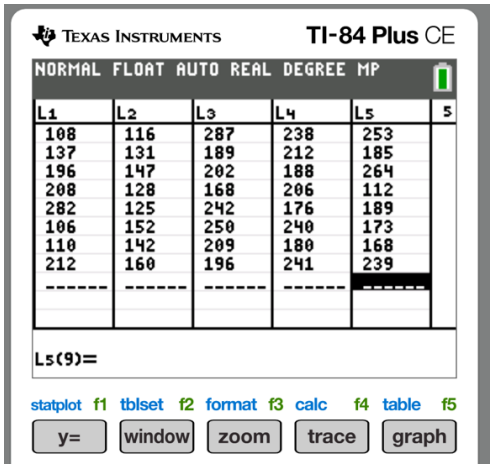
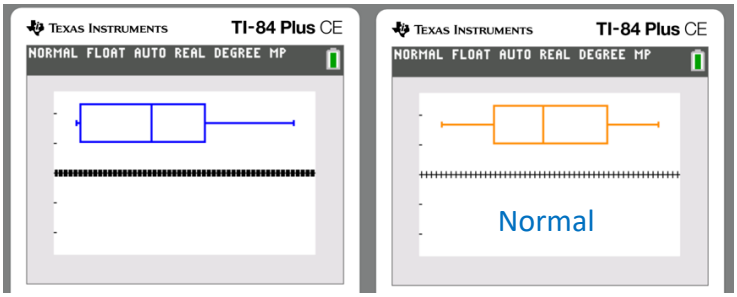
One Way ANOVA Worksheet Solutions

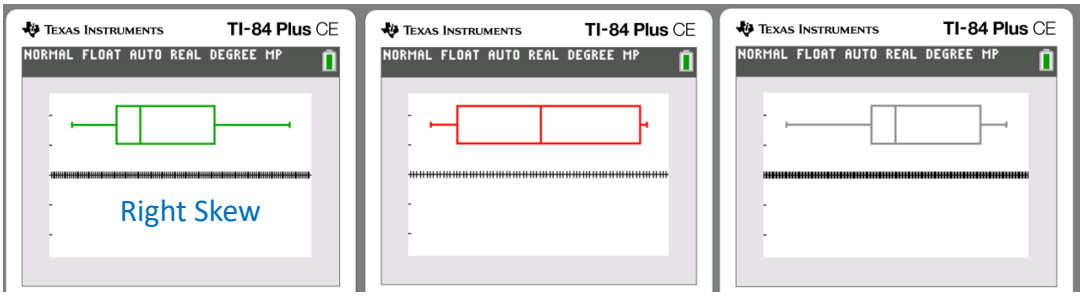
Analysis of Variance

1. **Fast Food Service Time-**The table below lists the service times for fast-food restaurants at the Local Mall and measured from the time you order to the time you receive your food. Use the **5% level of significance** to test the claim that the samples come from populations with the same mean.

					Local Mall				
	Tommy's Burgers		Shanghai Dumplings		Mario's Tacos		Luigi's Pizza		AZTECA Tacos
	108		116		287		238		253
	137		131		189		212		185
	196		147		202		188		264
	208		128		168		206		112
	282		125		242		176		189
	106		152		250		240		173
	110		142		209		180		168
	212		160		196		241		239
Mean	169.875	Mean	137.625	Mean	217.875	Mean	210.125	Mean	197.875
Var	4150.982	Var	225.411	Var	1503.268	Var	743.554	Var	2604.696
SD	64.428	SD	15.014	SD	38.772	SD	27.268	SD	51.036
n	8	n	8	n	8	n	8	n	8

