Assignment 1

Directions: Find the critical $Z_{\alpha/2}$ value given the following confidence levels.

1. 98%
2. 99%
3. 95%
4. 90%
5. 92%
6. 96%
7. 94%
8. 97%

Assignment 2

9. A 99% confidence interval was constructed to estimate the mean and it the resulting interval is [9.68, 11.02]. Write a statement to correctly interpret the interval.
10. Interpret the confidence coefficient used in problem 9. In other words, what does it mean to say we are 99% confident?
11. If an estimator is unbiased, what does that mean in plain terms?

For problems 12 – 15, calculate the Margin of Error that would be used when estimating the mean for the following scenarios:

12. The confidence level is 99%. The sample size is 37. The sample mean is 25, and the population standard deviation is 4.
13. The confidence level is 92%. The sample size is 49. The sample mean is 512, and the population standard deviation is 28.
14. The confidence level is 90%. The sample size is 100. The sample mean is 69, and the population standard deviation is 3.2.
15. The confidence level is 94%. The sample size is 32. The sample mean is 100, and the population standard deviation is 14.6.

For problems 16 – 19, use the provided information to construct a confidence interval to estimate the population mean.

16. Salaries of college statistics professors at Florida public universities: Confidence level = 95%, n =36, $\bar{x}$ =\$85,113, and σ =\$11,024.

17. Speeds of drivers ticketed in a 65mph zone: Confidence level = 98%, n =31, $\bar{x}$ =81, and σ =3.4.

18. Credit scores: Confidence level = 91%, n =48, $\bar{x}$ =688, and σ =67.

19. Losses of patrons at the Seminole Casinos: Confidence level = 93%, n =50, $\bar{x}$ =170, and σ =89.

For problems 20 – 23, use the information provided to determine the sample size needed to construct a confidence interval to estimate the population mean.

20. Margin of error: 0.19 Confidence level: 95% Population standard deviation: 4

21. Margin of error: 15 Confidence level: 90% Population standard deviation: 102

22. Margin of error: 0.68 Confidence level: 98% Population standard deviation: 3.9

23. Margin of error: 1 Confidence level: 99% Population standard deviation: 2.8

The following Minitab display was created from speed data collected on a strip of I-95 where the speed limit is posted as 55mph. Use the Minitab display below to answer questions 24 and 25:

MINITAB

Variable	N	Mean	StDev	SE Mean	95% CI
Speed	81	67.3849	3.3498	0.3722	(66.6554, 68.1144)

24. Identify the point estimate for the population mean.

25. Interpret the 95% confidence interval provided by Minitab.

Putting it all together

26. A survey of thirty-one, 2005 Major League Baseball salaries for pitchers playing in the National League had a mean of \$2,522,785 and a standard deviation of \$4,065,579. Construct the 98% confidence interval for the true average salary for all NLMLB pitchers in 2005.

27. What does it mean that the standard deviation is so large for this sample data?

28. A survey of thirty-one, 2005 Major League Baseball salaries for outfielders playing in the National League had a mean of $4,661,321 and a standard deviation of $5,046,335.26. Construct the 98% confidence interval for the true average salary for all NLMLB outfielders in 2005.

29. Again the standard deviation is large, what effect will this have on the margin of error? How can this effect be countered?

30. Compare the results from problem 26 and 28. Can we say that the average outfielder in the National league makes more than the average pitcher in the National league? Explain.

31. A survey of thirty-one, 2003 Major League Baseball salaries for pitchers playing in the American League had a mean of $2,030,032 and a standard deviation of $3,097,327. Construct the 98% confidence interval for the true average salary for all ALMLB pitchers in 2003.

32. Based on the work done in problems 26 and 31, can we conclude that pitchers in the American league in 2003 made less than pitchers in the National league in 2005?

33. Assuming the annual inflation rate is 5%, we can adjust the salaries in our sample of thirty-one 2003 American league pitchers by multiplying each salary by $(1.05)^2$. This will put the 2003 salaries into 2005 terms (assuming the 5% inflation rate is valid). After doing this, the sample mean becomes $2,238,111 and the sample standard deviation becomes $3,414,803. Construct the 98% confidence interval for the true mean again. When compared to the interval obtained in problem 26, does this interval provide evidence that American league pitchers make less than their National league counterparts?

34. A 1993 study of in-state annual tuition rates at public schools in the US drew a random sample of 56 public colleges and universities that had a mean of $2,319 and a standard deviation of $1,136. Construct the 95% confidence interval for the true mean annual, in-state tuition costs for US colleges and universities in 1993. In an interview from 1993, a college president claimed the $3,527 per year in-state tuition that his college charged was average for public schools. Does the interval you created contradict his claim?

