Date: May 17, 2024

To: Perry Cox, M.D., Chief of Medicine

Subject: Analysis of Variances for Admissions and Births

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Sacred Heart has provided the data set taken from *American Hospital Association Guide to the Health-Care Field*, published in Chicago, Illinois. The company has been provided an opportunity to expand and change the type of ownership. Before moving forward with testing the data, the company wants to make sure that the sample size and data are viable. This report will provide the Analysis of Variances (ANOVA) for admissions and births by geographical region and/or control. The data will help the company understand how different groups respond by comparing the samples to see whether there is a significant or no significant differences in the data and therefore approve the dataset for further analytical testing.

Contents of the report:
- Define Data terms
- ANOVA for Admissions
  - One- Factor ANOVA with:
    - Geographical Region
    - Control
  - Two-Factor ANOVA with Geographical Region and Control
- ANOVA for Births
  - One- Factor ANOVA with:
    - Geographical Region
    - Control
  - Two-Factor ANOVA with Geographical Region and Control
- Conclusion

DEFINE DATA TERMS:

Hospital: The numeric value given to a hospital on the report to make running the report easier
Geographic Region: The variable is coded from 1 to 7, and the numbers represent the following regions-
      1 = South
      2 = Northeast
      3 = Midwest
      4 = Southwest
      5 = Rocky Mountain
      6 = California
      7 = Northwest
Control: A type of ownership. Four categories of control are included in the database-
      1 = government, nonfederal

2 = nongovernment, not-for-profit
3 = for-profit
4 = federal government
Service: The type of hospital. The two types of hospitals used in this database are-
1 = general medical
2 = psychiatric
Beds: Number of beds in the hospital
Admissions: The number of people admitted to the hospital
Census: Average number of patients per day in a hospital over a given period of time; admitted patients and outpatients are counted separately
Outpat. (Outpatient) Visits: Any visit made during the person's reference period to a hospital outpatient department
Births: Number of births in the hospital
Tot. Exp. (Total Expenditure): All costs and expenses reasonably and properly incurred in units of $1,000.
Payroll Exp. (Payroll Expense): The amount of salaries and wages paid to employees in exchange for services rendered by them to a business in units of $1,000
Personnel: Number of people that work in the hospital

## ANOVA for Admission:

One-Factor ANOVA for Admissions with Geographical Region

Sacred Heart wants to know if there is a significant difference in the population means between Admissions and Geographical Region. After running the test, the data shows that the null hypothesis can't be rejected due to the statistical value, which is not small (as shown below).

Fit Group

Oneway Analysis of Admissions By Geog. Region
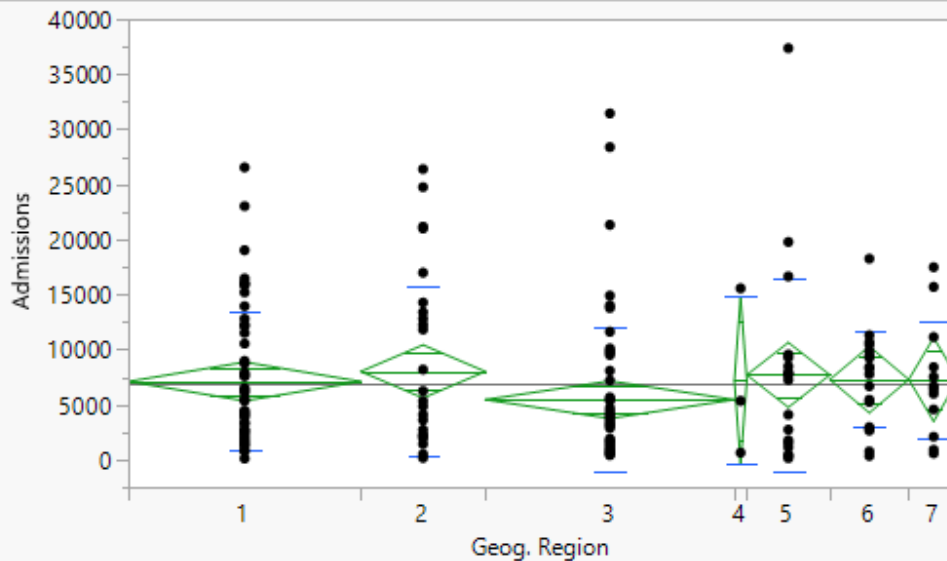
Oneway Anova

Summary of Fit

Rsquare	0.020792
Adj Rsquare	-0.00965
Root Mean Square Error	6678.128
Mean of Response	6831.835
Observations (or Sum Wgts)	200

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Geog. Region	6	182761795	30460299	0.6830	0.6636
Error	193	8607296329	44597390		
C. Total	199	8790058124			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	56	7103.11	892.4	5343	8863
2	30	8012.90	1219.3	5608	10418
3	60	5447.32	862.1	3747	7148
4	3	7182.00	3855.6	-423	14787
5	20	7699.05	1493.3	4754	10644
6	19	7283.11	1532.1	4261	10305
7	12	7288.42	1927.8	3486	11091

Std Error uses a pooled estimate of error variance

One-Factor ANOVA for Admissions with Control

Sacred Heart wants to know if there is a significant difference in the population means for Admissions and Control. After running the test, the data shows that the null hypothesis can be

rejected due to the statistical value (as shown below), which is small. Because the null hypothesis was rejected, the data needs further analyzation by considering the whether the variances are equal or not.

Oneway Analysis of Admissions By Control

Oneway Anova

Summary of Fit

Rsquare	0.081468
Adj Rsquare	0.067409
Root Mean Square Error	6418.226
Mean of Response	6831.835
Observations (or Sum Wgts)	200

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Control	3	716107274	238702425	5.7946	0.0008*
Error	196	8073950849	41193627		
C. Total	199	8790058124			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	51	6019.98	898.7	4247.6	7792
2	86	8901.66	692.1	7536.8	10267
3	45	5000.38	956.8	3113.5	6887
4	18	3821.56	1512.8	838.1	6805

Std Error uses a pooled estimate of error variance

To consider the equality of the variances, the data needs to be run and analyzed (as shown below). Based on the data, the statistical values are small and the variances are assumed to be unequal, which means that the ANOVA output can't be trusted and the null hypothesis continues to be rejected.

Tests that the Variances are Equal

Control
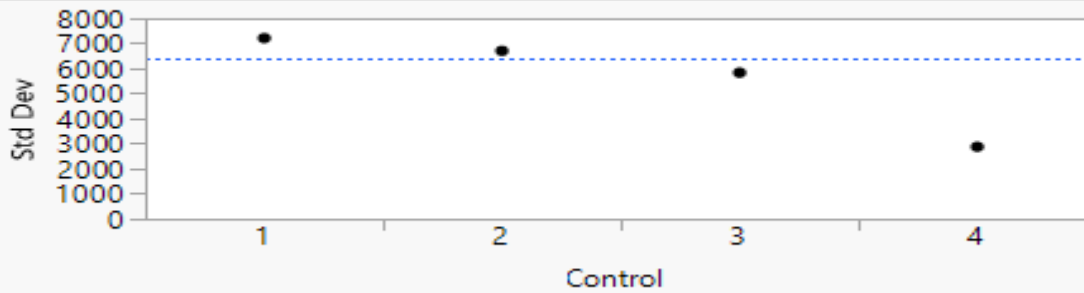
Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
1	51	7218.155	5986.877	5177.765
2	86	6709.855	5193.220	5068.988
3	45	5840.377	3441.609	3251.533
4	18	2881.369	2062.568	1975.000

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	0.9443	3	196	0.4203
Brown-Forsythe	2.9934	3	196	0.0320*
Levene	5.9438	3	196	0.0007*
Bartlett	5.3465	3	.	0.0011*

Due to the variances proving to be unequal, the next step is to check the Welch's Test (as shown below). Based on the Welch's Test there is a significant difference in the population meant of control (government (nonfederal), nongovernment (not-for-profit), for-profit, federal government).

