

STAT 230 FORMULA SHEET

$$s^2 = \frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2$$

$$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}$$

$$\bar{x} \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$$

$$t = \frac{\bar{x} - \mu}{s/\sqrt{n}}$$

$$\bar{x} \pm t_{\alpha/2, df} \frac{s}{\sqrt{n}}$$

Degrees of freedom: $n - 1$

$$z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\left(\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}\right)}}$$

$$(\bar{x}_1 - \bar{x}_2) \pm z_{\alpha/2} \sqrt{\left(\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}\right)}$$

$$z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\left(\frac{1}{n_1} + \frac{1}{n_2}\right) \sigma^2}}$$

$$(\bar{x}_1 - \bar{x}_2) \pm z_{\alpha/2} \sqrt{\left(\frac{1}{n_1} + \frac{1}{n_2}\right) \sigma^2}$$

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\left(\frac{1}{n_1} + \frac{1}{n_2}\right) s_{p\ell}^2}}$$

$$(\bar{x}_1 - \bar{x}_2) \pm t_{\alpha/2, df} \sqrt{\left(\frac{1}{n_1} + \frac{1}{n_2}\right) s_{p\ell}^2}$$

$$s_{p\ell}^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}$$

Degrees of freedom: $n_1 + n_2 - 2$

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)}}$$

$$(\bar{x}_1 - \bar{x}_2) \pm t_{\alpha/2, df} \sqrt{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)}$$

Degrees of freedom: $\frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{s_1^4}{n_1^2(n_1-1)} + \frac{s_2^4}{n_2^2(n_2-1)}}$

$$n = \frac{z_{\alpha/2}^2 \sigma^2}{ME^2}$$

$$n = \frac{2z_{\alpha/2}^2 \sigma^2}{ME^2}$$

$$n = \frac{\sigma^2 (z_{\alpha} + z_{\beta})^2}{\delta^2}$$

$$n = \frac{\sigma^2 (z_{\alpha/2} + z_{\beta})^2}{\delta^2}$$

$$n = \frac{2\sigma^2 (z_{\alpha} + z_{\beta})^2}{\delta^2}$$

$$n = \frac{2\sigma^2 (z_{\alpha/2} + z_{\beta})^2}{\delta^2}$$

$$\bar{d} = \frac{1}{n} \sum_{i=1}^n d_i$$

$$s_d^2 = \frac{1}{n-1} \sum_{i=1}^n (d_i - \bar{d})^2$$

$$t = \frac{\bar{d} - \mu_d}{s_d/\sqrt{n}}$$

$$\bar{d} \pm t_{\alpha/2, df} \frac{s_d}{\sqrt{n}}$$

Degrees of freedom: $n - 1$

$$y_{ij} = \mu + \alpha_i + \epsilon_{ij}, \quad i = 1, \dots, I; \quad j = 1, \dots, n$$

$$\sum_{i=1}^I \sum_{j=1}^n y_{ij}^2$$

$$\sum_{i=1}^I \sum_{j=1}^n \bar{y}_{..}^2$$

$$\sum_{i=1}^I \sum_{j=1}^n (y_{ij} - \bar{y}_{..})^2$$

$$\sum_{i=1}^I \sum_{j=1}^n (\bar{y}_{i.} - \bar{y}_{..})^2 = n \sum_{i=1}^I (\bar{y}_{i.} - \bar{y}_{..})^2$$

$$\bar{x}_1 - \bar{x}_2 \pm t_{\alpha/2, df_{\text{Error}}} \sqrt{\left(\frac{1}{n_1} + \frac{1}{n_2} \right) MS_{\text{Error}}}$$

$$\Phi^2 = \frac{n \sum_{i=1}^I \alpha_i^2}{I \sigma^2}$$

$$y_{ijk} = \mu + \alpha_i + \beta_j + (\alpha\beta)_{ij} + \epsilon_{ijk},$$

$$i = 1, \dots, I; \quad j = 1, \dots, J; \quad k = 1, \dots, n$$

$$\sum_{i=1}^I \sum_{j=1}^J \sum_{k=1}^n y_{ijk}^2$$

$$\sum_{i=1}^I \sum_{j=1}^J \sum_{k=1}^n \bar{y}_{...}^2$$

$$\sum_{i=1}^I \sum_{j=1}^J \sum_{k=1}^n (y_{ijk} - \bar{y}_{...})^2$$

$$\sum_{i=1}^I \sum_{j=1}^J \sum_{k=1}^n (\bar{y}_{i..} - \bar{y}_{...})^2 = Jn \sum_{i=1}^I (\bar{y}_{i..} - \bar{y}_{...})^2$$

$$\sum_{i=1}^I \sum_{j=1}^J \sum_{k=1}^n (\bar{y}_{.j.} - \bar{y}_{...})^2 = In \sum_{j=1}^J (\bar{y}_{.j.} - \bar{y}_{...})^2$$

$$\sum_{i=1}^I \sum_{j=1}^J \sum_{k=1}^n (\bar{y}_{ij.} - \bar{y}_{i..} - \bar{y}_{.j.} + \bar{y}_{...})^2$$

$$= n \sum_{i=1}^I \sum_{j=1}^J (\bar{y}_{ij.} - \bar{y}_{i..} - \bar{y}_{.j.} + \bar{y}_{...})^2$$

$$y_{ij} = \mu + \beta_j + \alpha_i + \epsilon_{ij},$$

$$i = 1, \dots, I; \quad j = 1, \dots, J;$$

$$y_{ijk} = \mu + \beta_j + \alpha_i + \gamma_k + (\alpha\gamma)_{ik} + \epsilon_{ijk},$$

$$i = 1, \dots, I; \quad j = 1, \dots, J; \quad k = 1, \dots, K;$$

$$y_{ijk} = \mu + \alpha_i + \beta_{j(i)} + \gamma_k + (\alpha\gamma)_{ik} + \epsilon_{ijk},$$

$$i = 1, \dots, I; \quad j = 1, \dots, J; \quad k = 1, \dots, K;$$

$$y_{ijk\ell} = \mu + \alpha_i + \beta_{j(i)}$$

$$+ \gamma_k + \eta_\ell + (\alpha\gamma)_{ik} + (\alpha\eta)_{i\ell} + (\gamma\eta)_{k\ell} + (\alpha\gamma\eta)_{ik\ell} + \epsilon_{ijk\ell},$$

$$i = 1, \dots, I; \quad j = 1, \dots, J; \quad k = 1, \dots, K; \quad \ell = 1, \dots, L$$

$$y_{ijk\ell} = \mu + \alpha_i + \eta_j + (\alpha\eta)_{ij} + \beta_{k(ij)}$$

$$+ \gamma_\ell + (\alpha\gamma)_{i\ell} + (\eta\gamma)_{j\ell} + (\alpha\eta\gamma)_{ij\ell} + \epsilon_{ijk\ell},$$

$$i = 1, \dots, I; \quad j = 1, \dots, J; \quad k = 1, \dots, K; \quad \ell = 1, \dots, L$$

$$y_{ijk} = \mu + \alpha_i + \beta_j + \tau_k + \epsilon_{ijk},$$

$$i = 1, \dots, K; \quad j = 1, \dots, K; \quad k = 1, \dots, K;$$

$$y_{ijk\ell} = \mu + \theta_i + \alpha_{j(i)} + \beta_{k(i)} + \tau_\ell + \epsilon_{ijk\ell},$$

$$i = 1, \dots, I; \quad j = 1, \dots, K; \quad k = 1, \dots, K; \quad \ell = 1, \dots, K$$