Tests to compare one sample of **continuous values with a claim** about the true mean μ_0. Null hypothesis H_0: $\mu = \mu_0$. Common assumption: The sample is a random sample, i.e. independence of observations.

Test	Variance σ^2	Distribution of Y_i	test statistic	null distribution
Z-test	known	$\mathcal{N}(\mu, \sigma^2)$	$Z = \frac{\bar{Y} - \mu}{\sigma/\sqrt{n}}$	$\mathcal{N}(0,1)$
T-test	unknown	$\mathcal{N}(\mu, \sigma^2)$	$T = \frac{\bar{Y} - \mu}{S/\sqrt{n}}$	T_{n-1}
T-test	unknown	Any, provided n is large	$T = \frac{\bar{Y} - \mu}{S/\sqrt{n}}$	$T_{n-1} \approx \mathcal{N}(0,1)$

Tests to compare one sample of **binary values with a claim** about the true proportion π of success. Null hypothesis H_0: $\pi = \pi_0$. Common assumptions, required for the number of successes Y to be $\mathcal{B}(n, \pi)$ distributed: random sampling (independence of observations) and a constant probability of success π across trials.

Test	sample size	test statistic	null distribution	the test is
Z-test	$n\pi$ and $n(1-\pi) \geq 5$	$Z = \frac{Y - n\pi}{\sqrt{n\pi(1-\pi)}}$	$\mathcal{N}(0,1)$	approximate
Chi-square test	$n\pi$ and $n(1-\pi) \geq 5$	X^2	χ^2 on 1 df	approximate
Binomial test	Any. typically used with small $n\pi$ or $n(1-\pi)$	Y	$\mathcal{B}(n, \pi)$	exact

Tests to compare one sample of **categorical values with a claim** about the true proportions p_j of categories. Null hypothesis H_0: $p_1 = p_1^0$ and $p_2 = p_2^0, \cdots$ and $p_r = p_r^0$. Assumption: random sampling and constant probabilities of category membership p_j across trials.

Test	sample size	test statistic	null distribution	the test is
Chi-square goodness-of-fit	Expected counts > 5 in 80% cells and > 1 in all cells	X^2	χ^2 on $(r-1)$ df	approximate

Tests to compare the means of 2 paired samples, continuous values. Null hypothesis H_0: $\mu_1 = \mu_2$. Common assumption: each sample is a random sample of size $n = n_1 = n_2$, and each observation in one sample is paired to another observation in the other sample.

Test	variance of D	Distribution of D	test statistic	null distribution
Paired z-test	known	$\mathcal{N}(\mu_d, \sigma_d^2)$	$Z = \frac{\bar{d} - \mu_d}{\sigma_d/\sqrt{n}}$	$\mathcal{N}(0,1)$
Paired t-test	unknown	$\mathcal{N}(\mu_d, \sigma_d^2)$ or large n	$T = \frac{\bar{d} - \mu_d}{S_d/\sqrt{n}}$	T_{n-1}
Signed rank test	any	any	(not covered)	

Tests to compare the means of 2 independent samples, continuous values. Null hypothesis H_0: $\mu_1 = \mu_2$. Common assumption: random sampling (independence) within samples, and independence across samples.

Test	variances σ_1^2, σ_2^2	Distribution of $Y_{i,j}$	test statistic	null distribution
Z-test	known	$\mathcal{N}(\mu_1, \sigma_1^2)$, $\mathcal{N}(\mu_2, \sigma_2^2)$	$Z = \dfrac{(\bar{Y}_1 - \bar{Y}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$	$\mathcal{N}(0,1)$
T-test	unknown, $\sigma_1 = \sigma_2$	$\mathcal{N}$ or: large n_1 and large n_2	$T = \dfrac{(\bar{Y}_1 - \bar{Y}_2) - (\mu_1 - \mu_2)}{S_p\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$	$T_{n_1+n_2-2}$
T-test	unknown	$\mathcal{N}$ or: large n_1 and large n_2	$T = \dfrac{(\bar{Y}_1 - \bar{Y}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$	T_{adf}
Mann-Whitney	similar	any	if $n_1 \leq n_2$: min of RS_1 and of $n_1(n_1 + n_2 + 1) - \text{RS}_1$	tabulated

Test to compare the means of k independent samples, continuous values.
Null hypothesis H_0: $\mu_1 = \mu_2 = \cdots = \mu_k$. Common assumption: Random sampling (independence) within samples, and independence across samples.

Test	variances σ_1^2, σ_2^2	Distribution of $Y_{i,j}$	test statistic	null distribution
ANOVA F-test	equal	$\mathcal{N}$ or: large n_i's	$F = \dfrac{\text{MSTreatment}}{\text{MSError}}$	$F_{k-1,N-k}$
Kruskall-Wallis	similar	any	based on ranks	(not covered)

Test to compare the variances of k independent samples, continuous values.
Null hypothesis H_0: $\sigma_1^2 = \sigma_2^2 = \cdots = \sigma_k^2$. Assumption: random sampling (independence) within samples, and independence across samples.

Levene's test: apply the ANOVA F-test on transformed data (roughly: on the absolute deviations). If $k = 2$, the ANOVA F-test is equivalent to the independent t-test that assumes equal variances.

Test of association: to compare proportions across k independent samples, categorical observations. Let r = number of categories. Null hypothesis H_0: p_1 is the same in all groups, and p_2 is the same in all groups, and ..., and p_r is the same in all groups. Equivalently, H_0 means that the **group membership is independent of the category membership**, i.e. no association. Assumption: Random sampling.

Test	sample size	test statistic	null distribution
Chi-square test of association	Expected counts > 5 in 80% of cells and > 1 in all cells	X^2	χ^2 on $(k-1)*(r-1)$ df