Assignment Problems

In each of the following cases determine:

– What is the "tail"ness of the hypothesis?

4.1 $H_0: \mu = 5$ versus $H_1: \mu > 5$.

4.2 $H_0: p \geq 0.2$ versus $H_1: p < 0.2$.

4.3 $H_0: \sigma = 4.5\ 5$ versus $H_1: \sigma \neq 4.55$.

4.4 $H_0: p \leq 0.75$ versus $H_1: p > 0.75$.

4.5 $H_0: \mu \geq 115$ versus $H_1: \mu < 115$.

4.6 $H_0: \sigma \leq 5$ versus $H_1: \sigma > 5$.

Assignment Problems

- In each of the following cases:

  a) Determine the null and alternative hypotheses.
  b) Explain what it would mean to a type I error, and
  c) Explain what it would mean to make a type II error.

4.7 According to the Federal Housing Finance Board, the mean price of a single-family home, in 2003, was $245,950. A real estate broker believes that because of the credit standing and the interest rate, the mean price has increased since then.

4.8 According to the Centers for Disease Control and Prevention, 16% of children aged 6 to 11 years are overweight. A school nurse thinks that the percentage, of 6- to 11-year-olds that is overweight, is higher in her school district.

4.9 In 2006, the standard deviation of SAT math score for all students taking the exam was 115. A teacher believes that, due to changes to the SAT Reasoning test in 2007, the standard deviation of SAT math scores will increase.

Assignment Problems

In Exercises 4.12 – 4.14, test the hypothesis using (a) the classical method and then (b) the P-value method. Be sure to verify the requirements of the test, and the conclusions in both methods are the same.

4.12 H_0: $p \geq 0.9$ versus H_1: $p < 0.9$, n 500, $x = 440$, $\sigma = 0.01$.

4.13 H_0: $p \leq 0.75$ versus H_1: $p > 0.75$, $n = 200$, $x = 75$, $\alpha = 0.05$

4.14 H_0: $p = 0.55$ versus H_1: $p \neq 0.55$ $n = 150$, $x = 785$, $\alpha = 0.10$

4.15 A tomato juice cannery attempts to put 46 ounces in the can. The measuring device puts in X ounces, a random variable that is normally distributed. If the average content is below 46 ounces, the company may get in trouble with the government inspectors for false labeling. On the other hand if the average content is above 46 ounces, the company will make less profit. In order to determine whether or not the weighing process is operating satisfactorily the plant statistician inspects a simple random sample of 25 cans and finds that $\overline{x} = 46.18$ ounces with $S = 0.5$. What conclusion should the company make, by using $\alpha = 1\%$?

Assignment Problems

4.16 To test H_0: $\mu \leq 15$ versus H_1: $\mu > 15$, a random sample of size 25 is obtained from a population that is known to be normally distributed with $\sigma = 5$. a) If the sample mean is determined to be 14.7, compute the test statistic. b) If the researcher decides to test this hypothesis at the level of significance of 0.05, determine the critical value. c) Draw a normal curve that will show the critical (or rejection) region. d) Will the researcher reject the null hypothesis? Why or why not?

4.17 To test H_0: $\mu \geq 40$ versus H_1: $\mu < 40$, a random sample of size 25 is obtained from a population that is known to be normally distributed with $\sigma = 6$. a) If the sample mean is determined to be 42.3, compute the test statistic. b) If the researcher decides to test this hypothesis at the level of significance of 0.10, determine the critical value. c) Draw a normal curve that will show the critical (or rejection) region. d) Will the researcher reject the null hypothesis? Why or why not?

4.18 To test H_0: $\mu = 100$ versus H_1: $\mu \neq 100$, a random sample of size 30 is obtained from a population that is known to be normally distributed with $\sigma = 7$. a) If the sample mean is determined to be 42.3, compute the test statistic. b) If the researcher decides to test this hypothesis at the level of significance of 0.01, determine the critical value. c) Draw a normal curve that will show the critical (or rejection) region. d) Will the researcher reject the null hypothesis? Why or why not?

4.19 A standard variety of wheat produces, on the average, 30 bushels per acre. A new imported variety is planted on nine randomly selected acre plots. The observed sample average for the new variety is 33.4 bushels per acre, with a standard deviation of 5.1 bushels. Should the new variety be used instead of the standard one, by using 5% level of significance?

Assignment Problems

4.20 To test H_0: $\mu = 45$ versus H_1: $\mu \neq 45$, a random sample of size 40 is obtained from a population that has a standard deviation of $\sigma = 8$. a) Does the population need to be normally distributed to compute the P value? b) If the sample mean is determined to be 48.3, compute the p-value, and interpret it. c) If the researcher decides to test this hypothesis at the level of significance of 0.05, determine the critical value. d) Draw a normal curve that will show the critical (or rejection) region. e) Will the researcher reject the null hypothesis? Why or why not?

4.21 To test H_0: $\mu \geq 40$ versus H_1: $\mu < 40$, a random sample of size 25 is obtained from a population that is known to be normally distributed. a) If the sample mean is determined to be 42.3, and $s = 4.3$, compute the test statistic. b) If the researcher decides to test this hypothesis at the level of significance of 0.10, determine the critical value. c) Draw a t-distribution curve that will show the critical (or rejection) region. d) Will the researcher reject the null hypothesis? Why or why not?

4.22 To test H_0: $\mu = 100$ versus H_1: $\mu \neq 100$, a random sample of size 23 is obtained from a population that is known to be normally distributed. a) If the sample mean is determined to be 104.8, with $s = 9.2$, compute the test statistic. b) If the researcher decides to test this hypothesis at the level of significance of 0.01, determine the critical value. c) Draw a t-distribution curve that will show the critical (or rejection) region. d) Will the researcher reject the null hypothesis? Why or why not?

Assignment Problems

4.23 To test H_0: $\mu \geq 20$ versus H_1: $\mu < 20$, a simple random sample of size 18 is obtained from a population that is known to be normally distributed. a) If the sample mean is determined to be 18.3, and $s = 4.3$, compute the test statistic. b) If the researcher decides to test this hypothesis at the level of significance of 0.10, determine the critical value. c) Draw a t-distribution curve that will show the critical (or rejection) region. d) Will the researcher reject the null hypothesis, use the P-value method? Why or why not?

4.24 State the requirements to test a claim regarding a population standard deviation, or a population variance.

4.25 Determine the critical value for a right-tailed test of a population standard deviation with 18 degrees of freedom at the 5% level of significance.

4.26 Determine the critical values for a two-tailed test of a population variance with 18 degrees of freedom at the 5% level of significance.

4.27 To test H_0: $\sigma \leq 35$ versus H_1: $\sigma > 35$, a random sample of $n = 15$ is obtained from a population that is normally distributed. a) If the sample standard deviation is determined to be $s = 37.4$, compute the test statistic. b) If the researcher decides to test this hypothesis at the level of significance of 0.01, determine the critical value. c) Draw a Chi-square distribution that will show the critical (or rejection) region. d) Will the researcher reject the null hypothesis? Why or why not?