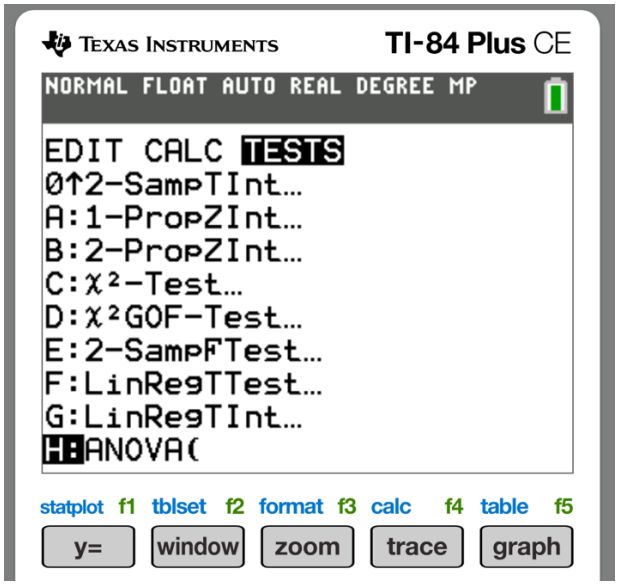


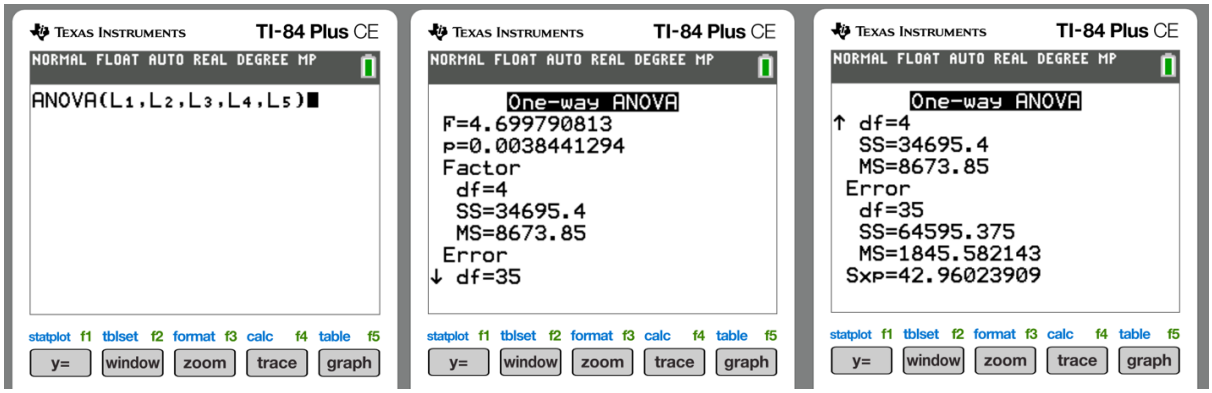




H_0: $\mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ **Claim**

H_1: at least one μ is not equal





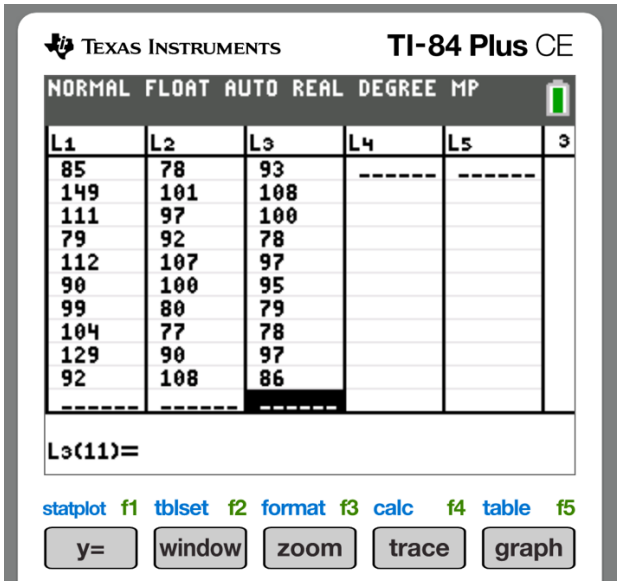
$p \approx 0.004$; $p < 0.005$; p value is low, H_0 has to go!