35. A study of children's weights was conducted in Hong Kong. A sample of forty children each 68 inches tall had a mean weight of 128.9 pounds and a standard deviation of 9.2 pounds. Create a 96% confidence interval for the true mean weight of children that are 68 inches tall children in Hong Kong. A Chinese researcher claims that the average child in Hong Kong is under weight. If the cut off weight for being under weight at 68 inches tall is 122 pounds, does this interval provide any evidence to contradict the claim that children in Hong Kong are under weight?

36. A stockbroker on Wall Street wants to estimate the average daily-high price for JAVA Sun Microsystems stock. What sample size is necessary to form a 99% confidence interval to estimate the mean daily-high within 0.25 dollars? Assume the population standard deviation is known to be 4.944 dollars.

37. A personal trainer wants to estimate the true average increase in chest circumference after a 12 week training program. If he wants to estimate the mean increase in circumference within a half inch using a 95% confidence interval, how many randomly chosen individuals will he need to measure? Assume the standard deviation is known to be 1.75 inches.

38. A college freshman wants to estimate the true time it takes to have his order completed at the Subway sandwich shop on campus. He has estimated that the standard deviation for order-completion times is 3.3 minutes. If he wants to estimate the true average, order-completion time to within one minute using a 95% confidence interval, how many times will he have to time himself purchasing a sandwich at Subway?

39. Sample Size for Atkins Diet You want to estimate the mean weight loss of people one year after using the Atkins diet. How many dieters must be surveyed if we want to be 95% confident that the sample mean weight loss is within 0.25 lb of the true population mean? Assume that the population standard deviation is known to be 10.6 lb (based on data from "Comparison of the Atkins, Ornish, Weight Watchers, and Zone Diets for Weight Loss and Heart Disease Risk Reduction," by Dansinger et al., *Journal of the American Medical Association,* Vol. 293, No. 1).

Finding the appropriate critical value ($Z_{\alpha/2}$ or $t_{\alpha/2}$). For problems 40 – 47, find the appropriate critical value given the sample size and confidence level.

40. For n = 29 and a confidence level of 98%

41. For n = 35 and a confidence level of 98%

42. For n = 19 and a confidence interval of 80%

43. For n = 128 and a confidence interval of 80%

44. For n = 15 and a confidence interval of 99%

45. For n = 100 and a confidence interval of 99%

46. For n = 27 and a confidence interval of 90%

47. For n = 49 and a confidence interval of 90%

48. You might have noticed the pattern in the eight questions above (t then Z, t then Z, …). You might also have noticed that for a given confidence level, the $t_{\alpha/2}$ is always larger than the $Z_{\alpha/2}$. What effect will this have on the corresponding confidence intervals?

Assignment 3

49. Use the given values to find the margin of error and the confidence interval used to estimate the mean: Weight loss after a year of dieting: n = 29, $\overline{x} = 3.1$, $s = 4.25$, and Clevel = 99%

50. Use the given values to find the margin of error and the confidence interval used to estimate the mean: Lifespan of a PC: n = 21, $\overline{x} = 6.2$, $s = 2.1$, and Clevel = 95%

51. A sample of 28 healthy babies has an average birth weight of 6.83 lbs and a standard deviation of 1.53 lbs. Construct a 95% confidence interval for the true average weight for healthy babies. If another study revealed that babies exposed to cocaine prenatally had an average birth weight of 4.92 lbs, does it seem that cocaine might lead to lower than normal birth weights?

52. A medical study designed to determine how much water is needed to become properly hydrated was conducted using 26 subjects. The average amount of water required daily by the subjects to be fully hydrated was 53.6 ounces with a standard deviation of 10 ounces. Form a 90% confidence interval to estimate the true average amount of water needed to become fully hydrated. Does this interval contradict the long standing belief that the average person requires 64 ounces of water per day to be fully hydrated?

53. For a study designed to measure the accuracy of stock broker predictions, twenty-four brokers were asked to predict the net gain or loss of a particular stock over the course of one week. The brokers predicted amount was then subtracted from the actual net gain or loss of the stock to get a prediction error. This yielded a mean error of 24 points and a standard deviation of 13 points. Construct a 98% confidence interval for the true average error made by stock brokers. Does this interval contain zero? If it doesn't what does say about their average prediction error?

54. I have kept track of my car's fuel consumption over the past month. I observed the mpgs for 17 trips from my home to FIU. The average mgs for the 17 trips was 31.1 mpg with a standard deviation of 2.1 mpg. Form a 95% confidence interval for my true fuel consumption when driving to FIU. To keep my gas budget in check, I need to average at least 30 miles per gallon. Based on the interval you just created, should I slow down?

