MATH 160 (chapter 8)

Road-Gear, a tire manufacturer, is using a new production method to manufacture tires. A simple random sample of 25 tires are tested. The sample has a standard deviation of 20 inches. At the 0.05 significance level, test the claim that the new production method manufactures tires with less variation than the old production method. (The old production method manufactures tires with a standard deviation of 50 inches)

1) Which parameter is being tested here? a) μ b) σ c) P

2) What is the claim? ___σ <50______

$s=20$
$\alpha=0.05$
$n=25$

3) The null hypothesis is ____H_0: σ =50_________

4) The alternate hypothesis is ___H_1: σ <50___________

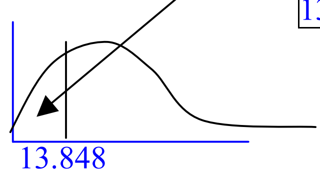
5) The test statistic is $x^2 = \frac{(n-1)s^2}{\sigma^2} = \frac{(25-1)20^2}{50^2} = \boxed{3.84}$

6) The critical value is

$\alpha = .05$

Since H_1: σ <50 where the inequality is pointing to the left this information gives us a LEFT TAIL TEST. Find the chi-square value to the left by taking 1-.05 = .95 and degrees of freedom is n-1 = 24 Use table A-4 Chi-square Distribution to find the critical value.

13.848



7) Which is the correct conclusion for the problem. _Reject H_0_Since the test statistic falls in the critical region Conclusion: The sample data support the claim that the new production method manufactures tires with less variation than the old production method.

8) Based on the your results **should Road-Gear adopt this new production method to manufacture** tires? Is it really better than the old production method?

The new production method should be adopted because it manufactures tires with less variation.

A car company claims that the mean gas mileage for its luxury sedan is 21 miles per gallon. You believe the claim is incorrect and find that a random sample of 17 cars has a mean gas mileage of 19 mpg and a standard deviation of 4 mpg. Assume that the gas mileage of all of the company's luxury sedans is normally distributed. **Use a significance level of 0.10** to test the company's claim.

9) What is the null hypothesis? __H_0: µ=21 (claim)__

$n=17$
$\bar{x}=19$
$s=4$
$\alpha = .10$

10) What is the alternate hypothesis?__H_1:µ≠21_____

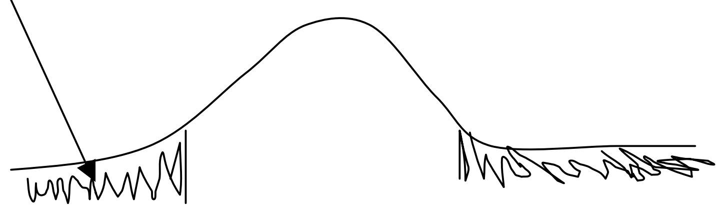
11) Find the test statistic

$$t = \frac{(\bar{X}-\mu)}{\left(\frac{s}{\sqrt{n}}\right)} = \frac{(19-21)}{\left(\frac{4}{\sqrt{17}}\right)} = -2.062$$

12) The critical value is

$\alpha = .10$

Since H_1: µ≠21 this information gives us a TWO TAIL TEST. Find the critical value by taking $\alpha = .10$ (area in two tails) and degrees of freedom is n-1 = 16 Use table A-3 to find the critical value ±1.746



The p-value is -1.746 1.746

Stat, Test, select T-test

p-value = .056

The p-value is less than $\alpha = .10$ REJECT H_0

13) Which is the correct conclusion for the problem. Reject H_0 The test statistic lies in the critical region.

Conclusion:

There is sufficient evidence to warrant rejection of the claim that the mean gas mileage for its luxury sedan is 21 miles per gallon.

A medical researcher claims that more than 10% of U.S. adults are smokers. In a random sample of 200 adults, 20% say that they are smokers. Test the claim that the proportion of adults who smoke is more than 10%. Use a significance level of .05

14) Where does the claim go? In the H_0 or in the H_1 ?

$\hat{p} = .20$
n = 200
Claim: p > 10%
x= $\hat{p}$ * n = 40
$\alpha = .05$

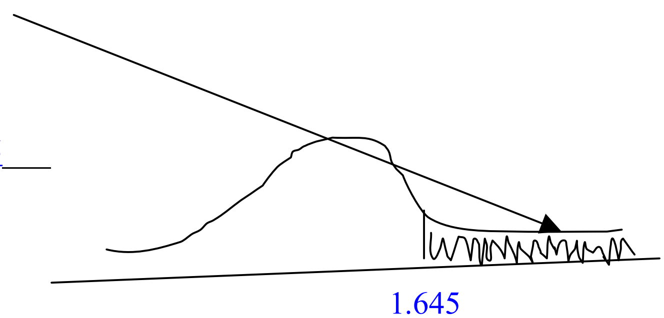
15) The null hypothesis is __H_0: p = .10___

16) The alternate hypothesis is _H_1: p > .10 (claim)_

17) The test statistic is __4.71______

$$z = \frac{(\hat{p} - p)}{\sqrt{\frac{pq}{n}}} = \frac{(.20 - .10)}{\sqrt{\frac{.10 * .90}{200}}} = 4.71$$

18) The critical value is ___1.645___
$\alpha = .05$



19) The p-value is _1.2156634E⁻6 which can be written as .0000012156634
Stat, Test, select 1-PropZTest

Since the p-value is less than $\alpha = .05$ then reject H_0

20) Choose one. a) FAIL TO REJECT H_0 b) REJECT H_0.
Since the Test statistic is in the critical region

21) What is your conclusion? Write out using the conclusions summary in your book.

The sample data support the claim that more than 10% of US adults are smokers.