

## ANOVA and Tukey Formulas

### ANOVA - Raw Score Formulas

$$SS_W = \sum X^2 - \left[ \frac{(\sum X_A)^2}{n_A} + \frac{(\sum X_B)^2}{n_B} + \dots + \frac{(\sum X_n)^2}{n_x} \right]$$

$$SS_A = \left[ \frac{(\sum X_A)^2}{n_A} + \frac{(\sum X_B)^2}{n_B} + \dots + \frac{(\sum X_n)^2}{n_x} \right] - \frac{(\sum X)^2}{n_T}$$

$$SS_T = \sum X^2 - \frac{(\sum X)^2}{n_T} \quad \text{or} \quad SS_T = SS_W + SS_A$$

$$df_W = (n_A - 1) + (n_B - 1) + \dots + (n_x - 1) \quad \text{or} \quad df_W = n_T - K \quad (\text{When } n\text{'s are equal per group})$$

$$df_A = K - 1$$

$$df_T = n_T - 1 \quad \text{or} \quad df_T = df_W + df_A$$

$$MS_W = \frac{SS_W}{df_W}$$

$$MS_A = \frac{SS_A}{df_A}$$

$$F = \frac{MS_A}{MS_W} \quad (\text{Table E is used for critical F value})$$

### Tukey HSD Test

$$t_q = \frac{\bar{X}_i - \bar{X}_j}{\sqrt{MS_W \left( \frac{1}{n_i} + \frac{1}{n_j} \right)}} \quad t_{critical} = \frac{q_{critical}}{\sqrt{2}} \quad (\text{Table F is used to determine } q \text{ critical value})$$