Welch's Test

Welch Anova testing Means Equal, allowing Std Devs Not Equal

F Ratio	DFNum	DFDen	Prob > F
9.0729	3	83.305	<.0001*

The last step is to compare the means by using the Tukey-Kramer Honest Significant Difference, the most desired of the methods. To identify mean differences, the Connecting Letters Report needs to be examined. Based on the Connecting Letters Report (as shown below); For-Profit and Federal Government ownership have means that are similar, but their means are significantly different from the Nongovernment (not-for-profit) ownership. The Government (nonfederal) mean falls somewhere in between.

Means Comparisons

Comparisons for all pairs using Tukey-Kramer HSD

Confidence Quantile

q*	Alpha
2.59122	0.05

HSD Threshold Matrix

Abs(Dif)-HSD

	2	1	3	4
2	-2536.2	-57.6	841.4	769.4
1	-57.6	-3293.4	-2381.8	-2361.1
3	841.4	-2381.8	-3506.1	-3459.4
4	769.4	-2361.1	-3459.4	-5543.7

Positive values show pairs of means that are significantly different.

Connecting Letters Report

Level			Mean
2	A		8901.6628
1	A	B	6019.9804
3		B	5000.3778
4		B	3821.5556

Levels not connected by same letter are significantly different.

Ordered Differences Report

Level	- Level	Difference	Std Err Dif	Lower CL	Upper CL	p-Value
2	4	5080.107	1663.590	769.37	9390.840	0.0136*
2	3	3901.285	1180.851	841.44	6961.135	0.0062*
2	1	2881.682	1134.334	-57.63	5820.996	0.0569
1	4	2198.425	1759.617	-2361.14	6757.987	0.5962
3	4	1178.822	1789.958	-3459.36	5817.003	0.9124
1	3	1019.603	1312.681	-2381.85	4421.054	0.8649
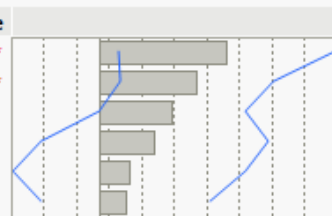
Two-Factor ANOVA for Admissions with Geographical Region and Control

Sacred Heart would like a comparison of the mean differences for Geographical Region and Control to see if there is an interaction between Geographical Region and Control and Admissions. Based on the small statistical value, it shows that there are significant differences in the means and therefore we can initially reject the null hypothesis. The means can be compared individually by Geographical Region, Control, and Geographical Region and Control.

Singularity Details

Term	Details
Intercept	=Geog. Region[1] + Geog. Region[2] + Geog. Region[3] - 6*Geog. Regio...
Control[1]	=Control[3] + Geog. Region[1]*Control[1] - Geog. Region[1]*Control[3] ...

Whole Model

Actual by Predicted Plot

Admissions Predicted RMSE=6334.1 RSq=0.21
PValue=0.0153

Effect Summary

Source	LogWorth		PValue	
Control	1.576		0.02655	
Geog. Region*Control	0.925		0.11887	
Geog. Region	0.405		0.39322 ^	

Residual by Predicted Plot

Summary of Fit

RSquare	0.205795
RSquare Adj	0.091685
Root Mean Square Error	6334.139
Mean of Response	6831.835
Observations (or Sum Wgts)	200

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	25	1808948140	72357926	1.8035
Error	174	6981109984	40121322	Prob > F
C. Total	199	8790058124		0.0153*

Effect Tests

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F	
Geog. Region	6	5	209512202	1.0444	0.3932	LostDFs
Control	3	1	200780568	5.0043	0.0266*	LostDFs
Geog. Region*Control	18	16	938397740	1.4618	0.1189	LostDFs

For Geographical region, the result is similar to the one-factor ANOVA that was done previously. The statistical value is not small, therefore the null hypothesis can't be rejected. This means that there is no significant differences in the means.
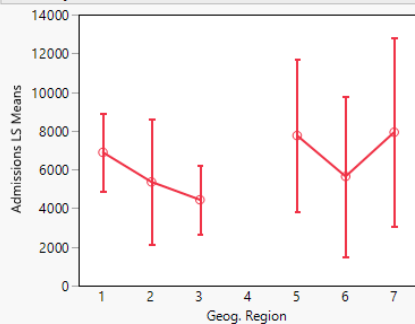
Geog. Region

Leverage Plot

Geog. Region Leverage, P=0.3932

Least Squares Means Table

Level	Least Sq Mean		Std Error	Mean
1	6889.6099		1030.1532	7103.11
2	5363.4125		1648.1953	8012.90
3	4440.6447		893.5531	5447.32
4	0.0000	NonEstimable	.	7182.00
5	7759.2421		1995.0664	7699.05
6	5645.1746		2097.1934	7283.11
7	7930.6042		2461.7050	7288.42

Least Squares Means Plot

Geog. Region

LSMeans Differences Tukey HSD

α= 0.050 Q= 2.98315

Mean[i]-Mean[j] Std Err Dif Lower CL Dif Upper CL Dif	1	2	3	4	5	6	7
1	0 0 0 0	1526.2 1943.65 -4272 7324.39	2448.97 1363.69 -1619.1 6517.06	6889.61 17514.1 -45358 59136.8	-869.63 2245.33 -7567.8 5828.52	1244.44 2336.54 -5725.8 8214.7	-1041 2668.56 -9001.7 6919.72
2	-1526.2 1943.65 -7324.4 4271.99	0 0 0 0	922.768 1874.83 -4670.1 6515.67	5363.41 17660.3 -47320 580468	-2395.8 2587.82 -10116 5324.04	-281.76 2667.35 -8238.9 7675.35	-2567.2 2962.52 -11405 6270.46
3	-2449 1363.69 -6517.1 1619.13	-922.77 1874.83 -6515.7 4670.13	0 0 0 0	4440.64 175024 -47772 56652.8	-3318.6 2186.03 -9839.9 3202.66	-1204.5 2279.62 -8005 5595.91	-3490 2618.86 -11302 4322.49
4	-6889.6 17514.1 -59137 45357.6	-5363.4 17660.3 -58047 47320	-4440.6 175024 -56653 47771.6	0 0 0 0	-7759.2 177328 -60659 45140.4	-5645.2 165395 -54985 43694.6	-7930.6 178767 -61260 45398.3
5	869.632 2245.33 -5828.5 7567.79	2395.83 2587.82 -5324 10115.7	3318.6 2186.03 -3202.7 9839.85	7759.24 177328 -45140 60658.8	0 0 0 0	2114.07 2894.57 -6520.9 10749	-171.36 3168.64 -9623.9 9281.17
6	-1244.4 2336.54 -8214.7 5725.83	281.762 2667.35 -7675.4 8238.87	1204.53 2279.62 -5595.9 8004.97	5645.17 16539.5 -43695 549849	-2114.1 2894.57 -10749 6520.86	0 0 0 0	-2285.4 3233.92 -11933 7361.83
7	1040.99 2668.56 -6919.7 9001.71	2567.19 2962.52 -6270.5 11404.8	3489.96 2618.86 -4322.5 11302.4	7930.6 17876.7 -45398 61259.5	171.362 3168.64 -9281.2 9623.89	228543 3233.92 -7361.8 11932.7	0 0 0 0

