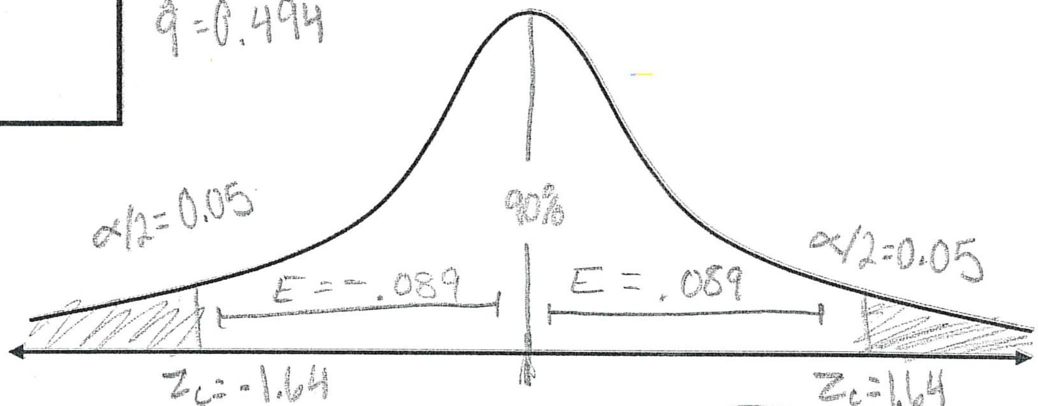
1. A college bookstore wants to find out what proportion of students will but their books at the store instead of somewhere else. They survey 85 students and 43 are going to buy their books on campus. Use a confidence level of 90% to find the confidence interval.

$N = ?$
$p = ?$
$q = ?$

$n = 85$
$\hat{p} = 43/85 = 0.505$ $\alpha = 0.1$
$\hat{q} = 0.494$



a) What would the point estimate be for this situation? $\boxed{\hat{p} = 0.505}$

b) $E = Z_c\sqrt{\frac{\hat{p}\cdot\hat{q}}{n}} = 1.64\sqrt{\frac{.505 \cdot .494}{85}} = \boxed{.089}$

c) Critical values = invNorm(.05, 0, 1) = $\boxed{-1.64, 1.64}$

d) Confidence interval = $\hat{p} \pm E = .505 \pm .089 = (.416, .594)$

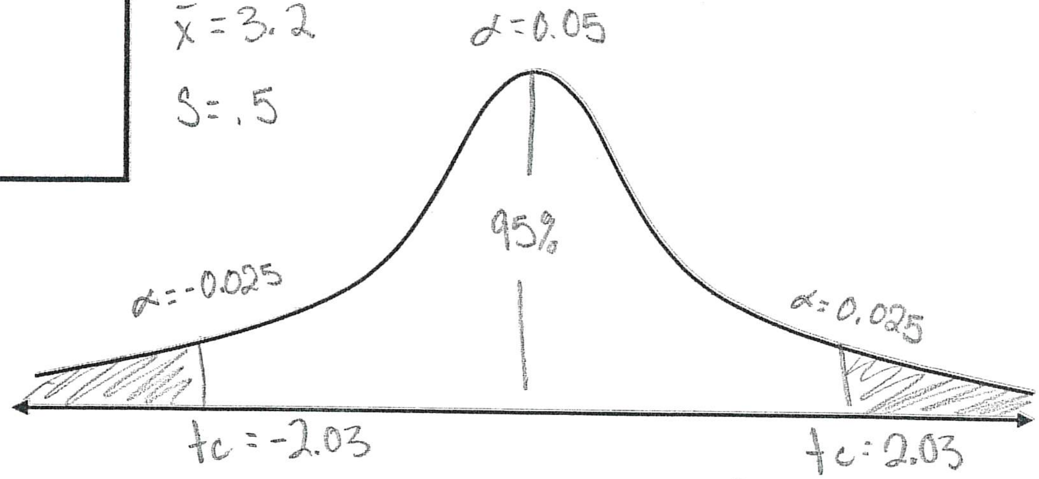
e) Write 1 sentence on what you have discovered.

There is a 90% confidence level that the proportion of students who will buy their books at the bookstore is between 41.6% and 59.4%

2. The NRA wants to determine the mean number of firearms there are per household in a certain city. They take a survey of 35 households and get a mean of 3.2 with a standard deviation of 0.5. Use a significance level of $\alpha = 0.05$ to determine the confidence interval for the number of firearms per household in this city.

N=?
σ =?
μ = ?

$n=35$
$\bar{x}=3.2$
$S=.5$



a) What would the point estimate be for this situation? $\boxed{3.2}$

b) $E = t_c\left(\frac{s}{\sqrt{n}}\right) = 2.03\left(\frac{.5}{\sqrt{35}}\right) = \boxed{.172}$

c) Critical values = invT(0.025,34) = $\boxed{-2.03, 2.03}$

d) Confidence interval = $3.2 \pm .172 = (3.028, 3.372)$

e) Write 1 sentence on what you have discovered.

There is a 95% confidence level that the average number of firearms per household is between 3.028 and 3.372

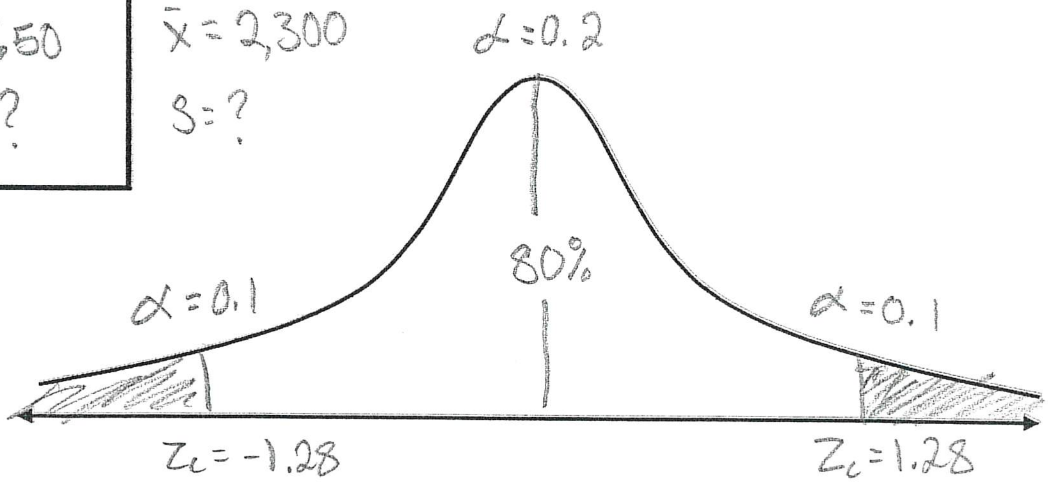
3. The athletic department of a college would like to determine the mean number of people who attend their football games. They know the data is $\boxed{\text{normally distributed}}$ with a standard deviation of 650. They take a survey of 12 games and get a mean of 2,300. Use a confidence level of 80% to determine the mean number of people that attend the games.

$\boxed{\begin{array}{l} N = ? \\ \sigma = 650 \\ \mu = ? \end{array}}$

$n = 12$

$\bar{x} = 2{,}300$

$s = ?$



a) What would the point estimate be for this situation? $\boxed{2{,}300}$

b) $E = z_c\left(\frac{\sigma}{\sqrt{n}}\right) = 1.28\left(\frac{650}{\sqrt{12}}\right) = 240.178$

c) Critical values = invNorm(0.1, 0, 1) = $\boxed{-1.28, 1.28}$

d) Confidence interval = $2{,}300 \pm 240.178 = (2059.822, 2540.178)$

*e) Write 1 sentence on what you have discovered.

There is a 80% confidence level that the average number of people who attend each football game is between 2,059.822 and 2540.178

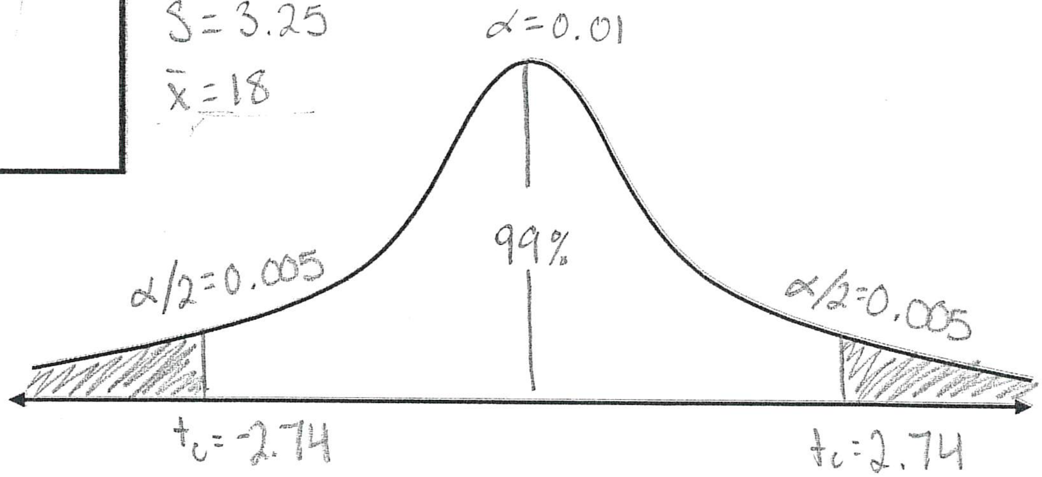
4. A survey of $\boxed{32}$ students at SDSU revealed that the mean amount of money spent at a local coffee stand per week was \$18, with a standard deviation of \$3.25. Use a confidence level of 99% to determine the mean amount spent at the coffee stand.

$$\boxed{\begin{array}{l} N = ? \\ \sigma = ? \\ \mu = ? \end{array}}$$

$n = 32$

$s = 3.25$

$\bar{x} = 18$



a) What would the point estimate be for this situation? $\boxed{18}$

b) $E = t_c\left(\frac{s}{\sqrt{n}}\right) = 2.74\left(\frac{3.25}{\sqrt{32}}\right) = \boxed{1.574}$

c) Critical values = $\text{invT}(.005, 31) = \boxed{-2.74}$

d) Confidence interval = $18 \pm 1.574 = (16.426, 19.574)$

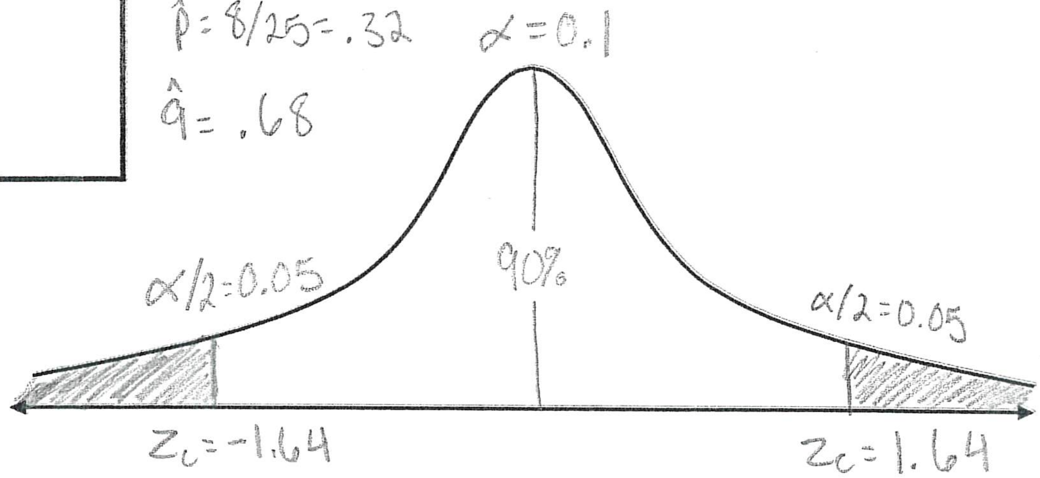
e) Write 1 sentence on what you have discovered.

There is a 99% confidence level that the mean amount of money spent at the local coffee stand is between 16.426 and 19.574 dollars

5. A statistics instructor would like to determine the proportion of students in their class that use their phones in class. During a certain lecture, the instructor observes his 25 students, and 8 of them are using their phones. Use a confidence level of 90% to calculate the confidence interval to the proportion using their phones in class.

$N = ?$
$p = ?$
$q = ?$

$n = 25$
$\hat{p} = 8/25 = .32$
$\hat{q} = .68$



a) What would the point estimate be for this situation? $\boxed{0.32}$

b) $E = z_c\sqrt{\frac{\hat{p}\cdot\hat{q}}{n}} = 1.64\sqrt{\frac{.32\cdot .68}{25}} = \boxed{.153}$

c) Critical values = invNorm(.05, 0, 1) = $\boxed{-1.64, 1.64}$

d) Confidence interval = $0.32 \pm 0.153 = (.167, .473)$

e) Write 1 sentence on what you have discovered.

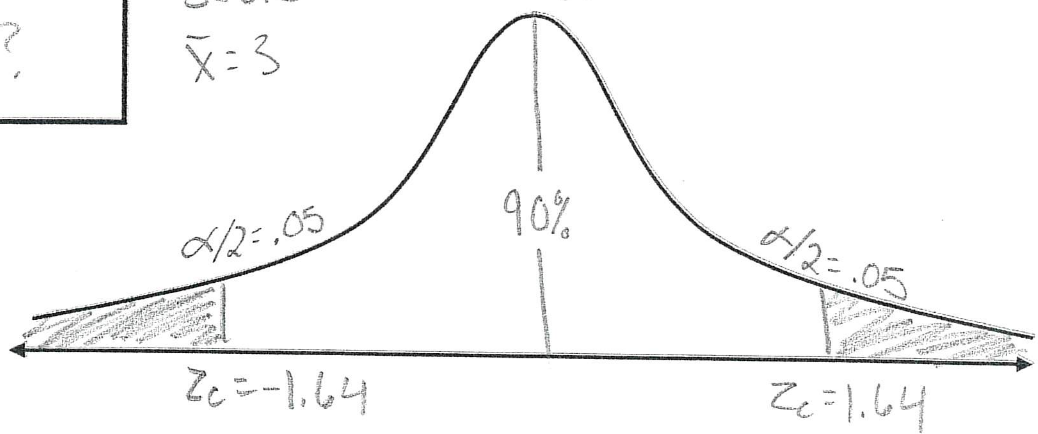
There is a 90% confidence level that the percentage of students on their phones in class is between 16.7% and 47.3%

6. A company wants to determine the mean number of hours their employees spend reading emails each day. They know the population standard deviation is 0.6 hours but want to get an idea of the mean. They conduct a survey of 38 employees and get a mean of 3 and a standard deviation of 0.5. Calculate a confidence interval with a confidence level of 90%.

$N = ?$
$\sigma = 0.6$
$\mu = ?$

$n = 38$
$s = 0.5$
$\bar{x} = 3$

$\alpha = .1$



a) What would the point estimate be for this situation? $\boxed{3}$

b) $E = Z_c\left(\frac{\sigma}{\sqrt{n}}\right) = 1.64\left(\frac{0.6}{\sqrt{38}}\right) = \boxed{0.160}$

c) Critical values = invNorm(.05,0,1) = $\boxed{-1.64, 1.64}$

d) Confidence interval = $3 \pm 0.160 = (2.84, 3.16)$

e) Write 1 sentence on what you have discovered.

There is a 90% confidence level that the number of hours the company's employees spend reading emails is between 2.84 and 3.16

7. A survey was conducted for the amount of money the average student spends at a coffee shop at a college campus. The following data was collected.

