Two-sample t-test: $T = \frac{(\overline{X}-\overline{Y})-(\mu_x-\mu_y)}{\sqrt{s_P^2(\frac{1}{n_x}+\frac{1}{n_y})}} \sim t_{n_x+n_y-2}$.

$$(\overline{x}-\overline{y}) \pm t_{\frac{\alpha}{2}, n_x+n_y-2} \times s_p \sqrt{\frac{1}{n_x}+\frac{1}{n_y}}$$

$$s_P^2 = \frac{\sum(x-\overline{x})^2+\sum(y-\overline{y})^2}{n_x+n_y-2} = \frac{(n_x-1)s_x^2+\left(n_y-1\right)s_y^2}{n_x+n_y-2}$$

p-Values: The **p-value** of the data is the probability of obtaining a test statistic at least as extreme as the one actually observed, assuming H_0 is correct. In other words, **the p-value is the maximum significance level at which we still reject the null hypothesis H_0 for that sample.** Thus, if we are given a fixed α, the null hypothesis H_0 is rejected if the p-value is less than or equal to α.

Rule: Smaller p-values suggest stronger evidence against H_0.