55. Assume the given sample data below is being used to estimate the population proportion, and calculate the margin of error:

The confidence level is 90% and out of 690 trials 298 were successful.

56. Assume the given sample data below is being used to estimate the population proportion, and calculate the margin of error:

The confidence level is 95% and out of 1000 trials 450 were successful.

57. Assume the given sample data below is being used to estimate the population proportion, and calculate the margin of error:

The confidence level is 98% and out of 800 trials 29% were successful.

58. Assume the given sample data below is being used to estimate the population proportion, and calculate the margin of error:

The confidence level is 99% and out of 1235 trials 74% were successful.

59. Use the following data to form a confidence interval for the proportion: n = 3896, x = 702, Clevel = 95%

60. Use the following data to form a confidence interval for the proportion: n = 1896, x = 500, Clevel = 98%

61. Use the following data to form a confidence interval for the proportion: n = 8000, x = 5234, Clevel = 90%

62. Use the following data to form a confidence interval for the proportion: n = 506, x = 390, Clevel = 99%

63. If you wanted to determine the number of people needed for a survey to determine the percent of the population without health insurance, how could this be done? Assume you would like to ultimately form a 95% confidence interval with a margin of error of just 2 percentage points (hint: think of the margin of error formula for the proportion interval).

64. A recent survey of 1000 married men revealed that 56% of them have been unfaithful at least once. Form a 95% confidence interval to estimate the true proportion of married men who are unfaithful.

65. A company claims that they have a method for preselecting your child's eye color. Out of 2000 couples trying to have a child with blues, 510 of them had a baby with blue eyes after undergoing the procedure. The company claims this is a success, but a researcher pointed out that these couples had a 25% chance of having a blue eyed baby simply due to the genes they already carried. Form a 98% confidence interval to estimate the true proportion of similar parents that would give birth to a blue eyed child after using the company's services. Can we conclude the company's methods produce more than a 25% success rate?

66. A common statistic that is thrown around is that at least half of all new marriages will end in divorce. A researcher followed the marriages of 1500 couples for ten years. In that time, 800 of the couples divorced. Use the data to form a 90% confidence interval for the true rate of divorce among new marriages. Does this evidence support the idea that at least half of all new marriages end in divorce?

67. Last semester after reviewing 3000 course evaluations, I noticed that 1632 of them stated they had an A in the class at the time of the evaluation (just a day or two before the final exam). Form a 95% confidence interval on the true proportion of students who say they have an A in their class at the time of evaluations. College records indicate that in those same classes only 12% of the students earn an A as their final grade and only another 20% will earn a B (that is 32% with an A or B by the end). Assuming that an A student would not do so poorly on their final to lower their overall grade below a B, what can you conclude about the truthfulness of students when they report that they have an A in the class at the time of the evaluation?

68. Detecting Fraud When working for the Brooklyn District Attorney, investigator Robert Burton analyzed the leading digits of amounts on checks from companies that were suspected of fraud. Among 784 checks, 61% had amounts with leading digits of 5. Construct a 99% confidence interval estimate of the proportion of checks having amounts with leading digits of 5. When checks are issued in the normal course of honest transactions, it is expected that 7.9% of the checks will have amounts with leading digits of 5. What does the confidence interval suggest?

69. Assuming that grades in a statistics class are normally distributed with a mean of 75 and a standard deviation of 20, there should be around 5% of the students who earn a C-. In a recent study of a class of 200 students there were 5 grades of C-. Construct the 95% confidence interval for the true proportion of C- grades for statistics classes like the class used in the study 200. If the class grades were normally distributed with a mean of 75 and a standard deviation of 20, we'd expect that around 10 grades (5% of 200) would be in the C- range. Looking at the interval we just created, what do you think about the idea that the grades are normally distributed?

70. In the same class of two hundred, 56 students earned a C- or less. Form a 95% confidence interval for the true proportion of students who earn a C- or less in a large statistics class. If the class grades were normally distributed with a mean of 75 and a standard deviation of 20, we'd expect that around 39% of the grades would be lower than a C. Looking at the interval we just created, what do you think about the idea that the grades are normally distributed?

