Exam 2 – Practice problems

1. True or **False**: A significant difference among groups is considered large and important.

2. A group of 75 psychology students in Delaware took the Psychology subject portion of the GRE and got a mean score of 520. The population mean score on the GRE is 500 with a standard deviation of 100. Would I be correct in concluding that Delaware psychology students scored better than the national average?
   Z = 520-500 / 11.55 = 1.73 Since this is a one tailed test (we predicted they would do better), this value is greater than the Zcrit of 1.64. Therefore, my conclusion would be correct…barely.

3. A group of 50 New York psychology students got a mean score of 530 on the psychology GRE with a standard deviation of 80. These students claim to be WAY more nerdy than a group of 50 California psychology students who had a mean score of 515 with a standard deviation of 50. Are the New York students truly more nerdy than the California students?
   t = 530-515 / 13.34 = 1.12 Tcrit = 2.009, so the New York students are NOT truly more nerdy than the California students.

4. I had two groups of people watch either Monty Python and the Holy Grail or In the Army Now (that Pauly Shore movie) and asked them to rate (on a scale of 1-10) how funny it was. People who watched Monty Python gave a mean rating of 9.5 and people who watched In the Army Now gave a mean rating of 6.5. The pooled standard deviation is 2.45. If there were 20 people in each group, what is the power of this experiment? What does this mean?
   1.22 * 3.16 = Delta = 3.87 power = .97 This means that if we say people thought Monty Python and the Holy Grail was funnier than In the Army Now, we have a 97% chance of being correct.

5. Assume we conducted a dependent samples t-test. Our observed t-value is 1.233. If everything else was equal, but the standard deviation was 4 times smaller, what observed t-value would we expect?
   1.233 * 4 = 4.932;

6. When do we use a one-tailed hypothesis test?
   When there is prior evidence suggesting directionality?

7. My experiment has a power of 0.5(assume two tailed, alpha=.05,known std dev with normal distribution). If I increase my sample size from N to 4N, what will my power become?
   Before change of sample size, effect size is 1.96 std errors (because of alpha=.05 and two tails).
   After change, std error is sqrt(4) – twice as small so now 2 new stderr fit in one old stderr so distance between means is now 1.96*2=3.92 std errors.
   New power is area beyond 1.96 because 3.92 is 1.96 beyond critical value of 1.96.

   New power is 0.975.

8. We are testing if a new drug called happilift affects BDI depression scores. The mean score on the BDI for the population of patients not taking happilift is 10, but we don't know the standard deviation of these scores. We collect a sample of 32 clients and find the standard deviation of these scores to be 4 and the mean of these scores to be 11. What will our observed test statistic (t value) be?
   Single sample t-test.

   Std error = stdev/sqrt(sample size) = 4/sqrt(32) =.707.

   Difference between our mean of 11 and pop mean of 10 is 1. So t-value = (11-10)/stderr = 1/.0707=1.414l

9. IF the variance of sample 1 (11 subjects) is 20 and the variance of sample 2 (11 subjects) is 40, then what is the pooled variance in an independent t-test?
   Equal sample sizes, pooled variance is average of other two variances = (20+40)/2 = 30;

10. IF the stdev of sample 1 (11 subjects) is 20 and the stdev of sample 2 (21 subjects) is 40, then what is the pooled variance in an independent t-test?
    Must do weighted sum.
    Pooled = ((df1*var1)+(df2*var2)) / dftot = (10*400+20*1600)/30 = 1200.

11. What are the 3 sources of variability in a within subjects anova?
    Subjects, between groups and within groups

12. For a dependent sample t-test that compares the ages of 10 husbands with the ages of their wives, what is the critical value for an alpha=.05 with 2 tails.
    2.26
    10 pairs, df=9.

13. In an independent t-test, the pooled variance is equal to both the variance of sample 1 and the variance of sample 2. If sample 1 has 100 subjects, then how many subjects are in sample 2?
    Any number fits in actually.

14. If a confidence interval constructed from a sample is 118<u<123, then the mean of that sample must be
    120.5; mean must be in middle of endpoints. Mean = (118+123)/2.

15. If the standard deviation is 10 and the standard error is 2, then what is the sample size?
    25
    Stderror = Stdev/sqrt(sample size)
    Sqrt(sample size)= Stdev/Stderr
    Sqrt(sample size)= 10/2
    Sqrt(sample size)= 5
    sample size =5^2
    sample size = 25

16. I run 1000 experiments, and the null hypothesis is true in reality in every single one of them. What proportion of the experiments will I CORRECTLY reject the null hypothesis (α=.05)?
    0
    Cannot correctly reject null hypothesis if it is true in reality.

17. I want to make a 95% confidence interval for the population mean given a sample mean of 100, a sample size of 64 and a known normally distributed population with a standard deviation of 10 . What is that confidence interval?
    97.55<u<102.45

18. For an independent sample t-test that compares the ages of 10 men with the ages of 10 women, what is the critical value for an alpha=.05 with 2 tails.
    2.101

19. The type II error rate of an experiment is the same as the power. If we are using a known population standard deviation with alpha=.05 and two tails, how large is the effect size measured in standard errors?
    1.96

20. The output indicates that $p < 0.05$; what does this mean? Explain in terms of hypothesis testing.
    It can be interpreted as the probability of obtaining your result (test value, e.g. z, t, F),given that the null hypothesis is true, is less than 5%. Or in other words if the null is true in reality and perform this same study 100 times you would obtain your test result less than 5 times.

21. What does significance (no significance) of results mean? What does it tell us about our hypothesis? What does it tell is about the differences between the groups?
    Significance is only a probability statement. If a test is significant it only means that the result is highly unlikely if the null hypothesis is true. So, we conclude that the null is "wrong" because it is an unlikely explanation for our result. If you have two groups and the difference is significant it means that a null that assumes the groups are equal does not adequately describe the results so we conclude that this is evidence that the group are in fact different.

22. Write out 7 hypothesis testing steps.
    1) **State null**
    2) **State alternative**
    3) **Pick alpha level**
    4) **State distribution/test**
    5) **Calculate critical value and state decision rule**
    6) **Perform test**
    7) **Apply decision rule and state conclusion**

23. During the tennis match, judges want to see who will do better men or women. In your own words, please state null hypothesis and alternative hypothesis.
Null: Men and Women will play tennis equally well or No difference between men and women
Alternative: Men and women will differ in their tennis playing ability

24. A researcher wants to see who eats more chocolate per day, college students or high school students. He randomly selects a total 30 students (15 college and 15 HS) and asks them to write down every time they eat something containing chocolate. His obtained t is 2.513. Is the difference between groups significant?
With 30 total students and 2 independent groups the degrees of freedom would by 15+15-2=28, and the question is stated without direction. So the critical t-value with 28 degrees of freedom and 2-tailed is 2.048. So yes the difference is significant.