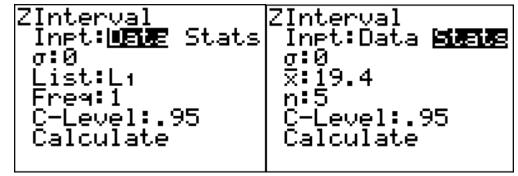
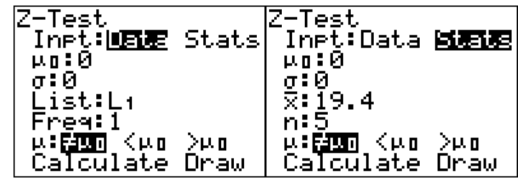
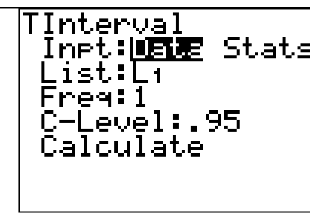
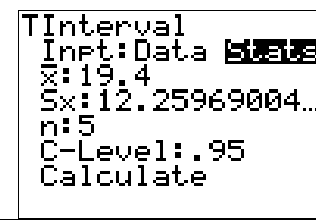
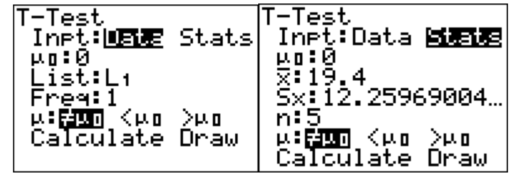
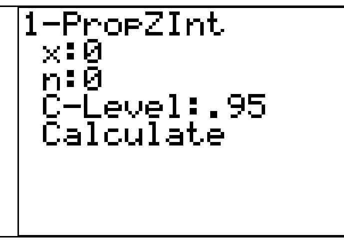
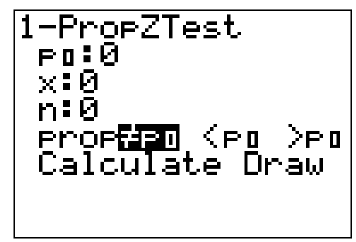
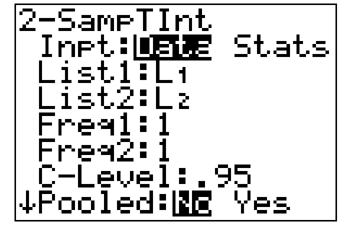
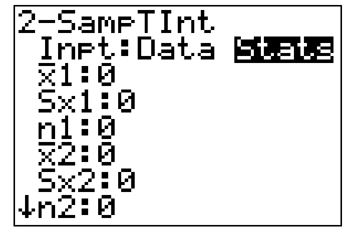
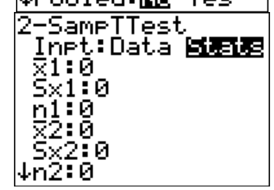
AP Statistics – Summary of Confidence Intervals and Hypothesis Tests

Procedure	Formula	Conditions	Calculator Options
One Sample – Mean and Proportion			
Confidence Interval for mean μ when σ is known	$\bar{x} \pm z^* \frac{\sigma}{\sqrt{n}}$	1. SRS 2. Given value of population standard deviation σ 3. Population distribution is normal (if not stated, use CLT as long as $n > 30$)	
Hypothesis Test for mean μ when σ is known (H_o: $\mu = \mu_o$)	$z = \frac{\bar{x} - \mu_o}{\sigma/\sqrt{n}}$	SAME AS ABOVE CI	 *Can also find *p*-value using 2nd-Distr normalcdf(lower, upper, mean, sd)
CI for mean μ when σ is unknown	$\bar{x} \pm t^* \frac{s}{\sqrt{n}}$ with $df = n - 1$	1. SRS 2. Using value of sample standard deviation *s* to estimate σ 3. Population distribution is given as normal OR $n > 30$ (meaning *t* procedures are robust even if skewness and outliers exist) OR $15 < n < 30$ with normal probability plot showing little skewness and no extreme outliers OR $n < 15$ with npp showing no outliers and no skewness	

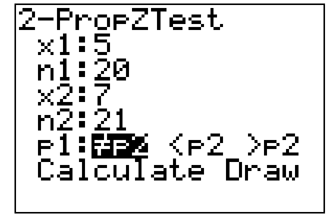
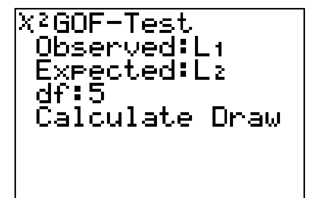
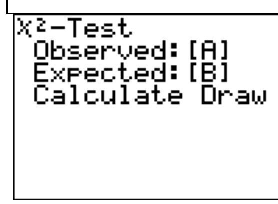
AP Statistics – Summary of Confidence Intervals and Hypothesis Tests

