Formulas

The statistic $\bar{x}$ has
$$\mu_{\bar{x}} = \mu, \quad \sigma_{\bar{x}} = \sigma/\sqrt{n}$$
and if the population is normal, or n is large enough, is approximately normally distributed.

The statistic $D = \bar{x_1} - \bar{x_2}$ has
$$\mu_D = \mu_1 - \mu_2$$

If the two random samples are independent of each other then $\sigma_D^2 = (\sigma_1^2/n_1 + \sigma_2^2/n_2)$. The distribution of D will be approximately normal.

We have discussed symmetric confidence intervals given by these formulas
$$\bar{x} \pm z^* \sigma/\sqrt{n}, \quad \bar{x} \pm t^* s/\sqrt{n}, \quad (\bar{x_1} - \bar{x_2}) \pm t^* SE, \quad \hat{p} \pm z^* \sqrt{\hat{p}(1-\hat{p})/n}$$
where the unspecified value SE may be one of two values depending on an assumption about equality of the standard deviations in the samples.

We discussed using the following test statistics of the form observed minus expected divided by SE: $z = \frac{\bar{x} - \mu}{\sigma}\sqrt{n},$
$$t = \frac{\bar{x} - \mu}{s}\sqrt{n}, \quad t = \frac{\bar{x_1} - \bar{x_2}}{s_p\sqrt{1/n_1 + 1/n_2}}, \quad t = \frac{\bar{x_1} - \bar{x_2}}{\sqrt{s_1^2/n_1 + s_2^2/n_2}}, z = \frac{\hat{p} - p}{\sqrt{p(1-p)/n}}$$
For those with a t-distribution, you need to remember the degrees of freedom associated with each.

For testing differences in two sample proportions against the null hypothesis: $p_1 = p_2$ (pooled)
$$D = \hat{p_1} - \hat{p_2}, \quad z = \frac{\hat{p_1} - \hat{p_2}}{SE_D}, \quad SE_D = \sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)} \quad \hat{p} = \frac{X_1 + X_2}{n_1 + n_2}$$

χ^2 Statistic:

$$\chi^2 = \sum \frac{(\text{Observed} - \text{Expected})^2}{\text{Expected}}$$

Means and Standard Deviations:

$$\overline{x} = \frac{1}{n}\Sigma x_i \qquad s^2 = \frac{1}{n-1}\Sigma(x_i - \overline{x})^2$$

Correlation Coeficient and Regression Lines:

$$r = \frac{1}{n-2}\Sigma\frac{(x_i - \overline{x})}{s_x}\frac{(y_i - \overline{y})}{s_y}$$

$$\hat{y} = b_1 x + b_0$$

where:

$$\begin{aligned} b_1 &= r\frac{s_y}{s_x} \\ b_0 &= \overline{y} - b_1\overline{x} \end{aligned}$$

$$e_i = y_i - \hat{y}_i$$

Confidence Intervals for population regression parameters β_0 and β_1:

$$b_1 \pm t^*\text{SE}_{b_1} \qquad b_0 \pm t^*\text{SE}_{b_0}$$

$$\text{SE}_{b_1} = \frac{s}{\sqrt{\Sigma(x_i - \overline{x})^2}}$$

$$\text{SE}_{b_0} = s\sqrt{\frac{1}{n} + \frac{\overline{x}^2}{\Sigma(x_i - \overline{x})^2}}$$

$$s^2 = \frac{\Sigma e_i^2}{n-2}$$

The hypothesis test for $H_0 : \beta_1 = 0$ is based on the t–statistic $t = \dfrac{b_1}{\text{SE}_{b_1}}$ and the $t(n-2)$ distribution.