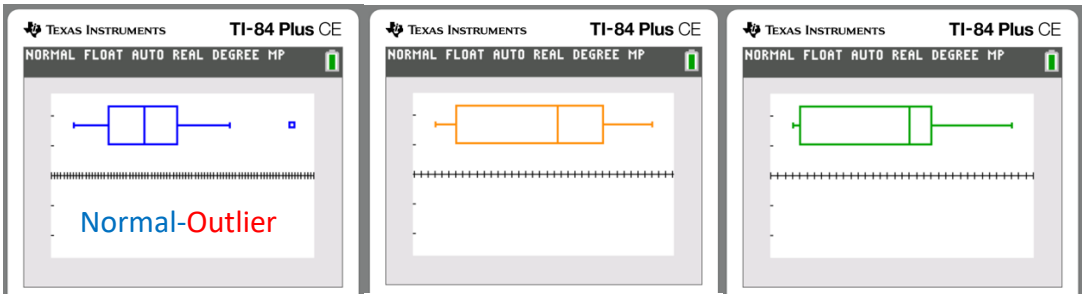
The Sample Does Not Support the Claim

The data comes from populations with unequal means

2. **Lead and Performance IQ Scores in Children**- IQ scores from three different blood levels are listed below. Use the **5% level of significance** to test the claim that the samples come from populations with the same mean.

	Low Lead Level			Blood Medium Lead Level			High Lead Level
	85			78			93
	149			101			108
	111			97			100
	79			92			78
	112			107			97
	90			100			95
	99			80			79
	104			77			78
	129			90			97
	92			108			86
Mean	105.000		**Mean**	93.000		**Mean**	91.100
Var	456.000		**Var**	134.444		**Var**	107.656
SD	21.354		**SD**	11.595		**SD**	10.376
n	10		**n**	10		**n**	10





$H_0: \mu_1 = \mu_2 = \mu_3$ **Claim**

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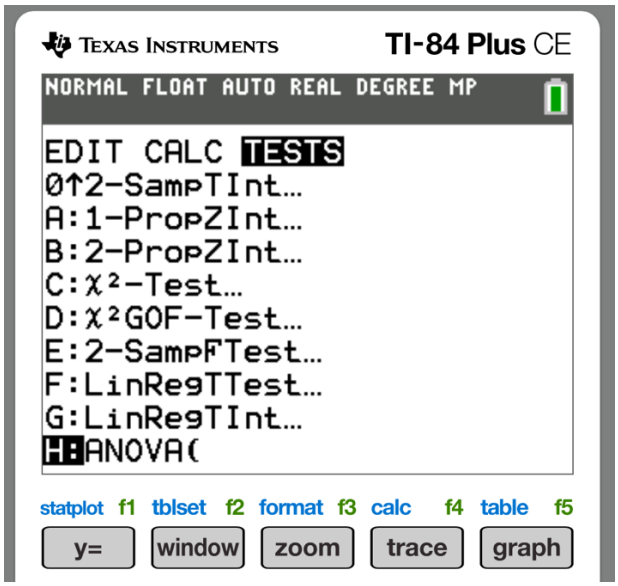
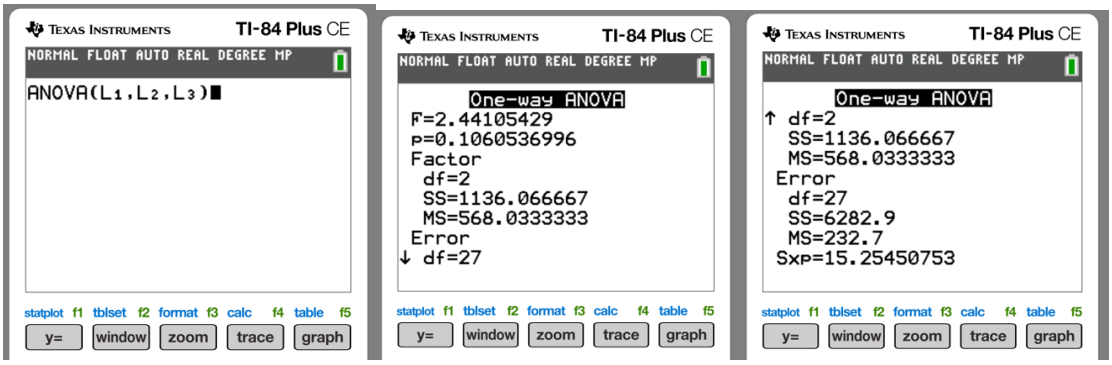




