The SAS System

Class Level Information		
Class	**Levels**	**Values**
location	2	1 2
variety	3	5 6 8

Number of Observations Read	12
Number of Observations Used	12

The SAS System

Dependent Variable: x1

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	401.9175000	80.3835000	4.63	0.0446
Error	6	104.2050000	17.3675000		
Corrected Total	11	506.1225000			

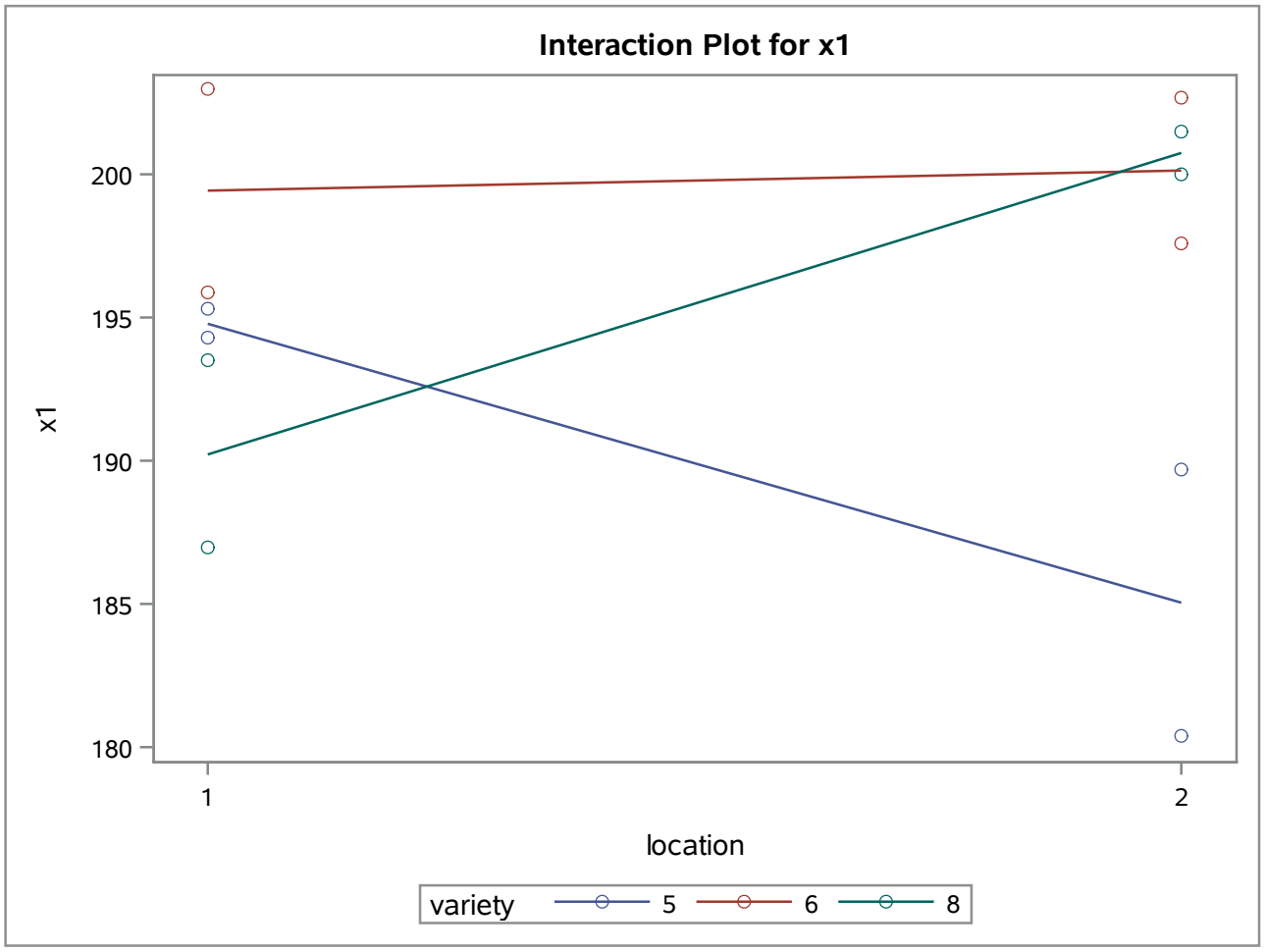
R-Square	Coeff Var	Root MSE	x1 Mean
0.794111	2.136324	4.167433	195.0750

Source	DF	Type I SS	Mean Square	F Value	Pr > F
location	1	0.7008333	0.7008333	0.04	0.8474
variety	2	196.1150000	98.0575000	5.65	0.0418
location*variety	2	205.1016667	102.5508333	5.90	0.0382

Source	DF	Type III SS	Mean Square	F Value	Pr > F
location	1	0.7008333	0.7008333	0.04	0.8474
variety	2	196.1150000	98.0575000	5.65	0.0418
location*variety	2	205.1016667	102.5508333	5.90	0.0382

Contrast	DF	Contrast SS	Mean Square	F Value	Pr > F
diff56	1	195.0312500	195.0312500	11.23	0.0154
diff58	1	62.1612500	62.1612500	3.58	0.1074
diff68	1	36.9800000	36.9800000	2.13	0.1948

Dependent Variable: x1



Dependent Variable: x2

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	2031.777500	406.355500	6.92	0.0177
Error	6	352.105000	58.684167		
Corrected Total	11	2383.882500			

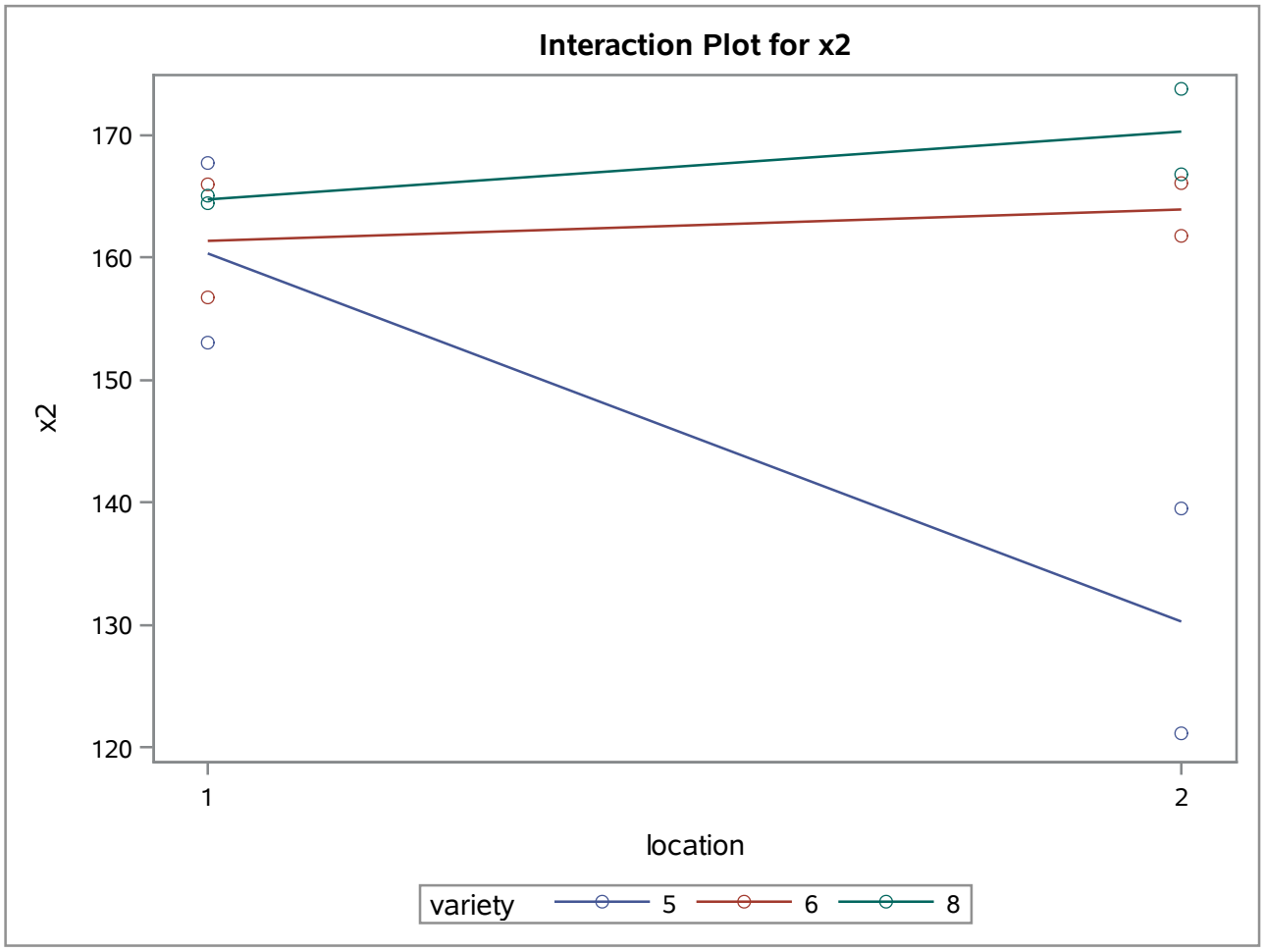
R-Square	Coeff Var	Root MSE	x2 Mean
0.852298	4.832398	7.660559	158.5250

