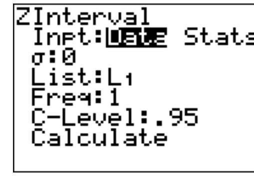
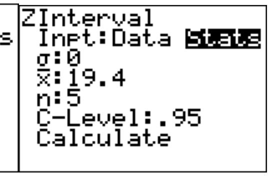
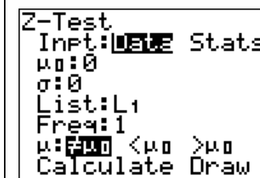
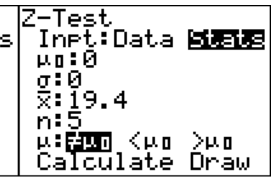
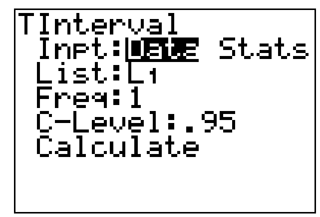
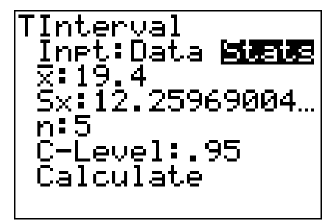
Inference Procedure Summary – AP Statistics

Procedure	Formula	Conditions	Calculator Options
One Sample Mean and Proportion			
Confidence Interval for mean μ when given σ	$\bar{x} \pm z^* \dfrac{\sigma}{\sqrt{n}}$	1. SRS 2. Given value of population standard deviation σ 3. Population distribution is normal (if not stated, use CLT as long as *n* is large)	
Hypothesis Test for mean μ when given σ (H_o: $\mu = \mu_o$)	$z = \dfrac{\bar{x} - \mu_o}{\sigma / \sqrt{n}}$	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	$\bar{x} \pm t^* \dfrac{s}{\sqrt{n}}$ 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 $n > 40$ (meaning *t* procedures are robust even if skewness and outliers exist) OR $15 < n < 40$ with normal probability plot showing little skewness and no extreme outliers OR $n < 15$ with npp showing no outliers and no skewness	

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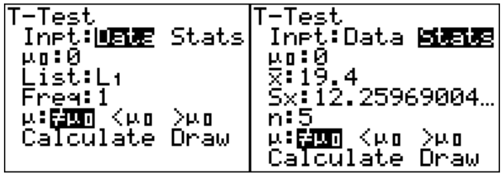
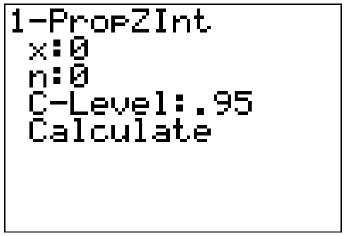
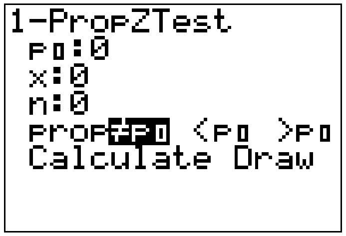
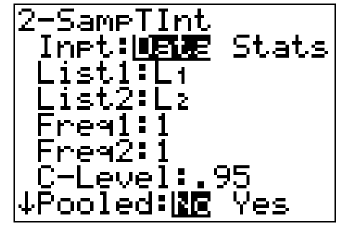
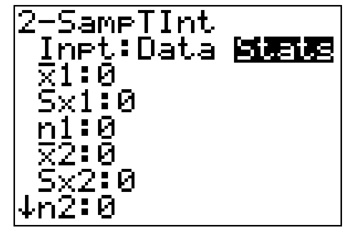
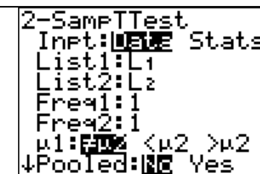
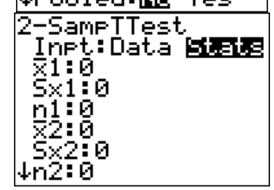
Test for mean μ when σ is unknown (H_o: $\mu = \mu_o$)	$t = \dfrac{\bar{x} - \mu_o}{s/\sqrt{n}}$ with $df = n - 1$	SAME AS ABOVE CI	 *Can also find *p*-value using 2nd-Distr tcdf(lower, upper, df)
CI for proportion *p*	$\hat{p} \pm z^* \sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}}$	1. SRS 2. Population is at 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)

