Test Statistic	Use Case	Type of Data	Null Hypothesis (H_0)	When to Use
Z-test	Comparing means	Continuous, normal (σ known)	$\mu_1 = \mu_2$	Large sample sizes (n > 30), population SD known
T-test	Comparing means	Continuous, approx. normal	$\mu_1 = \mu_2$	Small samples, σ unknown
→ **One-sample t-test**	Mean ≠ known value	Single group	$\mu = \mu_0$	Compare a sample mean to a known value
→ **Two-sample t-test**	Compare two group means	Two groups	$\mu_1 = \mu_2$	Independent groups
→ **Paired t-test**	Compare before/after	Paired samples	$\mu_1 - \mu_2 = 0$	Repeated measurements on same subjects
Chi-square test (χ^2)	Independence or goodness of fit	Categorical	No association / fits expected distribution	Survey or frequency data
→ **Test of independence**	Test association	Two variables	No relationship	Cross-tabulation data
→ **Goodness-of-fit test**	Fit to a model	One variable	Matches expected	Single variable categories
ANOVA (F-test)	Compare 3+ means	Continuous (normal)	$\mu_1 = \mu_2 = \mu_3 = \ldots$	More than two groups
→ **One-way ANOVA**	One factor	Groups of one variable	Equal group means	One independent variable
→ **Two-way ANOVA**	Two factors	Multiple variables	Interaction or main effects	Factorial designs
Mann-Whitney U test	Compare medians	Ordinal/non-normal data	Same distribution	Non-parametric, 2 independent groups
Wilcoxon Signed-Rank	Paired difference	Non-normal, paired	Median difference = 0	Like paired t-test, but non-parametric
Kruskal-Wallis test	Compare 3+ medians	Ordinal/non-normal	Same distribution	Like ANOVA but non-parametric
Correlation (r-test)	Strength of linear relation	Paired continuous	$\rho = 0$	Testing Pearson correlation
Regression F-test	Model fit	Continuous variables	No linear relation	Regression model significance
Binomial test	Proportion test	Binary data	$p = p_0$	E.g. coin flips, yes/no responses
Proportion z-test	Compare proportions	Binary data, large n	$p_1 = p_2$	Two population proportions