Assignment 4

For problems 71 – 76, examine the given statement and express the null and alternative hypothesis in symbolic form:

71. The average weight loss obtained on the Atkins Diet is greater than 4 pounds.

72. The average grade in this class will be at least a 74.

73. The average waist circumference of adult males is 36.5 inches.

74. The average American has less than $10,000 dollars of savings.

75. The average length of time to eliminate a cold from the body is at most 14 days.

76. The average age of college graduates on the day of their graduation is not 21.

In exercises 77 – 84, use the given info from a hypothesis test to find the critical z-values:

77. Claim: $\mu = 76$, $\alpha = 0.01$

78. Claim: $\mu < 1.234$, $\alpha = 0.05$

79. Claim: $\mu > 100$, $\alpha = 0.02$

80. Claim: $\mu \neq 68$, $\alpha = 0.02$

81. Claim: $\mu \geq 24$, $\alpha = 0.01$

82. Claim: $\mu \leq 73$, $\alpha = 0.10$

83. Claim: $\mu < 890$, $\alpha = 0.005$

84. Claim: $\mu < 14.8$, $\alpha = 0.04$

Assignment 5

In problems 85 – 87, state the final conclusion for the hypothesis test:

85. Original claim: The average grade in the class is a 76. Initial Conclusion: Reject the null.

86. Original claim: The average IQ is greater than 100. Initial Conclusion: Do not reject the null.

87. Original claim: The average time to finish exam one is less than 75 minutes. Initial Conclusion: Reject the null.

88. A consumer group claims that the Doritos snack pack size has an average weight below 1.75 ounces which is the weight labeled on the bags. A random sample of 49 bags had an average weight of 1.71 ounces and a standard deviation of 0.13 ounces. At the 5% significance level, test the consumer group's claim. Give the practical interpretation of the outcome of the test.

89. A professor claims that it takes the average student no more than 40 minutes to finish his final exam. A random selection of 39 students was timed while taking the final. The students had an average completion time of 41.6 minutes and a standard deviation of 6 minutes. Use a 1% significance level to test the professor's claim. Give the practical interpretation of the outcome of the test.

90. A gym owner claims that the average adult male has a waist measurement equal to 36 inches. A study of 42 males showed the average waist size to be 35.9 inches and a standard deviation of 3.33 inches. At the 2% significance level, test the gym owner's claim. Give the practical interpretation of the outcome of the test.

91. The US government claims that the average woman has a mean weight of 143 pounds. A study is done which involved a random sample of 35 women with an average weight of 146 pounds and a standard deviation of 29 pounds. Use a 1% significance level to test the government's claim. Give the practical interpretation of the outcome of the test.

92. A physician claims that the average male weighs less than 180 pounds. A sample of 32 randomly selected males has an average weight of 172 pounds and a standard deviation of 29 pounds. Use

a 5% significance level to test the physician's claim. Give the practical interpretation of the outcome of the test.

93. A sociologist claims that marriages that end in divorce on average last 6 years. A study of 35 divorced couples revealed an average length of their marriages to be 8.2 years with a standard deviation of 1.33 years. As a part of that study, the researchers constructed a 98% confidence interval for the true mean length of marriage in years for divorced couples. That interval was from 7.7 years to 8.7 years. Use the confidence interval to test the sociologist's claim at the 2% significance level. Give the practical interpretation of the outcome of the test.

In problems 94 – 100, use the given information to find the p-value:

94. Claim: $\mu < 36$ Test Stat: $z = -2.13$
95. Claim: $\mu > 84$ Test Stat: $z = 1.89$
96. Claim: $\mu \le 110$ Test Stat: $z = 2.05$
97. Claim: $\mu \ge 55$ Test Stat: $z = -1.10$
98. Claim: $\mu = 1.287$ Test Stat: $z = 2.89$
99. Claim: $\mu \ne 36$ Test Stat: $z = -2.56$
100. Claim: $\mu < 15$ Test Stat: $z = 1.58$

101. The amount of time to finish the US census is of interest to the federal government. A member of the Census bureau claims it takes no more than ten minutes to fill out the census. A study of 52 randomly chosen citizens who were timed while completing the census had a mean of 10.6 minutes and a standard deviation of 2.25 minutes. Use a 5% significance level and the p-value method to test the claim from the member of the census bureau.

102. Some researchers think that divorce is more likely when a couple marries at a young age. One researcher claims that the average divorced male was younger than 25 on the day of his wedding. A study of 33 divorced males shows their average age on the day of their wedding was 24.3 with a standard deviation of 2.5 years. At the 3% significance level and the p-value method to test the researcher's claim.

103. A speed reading teacher claims that it takes the average reader more than ten hours to finish a 300 page book. Thirty-one randomly selected readers were given 300 page novels to read and they timed themselves. The average completion time for the group was 11 hours with a standard deviation of 2.11 hours. At the 4% significance level and the p-value method to test the researcher's claim.

104. Historically, the average height for males was believed to be 68 inches. A doctor believes the average height has increased over the last 100 years. He claims the average male is now 70 inches tall. A random sample of 50 men had an average height of 68.9 inches and a standard deviation of 2.8 inches. Use a 10% significance level and the p-value method to test the doctor's claim.