Source	DF	Type I SS	Mean Square	F Value	Pr > F
location	1	162.067500	162.067500	2.76	0.1476
variety	2	1089.015000	544.507500	9.28	0.0146
location*variety	2	780.695000	390.347500	6.65	0.0300

Source	DF	Type III SS	Mean Square	F Value	Pr > F
location	1	162.067500	162.067500	2.76	0.1476
variety	2	1089.015000	544.507500	9.28	0.0146
location*variety	2	780.695000	390.347500	6.65	0.0300

Contrast	DF	Contrast SS	Mean Square	F Value	Pr > F
diff56	1	600.3112500	600.3112500	10.23	0.0186
diff58	1	985.6800000	985.6800000	16.80	0.0064
diff68	1	47.5312500	47.5312500	0.81	0.4028

Dependent Variable: x2



Dependent Variable: x3

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	442.5741667	88.5148333	5.60	0.0292
Error	6	94.8350000	15.8058333		
Corrected Total	11	537.4091667			

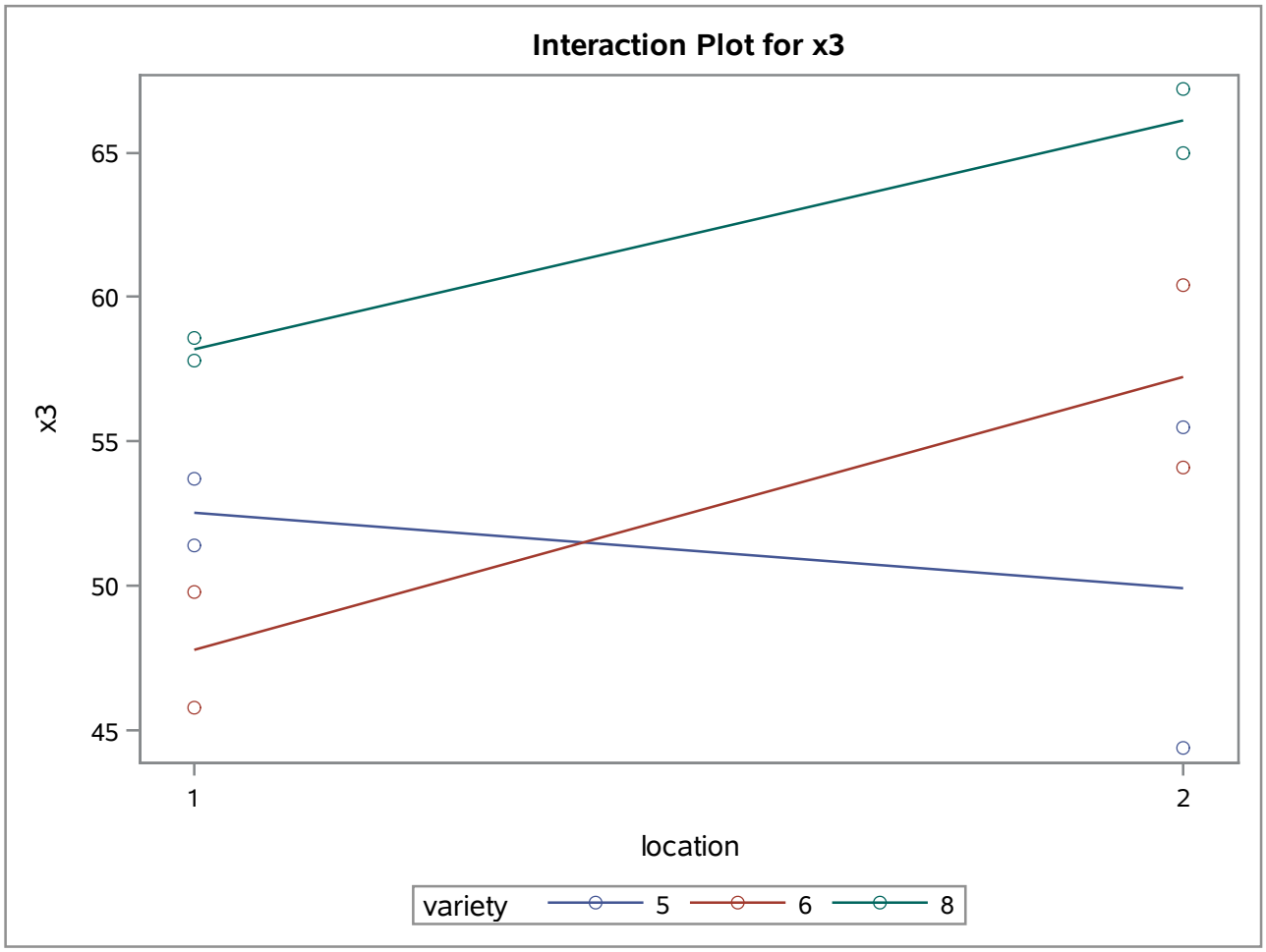
R-Square	Coeff Var	Root MSE	x3 Mean
0.823533	7.188166	3.975655	55.30833

Source	DF	Type I SS	Mean Square	F Value	Pr > F
location	1	72.5208333	72.5208333	4.59	0.0759
variety	2	284.1016667	142.0508333	8.99	0.0157
location*variety	2	85.9516667	42.9758333	2.72	0.1443

Source	DF	Type III SS	Mean Square	F Value	Pr > F
location	1	72.5208333	72.5208333	4.59	0.0759
variety	2	284.1016667	142.0508333	8.99	0.0157
location*variety	2	85.9516667	42.9758333	2.72	0.1443

Contrast	DF	Contrast SS	Mean Square	F Value	Pr > F
diff56	1	3.2512500	3.2512500	0.21	0.6661
diff58	1	237.6200000	237.6200000	15.03	0.0082
diff68	1	185.2812500	185.2812500	11.72	0.0141