Procedure	Formula	Conditions	Calculator Options
One Sample – Mean and Proportion – Continued			
Test for mean μ when σ is unknown (H_o: $\mu = \mu_o$)	$t = \dfrac{\overline{x} - \mu_o}{s/\sqrt{n}}$ with $df = n - 1$	SAME AS ABOVE CI	 *Can also find p-value using 2nd-Distr tcdf(lower, upper, df)
CI for proportion p	$\hat{p} \pm z^* \sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}}$	1. SRS 2. Population is at least 10 times n 3. Counts of success $n\hat{p}$ and failures $n(1-\hat{p})$ are both at least 10 (these counts verify the use of the normal approximation)	
Test for proportion p (H_o: $p = p_o$)	$z = \dfrac{\hat{p} - p_o}{\sqrt{\dfrac{p_o(1-p_o)}{n}}}$	1. SRS 2. Population is at least 10 times n 3. Counts of success np_o and failures $n(1-p_o)$ are both at least 10 (these counts verify the use of the normal approximation)	 *Can also find p-value using 2nd-Distr normalcdf(lower, upper, mean, sd)

AP Statistics – Summary of Confidence Intervals and Hypothesis Tests

Procedure	Formula	Conditions	Calculator Options
Two Samples – Means and Proportions			
CI for mean μ_1-μ_2 when σ is unknown	$$(\bar{x}_1 - \bar{x}_2) \pm t^* \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$ with *df* read from calculator or use conservative estimate that $df = n - 1$ where n is the smaller of n_1 or n_2	1. Populations are independent 2. Both samples are from SRSs 3. Using value of sample standard deviation s to estimate σ 4. Population distributions are given as normal OR $n_1 + n_2 > 30$ (meaning t procedures are robust even if skewness and outliers exist) OR $15 < n_1 + n_2 < 30$ with normal probability plots showing little skewness and no extreme outliers OR $n_1 + n_2 < 15$ with npps showing no outliers and no skewness	 
Test for mean μ_1- μ_2 when σ is unknown (H_0: $\mu_1 = \mu_2$)	$$t = \frac{(\bar{x}_1 - \bar{x}_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$ with *df* read from calculator	SAME AS ABOVE CI	  *Can also find p-value using 2[nd]-Distr tcdf(lower, upper, df) where df is either conservative estimate or value using long formula that calculator does automatically!

AP Statistics – Summary of Confidence Intervals and Hypothesis Tests

Procedure	Formula	Conditions	Calculator Options
Two Samples – Means and Proportions – Continued			
Test for proportion $p_1 - p_2$	$$z = \frac{(\hat{p}_1 - \hat{p}_2)}{\sqrt{\hat{p}_c(1-\hat{p}_c)\left(\frac{1}{n_1}+\frac{1}{n_2}\right)}}$$ where $\hat{p}_c = \frac{x_1 + x_2}{n_1 + n_2}$	1-3 are SAME AS ABOVE CI 4. Counts of success $n_1\hat{p}_c$ and $n_2\hat{p}_c$ and failures $n_1(1-\hat{p}_c)$ and $n_2(1-\hat{p}_c)$ are all at least 5 (these counts verify the use of the normal approximation)	 *Can also find p-value using 2nd-Distr normalcdf(lower, upper, mean, sd) where mean and sd are values from numerator and denominator of the formula for the test statistic
Categorical Distributions			
Chi Square Test	$$\chi^2 = \sum \frac{(O-E)^2}{E}$$ G. of Fit (GOF) – 1 sample, 1 variable Independence – 1 sample, 2 variables Homogeneity – 2 samples, 2 variables (GOF) df = # categories – 1 (Independence/Homogeneity) df = (# rows – 1) (# columns – 1)	1. All expected counts are at least 1 2. No more than 20% of expected counts are less than 5	  *Can also find p-value using 2nd-Distr χ^2cdf(lower, upper, df)

AP Statistics – Summary of Confidence Intervals and Hypothesis Tests

Procedure	Formula	Conditions	Calculator Options
		Slope	
CI for β	$b \pm t^* s_b$ where $s_b = \frac{s}{\sqrt{\sum (x-\bar{x})^2}}$ and $s = \sqrt{\frac{1}{n-2}\sum (y-\hat{y})^2}$ with $df = n - 2$	1. For any fixed x, y varies according to a normal distribution 2. Standard deviation of y is same for all x values	LinRegTInt Xlist:L1 Ylist:L2 Freq:1 C-Level:.95 RegEQ: Calculate
Test for β	$t = \frac{b}{s_b}$ with $df = n - 2$	SAME AS ABOVE CI	LinRegTTest Xlist:L1 Ylist:L2 Freq:1 β & ρ:≠0 <0 >0 RegEQ: Calculate *You will typically be given computer output for inference for regression

Variable Legend – here are a few of the commonly used variables

Variable	Meaning	Variable	Meaning
μ	population mean mu	CLT	Central Limit Theorem
σ	population standard deviation sigma	SRS	Simple Random Sample
$\bar{x}$	sample mean x-bar	npp	Normal Probability Plot (last option on stat plot)
s	sample standard deviation	p	population proportion
z	test statistic using normal distribution	$\hat{p}$	sample proportion p-hat
z^*	critical value representing confidence level C	$\hat{p}_c$	combined (pooled) sample proportion for two proportion z test
t	test statistic using t distribution	t^*	critical value representing confidence level C (e.g., 95%)
		n	sample size

Matched Pairs – same as one sample procedures but one list is created from the difference of two matched lists (i.e. pre and post test scores of left and right hand measurements)

Conditions – show that they are met (i.e. substitute values in and show sketch of box plot or npp) ... don't just list them