2	1	4	5	3	8	5	3	2	10
2	1	2	5	4	2	5	6	4	3
7	2	5	13	28	2	1	0	0	

The school knows the data is normally distributed with a population standard deviation of 0.5. Calculate a confidence interval with a confidence level of 98

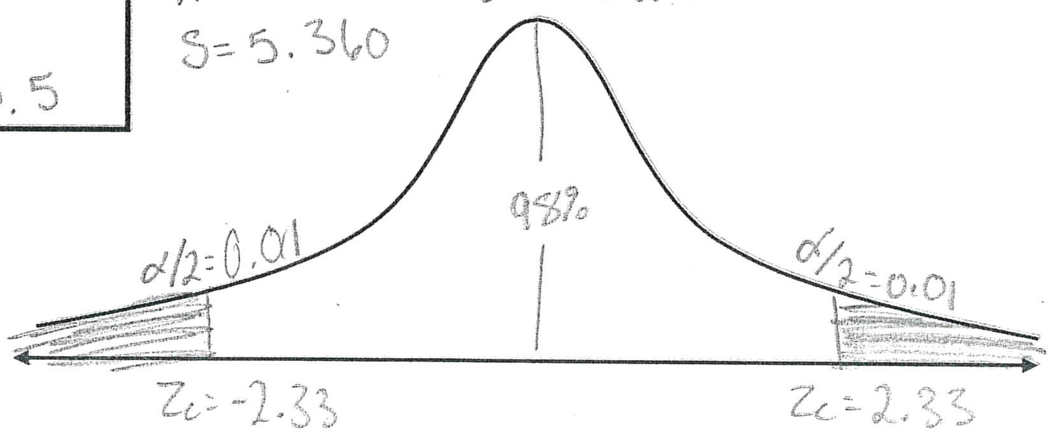
$\boxed{N = ? \quad \mu = ? \quad \sigma = 0.5}$

$n = 29$

$\bar{x} = 4.655$

$S = 5.360$

$\alpha = 0.02$



a) What would the point estimate be for this situation? $\boxed{4.655}$

b) $E = Z_c\left(\frac{\sigma}{\sqrt{n}}\right) = 2.33\left(\frac{0.5}{\sqrt{29}}\right) = \boxed{.216}$

c) Critical values = invNorm(.01,0,1) = $\boxed{-2.33, 2.33}$

d) Confidence interval = $4.655 \pm .216 = (4.439, 4.871)$

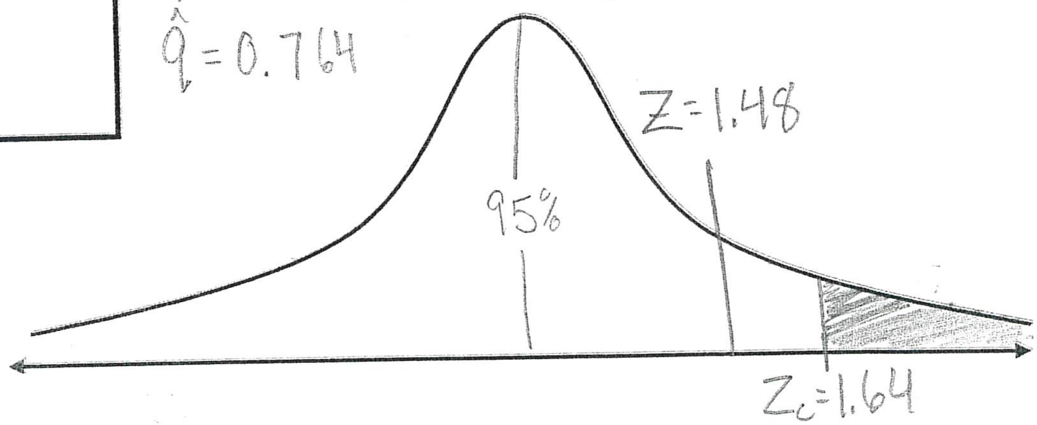
e) Write 1 sentence on what you have discovered.

There is a 98% confidence level that the mean amount of money spent at a coffee shop is between 4,439 and 4.871 dollars

9. Over the past few decades, public health officials have examined the link between weight concerns and teen girls' smoking. Researchers surveyed a group of 271 randomly selected teen girls living in San Diego (between 12 and 15 years old). After four years the girls were surveyed again. Sixty-four said they smoked to stay thin. Is there good evidence that more than twenty percent of the teen girls smoke to stay thin? Use $\alpha = 0.05$.

$N = ?$
$p = .2$
$q = .8$

$n = 271$
$\hat{p} = 64/271 = 0.236$ $\alpha = 0.05$
$\hat{q} = 0.764$



a) State the null and alternative hypothesis.

$H_0: p \leq .2$

$H_A: p > .2$

b) Calculate the critical value.

invNorm(0.95, 0, 1) $= \boxed{1.64}$

c) Calculate the test statistic.

$$Z = \frac{.236 - .2}{\sqrt{\frac{.2 \cdot .8}{271}}} = \boxed{1.48}$$

d) Calculate the $p-$value and compare it with the significance level.

p-value = normalcdf(1.48, 9999, 0, 1) = .069 $> \alpha$

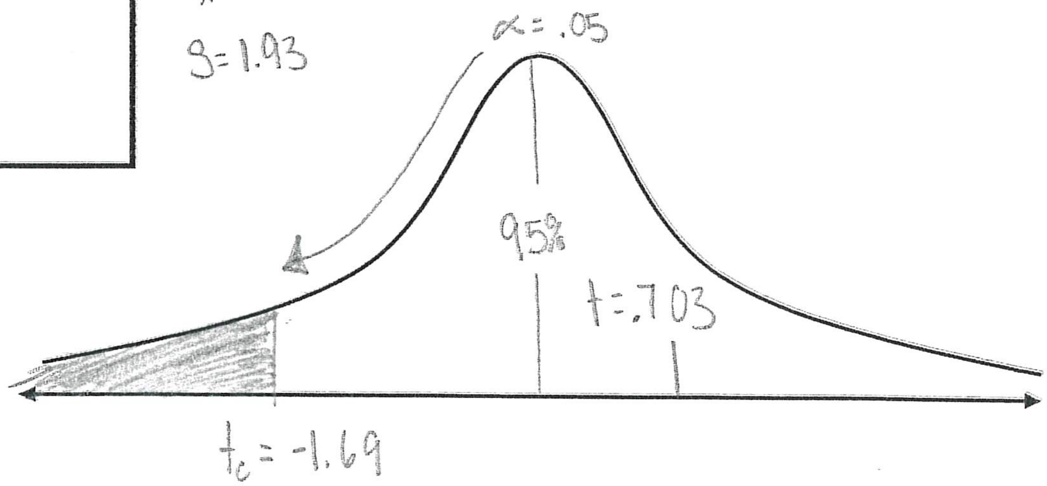
e) We fail to reject H_0, there is not enough evidence to support it.

z & t scores round to 2 χ^2_c Round to 3 decimals   f-Scores - 4 decimals

10. It is believed that San Diego Community College District (SDCCD) Statistics students get less than seven hours of sleep per night, on average. A survey of 32 SDCCD Statistics students generated a mean of 7.24 hours with a standard deviation of 1.93 hours. At a level of significance of 5%, do SDCCD Statistics students get less than seven hours of sleep per night, on average?

$N = ?$
$\mu = 7$
$\sigma = ?$

$n = 32$
$\bar{x} = 7.24$
$s = 1.93$



a) State the null and alternative hypothesis.

$H_0: \mu \geq 7$

$H_A: \mu < 7$

b) Calculate the critical value.

$\text{invT}(0.05, 31) = \boxed{-1.69}$

c) Calculate the test statistic.

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{7.24 - 7}{1.93/\sqrt{32}} = \boxed{0.703}$$

d) Calculate the $p-$value and compare it with the significance level.

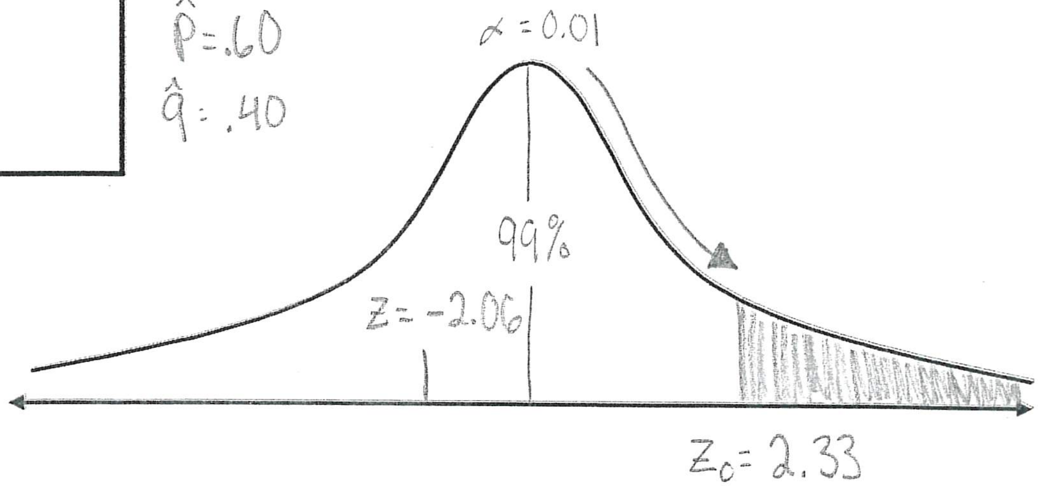
$\text{tcdf}(-9999, 0.703, 31) = \boxed{0.76 > \alpha}$

e) We fail to reject H_0, there is not enough evidence to support it.

11. *Glamour* magazine sponsored a survey of 2500 prospective brides and found that 60% of them spent less than \$750 on their wedding gown. Use a 0.01 significance level to test the claim that less than 62% of brides spend less than \$750 on their wedding gown.

$N = ?$
$p = .62$
$q = .38$

$n = 2500$
$\hat{p} = .60$
$\hat{q} = .40$



a) State the null and alternative hypothesis.

$H_0 = P < 62\%$
$H_A = P \geq 62\%$

b) Calculate the critical value.

invNorm(.99, 0, 1) = $\boxed{2.33}$

c) Calculate the test statistic.

$$Z = \frac{\hat{p} - p}{\sqrt{\frac{p \cdot q}{n}}} = \frac{.6 - .62}{\sqrt{\frac{.62 \cdot .38}{2500}}} = \boxed{-2.06}$$

d) Calculate the p−value and compare it with the significance level.

normalcdf(-9999, -2.06, 0, 1) = $\boxed{.02 > \alpha}$

e) We fail to reject H_0, there is not enough evidence to support it.

12. In a recent year, of the 109,857 arrests for Federal offenses, 29.1% were for drug offenses (based on data from the U.S. Department of Justice). Use a 0.01 significance level to test the claim that the drug offense rate is equal to 30%.

$N = ?$

$p = .3$

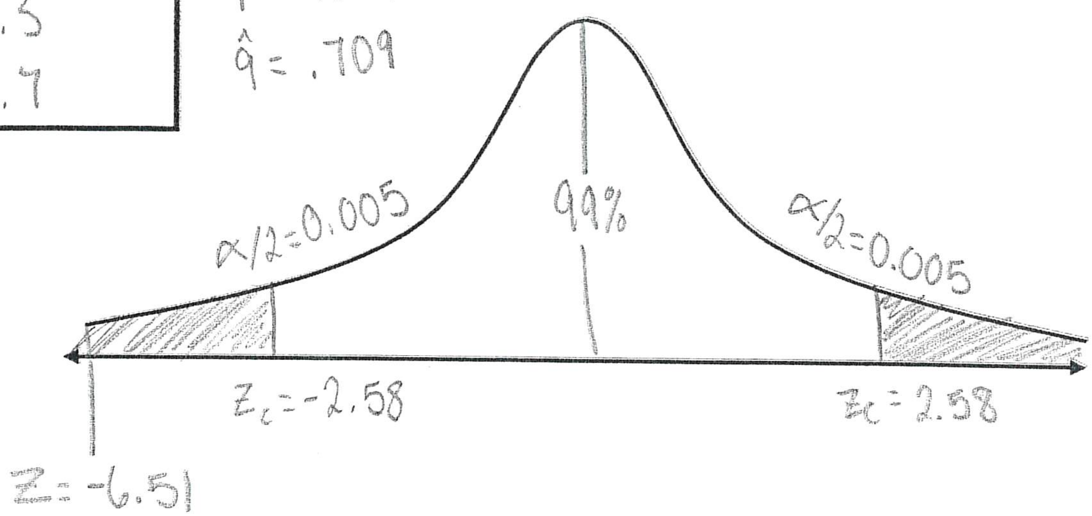
$q = .7$

$n = 109{,}857$

$\hat{p} = .291$

$\hat{q} = .709$

$\alpha = 0.01$



a) State the null and alternative hypothesis.

$H_0 = P \neq 30\%$

$H_A = P = 30\%$

b) Calculate the critical value.

invNorm$(.005, 0, 1) = \boxed{\pm 2.58}$

c) Calculate the test statistic.

$$Z = \frac{\hat{p} - p}{\sqrt{\frac{p \cdot q}{n}}} = \frac{0.291 - 0.3}{\sqrt{\frac{.3 \cdot .7}{109{,}857}}} = \boxed{-6.51}$$

d) Calculate the p-value and compare it with the significance level.

normalcdf$(-9999, -6.51) = 3.776 \times 10^{-11} < \alpha$

e) We reject H_0, there is enough evidence to support it.

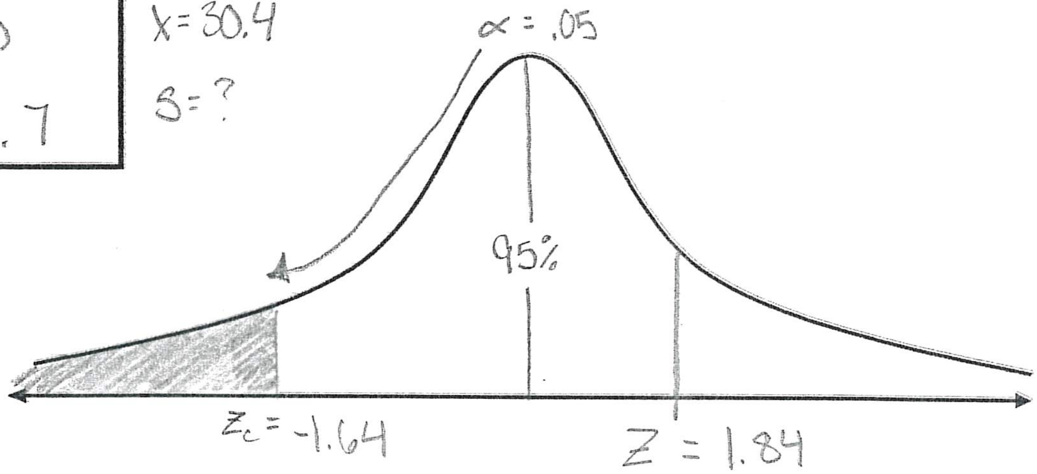
13. In order to monitor the ecological health of the Florida Everglades, various measurements are recorded at different times. The bottom temperatures are recorded at the Garfield Bight station and the mean of 30.4°C is obtained for 61 temperatures recorded on 61 different days. Assuming that $\sigma = 1.7°C$, test the claim that the population mean is greater than 30.0°C. Use a 0.05 significance level.

$N = ?$
$\mu = 30$
$\sigma = 1.7$

$n = 61$

$\bar{x} = 30.4$

$s = ?$



a) State the null and alternative hypothesis.

$H_0 = \mu > 30$

$H_A = \mu \leq 30$

b) Calculate the critical value.

$\text{invNorm}(.05, 0, 1) = \boxed{-1.64}$

c) Calculate the test statistic.

