Statistics Flowchart

If you are working with proportions: → **Proportions**

If you're working with means, determine if σ is known → **Means, σ known**

or if σ is unknown, determine the sample size n → **Means, σ unknown, n≥30** / **Means, σ unknown, n<30**

Means, σ known

Standard Error

$$\sigma_{\bar{X}} = \frac{\sigma}{\sqrt{n}}$$

Standardized score

$$z = \frac{\bar{X} - \mu}{\sigma_{\bar{X}}} = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}}$$

Margin of Error/
Required Sample size for a certain e

$$e = z_{\alpha/2}\sigma_{\bar{X}} = z_{\alpha/2}\frac{\sigma}{\sqrt{n}} \qquad n = \left(\frac{z_{\alpha/2}\sigma}{e}\right)^2$$

Confidence Interval

$$\mu = \bar{X} \pm e = \bar{X} \pm z_{\alpha/2}\sigma_{\bar{X}} = \bar{X} \pm z_{\alpha/2}\frac{\sigma}{\sqrt{n}}$$

Proportions

Standard Error

$$\sigma_{\bar{p}} = \sqrt{\frac{p(1-p)}{n}}$$

Standardized score

$$z = \frac{\bar{p} - p}{\sigma_{\bar{p}}} = \frac{\bar{p} - p}{\sqrt{\frac{p(1-p)}{n}}}$$

Margin of Error/
Required Sample size for a certain e

$$e = z_{\alpha/2}\sigma_{\bar{p}} = z_{\alpha/2}\sqrt{\frac{\bar{p}(1-\bar{p})}{n}} \qquad n = \frac{{z_{\alpha/2}}^2 p(1-p)}{e^2}$$

Confidence Interval

$$p = \bar{p} \pm e = \bar{p} \pm z_{\alpha/2}\sigma_{\bar{p}} = \bar{p} \pm z_{\alpha/2}\sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$$

Means, σ unknown, n≥30

Standard Error

$$s_{\bar{X}} = \frac{s}{\sqrt{n}}$$

Standardized score

$$z = \frac{\bar{X} - \mu}{s_{\bar{X}}} = \frac{\bar{X} - \mu}{s/\sqrt{n}}$$

Margin of Error/
Required Sample size for a certain e

$$e = z_{\alpha/2}s_{\bar{X}} = z_{\alpha/2}\frac{s}{\sqrt{n}} \qquad n = \left(\frac{z_{\alpha/2}s}{e}\right)^2$$

Confidence Interval

$$\mu = \bar{X} \pm e = \bar{X} \pm z_{\alpha/2}s_{\bar{X}} = \bar{X} \pm z_{\alpha/2}\frac{s}{\sqrt{n}}$$

Means, σ unknown, n<30

Standard Error

$$s_{\bar{X}} = \frac{s}{\sqrt{n}}$$

Standardized score

$$t = \frac{\bar{X} - \mu}{s_{\bar{X}}} = \frac{\bar{X} - \mu}{s/\sqrt{n}}$$

Margin of Error/
Required Sample size for a certain e

$$e = t_{\alpha/2}s_{\bar{X}} = t_{\alpha/2}\frac{s}{\sqrt{n}} \qquad n = \left(\frac{t_{\alpha/2}s}{e}\right)^2$$

Confidence Interval

$$\mu = \bar{X} \pm e = \bar{X} \pm t_{\alpha/2}s_{\bar{X}} = \bar{X} \pm t_{\alpha/2}\frac{s}{\sqrt{n}}$$

More Statistical Formulas

Standardized Score (z-score) – $z = \frac{X-\mu}{\sigma}$

Testing Differences Between Two Means (μ_1-μ_2)

for large independent samples where σ_1 and σ_2 are known

$$z = \frac{\overline{X}_1 - \overline{X}_2}{\sigma_{\overline{X}_1 - \overline{X}_2}}$$

$$\sigma_{\overline{X}_1 - \overline{X}_2} = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

$$\mu_1 - \mu_2 = \left(X_1 - X_2\right) \pm z_{\alpha/2}\sigma_{\overline{X}_1 - \overline{X}_2}$$

for large independent samples where σ_1 and σ_2 are unknown but assumed equal

$$z = \frac{\overline{X}_1 - \overline{X}_2}{s_{\overline{X}_1 - \overline{X}_2}}$$

$$s_{\overline{X}_1 - \overline{X}_2} = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

$$\mu_1 - \mu_2 = \left(X_1 - X_2\right) \pm z_{\alpha/2}s_{\overline{X}_1 - \overline{X}_2}$$

for small independent samples where σ_1 and σ_2 are unknown but assumed equal

$$t = \frac{\overline{X}_1 - \overline{X}_2}{s_p\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

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

$$\mu_1 - \mu_2 = \left(X_1 - X_2\right) \pm t_{\alpha/2}s_p\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$$

$$df = n_1 + n_2 - 2$$

for small independent samples where σ_1 and σ_2 are unknown but assumed not equal

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

$$\mu_1 - \mu_2 = \left(X_1 - X_2\right) \pm t_{\alpha/2}\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

$$df = \frac{\left(s_1^2/n_1 + s_2^2/n_2\right)^2}{\left(\frac{\left(s_1^2/n_1\right)^2}{n_1 - 1} + \frac{\left(s_2^2/n_2\right)^2}{n_2 - 1}\right)}$$

Testing Paired Differences Between Two Means

$$d = x_1 - x_2$$

$$\overline{d} = \frac{\sum d}{n}$$

$$s_d = \sqrt{\frac{\sum\left(d - \overline{d}\right)^2}{n - 1}}$$

$$t = \frac{\overline{d} - \mu_d}{\frac{s_d}{\sqrt{n}}}$$

$$\mu_d = \overline{d} \pm t_{\alpha/2}\frac{s_d}{\sqrt{n}}$$

Testing Differences Between Two Population Proportions (p_1-p_2)

$$\overline{p} = \frac{n_1\overline{p}_1 + n_2\overline{p}_2}{n_1 + n_2}$$

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

$$p_1 - p_2 = \left(\overline{p}_1 - \overline{p}_2\right) \pm z_{\alpha/2}\sqrt{\frac{\overline{p}_1\left(1 - \overline{p}_1\right)}{n_1} + \frac{\overline{p}_2\left(1 - \overline{p}_2\right)}{n_2}}$$