Summary of Confidence Interval Formulas

Statistic	Confidence Interval
Sample Mean, Known Variance	$\bar{X} \pm \frac{\sigma}{\sqrt{n}} Z_{\frac{\alpha}{2}}$
Sample Mean, Unknown Variance	$\bar{X} \pm \frac{S}{\sqrt{n}} t_{(n-1),\alpha/2}$
Sample Proportion	$\hat{P} \pm Z_{\alpha/2}\sqrt{\frac{\hat{P}(1-\hat{P})}{n}}$
Sample Variance	$\frac{(n-1)S^2}{\chi^2_{(n-1),Upper\ Tail}} \leq \sigma^2 \leq \frac{(n-1)S^2}{\chi^2_{(n-1),Lower\ Tail}}$
Two Sample Means, Dependent Samples	$\bar{d} \pm \frac{S_d}{\sqrt{n}} t_{(n-1),\frac{\alpha}{2}}$
Two Sample Means, Known Variances	$(\bar{X}-\bar{Y}) \pm \left(\sqrt{\frac{\sigma_X^2}{n_X}+\frac{\sigma_Y^2}{n_Y}}\right) Z_{\frac{\alpha}{2}}$
Two Sample Means, Unknown Variances assumed Equal	$\bar{X}-\bar{Y} \pm \left(\sqrt{\frac{S_P^2}{n_X}+\frac{S_P^2}{n_Y}}\right) t_{(n_X+n_Y-2),\frac{\alpha}{2}}$ Where the pooled variance is calculated as $S_P^2 = \frac{(n_x-1)S_X^2+(n_Y-1)S_Y^2}{n_X+n_Y-2}$
Two Sample Means, Unknown Variances not assumed Equal	$\bar{X}-\bar{Y} \pm \left(\sqrt{\frac{S_X^2}{n_X}+\frac{S_Y^2}{n_Y}}\right) t_{\left(m,\frac{\alpha}{2}\right)}$ Where the degrees of freedom m is from $m = \frac{\left(\frac{S_X^2}{n_X}+\frac{S_Y^2}{n_Y}\right)^2}{\frac{\left(\frac{S_X^2}{n_x}\right)^2}{n_X-1}+\frac{\left(\frac{S_Y^2}{n_Y}\right)^2}{n_Y-1}}$
Sample proportion when n_X and n_Y are "large"	$\hat{P}_X-\hat{P}_Y \pm Z_{\frac{\alpha}{2}}\sqrt{\frac{\hat{P}_X(1-\hat{P}_X)}{n_X}+\frac{\hat{P}_Y(1-\hat{P}_Y)}{n_Y}}$

Summary of Hypothesis Test Formulas and Decision Rules

Test Type	Test Statistic	Decision Rules
Sample Mean versus a constant such as: $H_0: \mu_x = k$ Known Variance	$Z_{calc} = \frac{\bar{X} - k}{\sigma / \sqrt{n}}$	$H_A: \mu_X > k$ Reject if $Z_{calc} > Z_\alpha$ $H_A: \mu_X < k$ Reject if $Z_{calc} < 0$ *and* $\lvert Z_{calc}\rvert > Z_\alpha$ $H_A: \mu_X \neq k$ Reject if $\lvert Z_{calc}\rvert > Z_{\alpha/2}$
Sample Mean versus a constant such as: $H_0: \mu_x = k$ Unknown Variance	$t_{calc} = \frac{\bar{X} - k}{S / \sqrt{n}}$	$H_A: \mu_X > k$ Reject if $t_{calc} > t_{n-1,\alpha}$ $H_A: \mu_X < k$ Reject if $t_{calc} < 0$ *and* $\lvert t_{calc}\rvert > t_{n-1,\alpha}$ $H_A: \mu_X \neq k$ Reject if $\lvert t_{calc}\rvert > t_{n-1,\alpha/2}$
Sample Proportion versus a constant such as: $H_0: P = P_0$	$Z_{calc} = \frac{\hat{P} - P_0}{\sqrt{\frac{P_0(1-P_0)}{n}}}$	$H_A: \hat{P} > P_0$ Reject if $Z_{calc} > Z_\alpha$ $H_A: \hat{P} < P_0$ Reject if $Z_{calc} < 0$ *and* $\lvert Z_{calc}\rvert > Z_\alpha$ $H_A: \hat{P} \neq P_0$ Reject if $\lvert Z_{calc}\rvert > Z_{\alpha/2}$
Sample Variance versus a constant such as: $H_0: \sigma^2 = \sigma_0^2$	$\chi_{calc} = \frac{(n-1)S^2}{\sigma_0^2}$	$H_A: \sigma^2 > \sigma_0^2$ Reject if $\chi_{calc} > \chi^2_{n-1,\alpha\ Upper}$ $H_A: \sigma^2 < \sigma_0^2$ Reject if $\chi_{calc} < \chi^2_{n-1,\alpha\ Lower}$ $H_A: \sigma^2 \neq \sigma_0^2$ Reject if $\chi_{calc} > \chi^2_{n-1,\alpha/2\ Upper}$ or $\chi_{calc} < \chi^2_{n-1,\alpha/2\ Lower}$
Two Sample Means, Dependent Samples $H_0: \bar{d} = 0$	$t_{calc} = \frac{\bar{d}}{S_d / \sqrt{n}}$	$H_A: \bar{d} > 0$ Reject if $t_{calc} > t_{n-1,\alpha}$ $H_A: \bar{d} < 0$ Reject if $t_{calc} < 0$ *and* $\lvert t_{calc}\rvert > t_{n-1,\alpha}$ $H_A: \bar{d} \neq 0$ Reject if $\lvert t_{calc}\rvert > t_{n-1,\alpha/2}$
Two Sample Means, Known Variances $H_0: \mu_X - \mu_Y = 0$	$Z_{calc} = \frac{(\bar{X} - \bar{Y})}{\sqrt{\frac{\sigma_X^2}{n_X} + \frac{\sigma_Y^2}{n_Y}}}$	$H_A: \mu_X > \mu_Y$ Reject if $Z_{calc} > Z_\alpha$ $H_A: \mu_X < \mu_Y$ Reject if $Z_{calc} < 0$ *and* $\lvert Z_{calc}\rvert > Z_\alpha$ $H_A: \mu_X \neq \mu_Y$ Reject if $\lvert Z_{calc}\rvert > Z_{\alpha/2}$