$\dfrac{\bar{x} - \mu}{\sigma / \sqrt{n}}$

$$Z = \frac{30.4 - 30}{1.7/\sqrt{61}} = \boxed{1.84}$$

d) Calculate the p–value and compare it with the significance level.

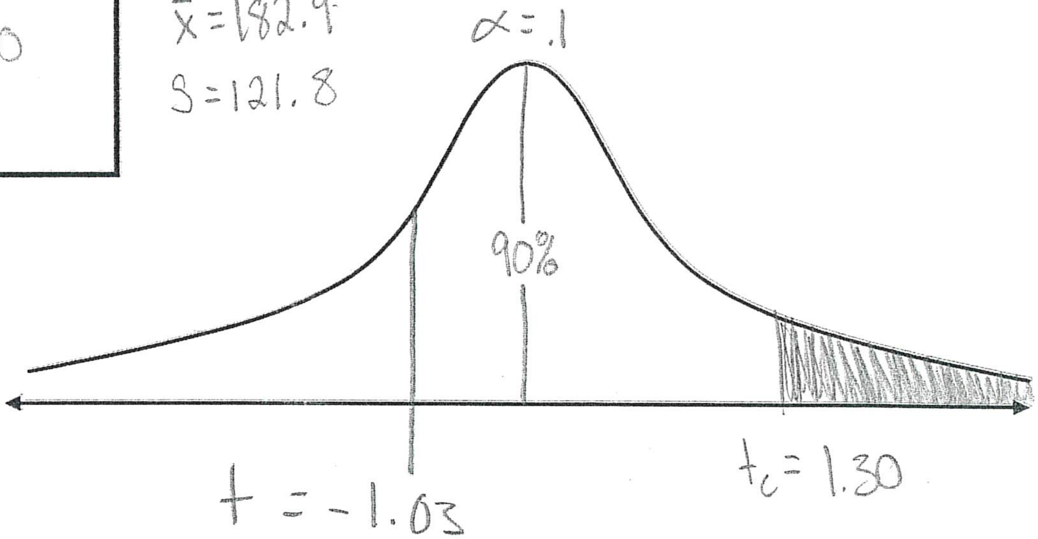
$\text{normalcdf}(-9999, 1.84, 0, 1) = \boxed{.97 > \alpha}$

e) We fail to reject H_0, there is not enough evidence to support it.

14. The health of the bear population in Yellowstone National Park is monitored by periodic measurements taken from anesthetized bears. A sample of 54 bears has a mean weight of 182.9 lb. Assuming that s is known to be 121.8 lb, use a 0.10 significance level to test the claim that the population mean of all such bear weights is less than 200 lb.

$N = ?$
$\mu = 200$
$\sigma = ?$

$n = 54$
$\bar{x} = 182.9$
$s = 121.8$



a) State the null and alternative hypothesis.

$H_0 = \mu \leq 200$

$H_A = \mu \geq 200$

b) Calculate the critical value.

$t_c = \text{invT}(.90, 53) = \boxed{1.30}$

c) Calculate the test statistic.

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{182.9 - 200}{121.8/\sqrt{54}} = \boxed{-1.03}$$

d) Calculate the $p-$value and compare it with the significance level.

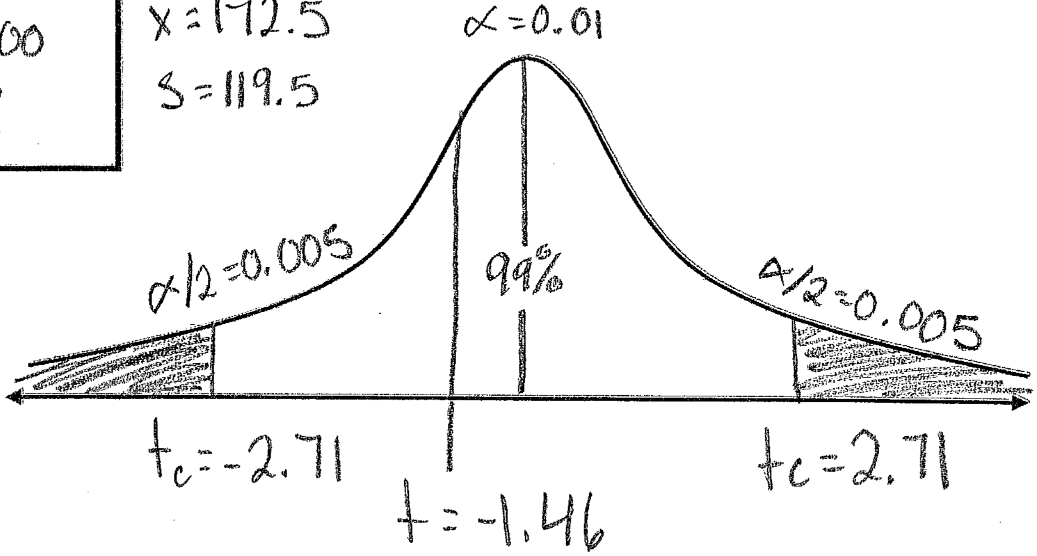
$\text{tcdf}(-1.03, 9999, 53) = .85 > \alpha$

e) We fail to reject H_0, there is not enough evidence to support it.

15. When people smoke, the nicotine they absorb is converted to cotinine, which can be measured. A sample of 40 smokers has a mean cotinine level of 172.5. Assuming that s is known to be 119.5, use a 0.01 significance level to test the claim that the mean cotinine level of all smokers is equal to 200.0.

$N = ?$
$\mu = 200$
$\sigma = ?$

$n = 40$
$\bar{x} = 172.5$
$s = 119.5$



a) State the null and alternative hypothesis.

$H_0 = \mu = 200$

$H_A = \mu \neq 200$

b) Calculate the critical value.

$\text{invT}(.005, 39) = \boxed{\pm 2.71}$

c) Calculate the test statistic.

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{172.5 - 200}{119.5/\sqrt{40}} = \boxed{-1.46}$$

d) Calculate the $p-$value and compare it with the significance level.

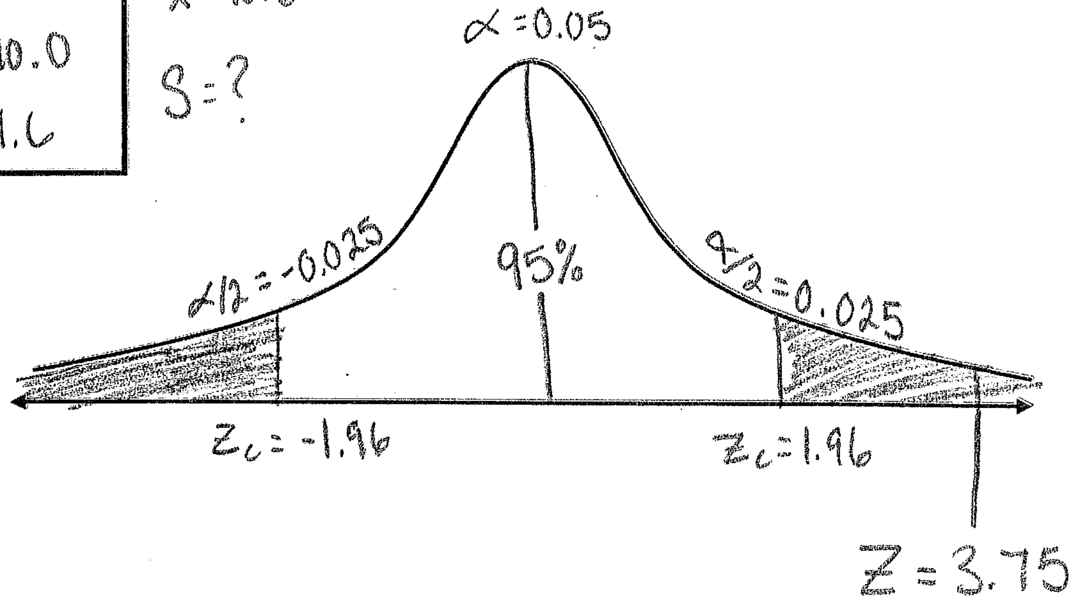
$\text{tcdf}(-9999, -1.46, 39) = 0.076 > \alpha$

e) We <u>fail to reject</u> H_0, there <u>is not</u> enough evidence to support it.

16. A random sample of 100 babies is obtained, and the mean head circumference is found to be 40.6 cm. Assuming that the population standard deviation is known to be 1.6 cm, use a 0.05 significance level to test the claim that the mean head circumference of all two-month-old babies is equal to 40.0 cm.

$\boxed{\begin{array}{l} N = ? \\ \mu = 40.0 \\ \sigma = 1.6 \end{array}}$

$n = 100$
$\bar{x} = 40.6$
$s = ?$



a) State the null and alternative hypothesis.

$H_0 = \mu = 40$

$H_A = \mu \neq 40$

b) Calculate the critical value.

invNorm(0.025, 0, 1) = $\boxed{\pm 1.96}$

c) Calculate the test statistic.

$$Z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}} = \frac{40.6 - 40}{1.6 / \sqrt{100}} = \boxed{3.75}$$

d) Calculate the p–value and compare it with the significance level.

normalcdf(3.75, 9999, 0, 1) = $\boxed{8.844459038 \text{E}^{-5} < \alpha}$

e) We ___reject___ H_0, there ___is___ enough evidence to support it.

Significance level = 0.05

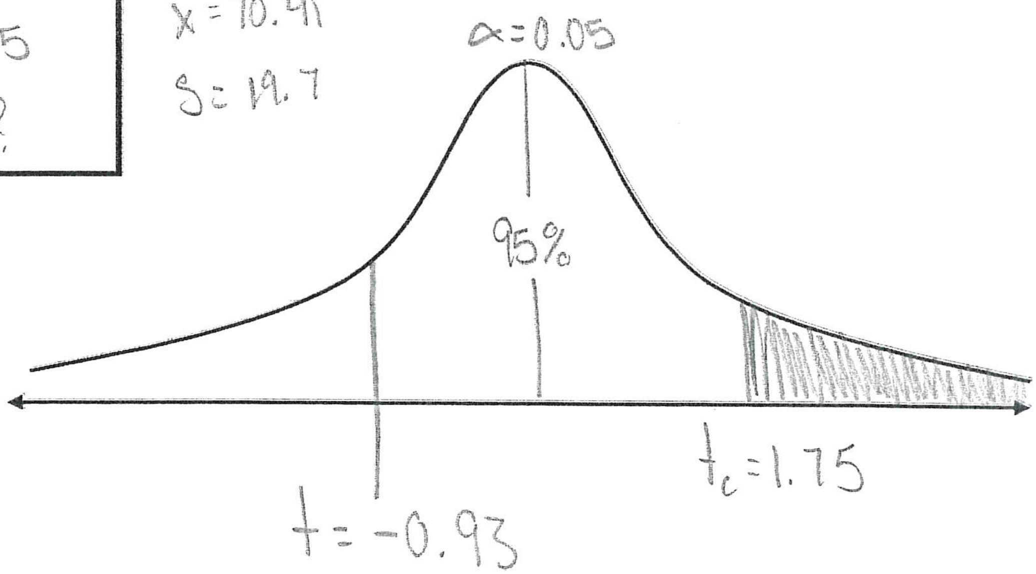
17. A random sample of 16 new textbooks in the college bookstore is chosen and it is found that they had prices with a mean of \$70.41 and a standard deviation of \$19.70. Is there sufficient evidence to warrant rejection of a claim in the college catalog that the mean price of a textbook at this college is less than \$75? Assume the population is normally distributed.

$\boxed{N = ?,\ \mu = 75,\ \sigma = ?}$

$n = 16$

$\bar{x} = 70.41$

$s = 19.7$



a) State the null and alternative hypothesis.

$H_0 = \mu < 75$

$H_A = \mu \geq 75$

b) Calculate the critical value.

$\text{invT}(.95, 15) = \boxed{1.75}$

c) Calculate the test statistic.

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{70.41 - 75}{19.7/\sqrt{16}} = \boxed{-0.93}$$

d) Calculate the $p-$value and compare it with the significance level.

$\text{tcdf}(-0.93, 9999, 15) = 0.82 > \alpha$

e) We fail to reject H_0, there is not enough evidence to support it.

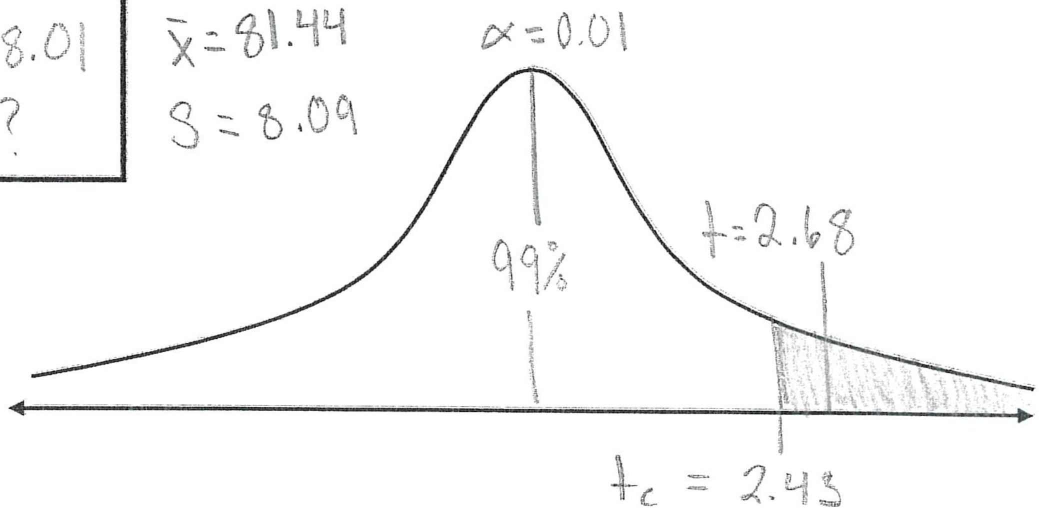
18. The R. R. Bowker Company collects information on the retail prices of books and publishes its findings in *The Bowker Annual Library and Book Trade Almanac.* In 2005, the mean retail price of all history books was \$78.01. This year's retail prices for 40 randomly selected history books are shown below.

82.55	72.80	73.89	80.54	80.26	74.43	81.37	82.28	77.55	88.25
73.58	89.23	74.35	77.44	78.91	77.50	77.83	77.49	87.25	98.93
74.25	82.71	78.88	78.25	80.35	77.45	90.29	79.42	67.63	91.48
83.99	80.64	101.92	83.03	95.59	69.26	80.31	98.72	87.81	69.20

At the 1% significance level, do the data provide sufficient evidence to conclude that this year's mean retail price of all history books has increased from the 2005 mean of \$78.01?

$N = ?$
$\mu = 78.01$
$\sigma = ?$

$n = 40$
$\bar{x} = 81.44$
$s = 8.09$



a) State the null and alternative hypothesis.

$H_0 = \mu \leq 78.01$

$H_A = \mu > 78.01$

b) Calculate the critical value.

$\text{invT}(.99, 39) = \boxed{2.43}$

c) Calculate the test statistic.

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{81.44 - 78.01}{8.09/\sqrt{40}} = \boxed{2.68}$$

d) Calculate the $p-$value and compare it with the significance level.

$\text{tcdf}(2.68, 9999, 39) = \boxed{.005 < \alpha}$

e) We ___reject___ H_0, there ___is___ enough evidence to support it.

