(Chapter 7 & 8)

1. 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.

   n = 10, $\overline{X} = 58$, $S = 11$, and $CILevel = 95\%$

2. 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.

   n = 49, $\overline{X} = 58$, $\sigma = 14$, and $CILevel = 95\%$

3. Use the given degree of confidence and sample data to construct a confidence interval for the population proportion p.
   Among 650 people polled, 62% of them stated that they eat at home at least 6 nights per week. Construct the 98% confidence interval for the true proportion of people who eat at home at least 6 nights per week.

4. A local university registrar's office wants to know the average length of time that students wait at the counter for assistance. A sample of 64 students has a mean wait time of 25 minutes. From previous studies we can assume that we know the population standard deviation is equal to 8 minutes. Form a 99% confidence interval for the true average wait time at the office of the registrar.

5. Interpret the interval found above.

6. A local university registrar's office wants to know the average length of time that students wait at the counter for assistance. A sample of 30 students has a mean wait time of 25 minutes and a standard deviation of 8 minutes. Form a 99% confidence interval for the true average wait time at the office of the registrar.

7. 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.
   $$99\%, \text{ n} = 9, \sigma = 15, \text{ and the}$$
   population appears to be normally distributed.

8. 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.
   $$90\%, \text{ n} = 29, s = 15, \text{ and the}$$
   population appears to be normally distributed.

9. Determine whether the given conditions justify using the margin of error E = $z_{\alpha/2} \dfrac{\sigma}{\sqrt{n}}$
   when finding a confidence interval estimate of the population mean.
   The sample size is 39 and the population standard deviation is unknown.

10. Find the margin of error using the information below:
    $\overline{X} = 38$, $\sigma = 15$, n = 81, 98% confidence interval

11. What is the most important difference between an interval estimator and a point estimator?

12. Explain what we mean when we say that we are 99% confident that an interval contains μ.

13. A researcher claims that the average length of Atlantic salmon is less than eleven inches. If a randomly selected sample of 36 salmon has a mean length of 10.5 inches, use a significance level of 2% to test the researcher's claim (assume $\sigma = 1.2$).

14. Assume that the data has a normal distribution and the population standard deviation is known. Find the critical z value used to test a null hypothesis.
$$\alpha = 0.025 \text{ for a right-tailed test}$$

15. Suppose a researcher claims that more than 10% of the population suffers from some form of ADD, and our hypothesis test decides to reject the null hypothesis. State your final conclusion in non-technical terms.

16. Find the p-value: For a left-tailed test with test statistic, z = -1.89

17. Find the p-value: For a two-tailed test with test statistic, z = 2.51

18. The Genetics and IVF Institute conducted a clinical trial of the YSORT method designed to increase the probability of conceiving a boy. To date out of 51 births, which used this YSORT method, 39 of them were boys. Test at the 0.01 significance level the claim that this method gives a couple greater than a 50% chance of having a boy.
    a. Identify the claim
    b. Identify the Null Hypothesis
    c. Identify the Alternative Hypothesis
    d. Identify the test statistic formula that will be used
    e. Calculate the test statistic
    f. Find the critical value for the rejection region
    g. State your initial conclusion
    h. Word your final conclusion

19. A random selection of nine supermodels found that their average height was 70.2 inches with a standard deviation of 1.5 inches. Use a 0.05 level of significance to test the claim that on average supermodels are taller than 63.6 inches (which is the mean height for all women). Assume heights are normally distributed.
    a. Identify the claim
    b. Identify the Null Hypothesis
    c. Identify the Alternative Hypothesis
    d. Identify the test statistic formula that will be used
    e. Calculate the test statistic
    f. Find the critical value for the rejection region
    g. State your initial conclusion
    h. Word your final conclusion

20. In the Everglades at the Garfield Bight station, the bottom water temperature was recorded once a day for 61 days. The average temperature was 30.377 degrees Celsius with a standard deviation of 1.7. Use the p-value method, to test the claim that the mean temperature is greater than 30 degrees.
    a. Identify the claim
    b. Identify the Null Hypothesis
    c. Identify the Alternative Hypothesis

d. Identify the test statistic formula that will be used
e. Calculate the p-value
f. State your initial conclusion
g. Word your final conclusion

Answers for Sample Exam 1 (STA 3123)
1. [50.132, 65.868]
2. [54.08, 61.92]
3. [0.576, 0.664]
4. [22.424, 27.576]
5. We are 99% confident that the true mean wait time at the registrar's office is between 22.4 and 27.6 minutes.
6. [20.9, 29.1]
7. T = 3.355
8. t = 1.701
9. Since the population standard deviation is unknown we cannot use the formula given.
10. 3.877
11. The interval estimator comes with a confidence level (a measure of reliability) which is not available with a point estimator.
12. If we were to create a large number of these intervals we would expect that about 95% of them would capture the true mean, but we do not know for certain that the interval we have created captures the true mean.

13. Claim: $\mu < 11$, $H_0: \mu = 11$, $H_A: \mu < 11$
   Test stat: -2.50
   Critical Value: -2.05
   Reject the Null
   The sample data support the claim that the average length of Atlantic salmon is less than eleven inches.
14. 1.960
15. The sample data support the claim that more than 10% of the population suffers from ADD.
16. 0.029
17. 0.012
18.
   a. Identify the claim $\rho > 0.5$
   b. Identify the Null Hypothesis $\rho = 0.5$
   c. Identify the Alternative Hypothesis $\rho > 0.5$
   d. Identify the test statistic formula that will be used $z = \dfrac{\hat{p} - \rho_0}{\sqrt{\dfrac{\rho_0 q_0}{n}}}$
   e. Calculate the test statistic: 3.781
   f. Find the critical value for the rejection region: 2.326
   g. State your initial conclusion: Reject the null

     h. Word your final conclusion : The sample data support the claim that …

19.
     a. Identify the claim $\mu > 63.6$
     b. Identify the Null Hypothesis $\mu = 63.6$
     c. Identify the Alternative Hypothesis $\mu > 63.6$

     d. Identify the test statistic formula that will be used $t = \dfrac{\bar{x} - \mu_0}{\frac{s}{\sqrt{n}}}$

     e. Calculate the test statistic: 13.2
     f. Find the critical value for the rejection region: 1.860
     g. State your initial conclusion: reject the null
     h. Word your final conclusion: The sample data support the claim that…

20.
     a. Identify the claim $\mu > 30$
     b. Identify the Null Hypothesis $\mu = 30$
     c. Identify the Alternative Hypothesis $\mu > 30$

     d. Identify the test statistic formula that will be used $z = \dfrac{\bar{x} - \mu_0}{\frac{\sigma}{\sqrt{n}}}$

     e. Calculate the p-value: 0.0416
     f. State your initial conclusion: Reject the null
     g. Word your final conclusion: The sample data support the claim …