REVIEW SHEET FOR SESSION 9

1. Know that $\text{MS}_{\text{Between}}$ is an estimate of the population variance using the group means.

2. Know that $\text{MS}_{\text{Within}}$ is an estimate of the population variance using variation of the scores around the group means.

3. Know that when the null hypothesis is true (i.e., all the population means are equal), the ratio $\frac{\text{MS}_{\text{Between}}}{\text{MS}_{\text{Within}}}$ is F distributed.

4. The values in the F-distribution are determined by the degrees of freedom in the numerator and the degrees of freedom in the denominator. The degrees of freedom in the numerator are equal to the number of groups minus one; the degrees of freedom in the denominator are equal to the total number of observations in all the groups minus the number of groups. For example, say there was a study with three groups and there were 10 subjects in each group. This is enough information to calculate the degrees of freedom for both the numerator and the denominator. We can calculate the degrees of freedom from the numerator from the number of groups. Since there were three groups, there are two degrees of freedom in the numerator (3-1=2). In order to calculate the degrees of freedom for the denominator we need the total number of observations across the three groups minus the number of groups. Since there were three groups with ten in each group, there are thirty observations total (10+10+10=30). The degrees of freedom for the denominator is then 30-3 or 27.

5. Know that the comparison of multiple means using an F ratio is called a One-way Analysis of Variance.

6. Be able to identify the assumptions of a one-way analysis of variance. That is, the observations (or errors) are independent, the observations within any of the populations being compared are normally distributed, and all of the populations have the same variance.

7. Know that a significant F statistic in a one-way analysis of variance only indicates that all the population means for the groups in the analyses are not equal, i.e., the null hypothesis $H_0: \mu_1 = \mu_2 = \ldots = \mu_k$ is false. Hence, additional tests are generally conducted after the analysis of variance to determine which specific means are different from each other.

8. Know that Tukey’s Honest Significant Difference test is often used when comparing all possible pairs of means.

9. Know that analysis of variance is a very general procedure that allows one to test for several factors at once, and to look at repeated measures as well as multiple groups.