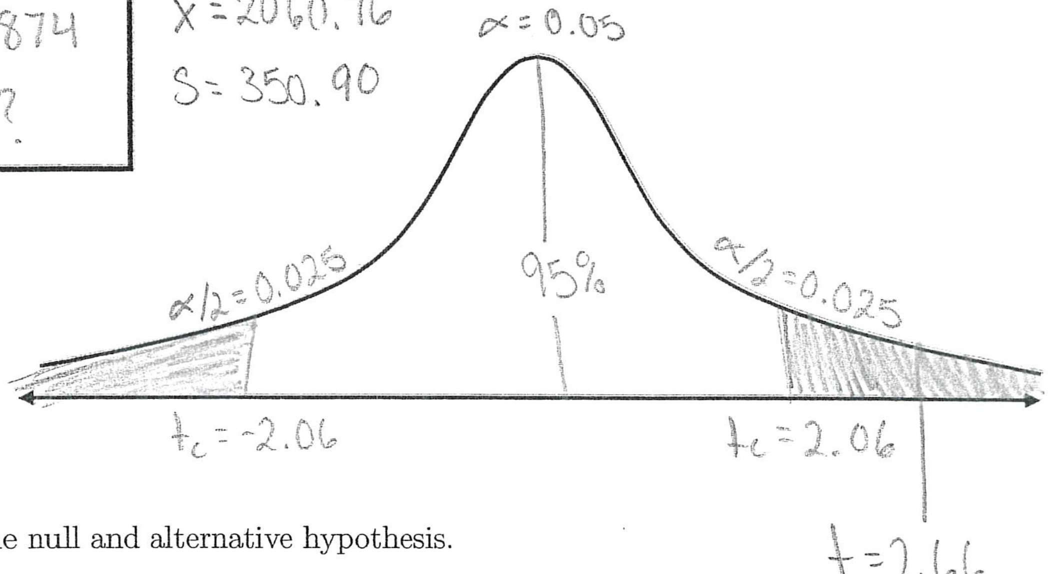
19. According to the document *Consumer Expenditures*, a publication of the Bureau of Labor Statistics, the average consumer unit spent \$1874 on apparel and services in 2006. That same year, 25 consumer units in the Northeast had the following annual expenditures, in dollars, on apparel and services.

1417	1595	2158	1820	1411	2361	2371	2330	1749	1872
2826	2167	2304	1998	2582	1982	1903	2405	1660	2150
2128	1889	2251	2340	1850					

At the 5% significance level, do the data provide sufficient evidence to conclude that the 2006 mean annual expenditure on apparel and services for consumer units in the Northeast differed from the national mean of \$1874? Assume the population is normally distributed.

$N = ?$
$\mu = 1874$
$\sigma = ?$

$n = 25$
$\bar{x} = 2060.76$
$S = 350.90$



a) State the null and alternative hypothesis.

$H_0 = \mu = 1874$

$H_A = \mu \neq 1874$

b) Calculate the critical value.

$\text{invT}(0.025, 24) = \boxed{\pm 2.06}$

c) Calculate the test statistic.

$$t = \frac{\bar{x} - x}{S/\sqrt{n}} = \frac{2060.76 - 1874}{350.90/\sqrt{25}} = \boxed{2.66}$$

d) Calculate the p–value and compare it with the significance level.

$\text{tcdf}(2.66, 9999, 24) = \boxed{.007 < \alpha}$

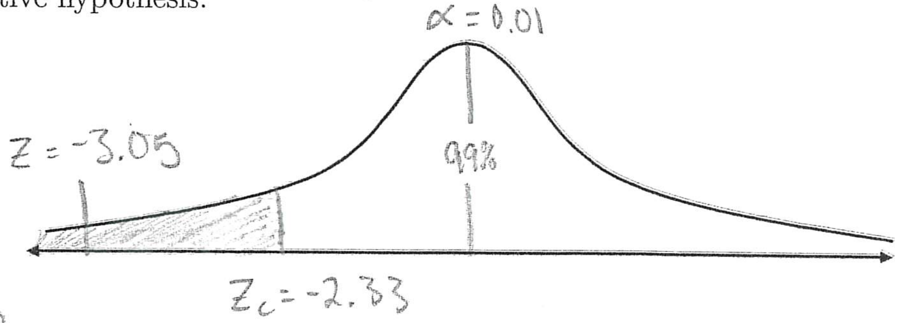
e) We reject H_0, there is enough evidence to support it.

20. Approximately 450,000 vasectomies are performed each year in the United States. In this surgical procedure for contraception, the tube carrying sperm from the testicles is cut and tied. Several studies have been conducted to analyze the relationship between vasectomies and prostate cancer. The results of one such study by E. Giovannucci et al. appeared in the paper "A Retrospective Cohort Study of Vasectomy and Prostate Cancer in U.S. Men" (*Journal of the American Medical Association*, Vol. 269(7), pp. 878–882). Of 21,300 men who had not had a vasectomy, 69 were found to have prostate cancer; of 22,000 men who had had a vasectomy, 113 were found to have prostate cancer. At the 1% significance level, do the data provide sufficient evidence to conclude that men who have had a vasectomy are at greater risk of having prostate cancer? $\hat{p}_1 = \frac{69}{21300}$ $\hat{p}_2 = \frac{113}{22000}$ $\bar{p} = \frac{69+113}{21300+22000}$

a) State the null and alternative hypothesis.

$H_0 : P_1 \geq P_2$

$H_A : P_1 < P_2$



b) Critical value= -2.33

c) Test statistic $Z = -3.05$

d) p–value .001 < α

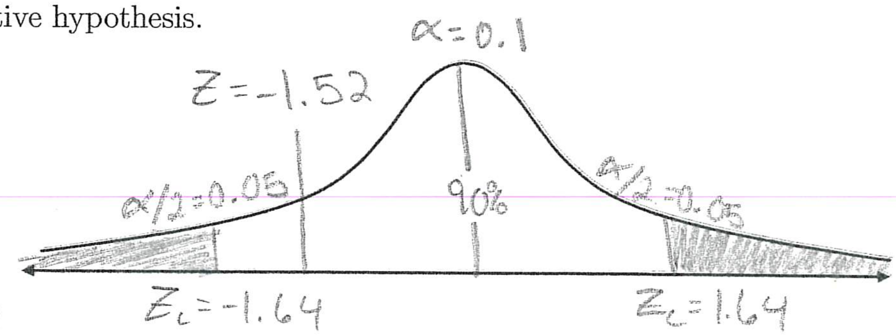
We reject H_0, there is enough evidence to support it.

21. *Response Insurance* collects data on seatbelt use among U.S. drivers. Of 1000 drivers 25–34 years old, 27% said that they buckle up, whereas 330 of 1100 drivers 45–64 years old said that they did. At the 10% significance level, do the data suggest that there is a difference in seat-belt use between drivers 25–34 years old and those 45–64 years old?

a) State the null and alternative hypothesis.

$H_0 = P_1 = P_2$

$H_A = P_1 \neq P_2$



b) Critical value= ±1.64

c) Test statistic $Z = -1.52$

d) p–value .94 > α

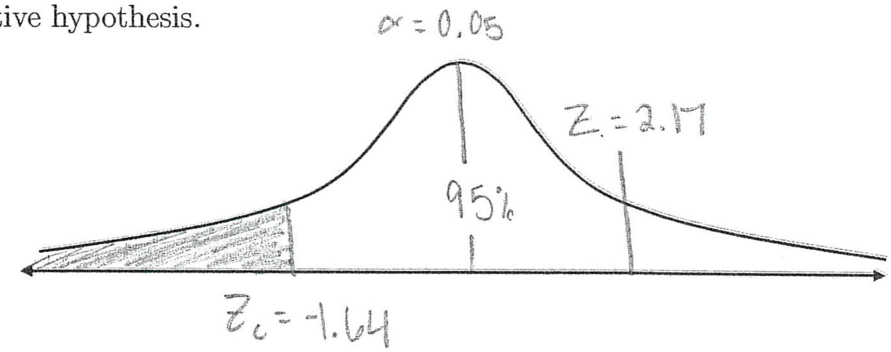
We fail to reject H_0, there is not enough evidence to support it.

22. A survey of 436 workers showed that 192 of them said that it was seriously unethical to monitor employee e-mail. When 121 senior-level bosses were surveyed, 40 said that it was seriously unethical to monitor employee e-mail (based on data from a Gallup poll). Use a 0.05 significance level to test the claim that for those saying that monitoring e-mail is seriously unethical, the proportion of employees is greater than the proportion of bosses.

a) State the null and alternative hypothesis.

$H_0 = P_1 \geq P_2$

$H_A = P_1 \leq P_2$



b) Critical value= -1.64

c) Test statistic 2.17

d) $p-$value .98 > α

We fail to reject H_0, there is not enough evidence to support it.

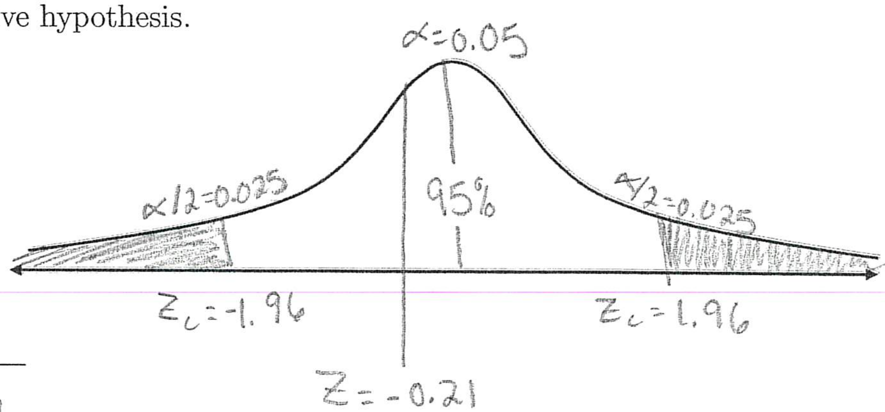
23. In the 2000 football season, 247 plays were reviewed by officials using instant video replays, and 83 of them resulted in reversal of the original call. In the 2001 football season, 258 plays were reviewed and 89 of them were reversed (based on data from "Referees Turn to Video Aid More Often" by Richard Sandomir, *New York Times*). Is there a significant difference in the two reversal rates? Does it appear that the reversal rate was the same in both years?

* Significance level is 0.05

a) State the null and alternative hypothesis.

$H_0 : P_1 = P_2$

$H_A : P_1 \neq P_2$



b) Critical value= ±1.96

c) Test statistic Z = -0.21

d) $p-$value .42 > α

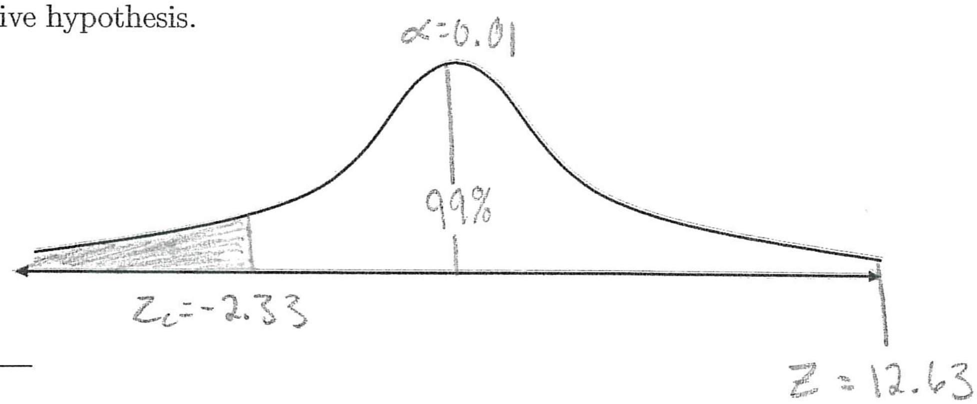
We fail to reject H_0, there is not enough evidence to support it.

24. In a study of red green color blindness, 500 men and 2100 women are randomly selected and tested. Among the men, 45 have red green color blindness. Among the women, 6 have red green color blindness (based on data from USA Today). Is there sufficient evidence to support the claim that men have a higher rate of red green color blindness than women? Use a 0.01 significance level.

a) State the null and alternative hypothesis.

$H_0 = P_1 > P_2$

$H_A = P_1 \leq P_2$



b) Critical value= -2.33

c) Test statistic $Z=12.63$

d) $p-$value $1>\alpha$

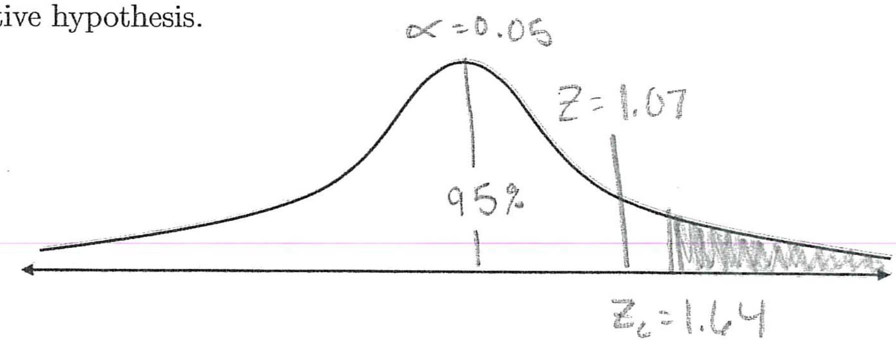
We fail to reject H_0, there is not enough evidence to support it.

25. A study was made of 413 children who were hospitalized as a result of motor vehicle crashes. Among 290 children who were not using seat belts, 50 were injured severely. Among 123 children using seat belts, 16 were injured severely (based on data from "Morbidity Among Pediatric Motor Vehicle Crash Victims: The Effectiveness of Seat Belts," by Osberg and Di Scala, *American Journal of Public Health*, Vol. 82, No. 3). Is there sufficient sample evidence to conclude, at the 0.05 significance level, that the rate of severe injuries is lower for children wearing seat belts?

a) State the null and alternative hypothesis.

$H_0 : P_1 \leq P_2$

$H_A : P_1 > P_2$



b) Critical value= 1.64

c) Test statistic 1.07

d) $p-$value $.14>\alpha$

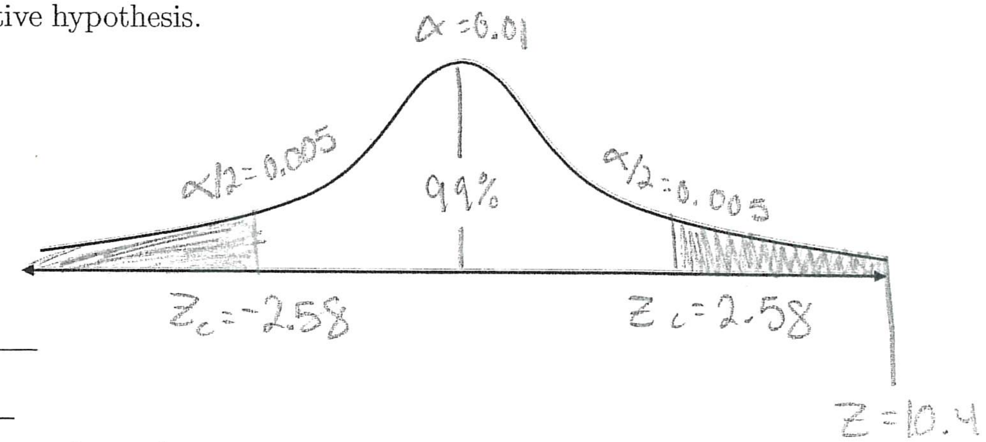
We fail to reject H_0, there is not enough evidence to support it.

26. In a recent year, Southwest Airlines had 3,131,727 aircraft seats available on all of its flights, and 2,181,604 of them were occupied by passengers. America West had 2,091,859 seats available, and 1,448,255 of them were occupied. The percentage of seats occupied is called the *load factor*, so these results show that the load factor is 69.7% (rounded) for Southwest Airlines and 69.2% (rounded) for America West. (The data are from the U.S. Department of Transportation.) Answer the following by assuming that the results are from randomly selected samples. Test the claim that both airlines have the same load factor at the 0.01 significance level.

a) State the null and alternative hypothesis.