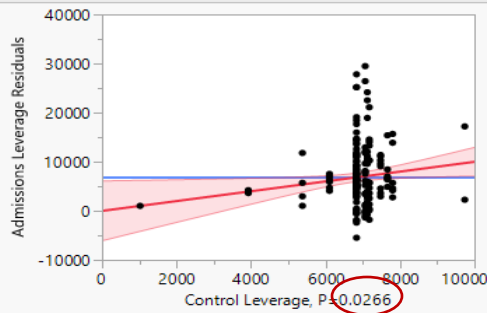| Level		Least Sq Mean
7	A	7930.6042
5	A	7759.2421
1	A	6889.6099
6	A	5645.1746
2	A	5363.4125
3	A	4440.6447
4	A	0.0000

Levels not connected by same letter are significantly different.

For Control, the result is similar to the one-factor ANOVA that was done previously. The statistical value is small coupled with the Connecting Letters Report, which shows 2 different letters (A and B), therefore the null hypothesis can be rejected. Based on the information below, there is a significant difference among the means.
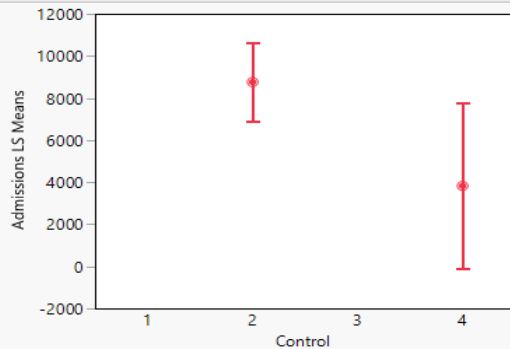
Control

Leverage Plot

Control Leverage, P=0.0266

Least Squares Means Table

Level	Least Sq Mean		Std Error	Mean
1	0.0000	NonEstimable	.	6019.98
2	8763.3077		935.7752	8901.66
3	0.0000	NonEstimable	.	5000.38
4	3827.9464		1997.9144	3821.56

Least Squares Means Plot

Control

LSMeans Differences Tukey HSD

α= 0.050 Q= 2.59404

		LSMean[j]			
	Mean[i]-Mean[j] Std Err Dif Lower CL Dif Upper CL Dif	1	2	3	4
LSMean[i]	1	0 0 0 0	-8763.3 8557.88 -30963 13436.2	0 7882.77 -20448 20448.3	-3827.9 8549.91 -26007 18350.9
	2	8763.31 8557.88 -13436 30962.8	0 0 0 0	8763.31 3192.11 482.841 17043.8	4935.36 2206.2 -787.63 10658.4
	3	0 7882.77 -20448 20448.3	-8763.3 3192.11 -17044 -482.84	0 0 0 0	-3827.9 3663.23 -13331 5674.64
	4	3827.95 8549.91 -18351 26006.8	-4935.4 2206.2 -10658 787.632	3827.95 3663.23 -5674.6 13330.5	0 0 0 0

Level		Least Sq Mean
2	A	8763.3077
4	A B	3827.9464
1	A B	0.0000
3	B	0.0000

Levels not connected by same letter are significantly different.

The comparison of Geographical Region and Control shows a not small statistical value coupled with the Connecting Letters Report, which only shows letter A, confirms that there is no significant difference among the means.

Geog. Region*Control

Leverage Plot

Geog. Region*Control Leverage, t=0.1189

Least Squares Means Plot

Geog. Region / Control
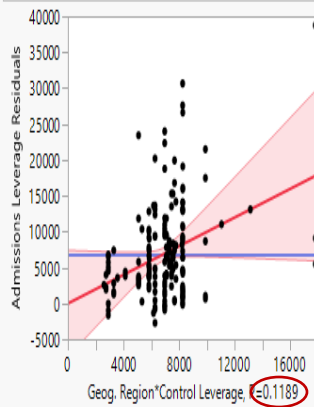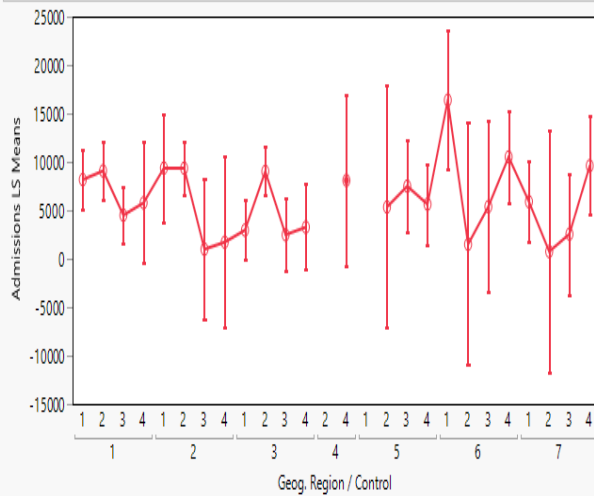
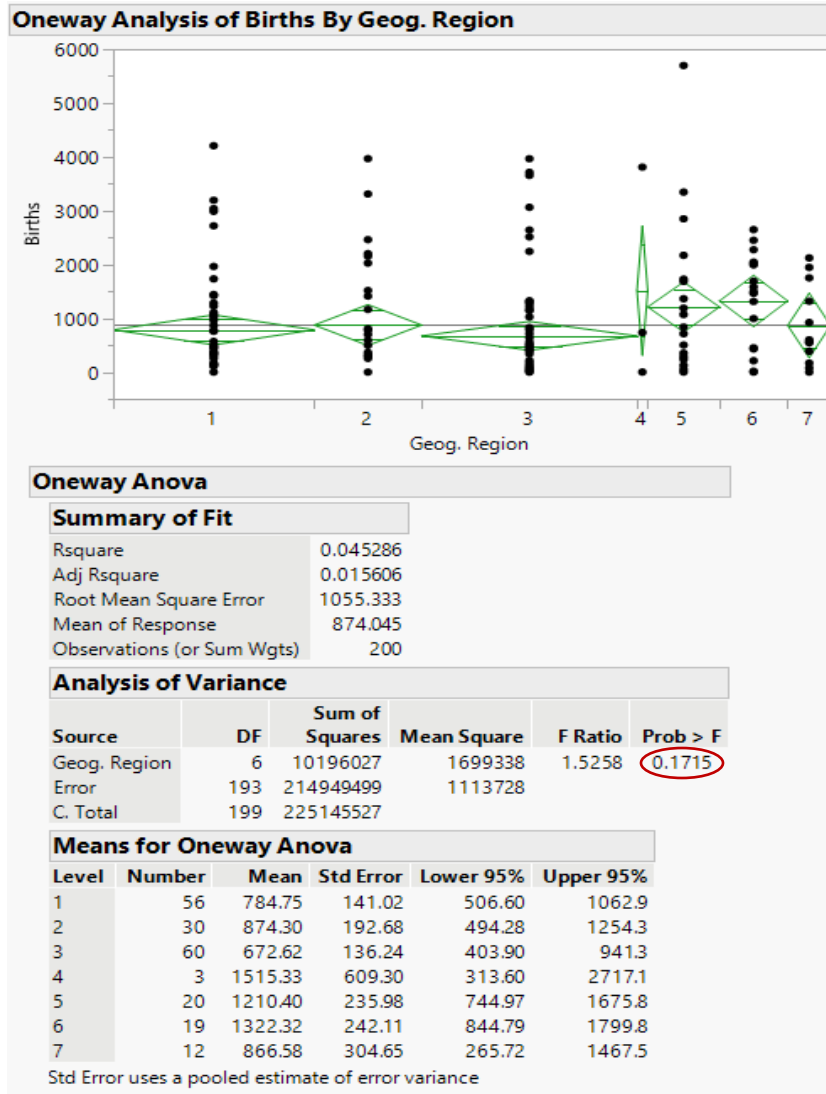| Level		Least Sq Mean
5,3	A	16386.333
7,3	A	11142.000
6,2	A	10524.143
7,2	A	9610.667
2,1	A	9381.600
2,2	A	9352.050
1,2	A	9083.176
3,2	A	9030.840
7,4	A	8408.000
1,1	A	8180.235
4,2	A	8099.500
5,1	A	7504.857
6,3	A	5907.556
1,4	A	5786.750
5,2	A	5642.778
6,1	A	5393.000
4,4	A	5347.000
1,3	A	4508.278
3,4	A	3272.875
3,1	A	2967.500
7,1	A	2561.750
3,3	A	2491.364
2,4	A	1722.000
5,4	A	1503.000
2,3	A	998.000
6,4	A	756.000
4,1	A	0.000
4,3	A	0.000

