These methods require the assumptions of normality and equal variances

Question	Observe	Method	Distribution	Standard Error
Does a group average differ from a hypothesized value? *Do cars on I-80 go faster than the 70 MPH speed limit?*	$\overline{X}$ *Average speed from a sample of n cars.*	z-test (σ is known) t-test (σ is unknown)	If we repeatedly sample n observations and calculate $\overline{X}$, the distribution will approximate: Z or t-distribution with n-1 df	$\hat{\sigma}_{\overline{X}} = \frac{\sigma}{\sqrt{n}}$ $\hat{\sigma}_{\overline{X}} = \frac{s}{\sqrt{n}}$
Do two independent group means differ? *Do male students write better essays than female students?*	$\overline{X}_1 - \overline{X}_2$ *Average essay rating for males and for females.*	t-test	If we repeatedly sample n observations and calculate $\overline{X}_1 - \overline{X}_2$, the distribution will approximate: t-distribution with $n_1 + n_2 - 2$ df	$s_{pooled} = \sqrt{\frac{1}{n_1} + \frac{1}{n_2}} \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}}$
Do two dependent group means differ? (matched pairs) *Do student scores increase from pretest to posttest?*	$\overline{D} = \overline{X}_1 - \overline{X}_2$ *Difference between avg. pre- and post-test scores.*	t-test	If we repeatedly sample n observations and calculate $\overline{D}$, the distribution will approximate: t-distribution with n-1 df	$\hat{\sigma}_{\overline{D}} = \frac{s_D}{\sqrt{n}}$
Does a group proportion differ from a hypothesized value? *Suppose the national smoking rate for men is 25%. Does the smoking rate for Iowa differ from the national percentage?*	p = proportion *Sample proportion of Iowans who smoke.*	z-test	If we repeatedly sample n observations and calculate p, the distribution will approximate: Z distribution	$SE(p) = \sqrt{\frac{p(1-p)}{n}}$
Do two group proportions differ? *Do more males or females vote Republican?*	p = proportion *Sample proportions of males and females who vote Republican*	z-test	If we repeatedly sample n observations and calculate the difference in proportions, the distribution will approximate: Z distribution	$SE(\hat{p}_1 - \hat{p}_2) = \sqrt{\frac{n_1\hat{p}_1 + n_2\hat{p}_2}{n_1 + n_2}\left(1 - \frac{n_1\hat{p}_1 + n_2\hat{p}_2}{n_1 + n_2}\right)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}$

Question	Observe	Method	Distribution	Standard Error
Does a group variance differ from a hypothesized value? *Is this new measurement procedure more precise than industry standards?*	s^2 *Variance in measurement for the new procedure.*	χ^2 -test	If we repeatedly sample n observations and calculate s^2, the distribution will approximate a χ^2 distribution with n-1 df	$\chi^2 = \frac{\sigma_o^2}{(n-1)}$
Do two group variances differ? *Do male and female students show the same amount of variation in reading ability?*	$\frac{s_1^2}{s_2^2}$ *Ratio of variance in male reading ability to variance in female reading ability.*	F-test	If we repeatedly sample n observations and calculate $\frac{s_1^2}{s_2^2}$, the distribution will approximate an F-distribution with (n-1) degrees of freedom in both the numerator and denominator	
Do three or more group means differ? *Which of three experimental drugs reduces cholesterol the most?*	$\overline{X}_1$, $\overline{X}_2$, $\overline{X}_3$ *Three group means.*	ANOVA (F-test)		