*** Hypothesis Testing Summary ***

one-sample

1): $Z = \dfrac{\bar{X}_n - u}{\sigma/\sqrt{n}}$ test the mean. σ: population s.d. is given

if p-value $< \alpha$, reject H_0.

Confidence Intervals:

$$\bar{X}_n - Z_{\alpha/2}\cdot\frac{\sigma}{\sqrt{n}} < u < \bar{X}_n + Z_{\alpha/2}\cdot\sigma/\sqrt{n}.$$

If not include 0, then reject H_0.

2): $Z = \dfrac{\hat{p} - p}{\sqrt{\frac{pq}{n}}}$, test the proportion.

if p-value $< \alpha$, then reject H_0.

Confidence Interval:

$$\hat{p} - Z_{\alpha/2}\cdot\sqrt{\frac{\hat{p}\hat{q}}{n}} < p < \hat{p} + Z_{\alpha/2}\sqrt{\frac{\hat{p}\,\hat{q}}{n}}$$

If not include 0, then reject H_0.

3): $t = \dfrac{\bar{X}_n - u}{s/\sqrt{n}}$, test the mean. σ is unknown. s is known.

if p-value $< \alpha$, reject H_0

Confidence Interval:

$$\bar{X}_n - t_{\alpha/2}\cdot s/\sqrt{n} < u < \bar{X}_n + t_{\alpha/2}\cdot s/\sqrt{n}.$$

if not include 0, then reject H_0.

2 samples. (independent)

1): $Z = \dfrac{(\bar{X}_1 - \bar{X}_2) - (u_1 - u_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$ σ_1, σ_2: given. test the mean difference.

Confidence Interval:

$$\left(\bar{X}_1 - \bar{X}_2 - Z_{\alpha/2}\cdot\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}},\ \bar{X}_1 - \bar{X}_2 + Z_{\alpha/2}\cdot\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}\right)$$

If not include 0, reject H_0.

2): $Z = \dfrac{(\hat{p}_1 - \hat{p}_2) - (p_1 - p_2)}{\sqrt{\bar{p}\cdot\bar{q}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$, $\bar{p} = \dfrac{X_1 + X_2}{n_1 + n_2}$

C.I.:

$$\left((\hat{p}_1 - \hat{p}_2) - Z_{\alpha/2}\sqrt{\frac{\hat{p}_1\hat{q}_1}{n_1} + \frac{\hat{p}_2\hat{q}_2}{n_2}},\ (\hat{p}_1 - \hat{p}_2) + Z_{\alpha/2}\cdot\sqrt{\frac{\hat{p}_1\hat{q}_1}{n_1} + \frac{\hat{p}_2\hat{q}_2}{n_2}}\right)$$

3): $t = \dfrac{(\bar{X}_1 - \bar{X}_2) - (u_1 - u_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$: test the diff. $d.f = \min(n_1 - 1, n_2 - 1)$

C.I.

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

If not include 0, reject H_0.