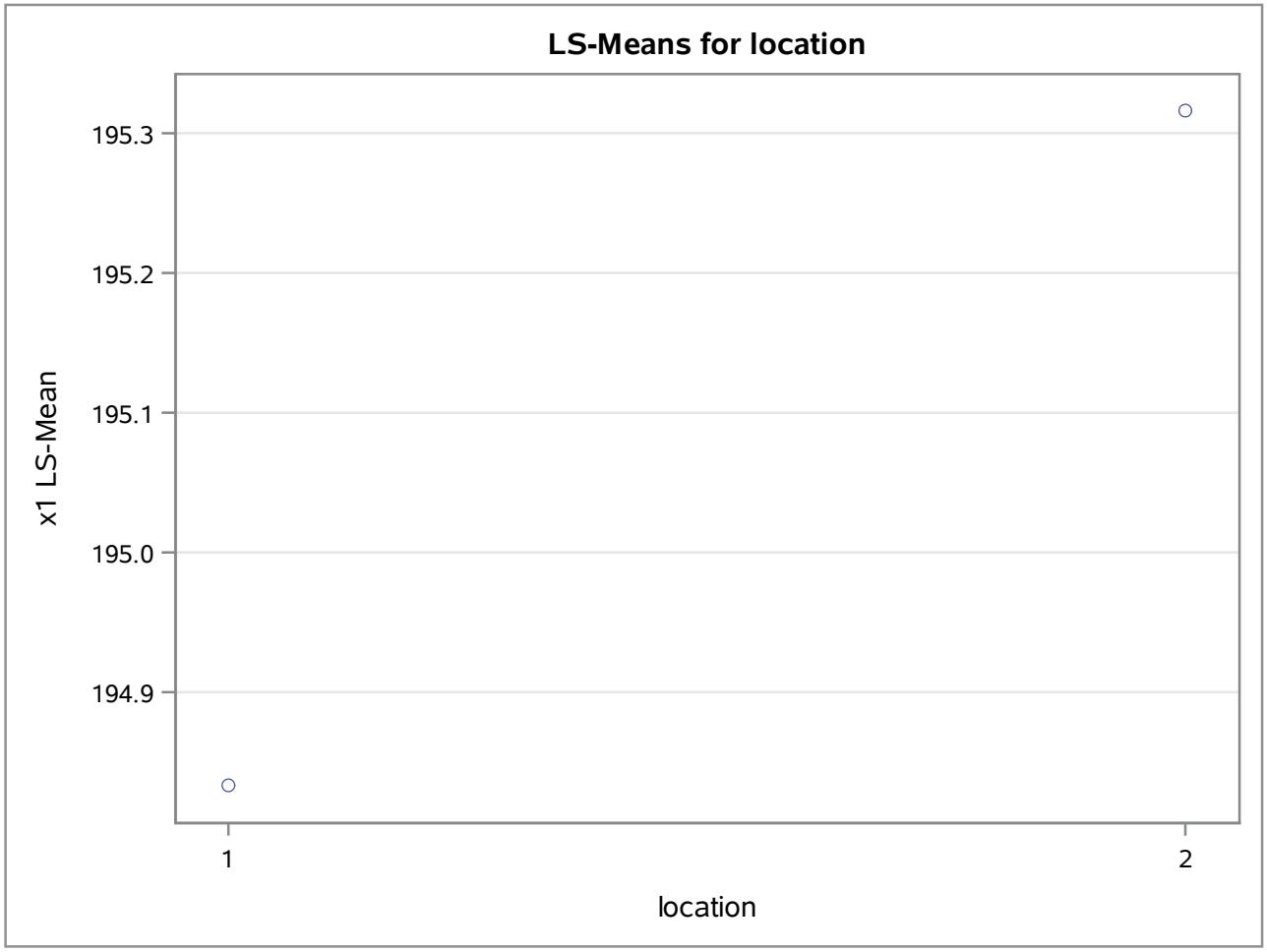
Dependent Variable: x3



The SAS System

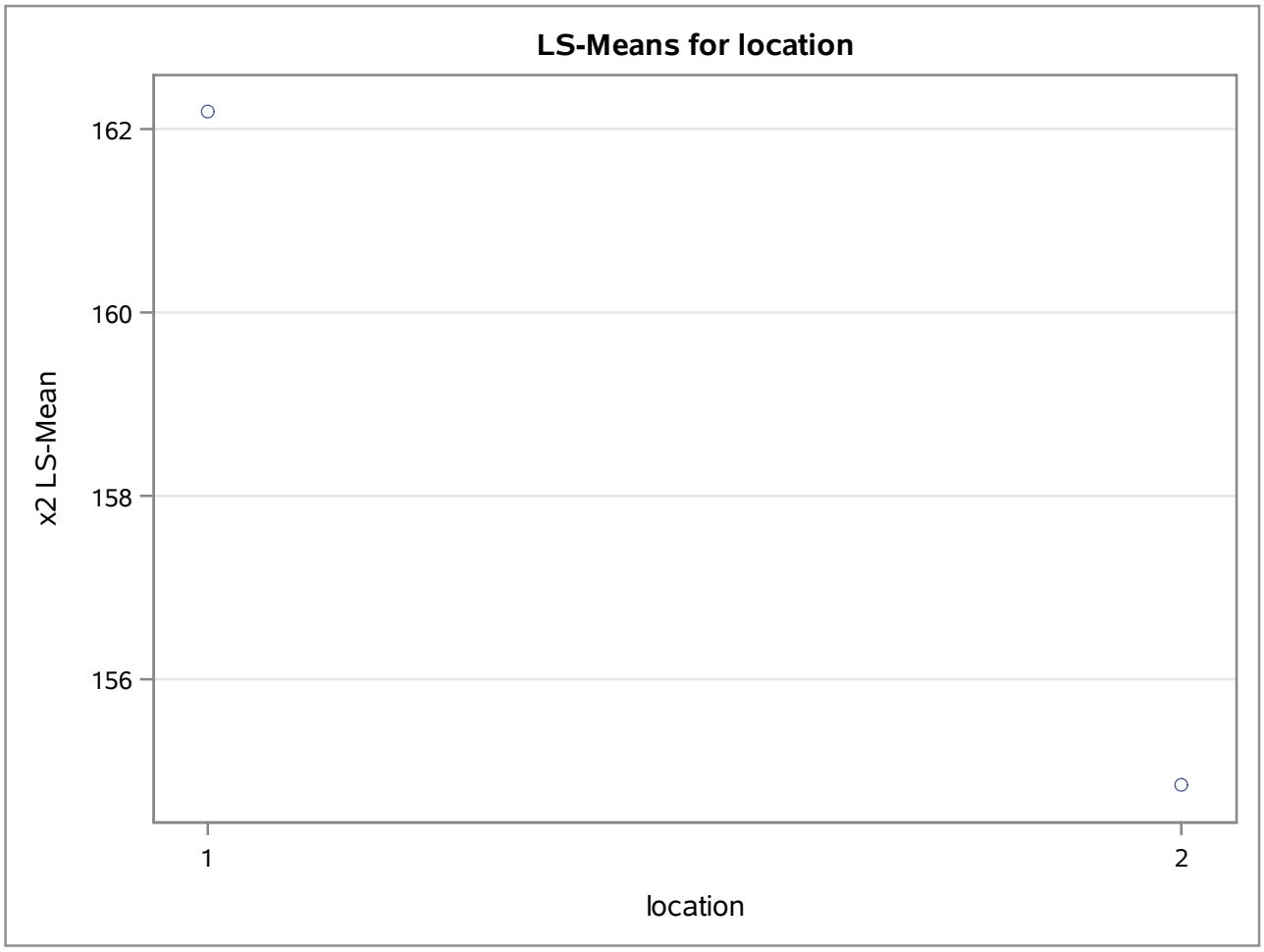
Least Squares Means

location	x1 LSMEAN
1	194.833333
2	195.316667