Test Type	Test Statistic	Decision Rules
Two Sample Means, Unknown Variances assumed Equal $H_0: \mu_X - \mu_Y = 0$	$t_{calc} = \dfrac{\bar{X} - \bar{Y}}{\sqrt{\dfrac{S_P^2}{n_X} + \dfrac{S_P^2}{n_Y}}}$ Where the pooled variance is calculated as $S_P^2 = \dfrac{(n_x - 1)S_X^2 + (n_Y - 1)S_Y^2}{n_X + n_Y - 2}$	$H_A: \mu_X > \mu_Y$ Reject if $t_{calc} > t_{(n_X+n_Y-2,\alpha)}$ $H_A: \mu_X < \mu_Y$ Reject if $t_{calc} < 0 \; and \; \lvert t_{calc}\rvert > t_{(n_X+n_Y-2,\alpha)}$ $H_A: \mu_X \neq \mu_Y$ Reject if $\lvert t_{calc}\rvert > t_{(n_X+n_Y-2,\alpha/2)}$
Two Sample Means, Unknown Variances not assumed Equal $H_0: \mu_X - \mu_Y = 0$	$t_{calc} = \dfrac{\bar{X} - \bar{Y}}{\sqrt{\dfrac{S_X^2}{n_X} + \dfrac{S_Y^2}{n_Y}}}$	$H_A: \mu_X > \mu_Y$ Reject if $t_{calc} > t_{(m,\alpha)}$ $H_A: \mu_X < \mu_Y$ Reject if $t_{calc} < 0 \; and \; \lvert t_{calc}\rvert > t_{(m,\alpha)}$ $H_A: \mu_X \neq \mu_Y$ Reject if $\lvert t_{calc}\rvert > t_{(m,\alpha/2)}$ Where the degrees of freedom m is from $m = \dfrac{\left(\dfrac{S_X^2}{n_X} + \dfrac{S_Y^2}{n_Y}\right)^2}{\dfrac{\left(\dfrac{S_X^2}{n_x}\right)^2}{n_X - 1} + \dfrac{\left(\dfrac{S_Y^2}{n_Y}\right)^2}{n_Y - 1}}$
Sample proportion when n_X and n_Y are "large" $H_0: P_X - P_Y = 0$	$Z_{calc} = \dfrac{\hat{P}_X - \hat{P}_Y}{\sqrt{\dfrac{P_0(1-P_0)}{n_X} + \dfrac{P_0(1-P_0)}{n_Y}}}$ Where the Pooled Proportion P_0 is from $P_0 = \dfrac{n_X\hat{P}_X + n_y\hat{P}_Y}{n_X + n_Y}$	$H_A: P_X > P_Y$ Reject if $Z_{calc} > Z_\alpha$ $H_A: P_X < P_Y$ Reject if $Z_{calc} < 0 \; and \; \lvert Z_{calc}\rvert > Z_\alpha$ $H_A: P_X \neq P_Y$ Reject if $\lvert Z_{calc}\rvert > Z_{\alpha/2}$
Two Sample Variances $H_0: \sigma_X^2 = \sigma_Y^2$	$F_{calc} = \dfrac{S_X^2}{S_Y^2}$	$H_A: \sigma_X^2 > \sigma_Y^2$ Reject if $F_{calc} > F_{(n_X-1,n_y-1,1-\alpha)}$ $H_A: \sigma_X^2 < \sigma_Y^2$ Reject if $F_{calc} < F_{(n_X-1,n_y-1,\alpha)}$