$H_0: P_1 = P_2$

$H_A: P_1 \neq P_2$



b) Critical value= ±2.58

c) Test statistic 10.42

d) $p-$value 1.02687215 E-25 < α

We reject H_0, there is enough evidence to support it.

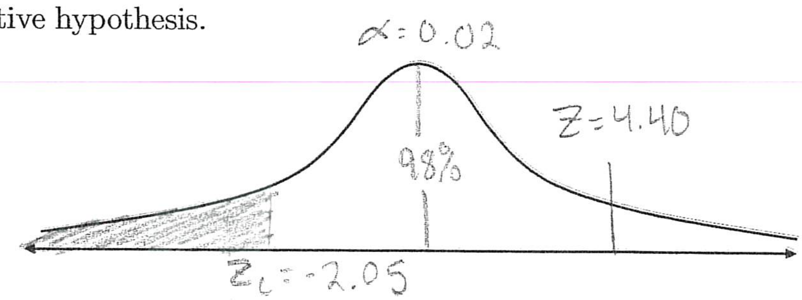
27. The table below displays the average hourly wages at day-care centers in the Northeast and Southeast, based on two random samples. Test the hypothesis that the average hourly wage in the Northeast is higher than the average hourly wage in the Southeast at the $\alpha = 0.02$ significance level.

	Northeast	Southeast
Sample mean	\$9.60	\$8.40
Sample size	52	38
Population Standard deviation	\$1.25	\$1.30

a) State the null and alternative hypothesis.

$H_0 = \mu_1 > \mu_2$

$H_A = \mu_1 \leq \mu_2$



b) Critical value= -2.05 c) Test statistic= Z = 4.40 d) $p-$value= 1 > α

We fail to reject H_0, there is not enough evidence to support it.

28. The table below displays the average bill per customer at a restaurant when different types of background music were played. The managers would like to determine the impact music has on the size of the bill. Assume the population is normally distributed. Test the hypothesis that the average bill of customers exposed to fast music is different from the average bill of customers exposed to slow music at the $\alpha = 0.10$ significance level.

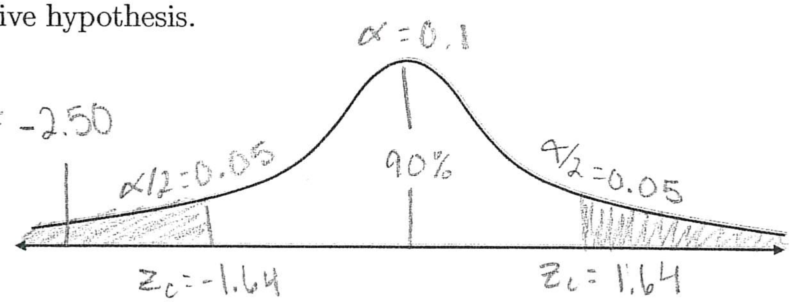
	Fast Music	Slow Music
Sample mean	\$39.65	\$42.60
Sample size	34	37
Population Standard deviation	\$4.21	\$5.67

a) State the null and alternative hypothesis.

$H_0 = \mu_1 = \mu_2$

$H_A = \mu_1 \neq \mu_2$

$Z = -2.50$



b) Critical value= ± 1.64 c) Test statistic= -2.50 d) p–value= $.006 < \alpha$

We reject H_0, there is enough evidence to support it.

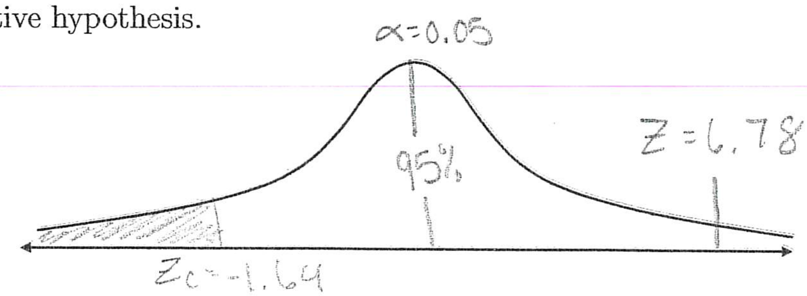
29. The table below displays the average number of minutes of battery life per charge for nickel-metal hydride (NiMH) batteries and lithium-ion (Li-ion) batteries, based on two random samples. Assume the population is normally distributed. Test the hypothesis that the average bill of customers exposed to fast music is different from the average bill of customers exposed to slow music at the $\alpha = 0.05$ significance level.

	Li-ion (1)	NiMH (2)
Sample mean	90.5	68.4
Sample size	45	41
Population Standard deviation	16.2	14.0

a) State the null and alternative hypothesis.

$H_0 : \mu_1 > \mu_2$

$H_A : \mu_1 \leq \mu_2$



b) Critical value= -1.64 c) Test statistic= $Z = 6.78$ d) p–value= $1 > \alpha$

We fail to reject H_0, there is not enough evidence to support it.

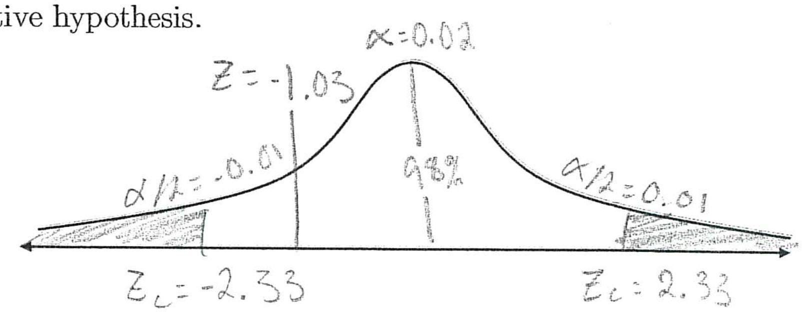
30. The table below displays the average ages of men and women at a retirement community based on two random samples. Assume that population age is normally distributed. An employee claims that the average ages of men and women in the community are not equal. Test the claim at the $\alpha = 0.02$ significance level.

	Men	**Women**
Sample mean	84.6	87.1
Sample size	17	14
Population Standard deviation	6.0	7.3

a) State the null and alternative hypothesis.

$H_0 = \mu_1 = \mu_2$

$H_A = \mu_1 \neq \mu_2$



b) Critical value= ± 2.33 c) Test statistic= -1.03 d) p−value= $.15 > \alpha$

We fail to reject H_0, there is not enough evidence to support it.

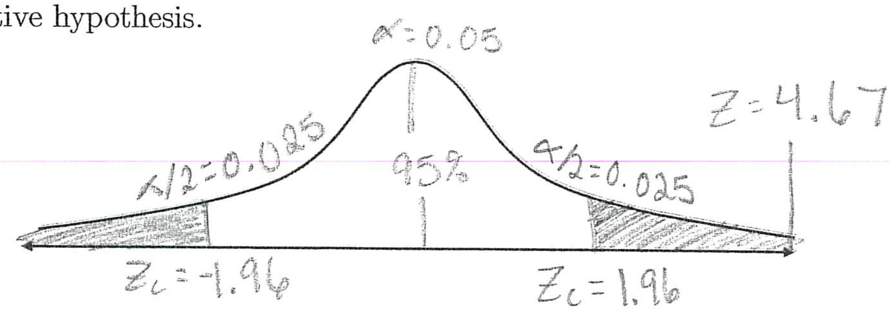
31. The table below displays the average number of words a random sample of five-year-old girls and boys were able to recognize. Assume the populations from which the samples are taken are normally distributed. Is there a statistically significant difference between the average number of words recognized by five-year-old girls and five-year-old boys when $\alpha = 0.05$?

	Girls	**Boys**
Sample mean	26.6	20.1
Sample size	35	37
Population Standard deviation	7.3	3.9

a) State the null and alternative hypothesis.

$H_0: \mu_1 = \mu_2$

$H_A: \mu_1 \neq \mu_2$



b) Critical value= ± 1.96 c) Test statistic= 4.67 d) p−value= 1.507687698E-6<

We reject H_0, there is enough evidence to support it.

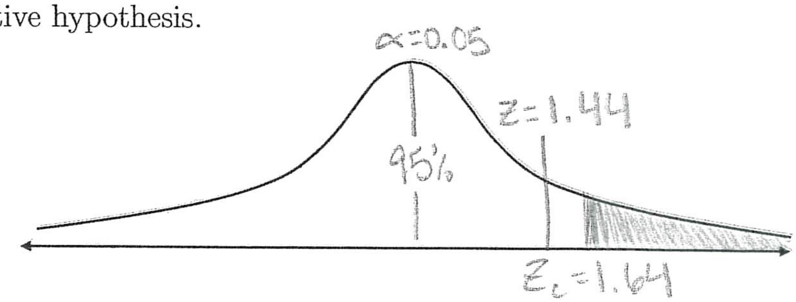
32. The table below displays the results of a taste test between competing soda brands *Coca Cola* and Pepsi. Two independent random samples were selected and the respondents rated the colas on a scale of 1 to 10. Test the hypothesis that *Coca Cola* is preferred over *Pepsi* at the $\alpha = 0.05$ significance level.

	Coca Cola	**Pepsi**
Sample mean	7.92	7.22
Sample size	38	45
Population Standard deviation	2.7	1.4

a) State the null and alternative hypothesis.

$H_0 = \mu_1 \le \mu_2$

$H_A = \mu_1 > \mu_2$



b) Critical value= 1.64 c) Test statistic= 1.44 d) p–value= .075 $> \alpha$

We fail to reject H_0, there is not enough evidence to support it.

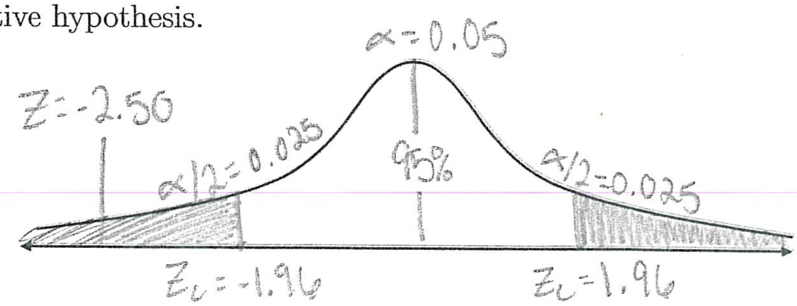
33. The table below displays the average systolic blood pressure (in mmHg) of men ages 20–30 and 40–50, based on two random samples. Test the claim that the age groups have a different average systolic blood pressure at the $\alpha = 0.05$ significance level.

	~~**Girls**~~ 20-30	~~**Boys**~~ 40-50
Sample mean	~~26.6~~ 128.1	~~20.1~~ 133.5
Sample size	~~35~~ 60	~~37~~ 52
Population Standard deviation	~~7.3~~ 10.7	~~3.9~~ 12.0

a) State the null and alternative hypothesis.

$H_0: \mu_1 = \mu_2$

$H_A: \mu_1 \ne \mu_2$



b) Critical value= ± 1.96 c) Test statistic= -2.50 d) p–value= .006 $< \alpha$

We reject H_0, there is enough evidence to support it.

34.

x	8	15	26	31	56
y	23	41	53	72	103

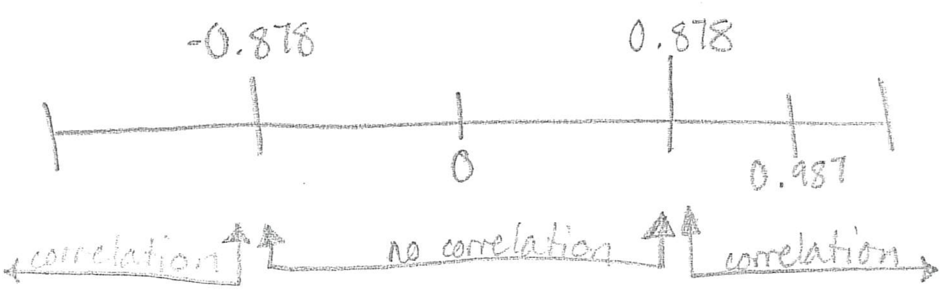
$\boxed{n=5}$ $\boxed{\text{critical values: } \pm 0.878}$

(a) Use your calculator and find the following

$a =$ 13.800, $b =$ 1.640, $r =$ 0.987

$y = a + bx =$ 13.800 + 1.640x

(b) Let the significance level be $\alpha = 0.05$, is there a significant correlation between these variables?



$\boxed{\text{There is a significant correlation}}$

35.

x	5	6	10	12	15	16
y	6	15	17	22	24	35

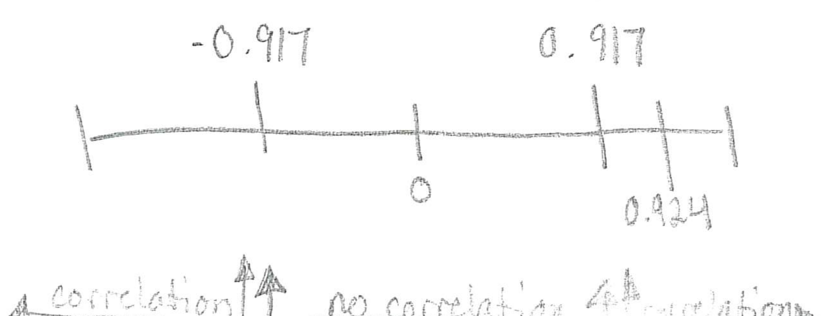
$\boxed{n=6}$ $\boxed{\text{critical values} = \pm 0.9}$

(a) Use your calculator and find the following

$a =$ -1.294, $b =$ 1.981, $r =$ 0.924

$y = a + bx =$ -1.294 + 1.981x

(b) Let the significance level be $\alpha = 0.01$, is there a significant correlation between these variables?



$\boxed{\text{there is a significant correlation}}$

36.

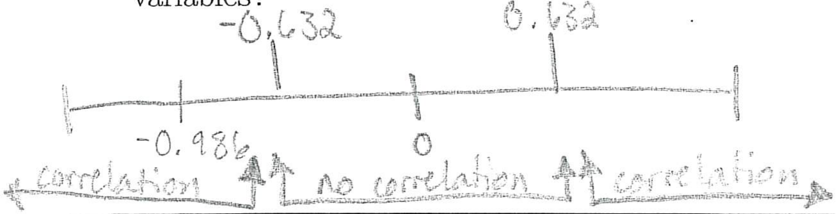
x	4	5	6	7	8	9	10	11	12	13
y	44.8	43.1	38.8	39	38	32.7	30.1	29.3	27	25.8

(a) Use your calculator and find the following

$a =$ 53.570, $b =$ -2.201, $r =$ -0.986 $\boxed{n=10}$

$y = a + bx =$ 53.570 + (-2.201)x $\boxed{\text{Critical values: } \pm 0.632}$

(b) Let the significance level be $\alpha = 0.05$, is there a significant correlation between these variables?



