MSCA 31000 - Introduction to Statistical Concepts

Chapter 10

Q24: (AM#6c) Is there a difference in how much males and females use aggressive behavior to improve an angry mood? For the "Anger-Out" scores, compute a 99% confidence interval on the difference between gender means.

Answer:

- There is a **0.7958** average difference between means in how much males and females use aggressive behavior to improve an angry mood.
- 99% confidence interval for difference of gender means is **(-1.8, 3.39)**

Steps to calculate:

1. Difference of means (M_{Males} - $M_{Females}$) = 0.7958
2. Degree of freedom (df) = N_{Males} + $N_{Females}$ - 2 = 30 + 48 - 2 = 76
3. SSE_{female} = sum((genderdata[genderdata$gender == "female",2]-gd[gd$gender == 'female',3])^2) = 806.4792
4. SSE_{male} = sum((genderdata[genderdata$gender == "male",2]-gd[gd$gender == 'male',3])^2) = 551.3667
5. MSE = (SSE_{female} + SSE_{male}) / df = 17.86639
6. Harmonic mean of sample size = n_h = 36.92308
7. $s_{M1 - M2}$ = Standard Error = sqrt(2*mse/nh) = 0.9837494
8. t_{CL} at 99% confidence interval = qt(c(.005,.995),76) = 2.642078
9. Lower Limit = M_1 - M_2 -(t_{CL})($s_{M1 - M2}$) = -1.8
10. Upper Limit = M_1 - M_2 +(t_{CL})($s_{M1 - M2}$) = 3.39

Q25: (AM#10) Calculate the 95% confidence interval for the difference between the mean Anger-In score for the athletes and non-athletes. What can you conclude?

Answer: 95% confidence interval for difference between mean of Anger-In scores between athletes and non-athletes = **(-4.9857, -0.5977) and (0.5977, 4.9857)**.

p-value = 2*pt(-abs(t),(sum(sportcat$num) - 2)) = .05, 0.5

Given the p-value, the difference between groups in Anger-In scores is statistically significant.

Q26: Find the 95% confidence interval on the population correlation between the Anger-Out and Control-Out scores.

Answer:
95% confidence interval of population correlation = cor.test(angerdata$Anger.Out,angerdata $Control.Out,conf.level=.95) = **- 0.71279 to -0.41381**

Chapter 11

Q20: True/false: It is easier to reject the null hypothesis if the researcher uses a smaller alpha (α) level.

Answer: True.

Q21: True/false: You are more likely to make a Type I error when using a small sample than when using a large sample.

Answer: False. Assuming acceptable size and power values, a sample size should not impact Type I errors. Increasing sample size will decrease Type II errors.

Ref: http://stats.stackexchange.com/questions/9653/can-a-small-sample-size-cause-type-1-error

Q22: True/false: You accept the alternative hypothesis when you reject the null hypothesis.

Answer: True. Once the null hypothesis is rejected, we accept the alternative hypothesis.

Q23: True/false: You do not accept the null hypothesis when you fail to reject it.

Answer: True. Failing to reject the null hypothesis does not imply there is enough evidence to accept it (based on p-value).

Q24: True/false: A researcher risks making a Type I error any time the null hypothesis is rejected.

Answer: False. If a null hypothesis is false, it is impossible to make a Type I error.

Chapter 12

Q21: (AM#17) Do athletes or non-athletes calm down more when angry? Conduct a t test to see if the difference between groups in Control-In scores is statistically significant.

Answer:
t = -1.991673 1.991673
p-value = 2*pt(-abs(t),(sum(sportcat$num) - 2)) = .05, 0.5

Given the p-value, the difference between groups in Control-In scores is statistically significant.

Q22: Do people in general have a higher Anger-Out or Anger-In score? Conduct a t test on the difference between means of these two scores. Are these two means independent or dependent?

Answer:
I don't know how to do this.

Chapter 13

Q5: Alan, while snooping around his grandmother's basement stumbled upon a shiny object protruding from under a stack of boxes . When he reached for the object a genie miraculously materialized and stated: "You have found my magic coin. If you flip this coin an infinite number of times you will notice that heads will show 60% of the time." Soon after the genie's declaration he vanished, never to be seen again. Alan, excited about his new magical discovery, approached his friend Ken and told him about what he had found. Ken was skeptical of his friend's story, however, he told Alan to flip the coin 100 times and to record how many flips resulted with heads.

(a) What is the probability that Alan will be able convince Ken that his coin has special powers by finding a p value below 0.05 (one tailed).
(b) If Ken told Alan to flip the coin only 20 times, what is the probability that Alan will not be able to convince Ken (by failing to reject the null hypothesis at the 0.05 level)?

Answer:
I don’t know how to do this.