Assignment 6

105. Degrees of freedom: When using a t table to find critical values, we must use the appropriate number of degrees of freedom. If a sample consists of ten values, what is the degrees of freedom for this problem? If you didn't know any of the ten values, but you knew their mean was 100, how many values could you make up before the remaining values are determined by the restriction that the mean is 100?

106. An accountant claims that the hourly wage for pizza delivery drivers is more than ten dollars. If a sample of 28 pizza delivery driver's paychecks has a mean of $9.25 and a standard deviation of $1.00, why is it not necessary to conduct a formal hypothesis test on the accountant's claim?

107. The CEO of Equifax credit reporting agency claims the average credit rating has dropped below 675 points. A study of 20 randomly selected credit scores had an average of 660 points and a standard deviation of 95.3 points. Use a 5% significance level to test the claim that credit scores are now on average below 675 points. The CEO claims the results are not valid since they came from too small a sample. Is there any merit to his argument?

108. The Natural Foods Diet claims that people lose an average of ten pounds in two months on the plan. A study of 26 people on the diet lost an average 8.9 pounds on the diet in two months. The standard deviation was 3.25 pounds. Use a 2% significance level to test the claim that the diet helps people lose an average of 10 pounds in two months.

109. A female student of mine claims that the average height of female super models is the same as the average for women in general (64 inches). I randomly selected 9 supermodels from a list of super models and found they had an average height of 70.2 inches with a standard deviation of 2.5 inches. Use a 1% significance level to test my student's claim. If she disputes the result of the test by arguing that I took too small a sample, is there some merit to her argument?

110. The lifespan for the general population of males born in 1980 is 77 years old. A worker for the Census Bureau claims that the average lifespan for college professors greater than 77. A random sample of 17 deceased college professors had a mean lifespan of 89 and a standard deviation of 9.5 years. Use a significance level of 10% to test the CB worker's claim.

111. The average undergrad cost for tuition, fees, room and board at two-year colleges 5 years ago was $13,252. This year a random sample of 20 schools had a mean (adjusted for inflation) of $15,560 and a standard deviation of $3,500. Use a 1% significance level to test the claim that tuition, fees, and room and board (adjusted for inflation) at two-year colleges has risen over the past 5 years.

112. An educator in Michigan estimates the dropout rate for seniors in high school to be 15%. Last year 38 seniors out of 201 seniors dropped out. Use the p-value method and a 5% significance level to determine if we can reject the educator's claim?

113. The government mint claims that at least 77% of the public is against changing dollar coins for dollar bills. In a survey of 800 people, 550 said they were opposed to the change. At the 5% level of significance, test the mint's claim.

114. Nationally 60% of Ph.D. students have paid assistantships. An FIU professor thinks at FIU the rate is lower than this. In a random sample of 50 Ph.D. students, 26 have assistantships. Using a 5% significance level, test the FIU professor's claim.

115. A senatorial candidate claims that most of the people in the country feel they are worse off today than they were two years ago. A poll of 500 people in the country reveals that 255 feel they are worse off today than two years ago. At the 10% significance level, test the senatorial candidates claim.

116. A professor claims that at most 10% of the class gets A's each semester in his course. A random sample of 100 students from previous terms show that he gave out 15 A's. Using a 5% significance level, test the professor's claim.

117. If you have a significance level of 1% and a p-value of 0.0238, after forming the appropriate conclusion what possible error might you have committed (Type one or two)? Explain.

118. If you are testing the claim: $\mu > 96$, and your significance level is 8%, what is the probability that you commit the type one error?

119. If you are testing the claim: $\mu = 200$, and your significance level is 5%, what is the probability that you commit the type one error?

Solutions:

1. 2.326
2. 2.576
3. 1.960
4. 1.645
5. 1.75
6. 2.05
7. 1.88
8. 2.17
9. There is 99% confidence that the true population mean μ is inside the interval from 9.68 to 11.02.

