Test statistic (hypothesis test about $\mu_D$ in paired-sample $t$-test):

$$t = \frac{\bar{x}_D - \mu_0}{s_D / \sqrt{n}}$$

CI for $\mu_1 - \mu_2$, if $\sigma_1^2 \neq \sigma_2^2$:

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

CI for $\mu_1 - \mu_2$, if $\sigma_1^2 = \sigma_2^2$:

$$(\bar{x}_1 - \bar{x}_2) \pm t_{\alpha/2} \sqrt{\frac{s_p^2}{n_1} + \frac{s_p^2}{n_2}}$$

where

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

Test statistic (comparing two means, independent samples), if $\sigma_1^2 \neq \sigma_2^2$:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Test statistic (comparing two means, independent samples), if $\sigma_1^2 = \sigma_2^2$:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_p^2}{n_1} + \frac{s_p^2}{n_2}}}$$

CI for $p_1 - p_2$:

$$(\hat{p}_1 - \hat{p}_2) \pm z_{\alpha/2} \sqrt{\frac{\hat{p}_1(1 - \hat{p}_1)}{n_1} + \frac{\hat{p}_2(1 - \hat{p}_2)}{n_2}}$$

Test statistic (comparing two proportions):

$$z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}(1 - \hat{p})(\frac{1}{n_1} + \frac{1}{n_2})}}$$

where $\hat{p}$ is the pooled sample proportion.
ANOVA table formulas:

\[ MST = \frac{SST}{(k - 1)}, \quad MSE = \frac{SSE}{(n - k)}, \quad F = \frac{MST}{MSE} \]

Regression and correlation formulas:

\[ \hat{\beta}_1 = \frac{SS_{xy}}{SS_{xx}}, \quad \hat{\beta}_0 = \bar{Y} - \hat{\beta}_1 \bar{X}, \quad s = \sqrt{MSE} = \sqrt{\frac{SSE}{(n - 2)}}, \]

\[ r = \frac{SS_{xy}}{\sqrt{SS_{xx}SS_{yy}}}, \quad r^2 = 1 - \frac{SSE}{SS_{yy}} \]

Test statistic for test of model usefulness:

\[ t = \frac{\hat{\beta}_1}{s/\sqrt{SS_{xx}}} \]

CI for \( \beta_1 \):

\[ \hat{\beta}_1 \pm t_{\alpha/2}(s/\sqrt{SS_{xx}}) \]

CI for \( E(Y) \) at \( x = x_p \):

\[ \hat{Y} \pm t_{\alpha/2}(s)\sqrt{\frac{1}{n} + (x_p - \bar{x})^2/SS_{xx}} \]

PI for new \( Y \) at \( x = x_p \):

\[ \hat{Y} \pm t_{\alpha/2}(s)\sqrt{\frac{1}{n} + 1 + (x_p - \bar{x})^2/SS_{xx}} \]

Test statistic, Test for Multinomial Probabilities:

\[ \chi^2 = \sum \frac{[n_i - E(n_i)]^2}{E(n_i)} \]

where \( E(n_i) = np_i \) is the expected cell count if \( H_0 \) is true.

Test statistic, Test for Independence:

\[ \chi^2 = \sum \frac{[n_{ij} - \hat{E}(n_{ij})]^2}{\hat{E}(n_{ij})} \]

where \( \hat{E}(n_{ij}) = R_iC_j/n \) is the expected count in cell \((i, j)\) under independence.