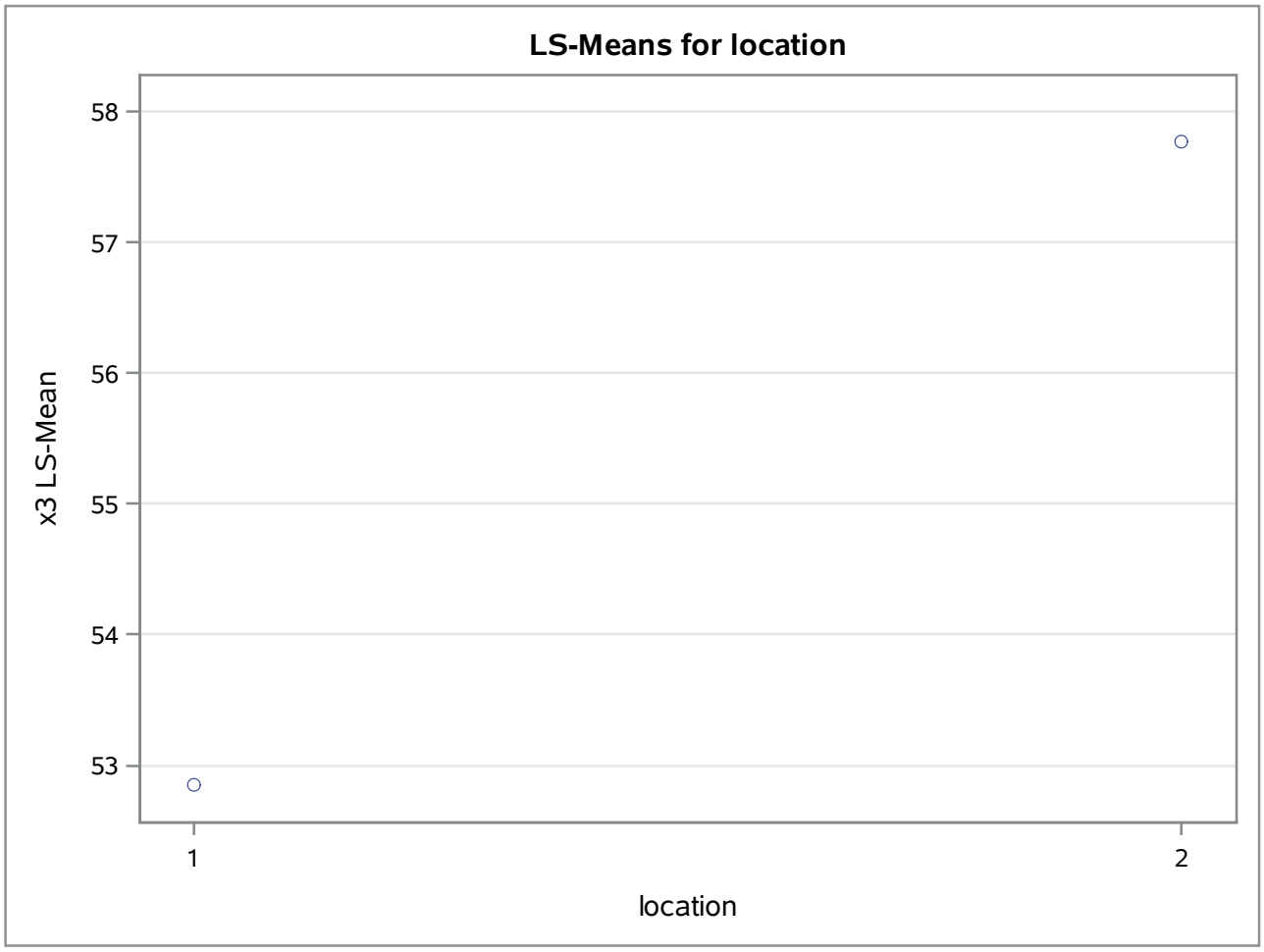
location	x2 LSMEAN
1	162.200000
2	154.850000

Least Squares Means



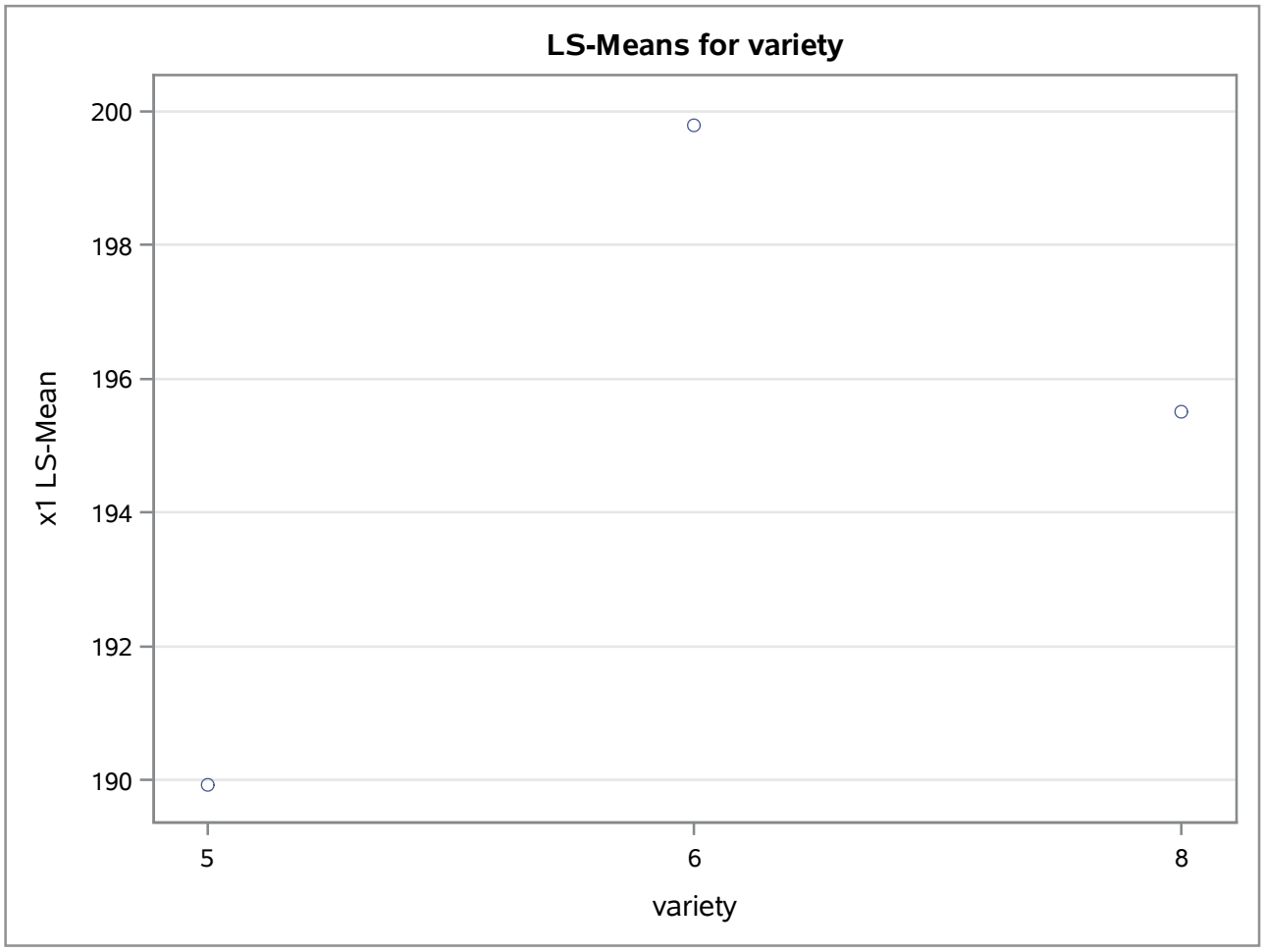
location	x3 LSMEAN
1	52.8500000
2	57.7666667

