Appendix B — Formula sheet

B.1 General Part

Mean: $\bar{X} = \frac{\Sigma_{i=1}^{n} x_i}{N}$

Variance: $S_x^2 = \frac{\Sigma_{i=1}^{n}(x_i - \bar{x})^2}{n-1}$

Standardized values (Z-values): $Z = \frac{X-\mu}{\sigma}$

Z-statistic in one sample Z-test: $Z = \frac{\bar{x}-\mu}{\sigma_{\bar{x}}}$

Standard error of the mean: $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$

Cohen's d: $\frac{\bar{X}_1 - \bar{X}_2}{s_{pooled}}$

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

$s_{pooled} = \sqrt{s_{pooled}^2}$

F-statistic in one-way ANOVA: $F(df_b, df_w) = \frac{(SS_b/df_b)}{(SS_w/df_w)} = \frac{MS_b}{(MS_w}$

Simple regression model: $Y' = b_0 + b_1 X$

Multiple regression model: $Y' = b_0 + b_1 X_1 + b_2 X_2$

Explained variance: $R^2 = \frac{s_{y'}^2}{s_y^2}$

t-statistic in a one sample t-test: $t = \frac{\bar{X}-\mu_{H0}}{se_x}$, where $se_x = \frac{s_x}{\sqrt{n}}, df = n-1$

t-statistic in an independent samples t-test: $t = \frac{(\bar{X}_1-\bar{X}_2)-(\mu_1-\mu_2)_{H0}}{se_{x_1-x_2}}$

$se_{x_1-x_2} = \sqrt{s_{pooled}^2(\frac{1}{n_1} + \frac{1}{n_2})}$

B.2 Business and economics

Logistic function: $P(Y=1|X) = \frac{e^{(b_0+b_1X)}}{1+e^{(b_0+b_1X)}}$

From probability to odds: $\text{odds} = \frac{P}{1-P}$

From odds to probability: $P = \frac{\text{odds}}{1+\text{odds}}$

From odds to logit: $\text{logit} = \ln(\text{odds})$

From probability to logit: $\text{logit} = \ln\left(\frac{P}{1-P}\right)$

From logit to odds: $\text{odds} = e^{\text{logit}}$

From logit to probability: $P = \frac{e^{\text{logit}}}{1+e^{\text{logit}}}$

Wald test statistic: $W = (\frac{b}{se_b})^2$

B.3 Cognitive neuroscience

Number of Possible Pairwise Comparisons: $k \times \frac{(k-1)}{2}$

Factorial ANOVA Linear Model: $Y_{jkl} = \mu_Y + \alpha_k + \beta_l + \alpha\beta_{kl} + \epsilon_{jkl}$

Eta-squared for Factor A: $\eta^2_A = \frac{SS_A}{SS_{total}}$

Partial eta-squared for Factor A: $\eta^2_{partial.A} = \frac{SS_A}{SS_A+SS_w}$

Adjusted Mean: $\bar{Y}_{i(adj)} = \bar{Y}_i - b_w(\bar{X}_i - \bar{X})$

t-Statistic in Paired Samples t-Test: $t = \frac{\bar{d}}{\frac{s_{\bar{d}}}{\sqrt{n}}}, \quad \text{df} = n - 1$

B.4 Social Sciences

Reliability: $r_{xx'} = \frac{\text{var}(T)}{\text{var}(X)} = \frac{\text{var}(T)}{\text{var}(T)+\text{var}(E)}$

Eigenvalue of Component 1 for 6 Items: $\lambda_1 = a^2_{11} + a^2_{21} + a^2_{31} + a^2_{41} + a^2_{51} + a^2_{61}$

The proportion of Variance Accounted For by component 1 (when there are J items) is: $\text{Proportion VAF} = \frac{\lambda_1}{\text{TotalVar}} = \frac{\lambda_1}{J}$

Component loadings for component 1 and item j are represented as: $a_{j1} = r_{X_jC_1}$

Communality for 2 Components: $h_{j2} = r^2_{XjC1} + r^2_{XjC2} = a^2_{j1} + a^2_{j2}$

Unicity for 2 Components: $b_{j2} = 1 - h_{j2}$