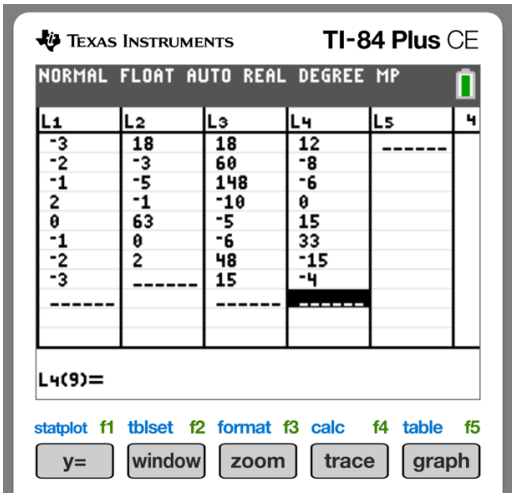
$p \approx 0.106; p \prec 0.005$; **Accept H_0**

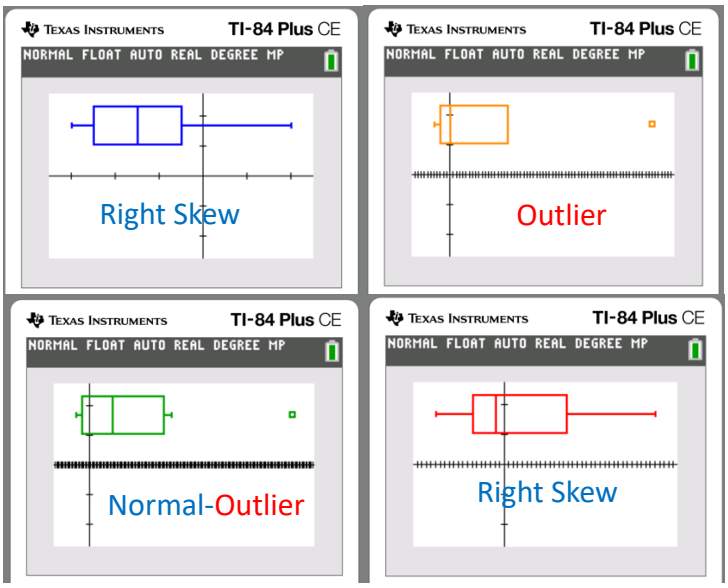
The Sample Supports the Claim

The data comes from populations with equal means

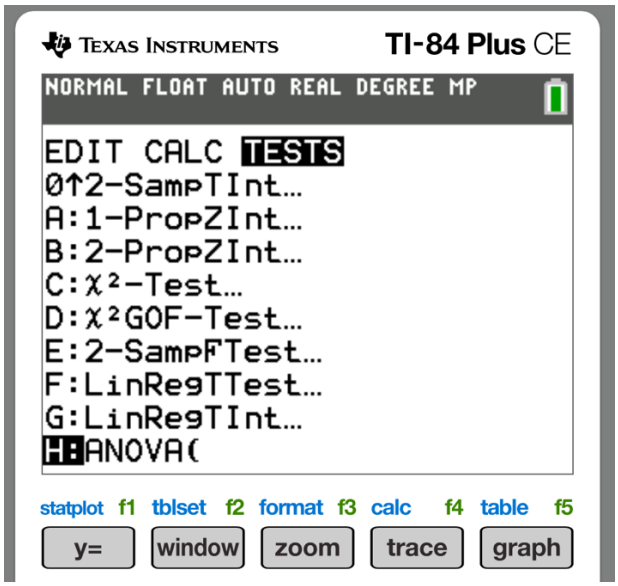
3. **Flight Departure Delay Times**- The table below lists the delay times (minutes) of a popular airline for flights headed to Las Vegas. Negative values correspond to flights that departed early. Use the **5% level of significance** to test the claim that the samples come from populations with the same mean.

