STAT 3400 - Homework #9

Alex Ojemann

Due April 13, 2023

Problem 19.4.6

a. 0.4 cm

b. We are 90% confident that the true mean height of physically active adults is between 170.4 cm and 172.0 cm.

c. We are 90% confident that the true mean height of physically active adults is between 170.4 cm and 172.0 cm. This is the same as the percentile confidence interval because the distribution is very close to normal.

Problem 19.4.14

a. False, the probability that we observe the mean value we did or more extreme given the true mean amount of cereal in a 10oz box is 10oz is 0.23.

b. False, the probability that we observe the mean value we did or more extreme given the true mean amount of cereal in a 10oz box is 10oz is 0.23.

c. False, because the p value is 0.23 we don't have evidence to say that the mean amount of cereal in 10oz boxes is not 10oz (assuming alpha <= 0.1 as we have used throughout the class).

d. False, because the p value is 0.23 we don't have evidence to say that the mean amount of cereal in 10oz boxes is greater than 10oz (assuming alpha <= 0.1 as we have used throughout the class).

e. True

Problem 20.6.4

H_0: Difference in mean of running speed between lizard species is 0.

H_A: Difference in mean of running speed between lizard species is not 0.

We reject the null hypothesis because the p value is 0 which is less than alpha (0.05). Thus we can safely assume that the difference in mean of running speed between lizard species is not 0.

Problem 20.6.6

a. We are 90% confident that the true mean difference in running speed between lizard species is between 0.5 and 0.9 m/s.

b. We are 90% confident that the true mean difference in running speed between lizard species is between 0.5 and 0.9 m/s. This is the same as the percentile confidence interval because the data is very close to normally distributed.

Problem 20.6.12

a. True

b. True

c. False, a 90% confidence interval is narrower than a 95% confidence interval so it may not include some of the values that the 95% interval does.

Problem 20.6.16

H_0: There is not a difference in the fuel efficiency of cars with automatic and manual transmissions.

H_A: There is a difference in the fuel efficiency of cars with automatic and manual transmissions.

SE for null distribution: sqrt((3.44/25)^2 + (4.58/25)^2) = 0.229

Test statistic = 22.7 - 17.4 = 5.3

p = 0

We do have sufficient evidence to say that there is a difference in the fuel efficiency of cars with automatic and manual transmissions.

Problem 22.5.4

H_0: The size of the cuckoo egg is the same for all host species.

H_A: The size of the cuckoo egg is different for at least one of the host species.

We have sufficient evidence to say that the size of cuckoo eggs is different for at least one of the host species because p=0.

Problem 22.5.6

a. H_0: There is no difference in mean test scores for any of the different teaching methods.

H_A: At least one of the teaching methods results in a mean test score different from the others.

b. The teaching method variable has 4 df and the residuals have 44 df.

c. Since p is less than our level of significance of 0.05, we reject the null hypothesis. We have sufficient evidence to say that there is a significant difference in the mean test score for at least one of the teaching methods than the rest.

Problem 22.5.10

a. H_0: The mean educational attainment level is the same for all schools.

H_A: The mean educational attainment level for at least one school is different from the rest of the schools.

b. Independence: These observations should be independent because students can't graduate from two different high schools.

Normality: These observations should be approximately normal within each group because we have at least 10 observations in each group.

Same variance: The variance is relatively similar within each group b ecause the lowest group standard deviation is 13.6 and the highest is 18.1.

c. We fail to reject the null hypothesis because p is less than our level of significance (0.05). This means that we don't have evidence to say that the mean level of education is different between these high schools.

Problem 22.5.14

a. H_0: The mean number of hours spent on child care is the same for all educational attainment levels.

H_A: The mean number of hours spent on child care for at least one educational attainment level is different from the rest of the educational attainment levels.

b. We fail to reject the null hypothesis because p is less than our level of significance (0.05). This means that we don't have evidence to say that the mean number of hours spent on child care is different between educational attainment levels.