Identifying the Proper Confidence Interval or Test

When creating a confidence interval (CI) or running a test for a mean, proportion, or difference in proportions, there is some *estimate* of the mean, proportion, or difference from the data. There is also the standard error (SE), which is a measure of the uncertainty of this *estimate*. The general form for a $100 * (1 - \alpha)\%$ confidence interval is

$$\textit{estimate} \pm (\textit{critical value}) * SE_{estimate}$$

The *critical value* is found from the appropriate table (normal or t table). ($\alpha = 0.05$ for a 95% confidence interval.) The general form for a hypothesis test statistic is

$$\textit{test statistic} = \frac{\textit{estimate} - \textit{parameter}}{SE_{estimate}}$$

where *parameter* is the "true" value under question in H_0. For instance, if $H_0 : \mu = 7.3$, then $\textit{parameter} = \mu = 7.3$. Alternatively, if $H_0 : p = 0.3$, then $\textit{parameter} = p = 0.3$.

To identify the *estimate* and $SE_{estimate}$, begin by asking

Are proportions or means of interest?	proportion	mean
How many samples are there?	1	2
Is this for a confidence interval or a hypothesis test?	CI	test

Using these answers, identify the proper CI or test in the table. Additional instructions and special circumstances for using the table below:

- If the data is for proportions, use the normal model. If it is for means, use the t distribution.
- If you chose (2, proportion, test) from above, only use the pooled test if H_0 is $p_1 - p_2 = 0$ (equivalently, $p_1 = p_2$). For the pooled test, $\hat{p}_c = \frac{x_1+x_2}{n_1+n_2} = \frac{n_1\hat{p}_1+n_2\hat{p}_2}{n_1+n_2}$.
- To avoid any confusion: s is the standard deviations of the sample.

Circumstance	parameter	estimate	$SE_{estimate}$
1-prop (CI)	p	$\hat{p}$	$\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$
1-prop (test, $p_0 = \textit{expected}$)	p	$\hat{p}$	$\sqrt{\frac{p_0(1-p_0)}{n}}$
2-prop (unpooled, test or CI)	$p_1 - p_2$	$\hat{p}_1 - \hat{p}_2$	$\sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$
2-prop (pooled, test only)	$p_1 - p_2$	$\hat{p}_1 - \hat{p}_2$	$\sqrt{\frac{\hat{p}_c(1-\hat{p}_c)}{n_1} + \frac{\hat{p}_c(1-\hat{p}_c)}{n_2}}$
1-samp (t-test or CI)	μ	$\bar{x}$	$s/\sqrt{n}$