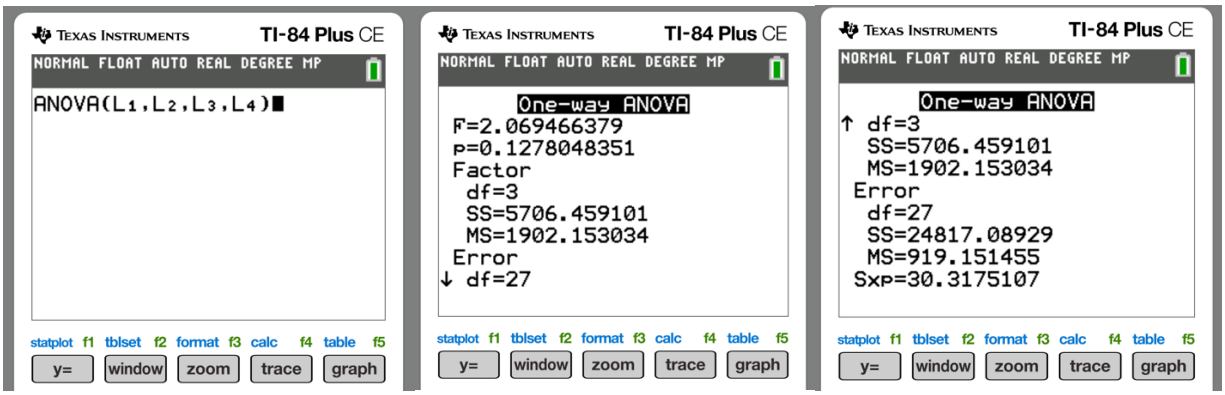
				Popular Airline					
	Flight 1			**Flight 18**			**Flight 23**		**Flight 37**
	-3			18			18		12
	-2			-3			60		-8
	-1			-5			148		-6
	2			-1			-10		0
	0			-4			-5		15
	-1			63			-6		33
	-2			0			48		-15
	-3			2			15		-4
Mean	-1.250		**Mean**	8.750		**Mean**	33.500	**Mean**	3.375
Var	2.786		**Var**	533.643		**Var**	2791.429	**Var**	243.982
SD	1.669		**SD**	23.101		**SD**	52.834	**SD**	15.620
n	8		**n**	8		**n**	8	**n**	8