$\boxed{\text{there is a significant correlation}}$

37.

x	3	4	5	6	7	8	9	10	11	12
y	21.90	22.22	22.74	22.26	20.78	17.60	16.52	18.54	15.76	13.68
x	13	14	15	16	17	18				
y	21.90	22.22	22.74	22.26	20.78	17.60				

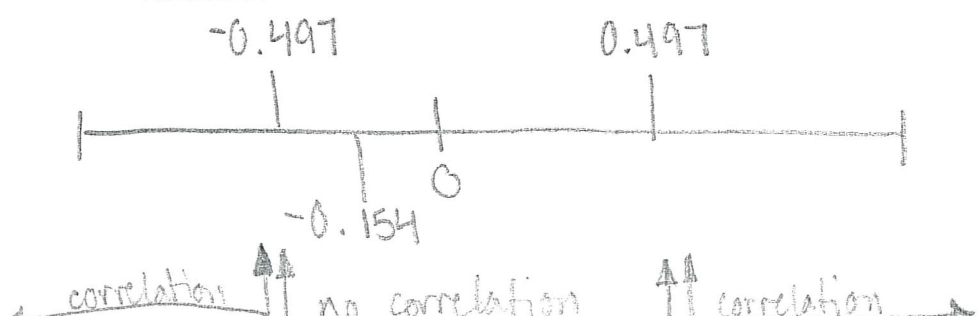
(a) Use your calculator and find the following

$a =$ 20.955, $b =$ -0.094, $r =$ -0.154 $\boxed{n=16}$

$\boxed{\text{Critical values: } \pm 0.497}$

$y = a + bx =$ 20.955 + (-0.094)x

(b) Let the significance level be $\alpha = 0.05$, is there a significant correlation between these variables?



$\boxed{\text{there is not a significant correlation}}$

38. (***Supermodel Heights and Weights***) Listed below are heights (in inches) and weights (in pounds) for supermodels Niki Taylor, Nadia Avermann, Claudia Schiffer, Elle MacPherson, Christy Turlington, Bridget Hall, Kate Moss, Valerie Mazza, and Kristy Hume.

Height (inches)	71	70.5	71	72	70	70	66.5	70	71
Weight (pounds)	125	119	128	128	119	127	105	123	115

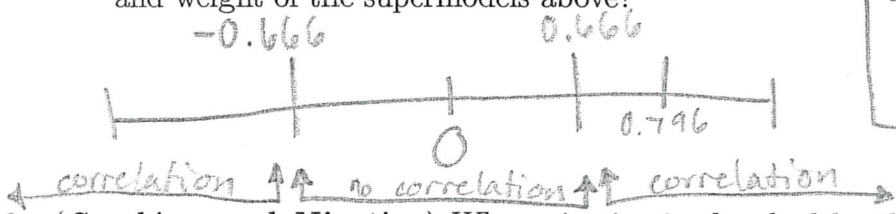
$\boxed{n=9}$ $\boxed{\text{Critical values: } \pm 0.666}$

(a) Use your calculator and find the following

$a =$ -151.700, $b =$ 3.883, $r =$ 0.796

$y = a + bx =$ -151.700 + 3.883x

(b) Let the significance level be $\alpha = 0.05$, is there a significant correlation between height and weight of the supermodels above?



There is a significant correlation

39. (***Smoking and Nicotine***) When nicotine is absorbed by the body, cotinine is produced. A measurement of cotinine in the body is therefore a good indicator of how much a person smokes. Listed below are the reported numbers of cigarettes smoked per day and the measured amounts of nicotine (in ng/mL). (The values are from randomly selected subjects in the National Health Examination Survey.)

x (cigarettes per day)	60	10	4	15	10	1	20	8	7	10	10	20
y (Cotinine)	179	283	75.6	174	209	9.51	350	1.85	43.4	25.1	408	344

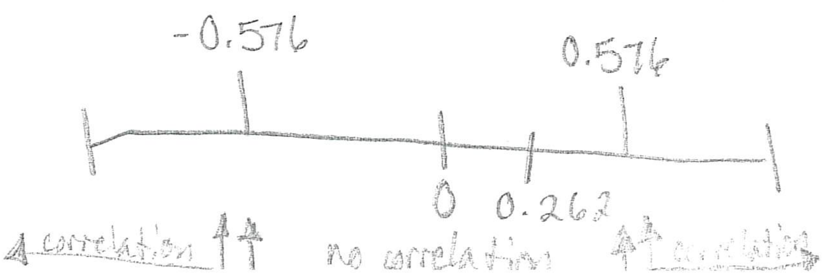
$\boxed{n=12}$

(a) Use your calculator and find the following

$a =$ 139.064, $b =$ 2.478, $r =$ 0.262 $\boxed{\text{Critical values: } \pm 0.576}$

$y = a + bx =$ 139.064 + 2.478x

(b) Let the significance level be $\alpha = 0.05$, is there a significant correlation between the number of cigarretes per day smoked and the cotinine levels?



there is not a significant correlation

40. (***Gasoline Consumption***) Gasoline consumption in the United States has been steadily increasing. Consumption data from 1994 to 2004 is shown in the table below.

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Consumption	113	116	118	119	123	125	126	128	131	133	136

(a) Use your calculator and find the following

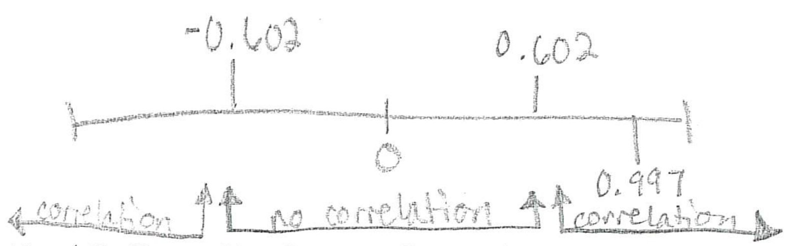
$\boxed{n = 11}$

$a =$ -4291.609, $b =$ 2.209, $r =$ 0.997

$y = a + bx =$ -4291.609 + 2.209x

$\boxed{\text{critical values: } \pm 0.602}$

(b) Let the significance level be $\alpha = 0.05$, is there a significant correlation between these variables?



$\boxed{\text{there is a significant correlation}}$

41. (***College Graduates Census***) The U.S. Census tracks the percentage of persons 25 years or older who are college graduates. That data for several years is given in the table below.

Year	1990	1992	1994	1996	1998	2000	2002	2004	2006	2008
Percent Graduates	21.3	21.4	22.2	23.6	24.4	25.6	26.7	27.7	28	29.4

(a) Use your calculator and find the following

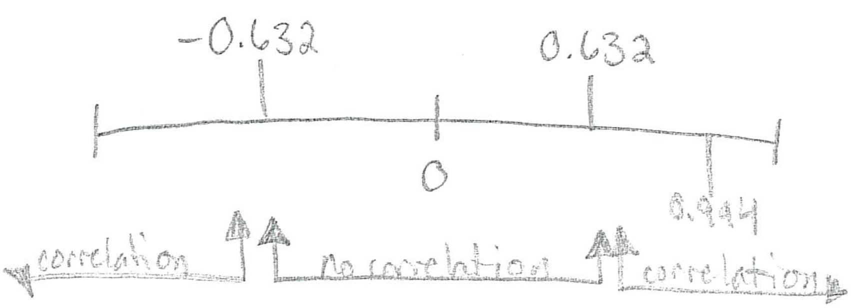
$\boxed{n = 10}$

$a =$ -926.615, $b =$ 0.476, $r =$ 0.994

$y = a + bx =$ -926.615 + 0.476x

$\boxed{\text{critical values: } \pm 0.632}$

(b) Let the significance level be $\alpha = 0.05$, is there a significant correlation between these variables?



$\boxed{\text{there is a significant correlation}}$

42. Quarters are currently minted with weights having a mean of 5.376 and a standard deviation of 0.067. New equipment is being tested in an attempt to improve quality by reducing variation. A simple random sample of 25 quarters is obtained from those manufactured with the new equipment, and this sample has a standard deviation of 0.042. Use a 0.025 significance level to test the claim that quarters manufactured with the new equipment have weights with a standard deviation less than 0.067.

a) $n =$ 25 $s =$ 0.042 $\sigma =$ 0.067

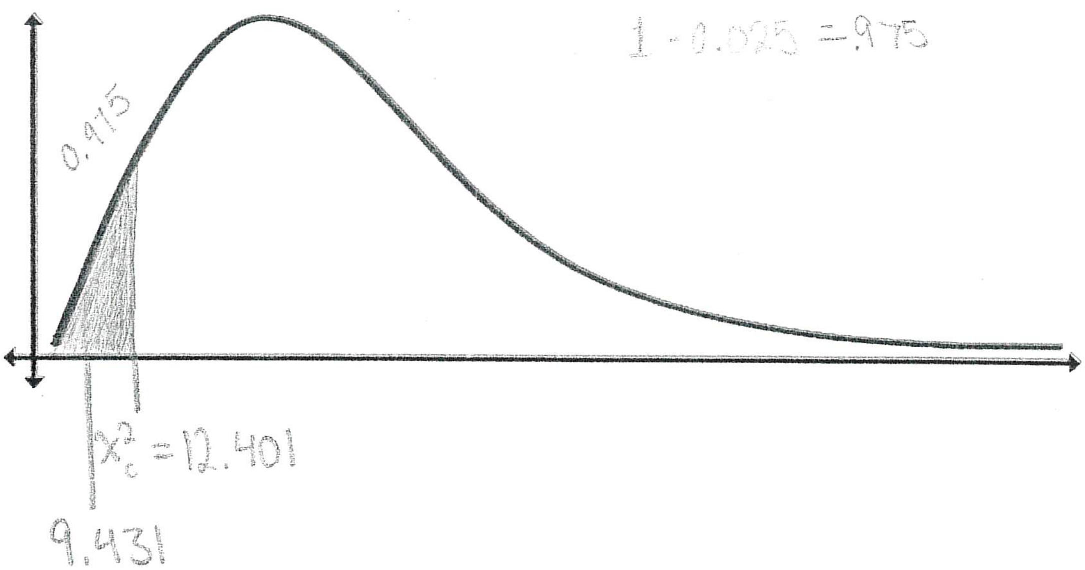
b) State the null and alternative hypothesis.

$H_0 = \sigma \geq 0.067$

$H_A = \sigma < 0.067$

c) Use the table A-4 to find the critical value χ^2_c. df = 25 - 1 = 24

1 - 0.025 = .975



d) Calculate the test statistic and compare with χ^2_c.

$$\chi^2 = \frac{(n-1)s^2}{\sigma^2} = \frac{(24)(0.042)^2}{(0.067)^2} = \boxed{9.431}$$

e) We reject H_0, there is enough evidence to support it.

43. Use a 0.01 significance level to test the claim that peanut MM candies have weights that vary more than the weights of plain MM candies. The standard deviation for the weights of plain MM candies is 0.04 g. A sample of 41 peanut MMs has weights with a standard deviation of 0.31 g. ~~Why should peanut MM candies have weights that vary more than the weights of plain MM candies?~~

a) $n =$ 41 $s =$ 0.31 $\sigma =$ 0.04

b) State the null and alternative hypothesis.

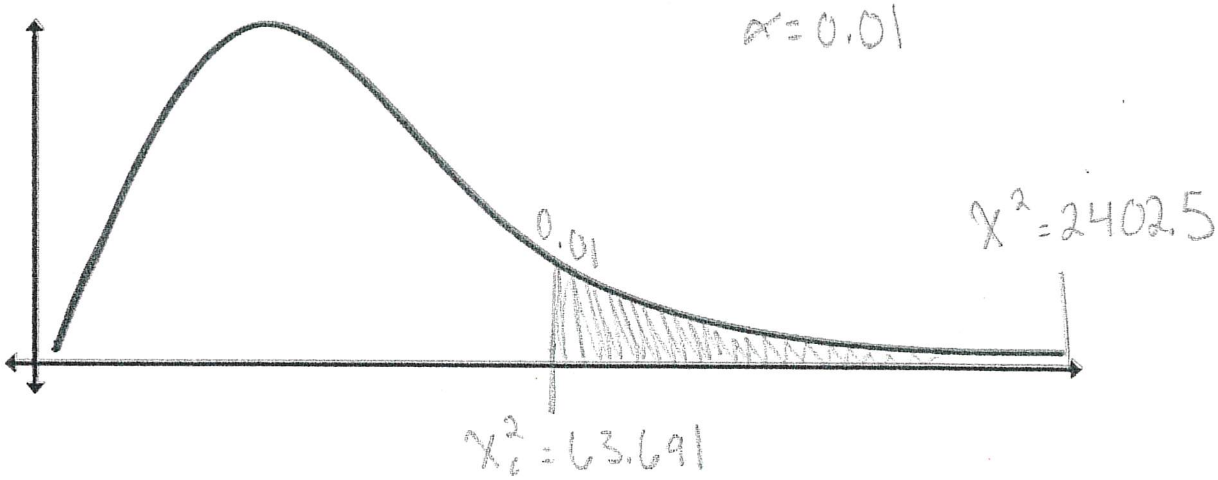
$H_0: \sigma \le 0.04$

$H_A: \sigma > 0.04$

c) Use the table A-4 to find the critical value χ^2_c.

$df = 41 - 1 = 40$

$\alpha = 0.01$



d) Calculate the test statistic and compare with χ^2_c.

$$\chi^2 = \frac{(n-1)s^2}{\sigma^2} = \frac{(40)(0.31)^2}{(0.04)^2} = \boxed{2402.5}$$

e) We reject H_0, there is enough evidence to support it.

44. When designing a piston to be used for a pump for transferring liquid solutions, engineers specified a mean of 0.1 in. as the target for the piston radius. The maximum standard deviation is specified as 0.0005 in. (based on data from Taylor Industries). When 12 pistons are randomly selected from the production line and measured, their radii have a standard deviation of 0.00047 in. Is there sufficient evidence to support the claim that the pistons are being manufactured with radii that have a standard deviation less than the specified maximum of 0.0005 in.? Use a 0.05 significance level.

a) $n =$ 12 $s =$ 0.00047 $\sigma =$ 0.0005

b) State the null and alternative hypothesis.

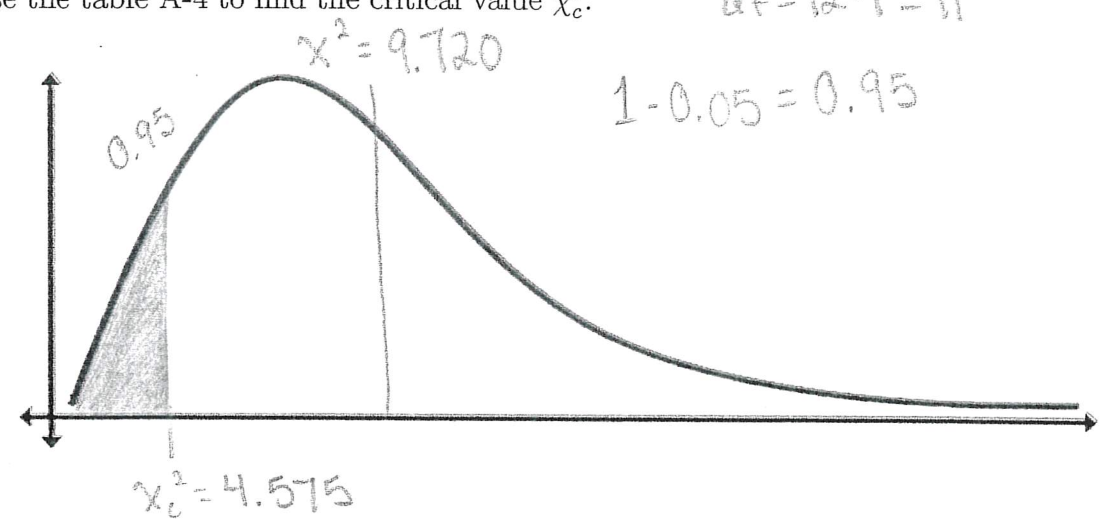
$H_0 = \sigma \geq 0.0005$

$H_A : \sigma < 0.0005$

c) Use the table A-4 to find the critical value χ^2_c.