10. It means with repeated sampling, 99% of similarly created intervals would capture the population mean.
11. Values of an unbiased estimator cluster around the target parameter, which means they do not systematically over estimate or underestimate. The average value of the unbiased estimator is the target parameter.
12. 1.69
13. 7
14. 0.5264
15. 4.852
16. [$81,511.83, $88,714.17]
17. [79.58, 82.42]
18. [671.6, 704.4]
19. [147.2, 192.8]
20. 1703
21. 126 (don't forget we always round sample size up)
22. 178
23. 53
24. 67.3849
25. We are 95% confident that the true average speed of cars on this stretch of I-95 is between 66.7 and 68.1 miles per hour.
26. [$824,340.86, $4,221,229.14] We are 98% confident that the true mean salary for NLMLB pitchers is between 0.8 million and 4.2 million dollars per year.
27. It means there is a lot of variation in the salaries of NLMLB pitchers. Several players are paid very large amounts of money, while others are paid relatively small sums.
28. [$2,553,154.23, $6,769,487.77] We are 98% confident that the true mean salary for NLMLB outfielders is between 2.6 million and 6.8 million dollars per year.
29. The large standard deviation will make the margin of error large, which means the confidence interval will be wide. To counter this, a researcher should increase the sample size.

30. Based on the intervals, we cannot say outfielders make more money. The lowest value in the confidence interval for the average salary of outfielders is inside the confidence interval for the pitchers average salary.

31. [$736,086.69, $3,323,977.31] We are 98% confident that the true mean salary for ALMLB pitchers is between 0.7 million and 3.3 million dollars per year.

32. Not necessarily, for example the interval in problem 26 allows for the possibility that NL pitchers make an average salary of 0.824 million per year, so what if the AL pitchers made 2.0 million per year on average (which is within the possibilities allowed for in their confidence interval). In that scenario AL pitchers make more on average. Since the intervals overlap we can't say for sure either way.

33. [$811,536.30, $3,664,685.70] The AL interval is still below the NL interval, but it is now closer. As written in the answer for problem 32, the intervals overlap, so we can't say for sure which average is higher.

34. [$2,021, $2,617] This interval does contradict the claim of the college president since the candidate values for the average are all lower than the value he claimed.

35. [125.9, 131.9] No, the lowest number in the interval is higher than 122lbs, so we do not have evidence that the children on average are under weight.

36. 2,596

37. 48

38. 42

39. 6,907

40. 2.467

41. 2.326

42. 1.330

43. 1.282

44. 2.977

45. 2.576

46. 1.706

47. 1.645

48. The t-intervals will always be wider than the z-intervals for the same given confidence level and sample size.

49. [0.919, 5.281]

50. [5.244, 7.156]

51. [6.24, 7.42] Since 4.92 is outside of the interval it seem cocaine exposure lowers birth weight.

52. [50.3, 56.9] Since 64 ounces is outside this interval it seems that the average person does not need that much water.

53. [17.4, 30.6] It seems the brokers do not have an average error of zero since it is not in the interval. An average of zero would be good since that would mean no error on average, but this interval does not include zero. This means the brokers make prediction errors on average.

54. [30.02, 32.18] I don't need to drive slower because the worst case scenario is that my average fuel consumption is 30.02 mpg which is higher than my minimum required fuel efficiency.

55. 0.031

56. 0.03083

57. 0.03732

58. 0.03215

59. [0.168, 0.192]

60. [0.240, 0.287]

61. [0.646, 0.663]

62. [0.723, 0.819]

63. You can use the ME formula $E = Z_{\alpha/2}\sqrt{\frac{\hat{p}\hat{q}}{n}}$ and solve for n the formula becomes

    $\left(\frac{Z_{\alpha/2}}{E}\right)^2 \hat{p}\hat{q} = n$ Plug in the numbers from the problem and always remember to round up on sample size calculations.

64. [0.529, 0.591]

65. [0.232, 0.278] Since 25% is inside this interval it is possible that the true proportion is only 25% which would mean their method is not effective. This is therefore not evidence to conclude that their method works.

66. [0.512, 0.555] Since this interval only contains values over 50% it seems that the interval provides evidence that at least half of all new marriages end in divorce.

67. [0.526, 0.562] Since only 32% of the students actually earn an A or B it seems that there is an inconsistency in the interval and reality. Based on the students response the interval says that the true proportion of A's in stats classes is between 53% and 56%, but in reality it is only 12% A's and 20% B's. This means students are probably lying about their standing in the class. This shows the interval is only as good as the data used to create it.

68. [0.565, 0.655] Since this is so much higher than the 7.9% it is supposed to be we must conclude that these checks are fraudulent.

69. [0.003, 0.047] This is showing the true proportion should be between 0.3% and 4.7%. This is not too far from the hypothesized value of 5%, but still 5% is outside of the interval. It might be that the distribution is not normally distributed.

70. [0.218, 0.342] This shows that the true proportion of grades below a C is between 22% and 34%, but we expected it to be around 39%. This shows there is a problem with the assumption of a normal distribution.

