Summary of one and two sample methods

| Inference For | Sample Size | Assumptions beyond Random Sampling | Conf Int Reference Dist | $H$ and Test Stat |
|---|---|---|---|---|
| $\mu$ | Large $n$ | | $\overline{X} \mp z\frac{S}{\sqrt{n}}$ Standard Normal | $H: \mu = \#$ $Z = \frac{\overline{X}-\#}{S/\sqrt{n}}$ |
| | Small $n$ | Normal Dist | $\overline{X} \mp t\frac{S}{\sqrt{n}}$ $T$ Dist with $d.f. = n-1$ | $H: \mu = \#$ $T = \frac{\overline{X}-\#}{S/\sqrt{n}}$ |
| $\mu_1 - \mu_2$ | Large $n_1$ and $n_2$ | Two Ind Samples | $\overline{X_1} - \overline{X_2} \mp z\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}$ Standard Normal | $H: \mu_1 - \mu_2 = \#$ $Z = \frac{\overline{X_1}-\overline{X_2}-\#}{\sqrt{S_1^2/n_1+S_2^2/n_2}}$ |
| | At least one $n_i$ is small | Normal Dist with $\sigma_1^2 = \sigma_2^2$ | $\overline{X_1} - \overline{X_2} \mp tS_p\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$ $T$, $d.f. = n_1 + n_2 - 2$ | $H: \mu_1 - \mu_2 = \#$ $T = \frac{\overline{X_1}-\overline{X_2}-\#}{S_p\sqrt{1/n_1+1/n_2}}$ |
| $\mu_d = \mu_1 - \mu_2$ | Large $n$ | Paired Data | $\overline{D} \mp z\frac{S_d}{\sqrt{n}}$ Standard Normal | $H: \mu = \#$ $Z = \frac{\overline{D}-\#}{S_d/\sqrt{n}}$ |
| | Small $n$ | Normal Dist | $\overline{D} \mp t\frac{S_d}{\sqrt{n}}$ $T$, $d.f. = n-1$ | $H: \mu = \#$ $T = \frac{\overline{D}-\#}{S_d/\sqrt{n}}$ |
| $p$ | Large $n$ | | $\hat{p} \mp z\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$ Standard Normal | $H: p = \#$ $Z = \frac{\hat{p}-\#}{\sqrt{\#(1-\#)/n}}$ |
| $p_1 - p_2$ | Large $n_1$ and $n_2$ | Two Ind Samples | $\hat{p}_1 - \hat{p}_2 \mp z\sqrt{\frac{\hat{p}_1\hat{q}_1}{n_1} + \frac{\hat{p}_2\hat{q}_2}{n_2}}$ Standard Normal | $H: p_1 - p_2 = 0$ $Z = \frac{\hat{p}_1-\hat{p}_2-0}{\sqrt{\hat{p}_p\hat{q}_p}\sqrt{1/n_1+1/n_2}}$ |

Where $S_p = \sqrt{\dfrac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{n_1+n_2-2}}$, $\hat{q} = 1-\hat{p}$, $\hat{q}_i = 1-\hat{p}_i$, $\hat{p}_p = \dfrac{n_1\hat{p}_1 + n_2\hat{p}_2}{n_1+n_2}$ and $\hat{q}_p = 1-\hat{p}_p$