

1. The amount of text message received per day by students with smart phones is approximately normal. 12 students were selected and the sample mean was 120 and the sample standard deviation was 40.

- a. Find a 99% confidence for the population mean.

$$\bar{x} = 120 \quad \alpha = .01$$

$$s = 40$$

$$n = 12$$

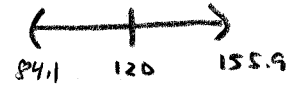
$$df = 11$$

$$t = 3.106$$

$$120 \pm (3.106) \frac{40}{\sqrt{12}}$$

$$120 \pm 35.9$$

$$(84.1, 155.9) \text{ text messages}$$



- b. If the confidence level decreased from 99% to 95%, would the margin of error for the confidence interval (mark one answer):

increase

decrease

stay the same

not enough information to answer

- c. If the sample size decreased from 12 to 10, would the margin of error for the confidence interval (mark one answer):

increase

decrease

stay the same

not enough information to answer

- d. If the sample mean changed to 130 and the sample standard deviation remained the same, would the margin of error for the confidence interval (mark one answer):

increase

decrease

stay the same

not enough information to answer

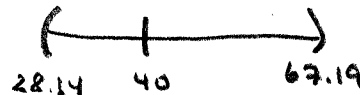
- e. Find a 95% confidence interval for the population standard deviation

$$\chi^2_L = 3.816$$

$$\chi^2_U = 21.920$$

$$\left(\sqrt{\frac{40^2(11)}{21.920}}, \sqrt{\frac{40^2(11)}{3.816}} \right)$$

$$(28.34, 67.91)$$



2. In a recent poll, 55% of 1000 adults polled said the views expressed in the Occupy Wall Street movement reflect their own views. At the 95% confidence level, what is the margin of error for this poll (round to the nearest .001)?

$$z = 1.96$$

$$\hat{p} = .55$$

$$n = 1000$$

$$.55 \pm 1.96 \sqrt{\frac{(.55)(.45)}{1000}}$$

$$.55 \pm .031$$

$$\text{Margin of Error} = 3.19\%$$

3. Carefully read the following questions and circle **one** answer for each of the following:

- a. True or False A test designed with a maximum Type I error of 5% will have more power than a test designed with a maximum Type I error of 1%.
- b. True or False Type I error can only occur when the Null Hypothesis is rejected.
- c. True or False The critical value depends on α and the p-value depends on the test statistic.
- d. True or False A test with more power has a higher chance of rejecting a false H_0 .
- e. True or False Sample statistics should never appear in the Null or Alternative Hypotheses.
- f. True or False If you fail to reject the Null Hypothesis, this means the Null Hypothesis is true.
You can never prove H_0 is true
- g. True or False The significance level of the test is chosen to reflect the maximum probability of making type I error the designer is willing to take.

4. Here are several proposed sets of null and alternative hypotheses. Determine if the hypotheses are valid or not valid for the models we have covered in our class. If the model is not valid, briefly explain why the model is not valid.

Hypotheses	Circle one choice	If Hypotheses are Not Valid, briefly explain why
$H_0: \mu \geq 15$ $H_A: \mu > 15$	<input type="checkbox"/> Valid <input checked="" type="checkbox"/> Not Valid	Alternative is complement of H_0
$H_0: \mu \neq 5$ $H_A: \mu = 5$	<input type="checkbox"/> Valid <input checked="" type="checkbox"/> Not Valid	Equality is in H_0
$H_0: \bar{X} = 20$ $H_A: \bar{X} \neq 20$	<input type="checkbox"/> Valid <input checked="" type="checkbox"/> Not Valid	Sample Statistics do <u>not</u> appear in H_0, H_A
$H_0: p \geq .6$ $H_A: p < .6$	<input checked="" type="checkbox"/> Valid <input type="checkbox"/> Not Valid	

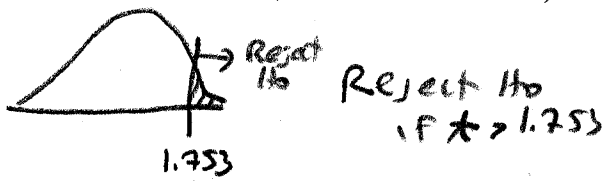
5. Choose the correct model (test statistic) for the following problems:

You want to support the claim that more than 60% of community college students are working more than 20 hours per weeks. 1100 students will be sampled.	<ul style="list-style-type: none"> <input type="radio"/> Z-test for mean vs. hypothesized value <input type="radio"/> t-test for mean vs. hypothesized value <input checked="" type="radio"/> Z-test for proportion vs. hypothesized value <input type="radio"/> Chi-square test for standard deviation
You want to test the null hypothesis that the standard deviation for a mutual fund is about 10. You have data for 36 months of returns.	<ul style="list-style-type: none"> <input type="radio"/> Z-test for mean vs. hypothesized value <input type="radio"/> t-test for mean vs. hypothesized value <input type="radio"/> Z-test for proportion vs. hypothesized value <input checked="" type="radio"/> Chi-square test for standard deviation
You want to test the null hypothesis that mean SAT math scores in a California school is 520. 100 students will be sample and the population standard deviation is known to be 100.	<ul style="list-style-type: none"> <input checked="" type="radio"/> Z-test for mean vs. hypothesized value <input type="radio"/> t-test for mean vs. hypothesized value <input type="radio"/> Z-test for proportion vs. hypothesized value <input type="radio"/> Chi-square test for standard deviation
You want to support the claim that Americans consume more than 120 grams of sugar per day. You will use sample data from 20 sampled Americans.	<ul style="list-style-type: none"> <input type="radio"/> Z-test for mean vs. hypothesized value <input checked="" type="radio"/> t-test for mean vs. hypothesized value <input type="radio"/> Z-test for proportion vs. hypothesized value <input type="radio"/> Chi-square test for standard deviation

