Sample for Means		
1		Variable 1	Variable 2
2	Mean	65.10738	66.18251
3	Known Variance	8.102938	10.27387
4	Observations	50	50
5	Hypothesized Mean Difference	0	
6	t	-1.773417	
7	P(T<=t) one-tail	0.0384	
8	T Critical one-tail	1.644853	
9	P(T<=t) two-tail	0.0768	
10	t Critical two-tail	1.959961	

Provide the appropriate answer.

- 18) (4 Points) An entomologist writes an article in a scientific journal which claims that fewer than 19% of male fireflies are unable to produce light due to a genetic mutation. Identify the Type I error in this context.

Do one of the following, as appropriate: (a) Find the critical value $z_{\alpha/2}$, (b) find the critical value $t_{\alpha/2}$, (c) state that neither the normal nor the t distribution applies.

19) 90%; $n = 9$; $\sigma = 4.2$; population appears to be very skewed.

20) 93%; $n = 40$; σ is known; population appears to be very skewed.

21) 90%; $n = 17$; σ is unknown; population appears to be normally distributed.

Test the given claim by using the P-value method of testing hypothesis. Assume that the sample is a simple random sample selected from a normally distributed population. Include the hypothesis, the test statistic, the p-value, and your conclusion.

22) Test the claim that for the adult population of one town, the mean annual salary is less than $\mu = \$30,000$.

Sample data are summarized as $n = 17$, $\bar{x} = \$22,298$, and $s = \$14,200$. Use a significance level of $\alpha = 0.05$.

a) State the claim, null and alternate hypothesis.

b) Graph and shade the critical region. Find the critical value, point estimate of the population mean, and test statistic. Label these values and areas on your graph above.

c) Explain the meaning of the P-value. Shade a graph showing the area equal to the p-value.

d) Clearly state your initial and final conclusion.