Mean

Proportion

Known Population SD (σ)

Unknown Population SD (σ)

One Sample

One-sample confidence interval and z-test on μ

CONFIDENCE INTERVAL: $\bar{x} \pm (\text{z critical value}) \cdot \frac{\sigma}{\sqrt{n}}$

SIGNIFICANCE TEST: $z = \frac{\bar{x} - \mu_0}{\frac{\sigma}{\sqrt{n}}}$

CONDITIONS:

- The sample must be reasonably random.
- The data must be from a normal distribution or large sample (need to check $n \geq 30$).
- σ must be known.
- The sample must be less than 10% of the population so that $\frac{\sigma}{\sqrt{n}}$ is valid for the standard deviation of the sampling distribution of $\bar{x}$.

One-sample confidence interval and t-test on μ

CONFIDENCE INTERVAL: $\bar{x} \pm (\text{t critical value}) \cdot \frac{s}{\sqrt{n}}$

SIGNIFICANCE TEST: $t = \frac{\bar{x} - \mu_0}{\frac{s}{\sqrt{n}}}$ where degrees of freedom df = n - 1

CONDITIONS:

- In theory, the data should be drawn from a normal distribution or it is a large sample (need to check that $n \geq 30$). In practice, using the t-distribution is sufficiently robust provided that there is little skewness and <u>no outliers</u> in the data. Look at a graph of the data.
- The data must be reasonably random.
- The sample must be less than 10% of the population.

One-sample confidence interval and z-test on p

CONFIDENCE INTERVAL: $\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$

TEST STATISTIC: $z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}}$

CONDITIONS:

- The sample must be reasonably random
- The sample must be less than 10% of the population
- The sample must be large enough so that:

$n \cdot \hat{p}$ and $n(1 - \hat{p}) \geq 10$ for a confidence interval
$n \cdot p$ and $n(1 - p) \geq 10$ for the significance test

General Note
$\lvert z_{calc} \rvert > \lvert z^* \rvert \rightarrow Reject\ H_0$
$\lvert t_{calc} \rvert > \lvert t^* \rvert \rightarrow Reject\ H_0$
$p\ value < \alpha \rightarrow Reject\ H_0$
<u>**Confidence Interval**</u>
-We are __% confident that the true population (mean/proportion) of _____ falls between __ and __.
<u>**Traditional Test**</u>
-With a (z_{calc}/t_{calc}) value of __ being (greater/ less) than a (z^*/t^*) value of __, we (reject/ fail to reject) H_0.
<u>**P-value Test**</u>
-With a p-value of __ being (greater/ less) than an α-value of __, we (reject/ fail to reject) H_0.

Two Sample

Two-sample confidence interval and t-test on $\mu_1 - \mu_2$

CONFIDENCE INTERVAL: $(\bar{x}_1 - \bar{x}_2) \pm t^* \sqrt{\frac{(s_1)^2}{n_1} + \frac{(s_2)^2}{n_2}}$

SIGNIFICANCE TEST: $t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{(s_1)^2}{n_1} + \frac{(s_2)^2}{n_2}}}$

CONDITIONS:

- The two samples must be reasonably random and drawn independently or, if it is an experiment, the subjects were randomly assigned to treatments.
- In theory, the data should be drawn from normal distributions or be large samples (check that $n_1 + n_2 \geq 30$). In practice, using the t-distribution is sufficiently robust provided that there is little skewness and <u>no outliers</u> in the data for each sample. Examine graphs of both sets of data.

df = n_1 -1 or n_2 -1

Whichever is Lower

Two-sample confidence interval and z-test on $p_1 - p_2$

CONFIDENCE INTERVAL: $(\hat{p}_1 - \hat{p}_2) \pm z^* \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$

TEST STATISTIC: $z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\frac{\hat{p}_c(1-\hat{p}_c)}{n_1} + \frac{\hat{p}_c(1-\hat{p}_c)}{n_2}}}$ where $\hat{p}_c = \frac{x_1 + x_2}{n_1 + n_2}$

CONDITIONS:

- The two samples must be independently drawn and reasonably random or subjects were randomly assigned to two groups.
- The sample sizes must be large enough so that: $n_1\hat{p}_1$, $n_1(1-\hat{p}_1)$, $n_2\hat{p}_2$, $n_2(1-\hat{p}_2)$ are all five or more. (the number of successes and the number of failures must be at least 5) for the confidence interval.

The sample size must be large enough so that: $n_1\hat{p}_c$, $n_1(1-\hat{p}_c)$, $n_2\hat{p}_c$, $n_2(1-\hat{p}_c)$ are all five or more. (the number of successes and the number of failures must be at least 5) for the significance test.