$df = 12 - 1 = 11$

$1 - 0.05 = 0.95$



d) Calculate the test statistic and compare with χ^2_c.

$$x^2 = \frac{(n-1)s^2}{\sigma^2} = \frac{(11)(0.00047)^2}{0.0005^2} = \boxed{9.720}$$

e) We fail to reject H_0, there is not enough evidence to support it.

45. Gas mileage estimates for cars and light-duty trucks are determined and published by the U.S. Environmental Protection Agency (EPA). According to the EPA, "...the mileages obtained by most drivers will be within plus or minus 15 percent of the [EPA] estimates...." The mileage estimate given for one model is 23 mpg on the highway. If the EPA claim is true, the standard deviation of mileages should be about $0.15 \cdot 23/3 = 1.15$ mpg. A random sample of 12 cars of this model yields the following highway mileages,

24.1	23.3	22.5	23.2	22.3	21.1	21.4	23.4	23.5	22.8	24.5	24.3

At the 5% significance level, do the data suggest that the standard deviation of highway mileages for all cars of this model is different from 1.15 mpg?

a) $n =$ 12 $s =$ 1.07 $\sigma =$ 1.15

b) State the null and alternative hypothesis.

$H_0: \sigma = 1.15$

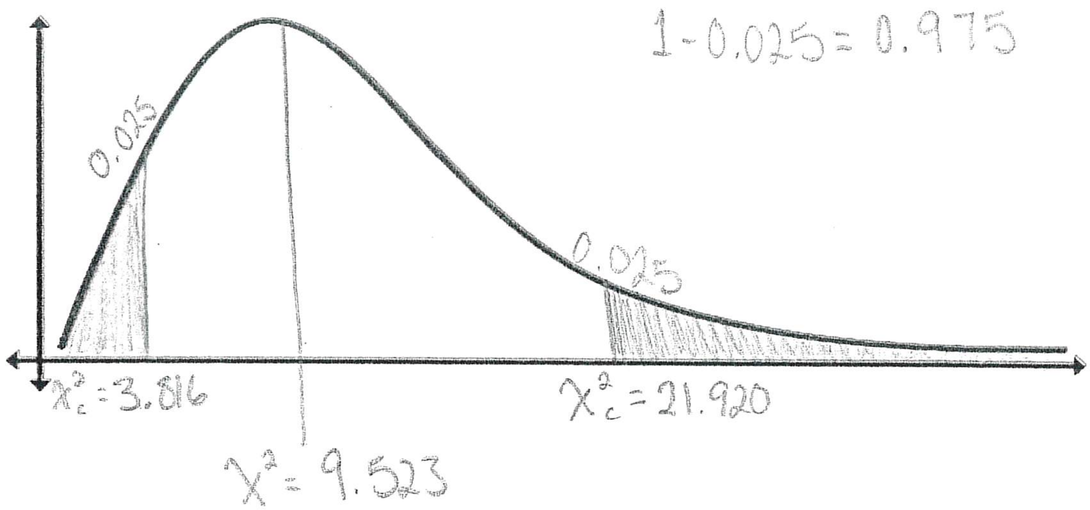
$H_A: \sigma \neq 1.15$

df = 12 − 1 = 11

c) Use the table A-4 to find the critical value χ^2_c.

$\alpha = 0.05$

$1 - 0.025 = 0.975$



d) Calculate the test statistic and compare with χ^2_c.

$$\chi^2 = \frac{(n-1)s^2}{\sigma^2} = \frac{(11)(1.07)^2}{(1.15)^2} = \boxed{9.523}$$

e) We fail to reject H_0, there is not enough evidence to support it.

46. R. Morris and E. Watson studied various aspects of process capability in the paper "Determining Process Capability in a Chemical Batch Process" (*Quality Engineering*, Vol. 10(2), pp. 389–396). In one part of the study, the researchers compared the variability in product of a particular piece of equipment to a known analytic capability to decide whether product consistency could be improved. The following data were obtained for 10 batches of product.

30.1	30.7	30.2	29.3	31.0	29.6	30.4	31.2	28.8	29.8

At the 1% significance level, do the data provide sufficient evidence to conclude that the process variation for this piece of equipment exceeds the analytic capability of 0.27?

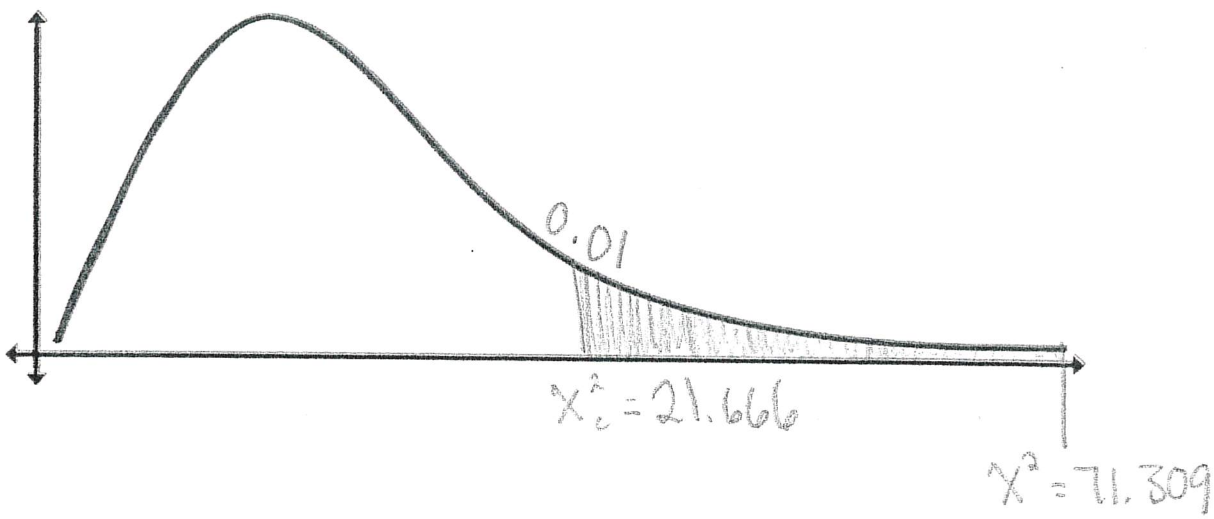
a) $n =$ 10 $s =$ 0.76 $\sigma =$ 0.27

b) State the null and alternative hypothesis.

$H_0: \sigma \leq 0.27$

$H_A: \sigma > 0.27$ $df = 10 - 1 = 9$

c) Use the table A-4 to find the critical value χ^2_c. $\alpha = 0.01$



d) Calculate the test statistic and compare with χ^2_c.

$$\chi^2 = \frac{(n-1)s^2}{\sigma^2} = \frac{(9)(0.76)^2}{(0.27)^2} = \boxed{71.309}$$

e) We reject H_0, there is enough evidence to support it.

47. An industrial process fills boxes with 18 ounces of cereal. Under normal operating conditions, the standard deviation of the weights of the boxes is 1.1 ounces. A random sample of 30 boxes has a sample standard deviation of 0.81 ounces. Determine whether the standard deviation of the filling process is operating under normal conditions at the $\alpha = 0.10$ significance level.

a) $n =$ 30 $\quad s =$ 0.81 $\quad \sigma =$ 1.1

b) State the null and alternative hypothesis.

$H_0 = \sigma = 1.1$

$H_A = \sigma \neq 1.1$

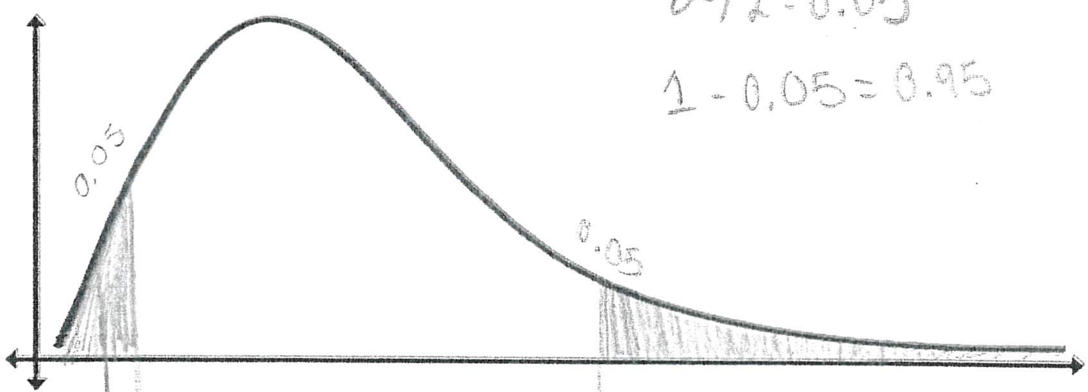
$df = 30-1 = 29$

$\alpha = 0.10$

$\alpha/2 = 0.05$

$1 - 0.05 = 0.95$

c) Use the table A-4 to find the critical value χ^2_c.



$\chi^2_c = 17.708$ $\quad \chi^2_c = 42.557$

$\chi^2 = 15.725$

d) Calculate the test statistic and compare with χ^2_c.

$$\chi^2 = \frac{(n-1)s^2}{\sigma^2} = \frac{(29)(0.81)^2}{(1.1)^2} = \boxed{15.725}$$

e) We reject H_0, there is enough evidence to support it.

48. Homestyle Pizza of Camp Verde, Arizona, provides baking instructions for its premade pizzas. According to the instructions, the average baking time is 12 to 18 minutes. If the times are normally distributed, the standard deviation of the times should be approximately 1 minute. A random sample of 15 pizzas yielded the following baking times to the nearest tenth of a minute.

15.4	15.1	14.0	15.8	16.0	13.7	15.6	11.6	14.8	12.8	17.6	15.1	16.4	13.1	15.3

At the 1% significance level, do the data provide sufficient evidence to conclude that the standard deviation of baking times exceeds 1 minute?

a) $n =$ 15 $s =$ 1.54 $\sigma =$ 1

b) State the null and alternative hypothesis.

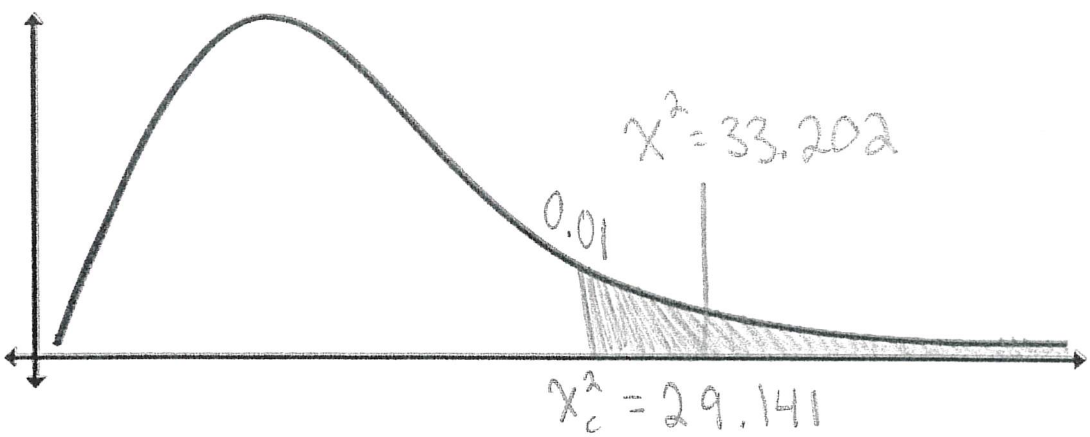
$H_0 = \sigma \leq 1$

$H_A = \sigma > 1$

df = 15 − 1 = 14

c) Use the table A-4 to find the critical value χ^2_c.

$\alpha = 0.01$



d) Calculate the test statistic and compare with χ^2_c.

$$\chi^2 = \frac{(n-1)s^2}{\sigma^2} = \frac{(14)(1.54)^2}{1^2} = 33.202$$

e) We reject H_0, there is enough evidence to support it.

49. The data set below displays the number of voters who are satisfied and unsatisfied with the current economy and their party affiliations.

	Satisfied	Unsatisfied
Democrat	140	172
Republican	135	163
Independent	30	22

Determine whether satisfaction with the economy and the party affiliation of the voter are independent variables at the $\alpha = 0.05$ significance level.

H_0 : Satisfaction with the economy is independent of party affiliation

H_1 : Satisfaction with the economy is not independent of party affiliation

2 = df= (r-1)(c-1) = (3-1)(2-1) $\chi_c^2 =$ 5.991 $\chi^2 =$ 3.078 p–value = 0.215

We fail to reject H_0, there is not enough evidence to support it.

50. The data set below displays the arrival status of 300 flights that originated from New York, Chicago, or Los Angeles airports.

	New York	Chicago	Los Angeles
Early	18	24	22
On time	62	45	50
Late	25	40	14

Determine whether arrival status and flight origin are independent at the $\alpha = 0.10$ significance level.

H_0 : Arrival status is independent of flight origin

H_1 : Arrival status is not independent of flight origin

df= 4 $\chi_c^2 =$ 7.779 $\chi^2 =$ 13.618 p–value = .008

We reject H_0, there is enough evidence to support it.

51. 300 recent graduates were surveyed as to their majors in college and their starting salaries after graduation. Such data is represented in the table below

	Under $50,000	$50,000-$68,999	$69,000 or more
English	5	20	5
Engineering	10	30	60
Nursing	10	15	15
Business	10	20	30
Psychology	20	30	20

Determine whether major and starting salaries are independent variables at the $\alpha = 0.05$ significance level.

H_0 : major is independent of starting salary

H_1 : major is not independent of starting salary

df= 8 $\chi^2_c =$ 15.507 $\chi^2 =$ 33.546 p–value = 4.9096763E-5

We reject H_0, there is enough evidence to support it.

52. Car manufacturers are interested in whether there is a relationship between the size of car an individual drives and the number of people in the driver's family. To test this, suppose that 800 car owners were randomly surveyed with the results in the table below,

	Sub & Compact	Mid-size	Full-size	Van & Truck
Family Size: 1	20	35	40	35
Family Size: 2	20	50	70	80
Family Size: 3-4	20	50	100	90
Family Size: 5+	20	30	70	70

Determine whether car size and family size are independent variables at the $\alpha = 0.05$ significance level.

H_0 : car size is independent of family size

H_1 : car size is not independent of family size

df= 9 $\chi^2_c =$ 16.919 $\chi^2 =$ 15.828 p–value = .071

We fail to reject H_0, there is not enough evidence to support it.

53. A major food manufacturer is concerned that the sales for its skinny french fries have been decreasing. As a part of a feasibility study, the company conducts research into the types of fries sold across the country to determine if the type of fries sold is independent of the area of the country. The results of the study are shown in

	Northeast	South	Central	West
Skinny fries	70	50	20	25
Curly fries	100	60	15	30
Steak fries	20	40	10	10

Conduct a test of independence at the $\alpha = 0.05$ significance level.

H_0 : fry type is independent of the area of the country

H_1 : fry type is not independent of the area of the country

df= 6 $\chi_c^2 =$ 12.592 $\chi^2 =$ 18.837 p−value = .004

We reject H_0, there is enough evidence to support it.

54. An ice cream maker performs a nationwide survey 391 people about favorite flavors of ice cream in different geographic areas of the U.S.. The table below represents the survey results,

	Strawberry	Chocolate	Vanilla	Rocky Road	Mint Chocolate Chip	Pistachio
East	8	31	27	8	15	7
Midwest	10	32	22	11	15	6
West	12	21	22	19	15	8
South	15	28	30	8	15	6

Determine whether geographic location is independent of favorite ice cream flavors at the $\alpha = 0.05$ significance level.

H_0 : Location is independent of favorite ice cream flavor

H_1 : location is not independent of favorite ice cream flavor

df= 15 $\chi_c^2 =$ 24.996 $\chi^2 =$ 14.063 p−value = 0.521

We fail to reject H_0, there is not enough evidence to support it.

