Institute of Quality & Reliability

Table 8A

Table of Hypothesis Tests

(Parametric Tests)

Objective	Type of Test	Null Hypothesis	Test Statistic	Distribution	Assumptions	Remarks
Compare sample mean with reference or historical mean when σ *is known*	**One Sample Z test**	$H_0 : \mu = \mu_0$	$z = \frac{\overline{X} - \mu o}{\sigma / \sqrt{n}}$	Normal	Standard Deviation is known	
Compare sample mean with reference or historical mean when σ *is not known*	**One Sample t test**	$H_0 : \mu = \mu_0$	$t = \frac{\overline{X} - \mu o}{s / \sqrt{n}}$	Student's t	X is normally distributed	standard Deviation of population is estimated by sample s.
Comparing two sample means assuming equal variances	**Two Sample t test, equal variances**	$H_0 : \mu_1 = \mu_2$	$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{1}{n_1} + \frac{1}{n_2}} \sqrt{\frac{[(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2]}{n_1 + n_2 - 2}}}$	t distribution with DF = n1+n2 - 2	$\sigma_1 = \sigma_2$ X_1 and X_2 are normally Distributed	standard Deviation of population is estimated by sample s_1 and s_2
Comparing two sample means without assuming equal variances	**Two Sample t test, unequal variances**	$H_0 : \mu_1 = \mu_2$	$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{s_1^2 / n_1 + s_2^2 / n_2}}$	t distribution, DF requires complex calculation	1. X_1 and X_2 are normally Distributed	Standard deviations of populations are estimated by sample s1 and s2.
Comparing two populations when data is in pairs	**Paired t test**	$H_0 : \mu_1 = \mu_2$	$t = \frac{\overline{d}}{s_d / \sqrt{n}}$	t distribution with DF = number of pairs - 1	Populations are normally distributed	Data are taken in n pairs, and difference d within each pair is calculated
Comparing Variances of a sample with reference or historical	**Chi-Square Test**	$H_0 : \sigma = \sigma_0$	$x^2 = \frac{(n-1)s^2}{\sigma_0^2}$	Chi - square distribution with DF = n - 1	Population is normally distributed	Standard deviation of population is estimated by sample s.
Comparing Variances of 2 populations	**F Test**	$H_0 : \sigma_1^2 = \sigma_2^2$	$F = \frac{s_1^2}{s_2^2}$	F distribution with DF1 = n1 - 1 and DF2 = n2 - 1	Populations are normally distributed	Standard deviation of population is estimated by sample s_1 and s_2
Test of One proportion	**1-Proportion Test**	$H_0 : p = p_0$	$z = \frac{X - np_0}{\sqrt{np_0(1 - p_0)}}$	Normal Approximation to Binomial	n is large ≥ 10 and p≥0.1	Proportion of population is estimated by sample proportion
Test of Two Proportions	**2-Proportions Test**	$H_0 : p_1 = p_2$	$Z = \frac{X_1 / n_1 - X_1 / n_1}{\sqrt{\hat{p}(1 - \hat{p})(1 / n_1 + 1 / n_2)}}$	Normal Approximation to Binomial	np>5 for each population. Sample sizes n1	$\hat{p} = \frac{X_1 + X_2}{n_1 + n_2}$