Least Squares Means



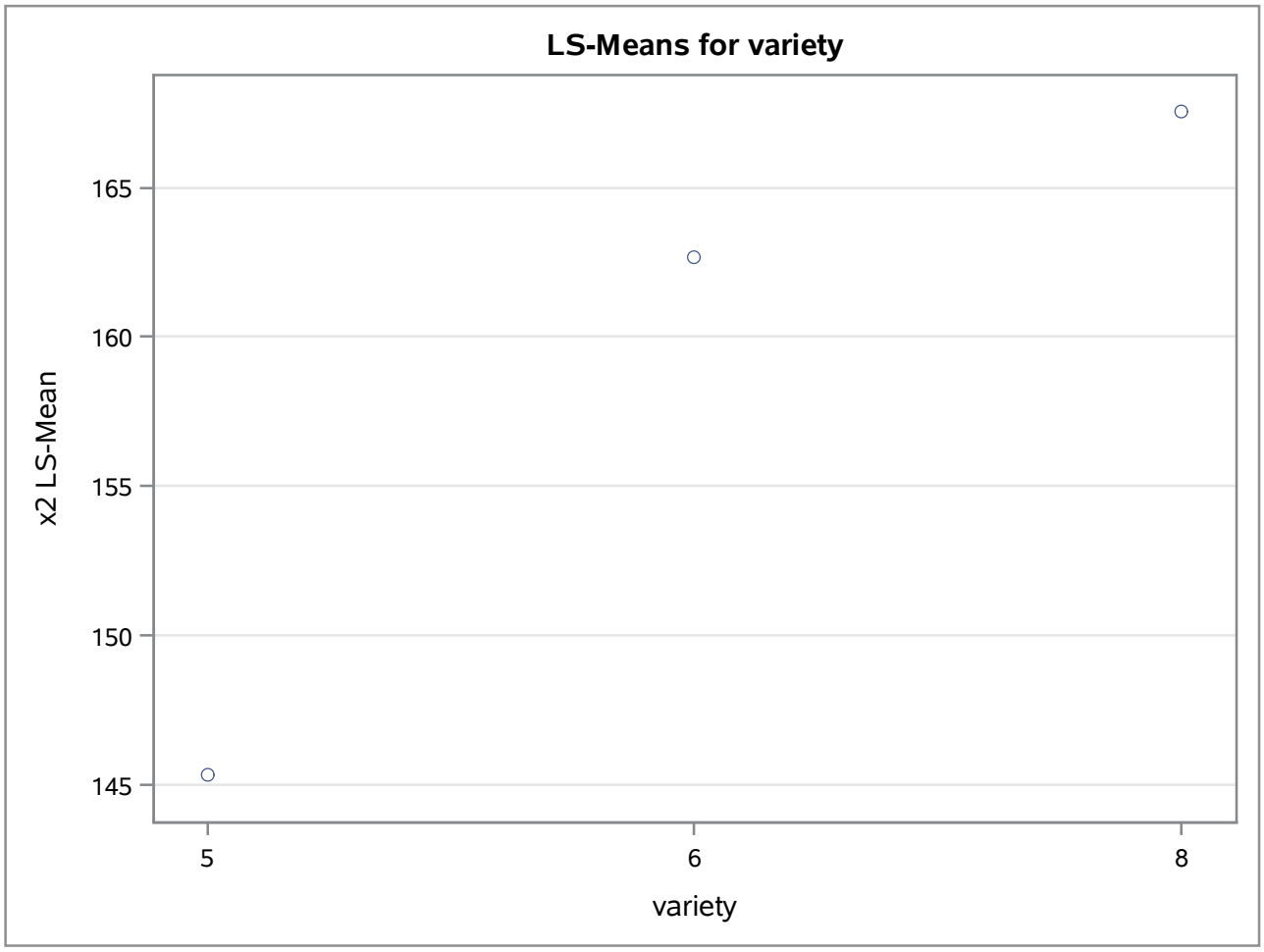
variety	x1 LSMEAN
5	189.925000
6	199.800000
8	195.500000

Least Squares Means



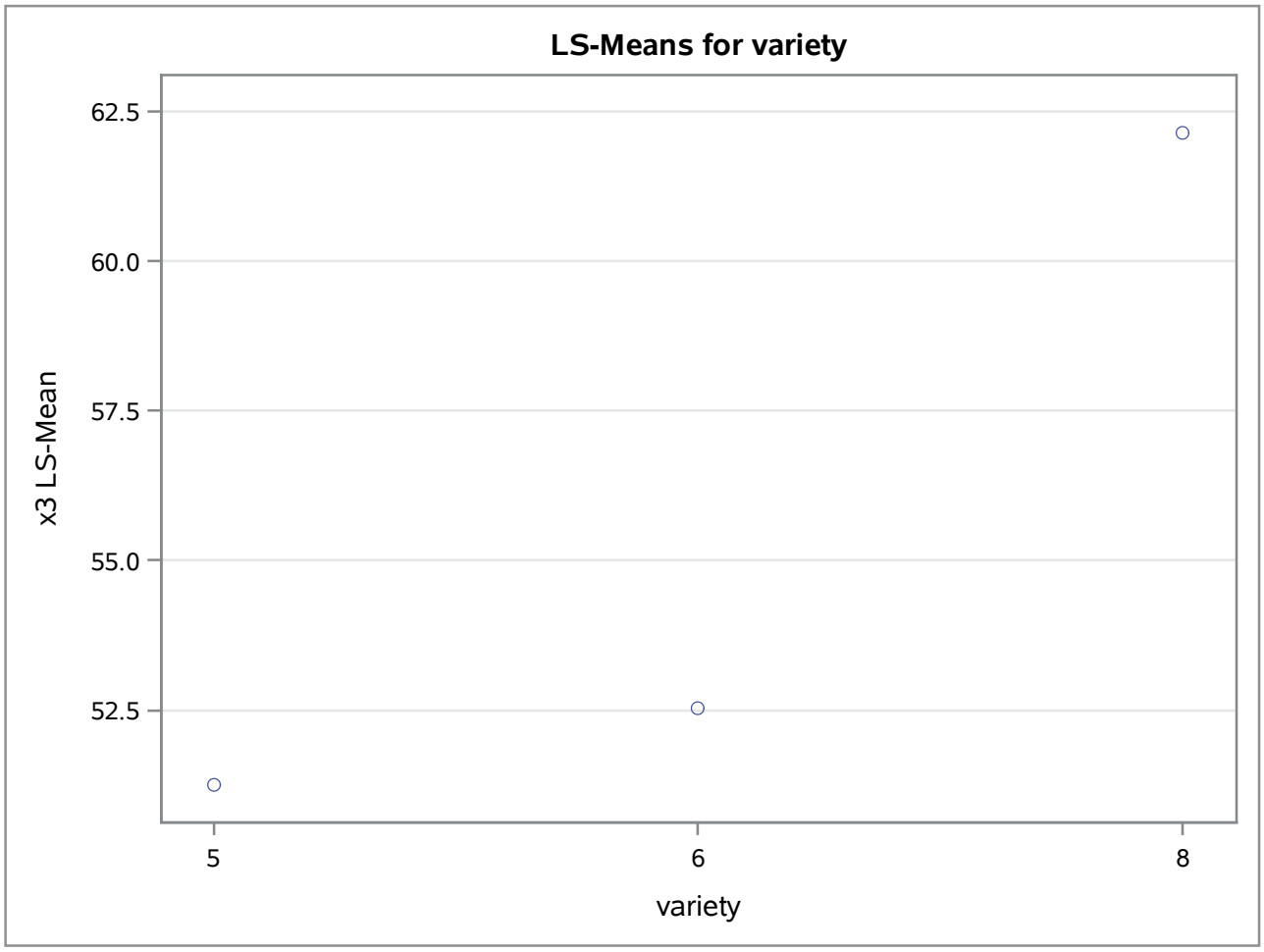
variety	x2 LSMEAN
5	145.350000
6	162.675000
8	167.550000