LSMeans Differences Tukey HSD

α=0.050 Q=3.77749

ANOVA for Births:

## One-Factor ANOVA for Births with Geographical Region

Sacred Heart wants to know if there is a significant difference in the population means for Births and Geographical Region. After running the test, the data shows that the null hypothesis can't be rejected due to the statistical value, which is not small (as shown below).

Oneway Analysis of Births By Geog. Region

Oneway Anova

Summary of Fit

Rsquare	0.045286
Adj Rsquare	0.015606
Root Mean Square Error	1055.333
Mean of Response	874.045
Observations (or Sum Wgts)	200

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Geog. Region	6	10196027	1699338	1.5258	0.1715
Error	193	214949499	1113728		
C. Total	199	225145527			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	56	784.75	141.02	506.60	1062.9
2	30	874.30	192.68	494.28	1254.3
3	60	672.62	136.24	403.90	941.3
4	3	1515.33	609.30	313.60	2717.1
5	20	1210.40	235.98	744.97	1675.8
6	19	1322.32	242.11	844.79	1799.8
7	12	866.58	304.65	265.72	1467.5

Std Error uses a pooled estimate of error variance

One-Factor ANOVA for Births with Control

Sacred Heart wants to know if there is a significant difference in the population means for Admissions and Control. After running the test, the data shows that the null hypothesis can be rejected due to the statistical value (as shown below), which is small. Because the null hypothesis was rejected, the data needs further analyzation by considering the whether the variances are equal or not.

Oneway Analysis of Births By Control
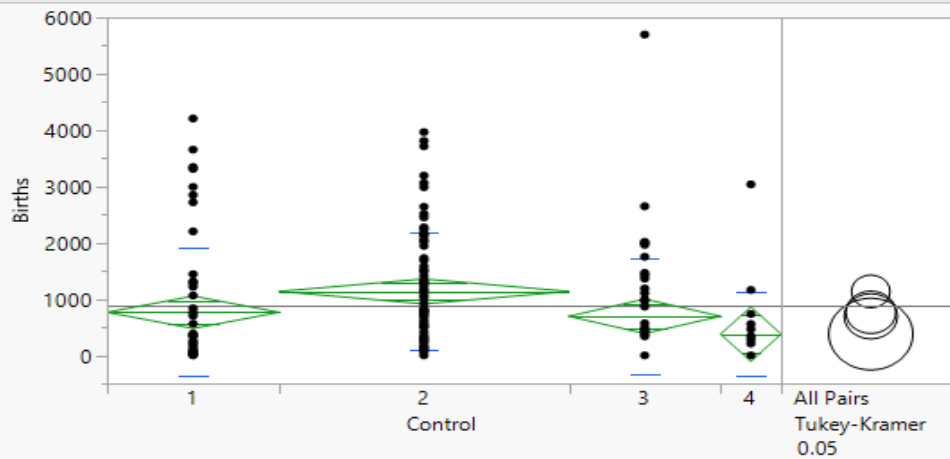
Oneway Anova

Summary of Fit

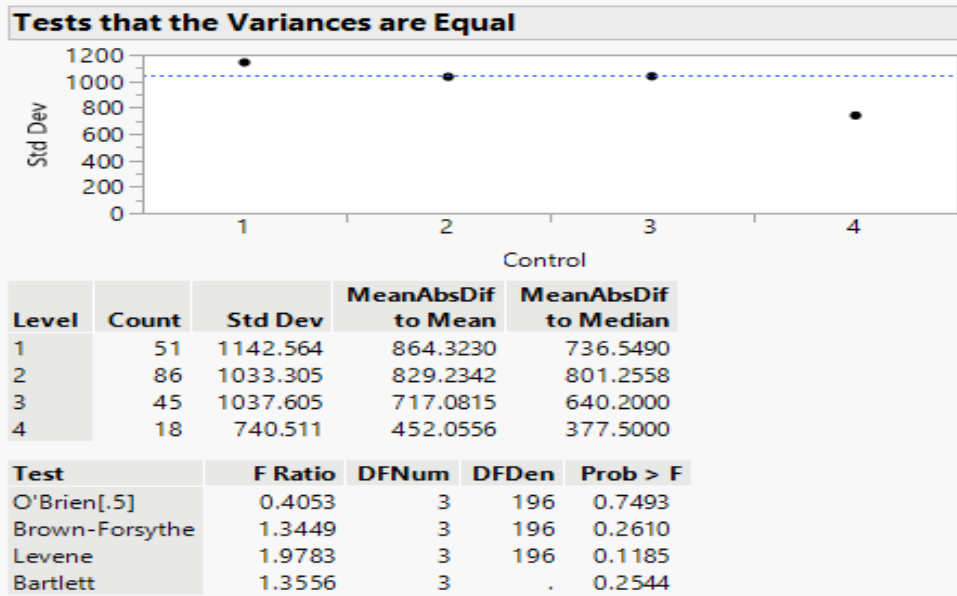|	
Rsquare	0.055179
Adj Rsquare	0.040718
Root Mean Square Error	1041.786
Mean of Response	874.045
Observations (or Sum Wgts)	200

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Control	3	12423343	4141114	3.8156	0.0109*
Error	196	212722183	1085317		
C. Total	199	225145527			

Means for Oneway Anova

Level	Number	Mean	Std Error	Lower 95%	Upper 95%
1	51	765.12	145.88	477.4	1052.8
2	86	1136.58	112.34	915.0	1358.1
3	45	694.38	155.30	388.1	1000.7
4	18	377.50	245.55	-106.8	861.8

Std Error uses a pooled estimate of error variance

To consider the equality of the variances, the data needs to be run and analyzed (as shown below). Based on the data, the statistical values are not small and the null hypothesis can't be rejected. In this case, the Welch's Test can be skipped.

