

# STAT 705 - Test 1 Formula Sheet

Two-Factor ANOVA formulas (balanced data)

$$SSTO = \sum_i \sum_j \sum_k (Y_{ijk} - \bar{Y}_{...})^2$$

$$SSTR = n \sum_i \sum_j (\bar{Y}_{ij.} - \bar{Y}_{...})^2$$

$$SSE = \sum_i \sum_j \sum_k (Y_{ijk} - \bar{Y}_{ij.})^2$$

$$SSA = nb \sum_i (\bar{Y}_{i..} - \bar{Y}_{...})^2, \quad SSAB = SSTR - SSA - SSB$$

$$SSB = na \sum_j (\bar{Y}_{.j.} - \bar{Y}_{...})^2$$

"Least squares Means":

$$\hat{\mu}_i = \frac{\sum_j \bar{Y}_{ij.}}{b}, \quad \hat{\mu}_{.j} = \frac{\sum_i \bar{Y}_{ij.}}{a}$$

$$ICC = \frac{\sigma_\mu^2}{\sigma_Y^2} = \frac{\sigma_\mu^2}{\sigma_\mu^2 + \sigma^2} \text{ in the random-effects}$$

ANOVA model.

CI's in the random-effects model:

100(1- $\alpha$ )% CI for  $\mu_0$  is:

$$\bar{Y}_{..} \pm t_{(1-\alpha/2; r-1)} \sqrt{\frac{MSTR}{rn}}$$

100(1- $\alpha$ )% CI for  $\sigma^2$  is:

$$\left[ \frac{r(n-1)MSE}{\chi^2_{[1-\alpha/2; r(n-1)]}}, \frac{r(n-1)MSE}{\chi^2_{[\alpha/2; r(n-1)]}} \right]$$

ANOVA formulas for RCBD:

$$SSBL = r \sum (\bar{y}_{i.} - \bar{y}_{..})^2$$

$$SSTR = n_b \sum (\bar{y}_{.j} - \bar{y}_{..})^2$$

$$SSBL.TR = \sum_{i,j} e_{ij}^2 \quad \text{where } e_{ij} = y_{ij} - \hat{y}_{ij} \\ = y_{ij} - [\bar{y}_{i.} + \bar{y}_{.j} - \bar{y}_{..}]$$

Repeated Measures:

$$\omega = \sigma_p^2 / \sigma_y^2 = \sigma_p^2 / [\sigma_p^2 + \sigma^2]$$

$$\chi_{KW}^{2*} = \frac{SSTR_R}{SSTO_R / (n_T - 1)}$$

$$SSTR_R = \sum_i n_i (\bar{R}_{i.} - \bar{R}_{..})^2, \quad SSTO_R = \sum_i \sum_j (R_{ij} - \bar{R}_{..})^2$$

$$Z_{1 - \frac{\alpha}{2g}} \sqrt{\frac{n_T (n_T + 1)}{12} \left[ \frac{1}{n_i} + \frac{1}{n_{i'}} \right]}$$

$$\chi_F^{2*} = \frac{SSTR_R}{(SSTR_R + SSBL.TR_R) / [n_b (r - 1)]}$$