Least Squares Means



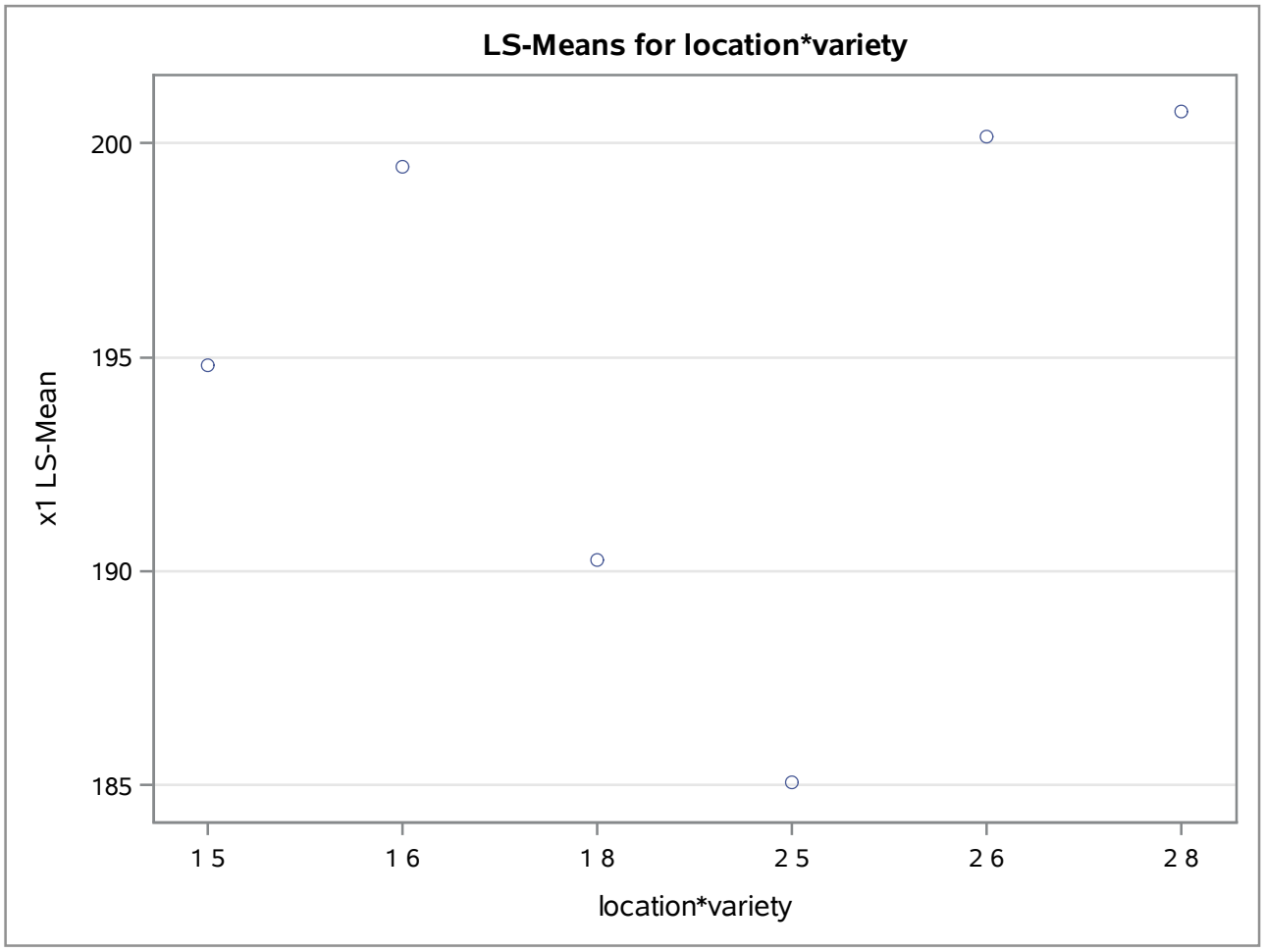
variety	x3 LSMEAN
5	51.2500000
6	52.5250000
8	62.1500000

Least Squares Means



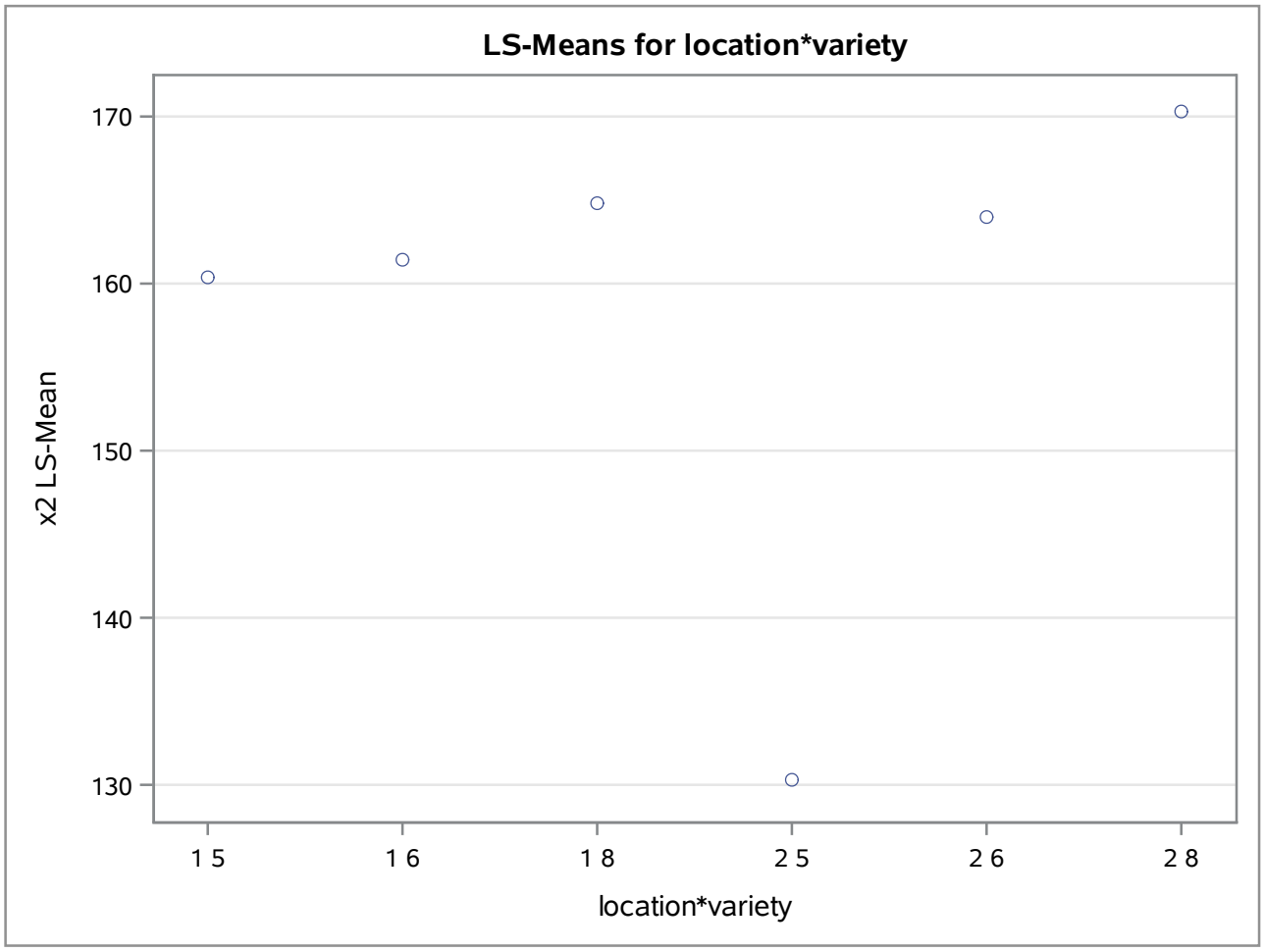
location	variety	x1 LSMEAN
1	5	194.800000
1	6	199.450000
1	8	190.250000
2	5	185.050000
2	6	200.150000
2	8	200.750000