H_0: $\mu_1 = \mu_2 = \mu_3 = \mu_4$ **Claim**
H_1: at least one μ is not equal

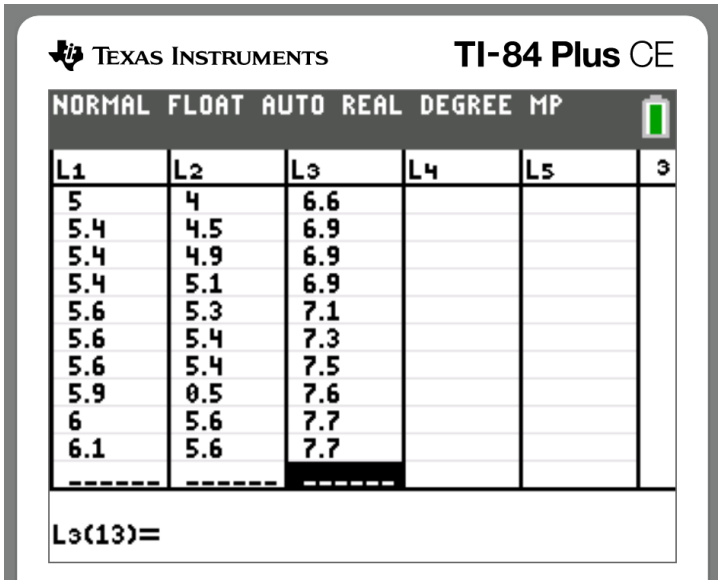


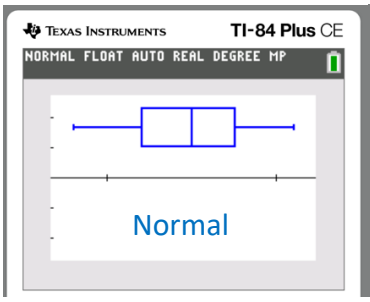


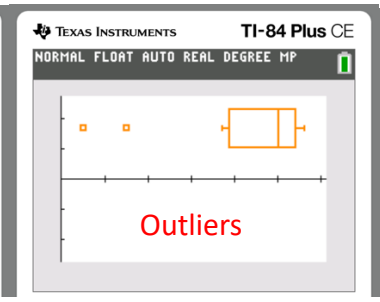
$p \approx 0.106; p \prec 0.005$; **Accept H_0**
The Sample Supports the Claim
The data comes from populations with equal means

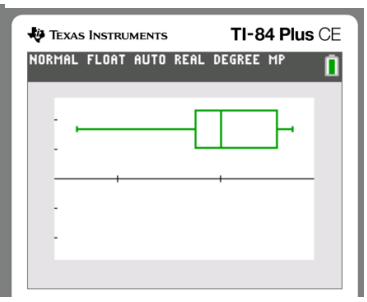
4. **Arsenic in Rice**- The tables below list the amount of Arsenic in Brown Rice from different states. The amounts are in micrograms of arsenic and all samples are of the same "serving sizes". The data is from the Food and Drug Administration. Use the **5% level of significance** to test the claim that the samples come from populations with the same mean.

				State			
	Arkansas			California			Texas
	4.8			1.5			5.6
	4.9			3.7			5.8
	5			4			6.6
	5.4			4.5			6.9
	5.4			4.9			6.9
	5.4			5.1			6.9
	5.6			5.3			7.1
	5.6			5.4			7.3
	5.6			5.4			7.5
	5.9			5.5			7.6
	6			5.6			7.7
	6.1			5.6			7.7
Mean	5.475		Mean	4.7083		Mean	6.967
Var	0.175		Var	1.4154		Var	0.479
SD	0.418		SD	1.1897		SD	0.692
n	12		n	12		n	12