Tests that the Variances are Equal

Level	Count	Std Dev	MeanAbsDif to Mean	MeanAbsDif to Median
1	51	1142.564	864.3230	736.5490
2	86	1033.305	829.2342	801.2558
3	45	1037.605	717.0815	640.2000
4	18	740.511	452.0556	377.5000

Test	F Ratio	DFNum	DFDen	Prob > F
O'Brien[.5]	0.4053	3	196	0.7493
Brown-Forsythe	1.3449	3	196	0.2610
Levene	1.9783	3	196	0.1185
Bartlett	1.3556	3	.	0.2544

The last step is to compare the means by using the Tukey-Kramer Honest Significant Difference. To identify mean differences, the Connecting Letters Report needs to be examined. Based on the Connecting Letters Report (as shown below); Government (nonfederal) and For Profit ownership have means that are similar and fall in the middle. The means are significantly different between the Nongovernment (not-for-profit) ownership and the Federal Government.

Means Comparisons

Comparisons for all pairs using Tukey-Kramer HSD

Confidence Quantile

q*	Alpha
2.59122	0.05

HSD Threshold Matrix

Abs(Dif)-HSD

	2	1	3	4
2	-411.67	-105.64	-54.46	59.38
1	-105.64	-534.58	-481.37	-352.48
3	-54.46	-481.37	-569.10	-435.98
4	59.38	-352.48	-435.98	-899.83

Positive values show pairs of means that are significantly different.

Connecting Letters Report

Level			Mean
2	A		1136.5814
1	A	B	765.1176
3	A	B	694.3778
4		B	377.5000

Levels not connected by same letter are significantly different.

Ordered Differences Report

Level	- Level	Difference	Std Err Dif	Lower CL	Upper CL	p-Value
2	4	759.0814	270.0285	59.377	1458.786	0.0276*
2	3	442.2036	191.6719	-54.461	938.868	0.0999
1	4	387.6176	285.6154	-352.476	1127.711	0.5278
2	1	371.4637	184.1214	-105.636	848.564	0.1851
3	4	316.8778	290.5401	-435.977	1069.732	0.6957
1	3	70.7399	213.0702	-481.373	622.852	0.9873
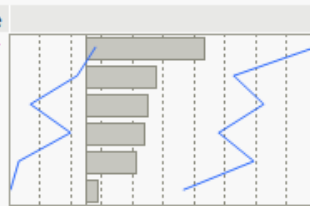
Two-Factor ANOVA for Births with Geographical Region and Control

Sacred Heart would like a comparison of the mean differences for Geographical Region and Control to see if there is an interaction between Geographical Region and Control and Births. Based on the small statistical value, it shows that there are significant differences in the means and therefore we can initially reject the null hypothesis. The means can be compared individually by Geographical Region, Control, and Geographical Region and Control.
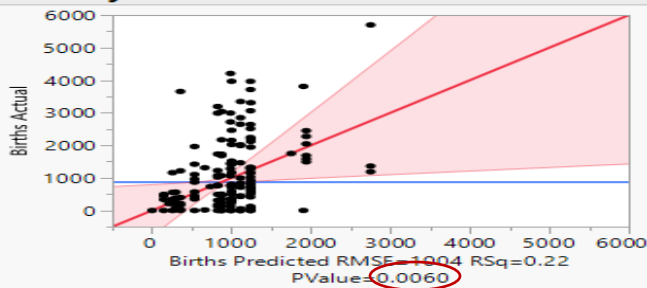
Singularity Details

| Term	Details
Intercept	=Geog. Region[1] + Geog. Region[2] + Geog. Region[3] - 6*Geog. Regio...
Control[1]	=Control[3] + Geog. Region[1]*Control[1] - Geog. Region[1]*Control[3] ...

Whole Model

Actual by Predicted Plot

Births Predicted RMSE=1004 RSq=0.22
PValue=0.0060

Effect Summary

Source	LogWorth		PValue
Control	2.146		0.00715
Geog. Region*Control	1.290		0.05125
Geog. Region	0.589		0.25735 ^