Least Squares Means



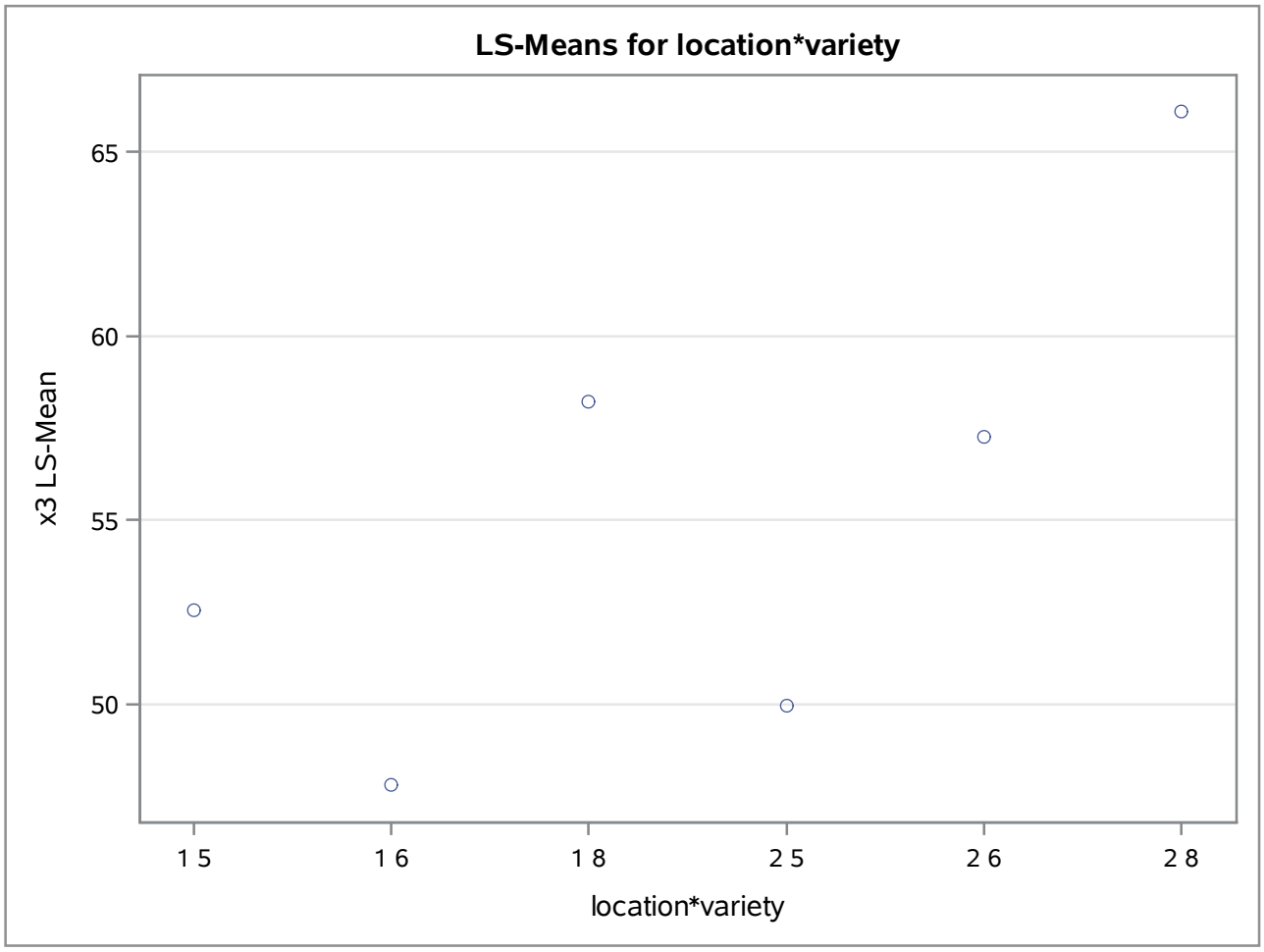
location	variety	x2 LSMEAN
1	5	160.400000
1	6	161.400000
1	8	164.800000
2	5	130.300000
2	6	163.950000
2	8	170.300000

Least Squares Means



location	variety	x3 LSMEAN
1	5	52.5500000
1	6	47.8000000
1	8	58.2000000
2	5	49.9500000
2	6	57.2500000
2	8	66.1000000

Least Squares Means



The SAS System

Multivariate Analysis of Variance

Characteristic Roots and Vectors of: E Inverse * H, where H = Type III SSCP Matrix for location E = Error SSCP Matrix				
Characteristic Root	Percent	Characteristic Vector V'EV=1		
		x1	x2	x3
8.38824348	100.00	-0.13688388	-0.07628041	0.23952166
0.00000000	0.00	0.10187838	0.00216080	-0.00678495
0.00000000	0.00	-0.06307410	0.03725453	0.06189287

MANOVA Test Criteria and Exact F Statistics for the Hypothesis of No Overall location Effect H = Type III SSCP Matrix for location E = Error SSCP Matrix S=1 M=0.5 N=1					
Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.10651620	11.18	3	4	0.0205
Pillai's Trace	0.89348380	11.18	3	4	0.0205
Hotelling-Lawley Trace	8.38824348	11.18	3	4	0.0205
Roy's Greatest Root	8.38824348	11.18	3	4	0.0205

Characteristic Roots and Vectors of: E Inverse * H, where H = Type III SSCP Matrix for variety E = Error SSCP Matrix				
Characteristic Root	Percent	Characteristic Vector V'EV=1		
		x1	x2	x3
18.1876113	85.09	-0.16986539	-0.06425268	0.23943636
3.1880638	14.91	0.00137509	0.03769309	0.03800092
0.0000000	0.00	0.06510456	-0.04076880	0.04973481

MANOVA Test Criteria and F Approximations for the Hypothesis of No Overall variety Effect H = Type III SSCP Matrix for variety E = Error SSCP Matrix S=2 M=0 N=1					
Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.01244417	10.62	6	8	0.0019
Pillai's Trace	1.70910921	9.79	6	10	0.0011
Hotelling-Lawley Trace	21.37567504	14.25	6	4	0.0113
Roy's Greatest Root	18.18761127	30.31	3	5	0.0012
NOTE: F Statistic for Roy's Greatest Root is an upper bound.					
NOTE: F Statistic for Wilks' Lambda is exact.					

The SAS System

Multivariate Analysis of Variance

Characteristic Roots and Vectors of: E Inverse * H, where H = Type III SSCP Matrix for location*variety E = Error SSCP Matrix				
Characteristic Root	Percent	Characteristic Vector V'EV=1		
		x1	x2	x3
6.82409388	90.45	0.15723347	0.06948572	-0.18762316
0.72019649	9.55	-0.08644203	0.01400396	0.12612011
0.00000000	0.00	0.03000259	-0.04676424	0.10069089

MANOVA Test Criteria and F Approximations for the Hypothesis of No Overall location*variety Effect H = Type III SSCP Matrix for location*variety E = Error SSCP Matrix S=2 M=0 N=1					
Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.07429984	3.56	6	8	0.0508
Pillai's Trace	1.29086073	3.03	6	10	0.0587
Hotelling-Lawley Trace	7.54429038	5.03	6	4	0.0699
Roy's Greatest Root	6.82409388	11.37	3	5	0.0113
NOTE: F Statistic for Roy's Greatest Root is an upper bound.					
NOTE: F Statistic for Wilks' Lambda is exact.					

