

## Formulas for Exam 2

- **Estimated Main Effect**

$$\text{Full Effect: } \bar{Y}_{high} - \bar{Y}_{low} \quad \text{or} \quad \frac{\sum(\text{coef} * \text{mean})}{2^{p-1}}$$

$$\text{Half Effect: } \bar{Y}_{high} - \bar{\bar{Y}} \quad \text{or} \quad \frac{\sum(\text{coef} * \text{mean})}{2^p}$$

- **Replication Error**

$$SS_{repError} = \sum(n_i - 1)s_i^2$$

$$df_{repError} = \sum(n_i - 1)$$

$$MS_{repError} = \frac{SS_{repError}}{df_{repError}}$$

- **Standard error of an estimated full effect**

$$\sqrt{MS_{repError} \left( \frac{4}{N} \right)}$$

- **Critical effect size**

$$t_{\frac{\alpha}{2}, df} \sqrt{MS_{repError} \left( \frac{4}{N} \right)}$$

(use t=3 for most situations.)

- **Prediction Interval**

$$\hat{Y} \pm t_{\frac{\alpha}{2}, df} \sqrt{MS_{repError} \left( \frac{N + k + 1}{N} \right)}$$

where  $k$  is the number of variables in the prediction equation and  $t$  is usually between 2 and 3.

- **Combining higher order interactions**

$$SS_{Effect} = \frac{N}{4}(Effect)^2$$

$$SS_{\text{"Error"}} = \sum(SS_{Effect})$$

$df_{\text{"Error"}}$  = number of effects in sum.

- **Test for Curvature**

$$t = \frac{\bar{Y}_F - \bar{Y}_C}{\sqrt{s^2 \left( \frac{1}{N_F} + \frac{1}{N_C} \right)}}$$

significant if  $t$  is greater than 3.

- **Randomized Complete Block Design**

$$SS_{Block} = \sum m(\bar{Y}_j - \bar{\bar{Y}})^2$$

$$df_{Block} = \#Blocks - 1$$

$$SS_{Error} = SS_{repError} - SS_{Block}$$

$$df_{Error} = df_{repError} - df_{Block}$$