Residual by Predicted Plot

Births Predicted
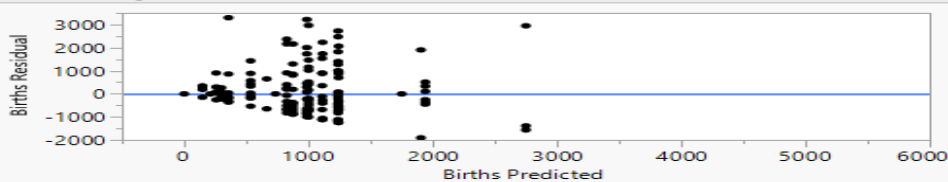
Summary of Fit

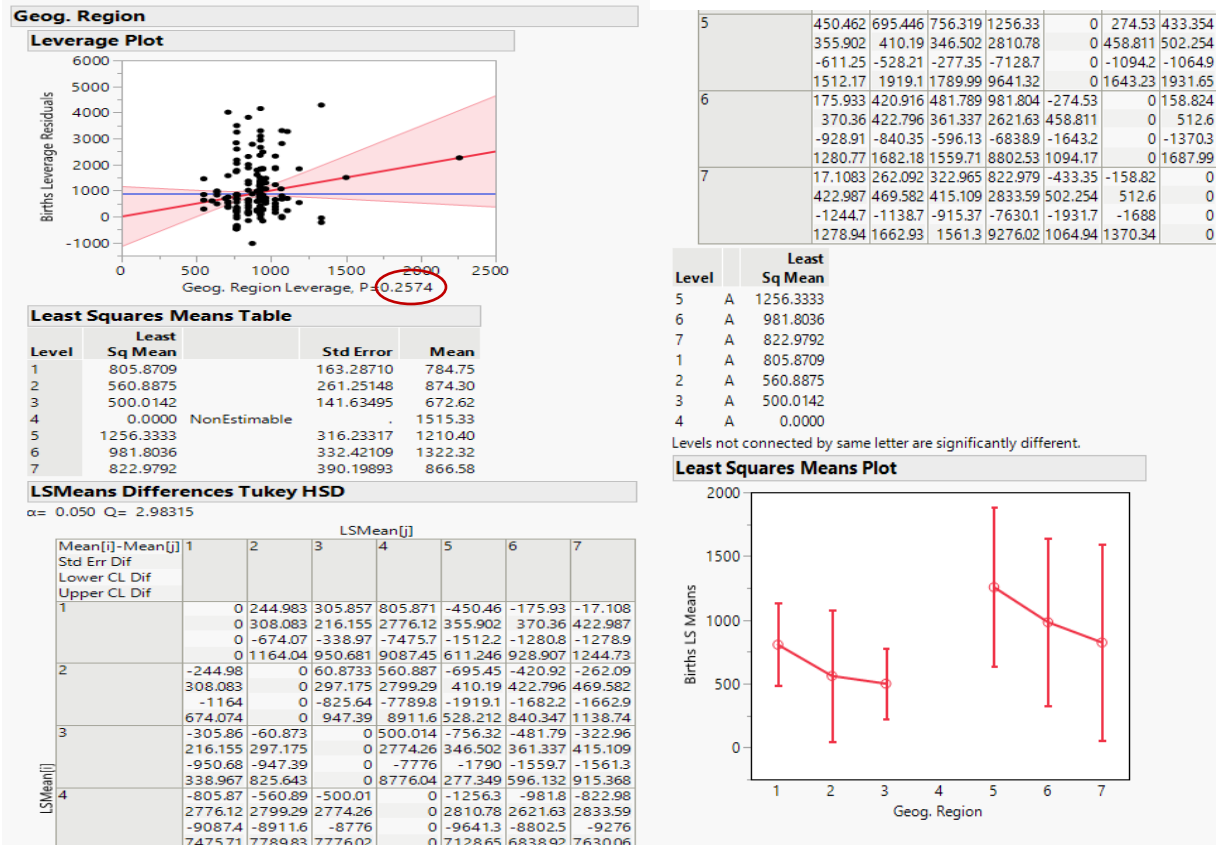|	
RSquare	0.220957
RSquare Adj	0.109026
Root Mean Square Error	1004.009
Mean of Response	874.045
Observations (or Sum Wgts)	200

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	25	49747529	1989901	1.9740
Error	174	175397998	1008034	Prob > F
C. Total	199	225145527		0.0060*

Effect Tests

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F	
Geog. Region	6	5	6657493	1.3209	0.2574	LostDFs
Control	3	1	7468420	7.4089	0.0072*	LostDFs
Geog. Region*Control	18	16	27344020	1.6954	0.0513	LostDFs

For Geographical region, the result is similar to the one-factor ANOVA that was done previously. The statistical value is not small, therefore the null hypothesis can't be rejected. This means that there is no significant differences in the means.
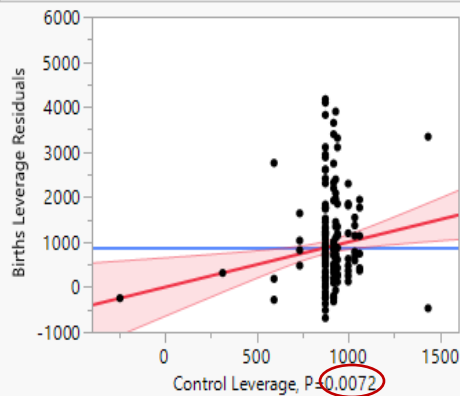
Geog. Region

Leverage Plot

Geog. Region Leverage, P=0.2574

Least Squares Means Table

Level	Least Sq Mean		Std Error	Mean
1	805.8709		163.28710	784.75
2	560.8875		261.25148	874.30
3	500.0142		141.63495	672.62
4	0.0000	NonEstimable	.	1515.33
5	1256.3333		316.23317	1210.40
6	981.8036		332.42109	1322.32
7	822.9792		390.19893	866.58

LSMeans Differences Tukey HSD

α= 0.050 Q= 2.98315

				LSMean[j]			
Mean[i]-Mean[j] Std Err Dif Lower CL Dif Upper CL Dif	1	2	3	4	5	6	7
1	0	244.983	305.857	805.871	-450.46	-175.93	-17.108
	0	308.083	216.155	2776.12	355.902	370.36	422.987
	0	-674.07	-338.97	-7475.7	-1512.2	-1280.8	-1278.9
	0	1164.04	950.681	9087.45	611.246	928.907	1244.73
2	-244.98	0	60.8733	560.887	-695.45	-420.92	-262.09
	308.083	0	297.175	2799.29	410.19	422.796	469.582
	-1164	0	-825.64	-7789.8	-1919.1	-1682.2	-1662.9
	674.074	0	947.39	8911.6	528.212	840.347	1138.74
3	-305.86	-60.873	0	500.014	-756.32	-481.79	-322.96
	216.155	297.175	0	2774.26	346.502	361.337	415.109
	-950.68	-947.39	0	-7776	-1790	-1559.7	-1561.3
	338.967	825.643	0	8776.04	277.349	596.132	915.368
4	-805.87	-560.89	-500.01	0	-1256.3	-981.8	-822.98
	2776.12	2799.29	2774.26	0	2810.78	2621.63	2833.59
	-9087.4	-8911.6	-8776	0	-9641.3	-8802.5	-9276
	7475.71	7789.83	7776.02	0	7128.65	6838.92	7630.06

5	450.462	695.446	756.319	1256.33	0	274.53	433.354
	355.902	410.19	346.502	2810.78	0	458.811	502.254
	-611.25	-528.21	-277.35	-7128.7	0	-1094.2	-1064.9
	1512.17	1919.1	1789.99	9641.32	0	1643.23	1931.65
6	175.933	420.916	481.789	981.804	-274.53	0	158.824
	370.36	422.796	361.337	2621.63	458.811	0	512.6
	-928.91	-840.35	-596.13	-6838.9	-1643.2	0	-1370.3
	1280.77	1682.18	1559.71	8802.53	1094.17	0	1687.99
7	17.1083	262.092	322.965	822.979	-433.35	-158.82	0
	422.987	469.582	415.109	2833.59	502.254	512.6	0
	-1244.7	-1138.7	-915.37	-7630.1	-1931.7	-1688	0
	1278.94	1662.93	1561.3	9276.02	1064.94	1370.34	0

Level		Least Sq Mean
5	A	1256.3333
6	A	981.8036
7	A	822.9792
1	A	805.8709
2	A	560.8875
3	A	500.0142
4	A	0.0000

Levels not connected by same letter are significantly different.

Least Squares Means Plot

For Control, the result is similar to the one-factor ANOVA that was done previously. The statistical value is small coupled with the Connecting Letters Report, which shows 2 different letters (A and B), therefore the null hypothesis can be rejected (as shown below).

Control

Leverage Plot

Control Leverage, P=0.0072

Least Squares Means Table

Level	Least Sq Mean		Std Error	Mean
1	0.0000	NonEstimable	.	765.12
2	1289.7694		148.32748	1136.58
3	0.0000	NonEstimable	.	694.38
4	337.9107		316.68461	377.50

LSMeans Differences Tukey HSD
α= 0.050 Q= 2.59404

LSMeans Differences Tukey HSD
α= 0.050 Q= 2.59404

		LSMean[j]			
Mean[i]-Mean[j] Std Err Dif Lower CL Dif Upper CL Dif	1		2	3	4
1		0 0 0 0	-1289.8 1356.49 -4808.6 2229.02	0 1249.48 -3241.2 3241.2	-337.91 1355.23 -3853.4 3177.6
2		1289.77 1356.49 -2229 4808.56	0 0 0 0	1289.77 505.973 -22.747 2602.29	951.859 349.7 44.7209 1859
3		0 1249.48 -3241.2 3241.2	-1289.8 505.973 -2602.3 22.7474	0 0 0 0	-337.91 580.65 -1844.1 1168.32
4		337.911 1355.23 -3177.6 3853.43	-951.86 349.7 -1859 -44.721	337.911 580.65 -1168.3 1844.14	0 0 0 0

Level			Least Sq Mean
2	A		1289.7694
4		B	337.9107
1	A	B	0.0000
3	A	B	0.0000

Levels not connected by same letter are significantly different.