Characteristic Roots and Vectors of: E Inverse * H, where H = Contrast SSCP Matrix for diff56 E = Error SSCP Matrix				
Characteristic Root	Percent	Characteristic Vector V'EV=1		
		x1	x2	x3
13.3762306	100.00	0.16362329	0.07216982	-0.21959460
0.0000000	0.00	-0.07951128	0.04394151	0.01873511
0.0000000	0.00	0.00034387	-0.00848122	0.11258151

MANOVA Test Criteria and Exact F Statistics for the Hypothesis of No Overall diff56 Effect H = Contrast SSCP Matrix for diff56 E = Error SSCP Matrix S=1 M=0.5 N=1					
Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.06955926	17.83	3	4	0.0089
Pillai's Trace	0.93044074	17.83	3	4	0.0089
Hotelling-Lawley Trace	13.37623060	17.83	3	4	0.0089
Roy's Greatest Root	13.37623060	17.83	3	4	0.0089

The SAS System

Multivariate Analysis of Variance

Characteristic Roots and Vectors of: E Inverse * H, where H = Contrast SSCP Matrix for diff58 E = Error SSCP Matrix				
Characteristic Root	Percent	Characteristic Vector V'EV=1		
		x1	x2	x3
3.28027873	100.00	-0.03001021	0.02518235	0.08155394
0.00000000	0.00	-0.14950993	-0.07717842	0.23365861
0.00000000	0.00	-0.09920138	0.02491206	0.00000000

MANOVA Test Criteria and Exact F Statistics for the Hypothesis of No Overall diff58 Effect H = Contrast SSCP Matrix for diff58 E = Error SSCP Matrix S=1 M=0.5 N=1					
Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.23362964	4.37	3	4	0.0940
Pillai's Trace	0.76637036	4.37	3	4	0.0940
Hotelling-Lawley Trace	3.28027873	4.37	3	4	0.0940
Roy's Greatest Root	3.28027873	4.37	3	4	0.0940

Characteristic Roots and Vectors of: E Inverse * H, where H = Contrast SSCP Matrix for diff68 E = Error SSCP Matrix				
Characteristic Root	Percent	Characteristic Vector V'EV=1		
		x1	x2	x3
15.4070032	100.00	-0.16630625	-0.05562589	0.24224183
0.0000000	0.00	0.01364378	0.05944518	-0.02401319
0.0000000	0.00	0.07246255	-0.02415163	0.04460552

MANOVA Test Criteria and Exact F Statistics for the Hypothesis of No Overall diff68 Effect H = Contrast SSCP Matrix for diff68 E = Error SSCP Matrix S=1 M=0.5 N=1					
Statistic	Value	F Value	Num DF	Den DF	Pr > F
Wilks' Lambda	0.06094958	20.54	3	4	0.0068
Pillai's Trace	0.93905042	20.54	3	4	0.0068
Hotelling-Lawley Trace	15.40700323	20.54	3	4	0.0068
Roy's Greatest Root	15.40700323	20.54	3	4	0.0068

The SAS System

Variable: res1

Moments			
N	12	**Sum Weights**	12
Mean	0	**Sum Observations**	0
Std Deviation	3.07785344	**Variance**	9.47318182
Skewness	0	**Kurtosis**	-1.2920942
Uncorrected SS	104.205	**Corrected SS**	104.205
Coeff Variation	.	**Std Error Mean**	0.88849976

Basic Statistical Measures			
Location		**Variability**	
Mean	0	**Std Deviation**	3.07785
Median	0	**Variance**	9.47318
Mode	.	**Range**	9.30000
		Interquartile Range	5.80000

Tests for Location: Mu0=0				
Test	**Statistic**		**p Value**	
Student's t	**t**	0	**Pr > |t|**	1.0000
Sign	**M**	0	**Pr >= |M|**	1.0000
Signed Rank	**S**	0	**Pr >= |S|**	1.0000

Tests for Normality				
Test	**Statistic**		**p Value**	
Shapiro-Wilk	**W**	0.951244	**Pr < W**	0.6552
Kolmogorov-Smirnov	**D**	0.129639	**Pr > D**	>0.1500
Cramer-von Mises	**W-Sq**	0.034145	**Pr > W-Sq**	>0.2500
Anderson-Darling	**A-Sq**	0.242943	**Pr > A-Sq**	>0.2500

Quantiles (Definition 5)	
Level	**Quantile**
100% Max	4.65
99%	4.65
95%	4.65
90%	3.55
75% Q3	2.90
50% Median	0.00
25% Q1	-2.90

The SAS System

Variable: res1

Quantiles (Definition 5)	
Level	**Quantile**
10%	-3.55
5%	-4.65
1%	-4.65
0% Min	-4.65

Extreme Observations			
Lowest		**Highest**	
Value	**Obs**	**Value**	**Obs**
-4.65	4	0.75	11
-3.55	6	2.55	7
-3.25	10	3.25	9
-2.55	8	3.55	5
-0.75	12	4.65	3

The SAS System

Variable: res2

Moments			
N	12	**Sum Weights**	12
Mean	0	**Sum Observations**	0
Std Deviation	5.65769789	**Variance**	32.0095455
Skewness	0	**Kurtosis**	-0.765913
Uncorrected SS	352.105	**Corrected SS**	352.105
Coeff Variation	.	**Std Error Mean**	1.6332367

Basic Statistical Measures			
Location		**Variability**	
Mean	0	**Std Deviation**	5.65770
Median	-142E-16	**Variance**	32.00955
Mode	.	**Range**	18.40000
		Interquartile Range	8.10000

Tests for Location: Mu0=0				
Test	**Statistic**		**p Value**	
Student's t	**t**	0	**Pr > |t|**	1.0000
Sign	**M**	0	**Pr >= |M|**	1.0000
Signed Rank	**S**	0	**Pr >= |S|**	1.0000

Tests for Normality				
Test	**Statistic**		**p Value**	
Shapiro-Wilk	**W**	0.984007	**Pr < W**	0.9949
Kolmogorov-Smirnov	**D**	0.068189	**Pr > D**	>0.1500
Cramer-von Mises	**W-Sq**	0.011579	**Pr > W-Sq**	>0.2500
Anderson-Darling	**A-Sq**	0.099239	**Pr > A-Sq**	>0.2500

Quantiles (Definition 5)	
Level	**Quantile**
100% Max	9.20
99%	9.20
95%	9.20
90%	7.30
75% Q3	4.05
50% Median	-0.00
25% Q1	-4.05

The SAS System

Variable: res2

Quantiles (Definition 5)	
Level	**Quantile**
10%	-7.30
5%	-9.20
1%	-9.20
0% Min	-9.20

Extreme Observations			
Lowest		**Highest**	
Value	**Obs**	**Value**	**Obs**
-9.20	4	2.15	7
-7.30	1	3.50	12
-4.60	5	4.60	6
-3.50	11	7.30	2
-2.15	8	9.20	3

The SAS System

Variable: res3

Moments			
N	12	**Sum Weights**	12
Mean	0	**Sum Observations**	0
Std Deviation	2.93621587	**Variance**	8.62136364
Skewness	0	**Kurtosis**	0.48859566
Uncorrected SS	94.835	**Corrected SS**	94.835
Coeff Variation	.	**Std Error Mean**	0.84761251

Basic Statistical Measures			
Location		**Variability**	
Mean	0	**Std Deviation**	2.93622
Median	3.55E-15	**Variance**	8.62136
Mode	.	**Range**	11.10000
		Interquartile Range	3.15000

Tests for Location: Mu0=0				
Test	**Statistic**		**p Value**	
Student's t	**t**	0	**Pr > |t|**	1.0000
Sign	**M**	0	**Pr >= |M|**	1.0000
Signed Rank	**S**	0	**Pr >= |S|**	1.0000

Tests for Normality				
Test	**Statistic**		**p Value**	
Shapiro-Wilk	**W**	0.992738	**Pr < W**	1.0000
Kolmogorov-Smirnov	**D**	0.097655	**Pr > D**	>0.1500
Cramer-von Mises	**W-Sq**	0.0184	**Pr > W-Sq**	>0.2500
Anderson-Darling	**A-Sq**	0.131482	**Pr > A-Sq**	>0.2500

Quantiles (Definition 5)	
Level	**Quantile**
100% Max	5.550
99%	5.550
95%	5.550
90%	3.150
75% Q3	1.575
50% Median	0.000
25% Q1	-1.575

The SAS System

Variable: res3

Quantiles (Definition 5)	
Level	**Quantile**
10%	-3.150
5%	-5.550
1%	-5.550
0% Min	-5.550

Extreme Observations			
Lowest		**Highest**	
Value	**Obs**	**Value**	**Obs**
-5.55	4	1.10	12
-3.15	8	1.15	2
-2.00	6	2.00	5
-1.15	1	3.15	7
-1.10	11	5.55	3