Inference Procedure Summary – AP Statistics

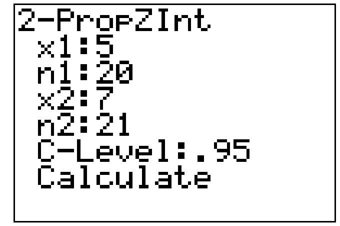
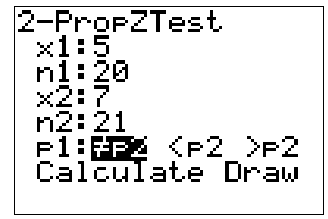
<table>
<tr><th colspan="4">Two Sample Means and Proportions</th></tr>
<tr>
<td>CI for mean μ_1-μ_2 when σ is unknown</td>
<td>$$(\bar{x}_1 - \bar{x}_2) \pm t^* \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$
with conservative
$df = n - 1$ of
smaller sample</td>
<td>1. Populations are independent
2. Both samples are from SRSs
3. Using value of sample standard deviation s to estimate σ
4. Population distributions are given as normal OR $n_1 + n_2 > 40$ (meaning t procedures are robust even if skewness and outliers exist) OR $15 < n_1 + n_2 < 40$ 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</td>
<td>


</td>
</tr>
<tr>
<td>Test for mean μ_1-μ_2 when σ is unknown
(H_o: $\mu_1 = \mu_2$)</td>
<td>$$t = \frac{(\bar{x}_1 - \bar{x}_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$
with conservative
$df = n - 1$ of
smaller sample</td>
<td>SAME AS ABOVE CI</td>
<td>

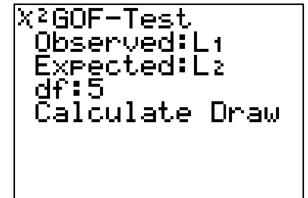
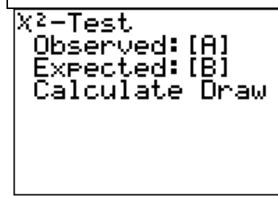
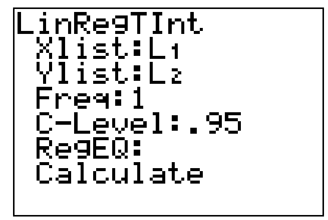
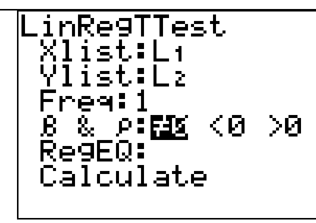


*Can also find p-value using 2^{nd}-Distr tcdf(lower, upper, df) where df is either conservative estimate or value using long formula that calculator does automatically!</td>
</tr>
</table>

Inference Procedure Summary – AP Statistics

CI for proportion $p_1 - p_2$	$(\hat{p}_1 - \hat{p}_2) \pm z^* \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$	1. Populations are independent 2. Both samples are from SRSs 3. Populations are at least 10 times n 4. Counts of success $n_1\hat{p}_1$ and $n_2\hat{p}_2$ and failures $n_1(1-\hat{p}_1)$ and $n_2(1-\hat{p}_2)$ are all at least 5 (these counts verify the use of the normal approximation)	
Test for proportion $p_1 - p_2$	$z = \frac{(\hat{p}_1 - \hat{p}_2)}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$ where $\hat{p} = \frac{X_1 + X_2}{n_1 + n_2}$	1-3 are SAME AS ABOVE CI 4. Counts of success $n_1\hat{p}$ and $n_2\hat{p}$ and failures $n_1(1-\hat{p})$ and $n_2(1-\hat{p})$ 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

Inference Procedure Summary – AP Statistics

Categorical Distributions			
Chi Square Test	$\chi^2 = \sum \frac{(O-E)^2}{E}$ G. of Fit – 1 sample, 1 variable Independence – 1 sample, 2 variables Homogeneity – 2 samples, 2 variables	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 x^2cdf(lower, upper, df)
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	
Test for β	$t = \frac{b}{s_b}$ with $df = n - 2$	SAME AS ABOVE CI	 *You will typically be given computer output for inference for regression

Inference Procedure Summary – AP Statistics

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 or pooled proportion p-hat for two sample procedures
z^*	critical value representing confidence level C		t^*	critical value representing confidence level C
t	test statistic using t distribution		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 npp) ... don't just list them