71. $H_0: \mu \le 4$
    $H_A: \mu > 4$

72. $H_0: \mu \ge 74$
    $H_A: \mu < 74$

73. $H_0: \mu = 36.5$
    $H_A: \mu \ne 36.5$

74. $H_0: \mu \ge \$10,000$
    $H_A: \mu < \$10,000$

75. $H_0: \mu \le 14$
    $H_A: \mu > 14$

76. $H_0: \mu = 21$
    $H_A: \mu \ne 21$

77. -2.576, 2.576

78. -1.645

79. 2.05

80. -2.326, 2.326

81. -2.326

82. 1.282

83. -2.576

84. -1.75

85. There is sufficient evidence to reject the claim that the average grade in the class is a 76.

86. There is not sufficient evidence to support the claim that the average IQ is greater than 100.

87. There is sufficient evidence to support the claim that the average time to finish exam one is less than 75 minutes.

88. $Claim: \mu < 1.75$, $\begin{matrix} H_0 : \mu \geq 1.75 \\ H_A : \mu < 1.75 \end{matrix}$, $TestStat: Z = -2.15$, $CriticalValue(s): -1.645$,

$InitialConclusion:$ Reject the null, support the alternative

There is sufficient evidence to support the claim…

Practical outcome: Doritos is under filling its bags.

89. $Claim: \mu \leq 40$, $\begin{matrix} H_0 : \mu \leq 40 \\ H_A : \mu > 40 \end{matrix}$, $TestStat: Z = 1.67$, $CriticalValue(s): 2.326$,

$InitialConclusion:$ Do not reject the null, do not support the alternative

There is not sufficient evidence to reject the claim…

Practical outcome: The professor is correct.

90. $Claim: \mu = 36$, $\begin{matrix} H_0 : \mu = 36 \\ H_A : \mu \neq 36 \end{matrix}$, $TestStat: Z = -0.19$, $CriticalValue(s): -2.326, 2.326$,

$InitialConclusion:$ Do not reject the null, do not support the alternative

There is not sufficient evidence to reject the claim…

Practical outcome: The males have an average waist measurement of 36 inches.

91. $Claim: \mu = 143$, $\begin{matrix} H_0 : \mu = 143 \\ H_A : \mu \neq 143 \end{matrix}$, $TestStat: Z = 0.61$, $CriticalValue(s): -2.576, 2.576$,

$InitialConclusion:$ Do not reject the null, do not support the alternative

There is not sufficient evidence to reject the claim…

Practical outcome: The females have an average weight of 143 pounds.

92. $Claim: \mu < 180$, $\begin{matrix} H_0: \mu \geq 180 \\ H_A: \mu < 180 \end{matrix}$, $TestStat: Z = -1.56$, $CriticalValue(s): -1.645$,

$InitialConclusion:$ Do not reject the null, Do not support the alternative

There is not sufficient evidence to support the claim…

Practical outcome: This evidence can't be used to argue men on average weigh less than 180 pounds.

93. Since 6 years is not a part of the given interval which says the average is from 7.7 to 8.7 years, we should reject the sociologist's claim, so it seems these failed marriages last longer than 6 years.
94. P = 0.0166
95. P = 0.0294
96. P = 0.0202
97. P = 0.1357
98. P = 0.0038
99. P = 0.0104
100. P = 0.9429
101. $Claim: \mu \leq 10$, $\begin{matrix} H_0: \mu \leq 10 \\ H_A: \mu > 10 \end{matrix}$, $TestStat: Z = 1.92$, $PValue: 0.0274$,

$InitialConclusion:$ Reject the null, Support the alternative

There is sufficient evidence to reject the claim…

102. $Claim: \mu < 25$, $\begin{matrix} H_0: \mu \geq 25 \\ H_A: \mu < 25 \end{matrix}$, $TestStat: Z = -1.61$, $PValue: 0.0537$,

$InitialConclusion:$ Do not reject the null, do not support the alternative

There is not sufficient evidence to support the claim…

103. $Claim:\mu > 10$, $\begin{matrix} H_0:\mu \le 10 \\ H_A:\mu > 10 \end{matrix}$, $TestStat:Z = 2.64$, $PValue:0.0041$,

$InitialConclusion:$ Reject the null, support the alternative

There is sufficient evidence to support the claim…

104. $Claim:\mu = 70$, $\begin{matrix} H_0:\mu = 70 \\ H_A:\mu \ne 70 \end{matrix}$, $TestStat:Z = -2.78$, $PValue:0.0054$,

$InitialConclusion:$ Reject the null, support the alternative

There is sufficient evidence to reject the claim…

105. 9; 9 because to have an average of 100 you'd need a sum of 1000 (1000/10 = 100), so you can pick any random 9 numbers. Say I chose: 1, 2, 3, 4, 5, 6, 7, 8, 9, the sum of these is 45. Thus to have a sum of 1000 my last number would have to be 955 (I wasn't free to choose this last value. It had to 955 or I wouldn't have an average of 100 for the ten numbers.).