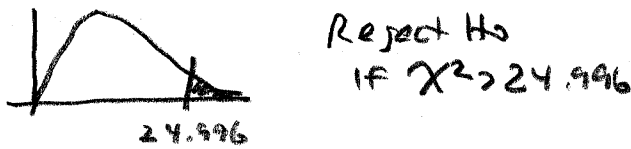
6. A textbook review committee analyzed the retail cost for 16 Introductory Statistics textbooks. The following statistics are summarized in US dollars:

$$\bar{X} = \$100 \quad s = \$20$$

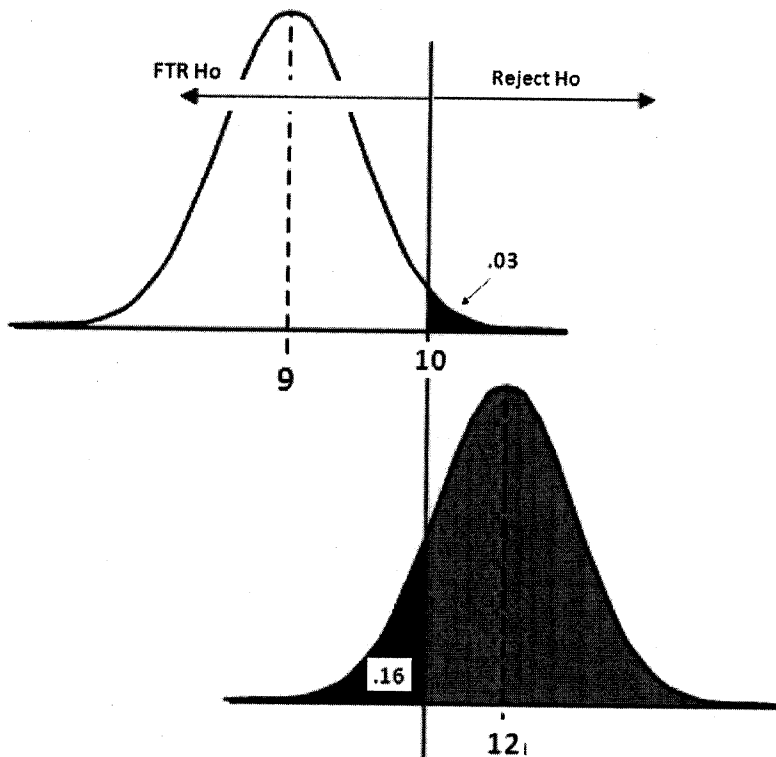
a. Does the data show that the mean price for Statistics textbooks is over \$90? Conduct the test with $\alpha = 5\%$ and **SHOW ALL STEPS**.

<p>DESIGN- State your Hypothesis</p> $H_0: \mu \leq 90$ $H_a: \mu > 90$	<p>DESIGN -Decision Rule (Critical Value Method)</p> 
<p>DESIGN - State the Significance Level</p> $\alpha = .05$	<p>DATA - Conduct the Test - Decision</p> $t = \frac{100 - 90}{20/\sqrt{16}} = 2 \Rightarrow \underline{\text{Reject } H_0}$
<p>DESIGN - Determine the Test Statistic</p> $t = \frac{\bar{X} - \mu_0}{s/\sqrt{n}} \quad df = 16 - 1 = 15$	<p>CONCLUSION in non-statistical language</p> <p>The mean price of statistics books is over \$90.</p>

b. Does the data show that the standard deviation for Statistics textbooks is over \$15? Conduct the test with $\alpha = 5\%$ and **SHOW ALL STEPS**.

<p>DESIGN- State your Hypothesis</p> $H_0: \sigma \leq 15$ $H_a: \sigma > 15$	<p>DESIGN -Decision Rule (Critical Value Method)</p> 
<p>DESIGN - State the Significance Level</p> $\alpha = .05$	<p>DATA - Conduct the Test - Decision</p> $\chi^2 = \frac{20^2(15)}{152} = 26.667 \Rightarrow \text{Reject } H_0$
<p>DESIGN - Determine the Test Statistic</p> $\chi^2 = \frac{s^2(n-1)}{\sigma_0^2} \quad df = 15$	<p>CONCLUSION in non-statistical language</p> <p>Standard deviation for cost of textbooks exceed \$15.</p>

7. The drawing shown diagrams the distribution of the sample mean under the Null Hypothesis (top drawing) and a specific Alternative Hypothesis (bottom drawing). The sample size for the test is 50.



a. State the Null and Alternative Hypotheses.

$$H_0: \mu \leq 9$$

$$H_a: \mu > 9$$

b. What are the values of μ_0 and μ_a in this problem?

$$\mu_0 = 9$$

$$\mu_a = 12$$

c. What is the significance level of the test?

$$\alpha = .03$$

d. What is the Power of the test when the population mean = 12?

$$\text{power} = 1 - .16 = .84$$

e. Under the Null Hypothesis, what is the probability the sample mean will exceed 10?

$$\alpha = .03$$

f. Under the Alternative Hypothesis, what is the probability the sample mean will exceed 10?

$$\boxed{\text{power} = .84}$$

g. If the test was conducted, and the p-value was .035, would the decision be Reject or Fail to Reject the Null Hypothesis?

$\boxed{\text{FTR } H_0}$

$$p\text{-value} > \alpha$$

$$p\text{-value} = .035$$

$$\alpha = .03$$

h. If the significance level of the test was changed to 0.05, would the shaded on area on the bottom (Ha) graph increase, decrease or stay the same?

Black area (β) would decrease