Least Squares Means Plot
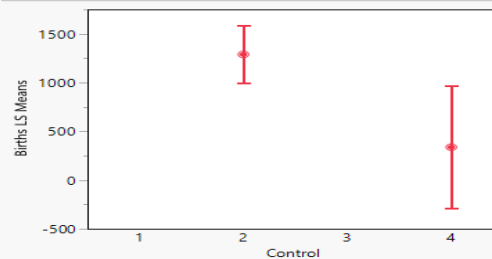
The comparison of Geographical Region and Control shows statistical value that is slightly not small, but the Connecting Letters Report, which shows a majority of a combination of A and B. This seems to have conflicting information and overall shows that there is a slight significance in the means.

Geog. Region*Control

Leverage Plot

Geog. Region*Control Leverage, P=0.0513
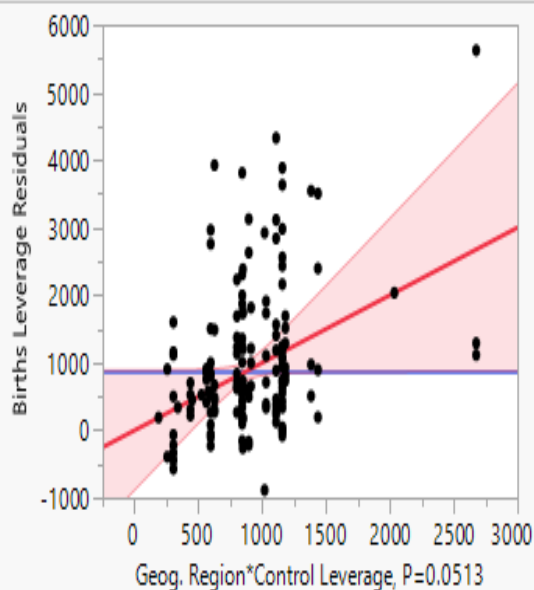
Level			Sq Mean
5,3	A		2750.667
6,2	A	B	1940.714
4,2	A	B	1905.500
7,3	A	B	1751.000
2,1	A	B	1242.800
7,2	A	B	1242.167
3,2	A	B	1239.000
5,1	A	B	1114.000
6,3	A	B	1111.000
2,2	A	B	1000.750
1,1	A	B	987.118
1,4	A	B	876.000
5,2	A	B	874.667
1,2	A	B	825.588
4,4	A	B	735.000
6,1	A	B	664.500
1,3	A	B	534.778
3,1		B	356.500
7,1	A	B	298.750
5,4	A	B	286.000
3,4	A	B	257.375
6,4	A	B	211.000
3,3		B	147.182
4,1	A	B	0.000
4,3	A	B	0.000
2,3	A	B	-2.274e-13
2,4	A	B	-2.728e-12
7,4	A	B	-4.775e-12

Levels not connected by same letter are significantly different.