55. A video game developer is testing a new game on three different groups. Each group represents a different target market for the game. The developer collects scores from a random sample from each group. The results are shown in the table below,

Group A	Group B	Group C
101	151	101
108	149	109
98	160	198
107	112	186
111	126	160

$K = 3$

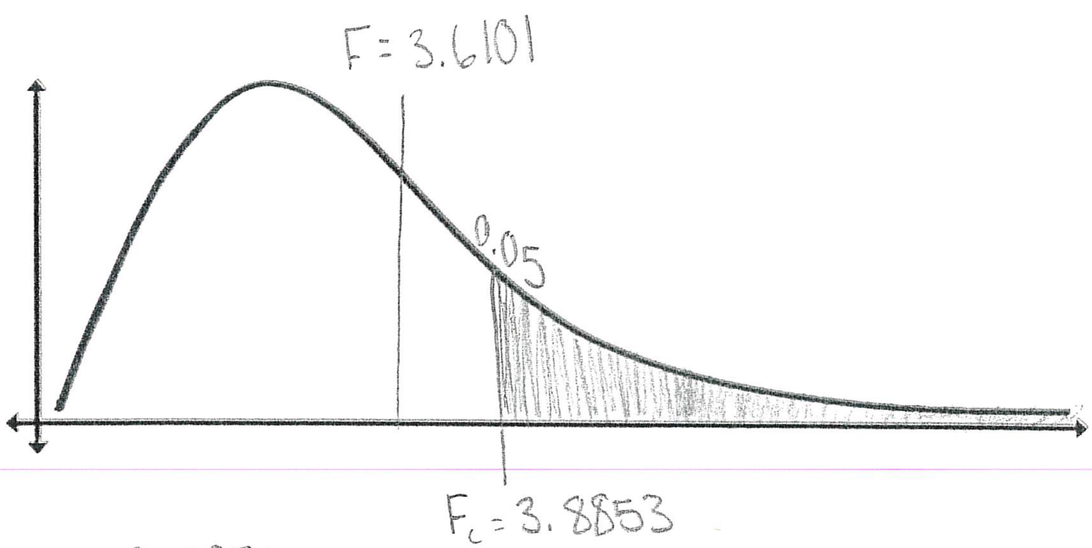
$n_T = 15$

Perform a hypothesis test to determine whether the scores among the different groups are different at the $\alpha = 0.05$ significance level.

H_0 : $\mu_1 = \mu_2 = \mu_3$

H_1 : At least one mean differs from the others

$D_1 =$ $K - 1 = 3 - 1 = \underline{2}$ $D_2 =$ $n_T - K = 15 - 3 = \underline{12}$



F–critical= 3.8853

F–statistic= 3.6101

p–value= .059

We fail to reject H_0, there is not enough evidence to support it.

56. Three students, Linda, Tuan, and Javier, are given five laboratory rats each for a nutritional experiment. Each rat's weight is recorded in grams. Linda feeds her rats Formula A, Tuan feeds his rats Formula B, and Javier feeds his rats Formula C. At the end of a specified time period, each rat is weighed again, and the net gain in grams is recorded.

Linda's rats	Tuan's rats	Javier's rats
43.5	47.0	51.2
39.4	40.5	40.9
41.3	38.9	37.9
46.0	46.3	45.0
38.2	44.2	48.6

$K=3$

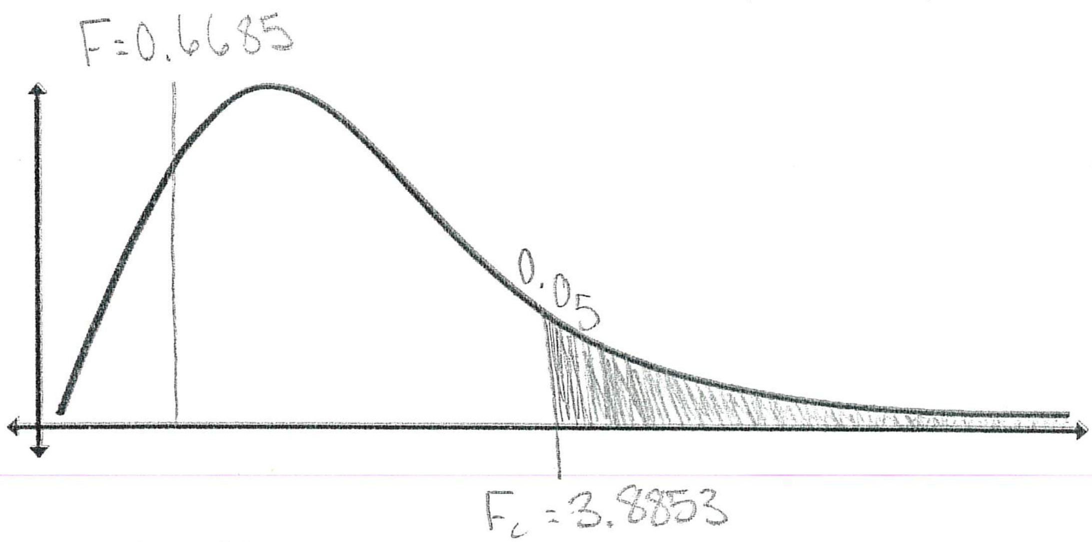
$n_T=15$

Using a significance level of $\alpha = 0.05$, test the hypothesis that the three formulas produce the same mean weight gain.

H_0 : $\mu_1 = \mu_2 = \mu_3$

H_1 : At least one of the means differs from the others

$D_1 =$ $K-1=2$ $\qquad$ $D_2 =$ $n_T - K = 12$



F−critical= 3.8853

F−statistic= 0.6685

p−value= 0.531

We fail to reject H_0, there is not enough evidence to support it.

57. A grassroots group opposed to a proposed increase in the gas tax claimed that the increase would hurt working-class people the most, since they commute the farthest to work. Suppose that the group randomly surveyed 24 individuals and asked them their daily one-way commuting mileage. The results are in the table below,

$K=3$

$n_T=24$

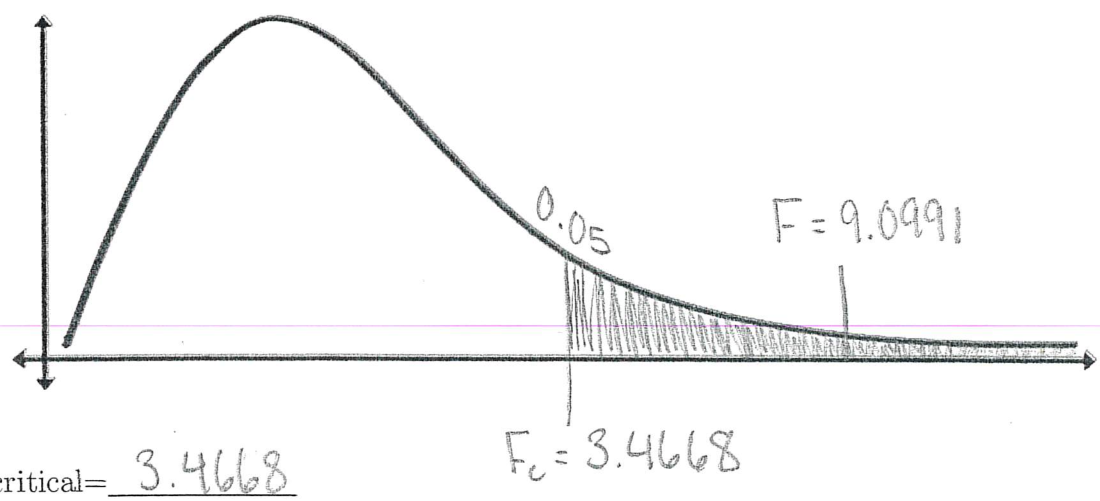
Working-class	Professional (middle-incomes)	Professional (wealthy)
17.8	16.5	8.5
26.7	17.4	6.3
49.4	22.0	4.6
9.4	7.4	12.6
65.4	9.4	11.0
47.1	2.1	28.6
19.5	6.4	15.4
51.2	13.9	9.3

Using a 5% significance level, test the hypothesis that the three mean commuting mileages are the same.

H_0 : $\mu_1 = \mu_2 = \mu_3$

H_1 : At least one of the means differs from the others

D_1 = $3-1=2$ D_2 = $24-3=21$



F–critical= 3.4668

F–statistic= 9.0991

p–value= 0.0014

We ______________ H_0, there ______________ enough evidence to support it.

58. The table below lists the number of pages in four different types of magazines.

$K = 4$

$n_T = 20$

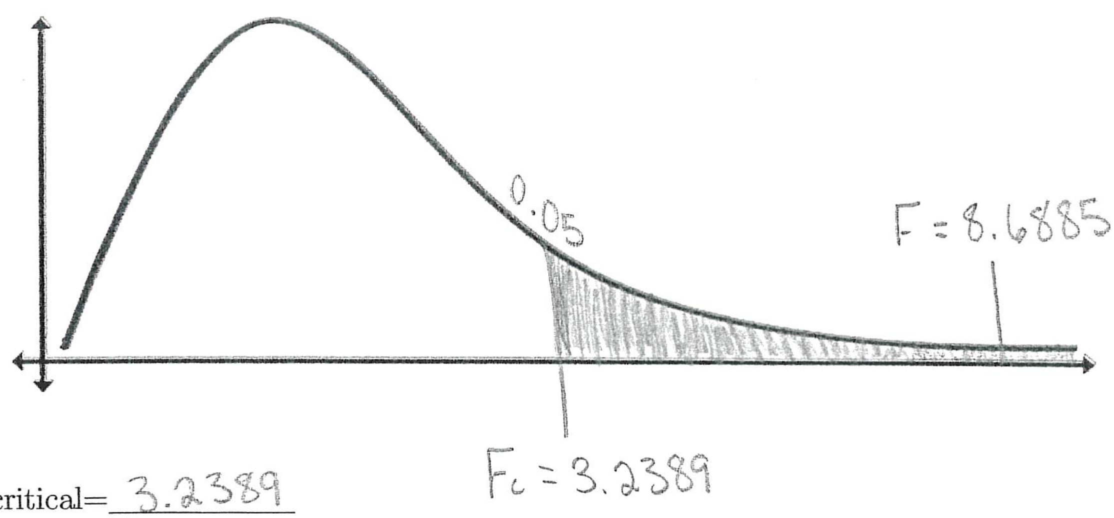
Home decorating	News	Health	Computer
172	87	82	104
286	94	153	136
163	123	87	98
205	106	103	207
197	101	96	146

Using a significance level of 5%, test the hypothesis that the four magazine types have the same mean length.

H_0 : $\mu_1 = \mu_2 = \mu_3$

H_1 : At least one mean differs from the others

$D_1 = 4 - 1 = 3$ $D_2 = n_T - K = 16$



F–critical= 3.2389

F–statistic= 8.6885

p–value= .0012

We reject H_0, there is enough evidence to support it.

59. A researcher wants to know if the mean times (in minutes) that people watch their favorite news station are the same. The table below shows the results of a study.

CNN	FOX	Local
45	15	72
12	43	37
18	68	56
38	50	60
23	31	51
35	22	

$K=3$

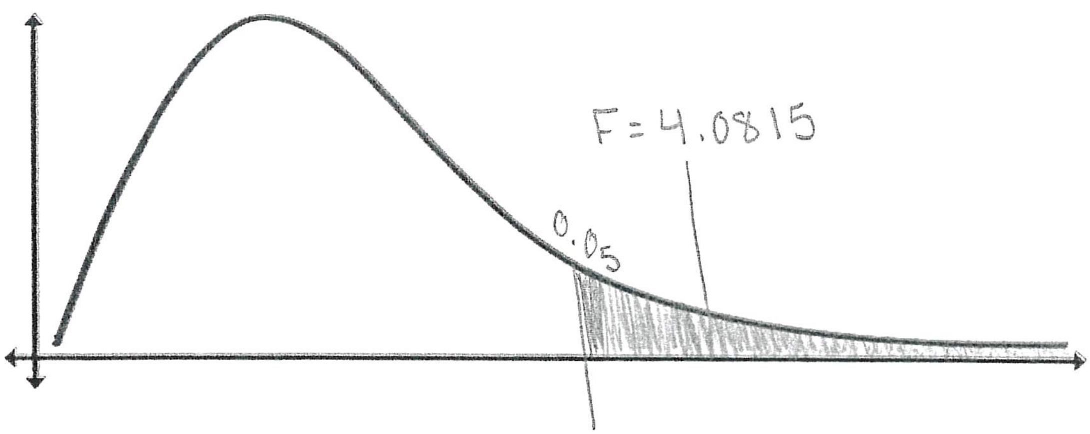
$n_T=17$

Test the claim using a significance level of 5%.

H_0 : $\mu_1=\mu_2=\mu_3$

H_1 : At least one mean differs from the others

D_1= $3-1=\underline{2}$ D_2 = $17-3=\underline{14}$



F−critical= 3.7389

F−statistic= 4.0815

p−value= .0401

We reject H_0, there is enough evidence to support it.

60. Are the means for the final exams the same for all statistics class delivery types? The table below shows the scores on final exams from several randomly selected classes that used the different delivery types.

$K=3$

$n_T=16$

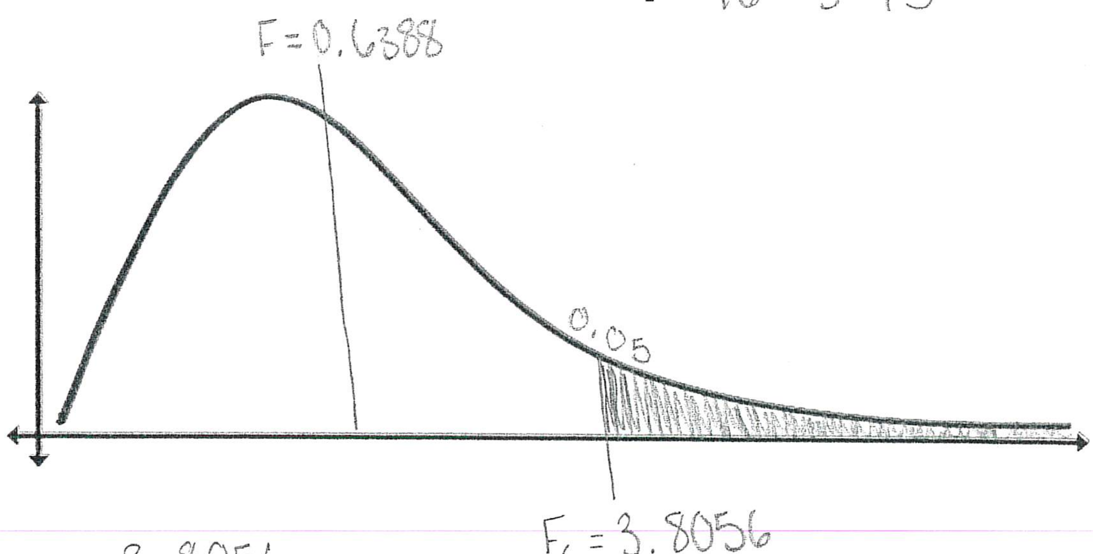
Online	Hybrid	Face-to-Face
72	83	80
84	73	78
77	84	84
80	81	81
81		86
		79
		82

Test the claim using a significance level of 5%.

H_0 : $\mu_1 = \mu_2 = \mu_3$

H_1 : At least one mean differs from the others

$D_1 = 3-1=2$ $D_2 = 16-3=13$



F–critical= 3.8056

F–statistic= 0.6388

p–value= 0.544

We fail to reject H_0, there is not enough evidence to support it.