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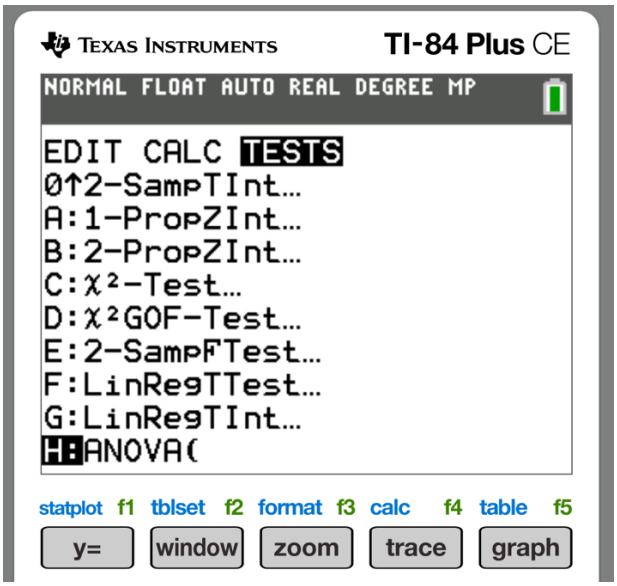
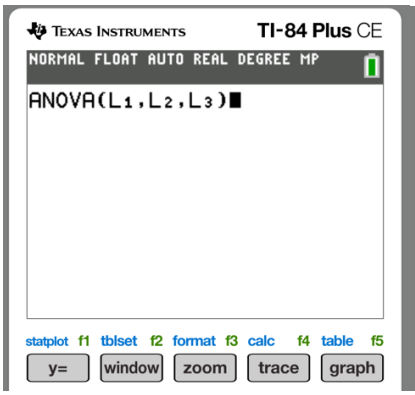
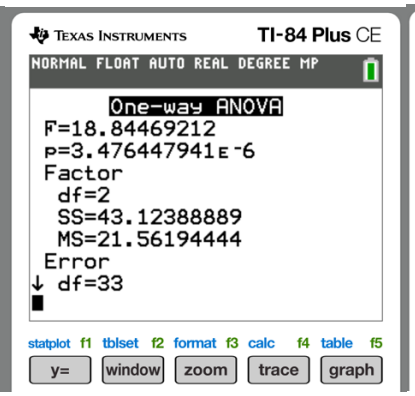
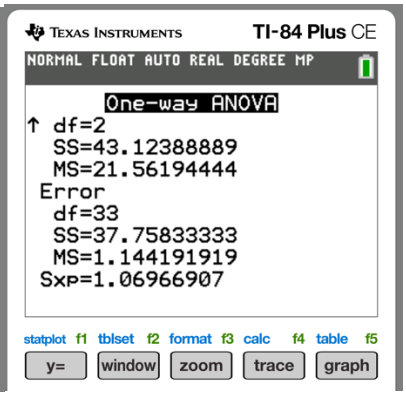




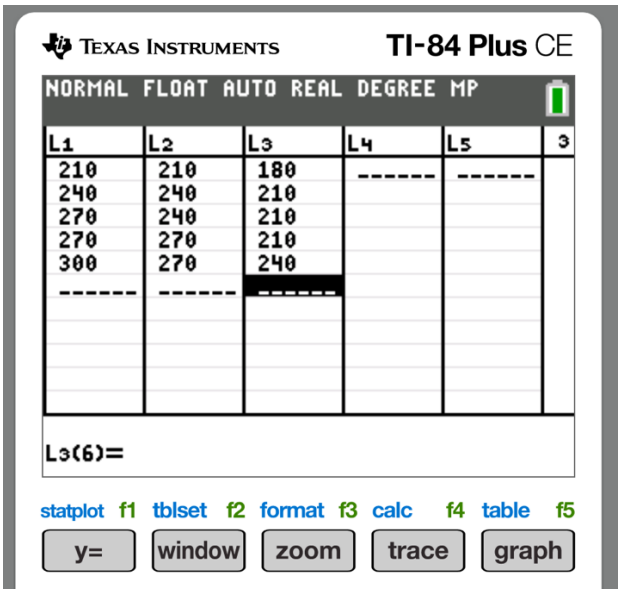


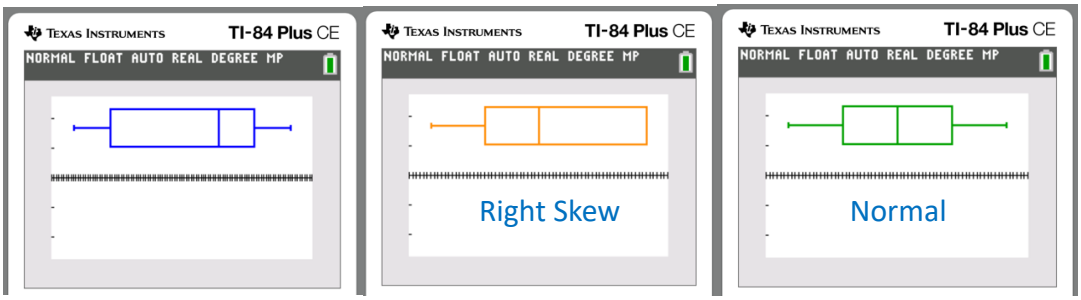


$p \approx 0.000$; $p < 0.005$; p value is low, H_0 has to go!
The Sample Does Not Support the Claim
The data comes from populations with unequal means

