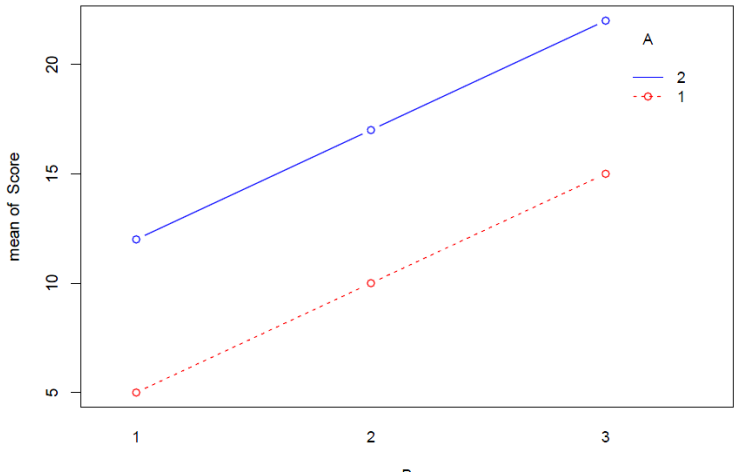
Psychology 311
Review Session Questions

1. In the following interaction plot, we see

a) A main effect for factor *A*, a main effect for factor *B* and no interaction.
b) No main effects, an interaction, and simple main effects for *B* at A_1 and for *B* at A_2.
c) A main effect for *A*, no main effect for *B*, and an interaction.
d) A main effect for *B*, no main effect for *A*, and an interaction.



2. Consider the following table of sample cell means. Suppose that $MS_{S/AB} = 24.75$, and that there are $n = 6$ observations per cell. In this case, the *F* statistic for the *A* main effect is _____.

	B1	B2	B3
A1	20.4	13.2	8.4
A2	22.7	14.4	10.9
A3	29.1	13.9	14.0

a) 4.000
b) 4.606
c) 5.767
d) 3.886

3. In the previous problem, what are the degrees of freedom for the *F* statistic?

a) 3, 54
b) 3, 45
c) 2, 18
d) 2, 45

4. In a purely exploratory study, you plan to perform tests that $\rho = 0$ on all the non-redundant elements of a 30×30 correlation matrix. How many tests will you be performing?

a) 900
b) 450
c) 465
d) 435

5. Suppose that, in the preceding problem, you decided that you wished to assure that (at least in the long run), of those correlations declared significant in your testing, no more than 5% were actually zero. In this case, you are seeking to control _____ at or below 0.05.

a) Familywise Error Rate
b) Per Comparison Error Rate
c) Per Experiment Error Rate
d) False Discovery Rate

6. You are comparing two sample means for equality, and each sample mean is based on a sample of size *n*. Assuming that both populations have variance σ^2, which expression below is correct for the sampling variance of the sample mean difference?

a) σ^2 / n
b) $2\sigma^2 / n$
c) $4\sigma^2 / n$
d) $2\sigma / n$

7. You have a set of 10 means, and wish to compare them all pairwise. Which of the following is closest to the Studentized Range Statistic needed to control FWER at 0.05?

a) 3.65
b) 4.59
c) 4.93
d) 5.65

8. Explain why the textbook converts a Studentized Range statistic into an equivalent *t* statistic by the formula

$$t = \frac{q}{\sqrt{2}}$$

9. Consider the data in Box 10.4 of RDASA3, shown below. With FWER controlled at 0.05, construct a confidence interval for $\mu_{HS} - \mu_C$, using the Games-Howell approach adapted to a confidence interval. The limits of the CI are _____ and _____.

Box 10.4 The Games–Howell Procedure for Testing All Pairwise Comparisons When Variances Are Not Equal

1. Compute Welch's t' and df', using Equations 6.15 and 6.16. For the *HS* and *C* statistics of Table 10.3, panel *a*, we have:

$$t' = \frac{\bar{Y}_{HS} - \bar{Y}_C}{\sqrt{\frac{s_{HS}^2}{n_{HS}} + \frac{s_C^2}{n_C}}} = \frac{6.903 - 3.674}{\sqrt{\frac{34.541}{19} + \frac{5.970}{33}}} = 2.284$$

and

$$df' = \frac{\left(\frac{s_{HS}^2}{n_{HS}} + \frac{s_C^2}{n_C}\right)^2}{\frac{s_{HS}^4}{n_{HS}^2(n_{HS} - 1)} + \frac{s_C^4}{n_c^2(n_C - 1)}} = \frac{\left(\frac{34.541}{19} + \frac{5.970}{33}\right)^2}{\frac{34.541^2}{(19^2)(18)} + \frac{5.970^2}{(33^2)(32)}} \approx 22$$

2. Obtain the critical value of t from Appendix Table C.9. For our example with 22 *df*, interpolate in Appendix Table C.9 between $df = 20$ and $df = 24$, with $a = 4$, $FWE = .05$. The critical q value is approximately 3.93. Then

$$t_{.05,4,22} = 3.93 / \sqrt{2} = 2.779$$

3. Because $2.284 < 2.779$, we cannot reject H_0: $\mu_5 = \mu_6$. In similar fashion, values of t' and df' can be calculated for each of the remaining five pairwise comparisons. Note that the critical value of t must be recalculated for each test because the df' are likely to change for each comparison.

a) –0.70, + 7.16
b) +0.25, + 9.34
c) –1.44, + 7.84
d) –2.87, + 7.97

10. Consider the following data, and suppose that you were performing a total of 4 planned contrasts. Test the mean of the movie and lecture conditions against the mean of the Neutral Movie and Neutral Lecture conditions, controlling FWER at 0.05. n = 5 per cell. Assume homogeneity of variances in choosing an error term.

	Movie	Lecture	Movie +Lecture	Control	Neutral Movie	Neutral Lecture
Mean	5.4	3.0	6.4	–1.4	0.8	–0.6
Variance	13.1	11.8	11.1	15.1	16.3	16.6

t=?

Do you reject the null hypothesis?

11. Suppose you have an ANOVA with the values of the independent variable not evenly spaced, i.e., 0,1,3,4. Moreover, the sample sizes are 4,5,5,4 for the 4 groups. Derive the orthogonal polynomial weights for the linear, quadratic, and cubic trends.