106. He is trying to support his claim that it is over $10, but his evidence is lower than $10 dollars, how can this ever provide support for his argument?

107. $Claim:\mu < 675$, $\begin{matrix} H_0:\mu \ge 675 \\ H_a:\mu < 675 \end{matrix}$, $TestStat:-0.70$, $CriticalValue:-1.729$,

$InitialConclusion:$ Do not reject the null, do not support the alternative

$FinalConclusion:$ There is not sufficient evidence to support the claim…

The t-test is a less powerful test than the z-test, so when the t-test does not reject the null it is possible that it is because it is not powerful enough. However, if we can reject the null with the t-test then we do not need to worry that the test was too weak. In this case, it is possible the test was too weak to detect the shift lower in credit scores, but the test stat wasn't very extreme at all. Probably, the z-test would have the same conclusion.

108. $Claim:\mu = 10$, $\begin{matrix} H_0:\mu = 10 \\ H_a:\mu \ne 10 \end{matrix}$, $TestStat:-1.73$, $CriticalValues:-2.485, 2.485$,

$InitialConclusion:$ Do not reject the null, do not support the alternative

$FinalConclusion:$ There is not sufficient evidence to reject the claim…

109. $Claim:\mu = 64$, $\begin{matrix} H_0:\mu = 64 \\ H_a:\mu \ne 64 \end{matrix}$, $TestStat:7.44$, $CriticalValues:-3.355, 3.355$,

$InitialConclusion:$ Reject the null, support the alternative

$FinalConclusion:$ There is sufficient evidence to reject the claim…

Remember, the t-test is a less powerful test than the z-test, so when the t-test rejects the null it means the z-test would almost certainly also reject the null. If we can reject the null with the t-test then we do not need to worry that the test was too weak. The student's complaint has no merit.

110. $Claim: \mu > 77$, $\begin{matrix} H_0: \mu \le 77 \\ H_a: \mu > 77 \end{matrix}$, $TestStat: 5.21$, $CriticalValue: 1.337$,

$InitialConclusion:$ Reject the null, support the alternative

$FinalConclusion:$ There is sufficient evidence to support the claim…

111. $Claim: \mu > \$13,252$, $\begin{matrix} H_0: \mu \le \$13,252 \\ H_a: \mu > \$13,252 \end{matrix}$, $TestStat: 2.95$, $CriticalValue: 2.539$,

$InitialConclusion:$ Reject the null, support the alternative

$FinalConclusion:$ There is sufficient evidence to support the claim…

112. $Claim: \rho = 15\%$, $\begin{matrix} H_0: \rho = 15\% \\ H_a: \rho \ne 15\% \end{matrix}$, $TestStat: 1.55$, $PValue: 0.1212$,

$InitialConclusion:$ Do not reject the null, do not support the alternative

$FinalConclusion:$ There is not sufficient evidence to reject the claim…

113. $Claim: \rho \ge 77\%$, $\begin{matrix} H_0: \rho \ge 77\% \\ H_a: \rho < 77\% \end{matrix}$, $TestStat: -5.54$, $CriticalValue: -1.645$,

$InitialConclusion:$ Reject the null, support the alternative

$FinalConclusion:$ There is sufficient evidence to reject the claim…

114. $Claim: \rho < 60\%$, $\begin{matrix} H_0: \rho \ge 60\% \\ H_a: \rho < 60\% \end{matrix}$, $TestStat: -1.15$, $CriticalValue: -1.645$,

$InitialConclusion:$ Do not reject the null, do not support the alternative

$FinalConclusion:$ There is not sufficient evidence to support the claim…

115. $Claim: \rho > 50\%$, $\begin{matrix} H_0: \rho \leq 50\% \\ H_a: \rho > 50\% \end{matrix}$, $TestStat: 0.45$, $CriticalValue: 1.282$,

$InitialConclusion$: Do not reject the null, do not support the alternative

$FinalConclusion$: There is not sufficient evidence to support the claim…

116. $Claim: \rho \leq 10\%$, $\begin{matrix} H_0: \rho \leq 10\% \\ H_a: \rho > 10\% \end{matrix}$, $TestStat: 1.67$, $CriticalValue: 1.645$,

$InitialConclusion$: Reject the null, support the alternative

$FinalConclusion$: There is sufficient evidence to reject the claim…

117. Since the p-value is greater than alpha, we do not reject the null. If we do not reject the null, we may have just committed a type two error.

118. At most 8% (one-tail test)

119. Exactly 5% (two-tail test)