5. **Cholesterol Medication**- A Pharmaceutical Company wants to test the effectiveness of a new medication. The table below represents the cholesterol levels with various doses of the new cholesterol medication. Use the **5% level of significance** to test the claim that the samples come from populations with the same mean.

				Dosage			
	Group 1			**Group 2**			**Group 3**
	0 mg			**50 mg**			**100 mg**
	210			210			180
	240			240			210
	270			240			210
	270			270			210
	300			270			240
Mean	258.000		**Mean**	246.000		**Mean**	210.000
Var	1170.000		**Var**	630.000		**Var**	450.000
SD	34.205		**SD**	25.100		**SD**	21.213
n	5		**n**	5		**n**	5





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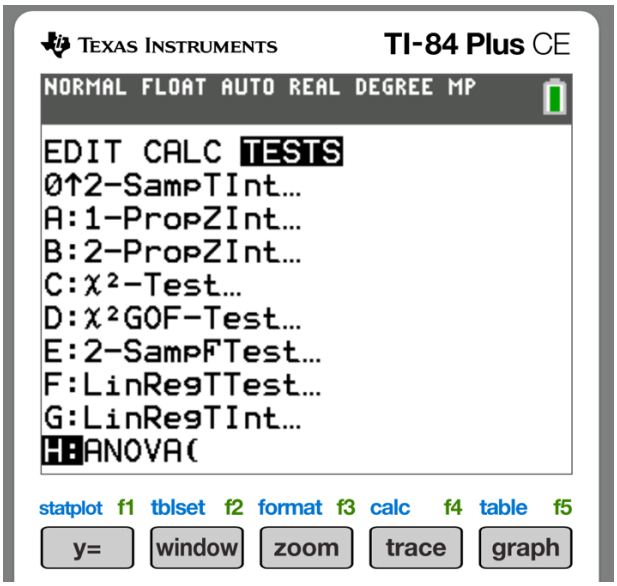

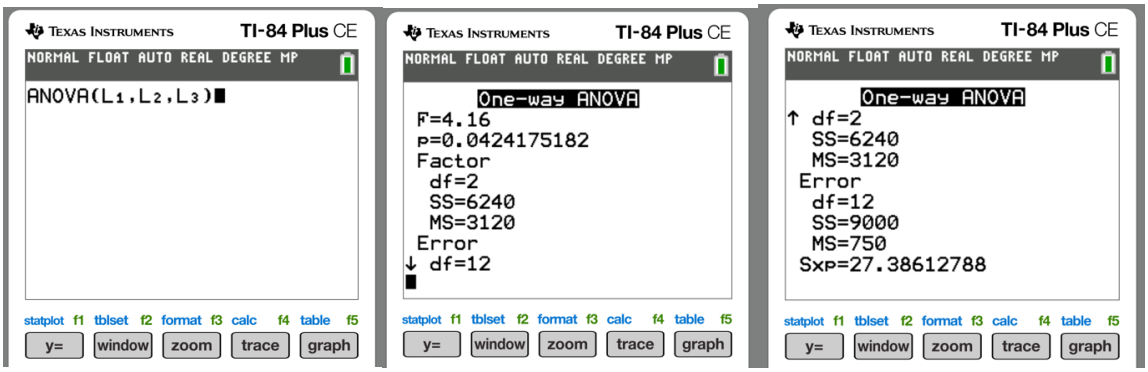

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