Least Squares Means Plot

Geog. Region / Control

LSMeans Differences Tukey HSD

α= 0.050 Q= 3.77749
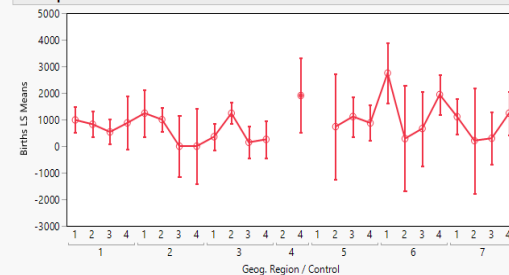
	Mean[i]-Mean[j] Std Err Dif Lower CL Dif Upper CL Dif	LSMean[j]																										
LSMean[i]		1,1	1,2	1,3	1,4	2,1	2,2	2,3	2,4	3,1	3,2	3,3	3,4	4,1	4,2	4,3	4,4	5,1	5,2	5,3	5,4	6,1	6,2	6,3	6,4	7,1	7,2	7,3	7,4
	1,1	0 0 0 0	161.529 344.372 -1139.3 1462.39	452.34 339.556 -830.33 1735.01	111.118 557.947 -1996.5 2218.76	-255.68 510.787 -2185.2 1673.81	-13.632 331.207 -1264.8 1237.5	987.118 628.735 -1387.9 3362.16	987.118 750.542 -1848 3822.28	630.618 349.712 -690.42 1951.65	-251.88 315.622 -1444.1 940.379	839.936 388.504 -627.64 2307.51	729.743 430.465 -896.34 2355.82	987.118 9149.35 -33574 35548.7	-918.38 750.542 -3753.5 1916.78	987.118 3469.49 -12119 14093.1	252.118 1033.12 -3650.5 4154.71	-126.88 450.889 -1830.1 1576.35	112.451 413.884 -1451 1675.89	-1763.5 628.735 -4138.6 611.492	701.118 1033.12 -3201.5 4603.71	322.618 750.542 -2512.5 3157.78	-953.6 450.889 -2656.8 749.633	-123.88 413.884 -1687.3 1439.56	776.118 1033.12 -3126.5 4678.71	688.368 557.947 -1419.3 2796.01	-255.05 476.762 -2056 1545.91	-763.88 1033.12 -4666.5 3138.71	987.118 1033.12 -2915.5 4889.71
	1,2	-161.53 344.372 -1462.4 1139.33	0 0 0 0	290.81 339.556 -991.86 1573.48	-50.412 557.947 -2158.1 2057.23	-417.21 510.787 -2346.7 1512.28	-175.16 331.207 -1426.3 1075.97	825.588 628.735 -1549.5 3200.63	825.588 750.542 -2009.6 3660.75	469.088 349.712 -851.94 1790.12	-413.41 315.622 -1605.7 778.849	678.406 388.504 -789.17 2145.98	568.213 430.465 -1057.9 2194.29	825.588 9129.89 -33662 35313.7	-1079.9 750.542 -3915.1 1755.25	825.588 3452.36 -12216 13866.8	90.5882 1033.12 -3812 3993.18	-288.41 450.889 -1991.6 1414.82	-49.078 413.884 -1612.5 1514.36	-1925.1 628.735 -4300.1 449.962	539.588 1033.12 -3363 4442.18	161.088 750.542 -2674.1 2996.25	-1115.1 450.889 -2818.4 588.104	-285.41 413.884 -1848.9 1278.03	614.588 1033.12 -3288 4517.18	526.838 557.947 -1580.8 2634.48	-416.58 476.762 -2217.5 1384.39	-925.41 1033.12 -4828 2977.18	825.588 1033.12 -3077 4728.18
	1,3	-452.34 339.556 -1735 830.329	-290.81 339.556 -1573.5 991.858	0 0 0 0	-341.22 554.987 -2437.7 1755.24	-708.02 507.552 -2625.3 1209.25	-465.97 326.196 -1698.2 766.229	534.778 626.11 -1830.3 2899.9	534.778 748.344 -2292.1 3361.64	178.278 344.97 -1124.8 1481.4	-704.22 310.36 -1876.6 468.16	387.596 384.241 -1063.9 1839.06	277.403 426.622 -1334.2 1888.96	534.778 9142.69 -34002 35071.2	-1370.7 748.344 -4197.6 1456.14	534.778 3485.12 -12630 13699.8	-200.22 1031.52 -4096.8 3696.34	-579.22 447.221 -2268.6 1110.15	-339.89 409.885 -1888.2 1208.45	-2215.9 626.11 -4581 149.235	248.778 1031.52 -3647.8 4145.34	-129.72 748.344 -2956.6 2697.14	-1405.9 447.221 -3095.3 283.438	-576.22 409.885 -2124.6 972.115	323.778 1031.52 -3572.8 4220.34	236.028 554.987 -1860.4 2332.49	-707.39 473.294 -2495.3 1080.48	-1216.2 1031.52 -5112.8 2680.34	534.778 1031.52 -3361.8 4431.34
	1,4	-111.12 557.947 -2218.8 1996.52	50.4118 557.947 -2057.2 2158.05	341.222 554.987 -1755.2 2437.68	0 0 0 0	-366.8 673.51 -2911 2177.38	-124.75 549.918 -2202.1 1952.56	876 766.825 -2020.7 3772.67	876 869.497 -2408.5 4160.52	519.5 561.258 -1600.6 2639.65	-363 540.675 -2405.4 1679.4	728.818 586.215 -1485.6 2943.24	618.625 614.828 -1703.9 2941.13	876 9180.89 -33805 35556.7	-1029.5 869.497 -4314 2255.02	876 3497.15 -12334 14086.5	141 1122.52 -4099.3 4381.3	-238 629.296 -2615.2 2139.16	1.33333 603.334 -2277.8 2280.42	-1874.7 766.825 -4771.3 1022.01	590 1122.52 -3650.3 4830.3	211.5 869.497 -3073 3496.02	-1064.7 629.296 -3441.9 1312.45	-235 603.334 -2514.1 2044.09	665 1122.52 -3575.3 4905.3	577.25 709.942 -2104.5 3259.05	-366.17 648.085 -2814.3 2081.97	-875 1122.52 -5115.3 3365.3	876 1122.52 -3364.3 5116.3
	2,1	255.682 510.787 -1673.8 2185.17	417.212 510.787 -1512.3 2346.7	708.022 507.552 -1209.3 2625.29	366.8 673.51 -2177.4 2910.98	0 0 0 0	242.05 502.005 -1654.3 2138.37	1242.8 733.225 -1526.9 4012.55	1242.8 840.014 -1930.3 4415.95	886.3 514.402 -1056.8 2829.45	3.8 491.862 -1854.2 1861.8	1095.62 541.522 -949.98 3141.21	985.425 572.373 -1176.7 3147.56	1242.8 9172.66 -33407 35892.4	-662.7 840.014 -3835.8 2510.45	1242.8 3489.94 -11940 14426	507.8 1099.84 -3646.8 4662.42	128.8 587.888 -2091.9 2349.54	368.133 560.01 -1747.3 2483.56	-1507.9 733.225 -4277.6 1261.88	956.8 1099.84 -3197.8 5111.42	578.3 840.014 -2594.8 3751.45	-697.91 587.888 -2918.7 1522.83	131.8 560.01 -1983.6 2247.23	1031.8 1099.84 -3122.8 5186.42	944.05 673.51 -1600.1 3488.23	0.63333 607.958 -2295.9 2297.19	-508.2 1099.84 -4662.8 3646.42	1242.8 1099.84 -2911.8 5397.42
	2,2	13.6324 331.207 -1237.5 1264.76	175.162 331.207 -1076 1426.29	465.972 326.196 -766.23 1698.17	124.75 549.918 -1952.6 2202.06	-242.05 502.005 -2138.4 1654.27	0 0 0 0	1000.75 621.621 -1347.4 3348.92	1000.75 744.593 -1811.9 3813.44	644.25 336.755 -627.84 1916.34	-238.25 301.203 -1376 899.541	853.568 376.884 -570.11 2277.24	743.375 420.007 -843.2 2329.95	1000.75 9131.35 -33493 35494.4	-904.75 744.593 -3717.4 1907.94	1000.75 3453.64 -12045 14046.9	265.75 1028.8 -3620.5 4152.05	-113.25 440.916 -1778.8 1552.31	126.083 402.996 -1396.2 1648.4	-1749.9 621.621 -4098.1 598.253	714.75 1028.8 -3171.5 4601.05	336.25 744.593 -2476.4 3148.94	-939.96 440.916 -2605.5 725.591	-110.25 402.996 -1632.6 1412.06	789.75 1028.8 -3096.5 4676.05	702 549.918 -1375.3 2779.31	-241.42 467.341 -2006.8 1523.96	-750.25 1028.8 -4636.5 3136.05	1000.75 1028.8 -2885.5 4887.05
	2,3	-987.12 628.735 -3362.2 1387.92	-825.59 628.735 -3200.6 1549.45	-534.78 626.11 -2899.9 1830.35	-876 766.825 -3772.7 2020.67	-1242.8 733.225 -4012.5 1526.95	-1000.8 621.621 -3348.9 1347.42	0 0 0 0	2.5e-12 916.531 -3462.2 3462.19	-356.5 631.675 -2742.6 2029.65	-1239 613.46 -3556.3 1078.34	-147.18 653.95 -2617.5 2323.11	-257.38 679.717 -2825 2310.25	-2e-13 9157.99 -34594 34594.2	-1905.5 916.531 -5367.7 1556.69	-2e-13 3603.62 -13613 13612.7	-735 1159.33 -5114.4 3644.36	-1114 692.832 -3731.2 1503.17	-874.67 669.339 -3403.1 1653.76	-2750.7 819.77 -5847.3 346.007	-286 1159.33 -4665.4 4093.36	-664.5 916.531 -4126.7 2797.69	-1940.7 692.832 -4557.9 676.453	-1111 669.339 -3639.4 1417.42	-211 1159.33 -4590.4 4168.36	-298.75 766.825 -3195.4 2597.92	-1242.2 709.942 -3924 1439.63	-1751 1159.33 -6130.4 2628.36	4.5e-12 1159.33 -4379.4 4379.36
	2,4	-987.12 750.542 -3822.3 1848.05	-825.59 750.542 -3660.8 2009.58	-534.78 748.344 -3361.6 2292.09	-876 869.497 -4160.5 2408.52	-1242.8 840.014 -4415.9 1930.35	-1000.8 744.593 -3813.4 1811.94	-3e-12 916.531 -3462.2 3462.19	0 0 0 0	-356.5 753.007 -3201 2487.98	-1239 737.793 -4026 1548.01	-147.18 771.788 -3062.6 2768.24	-257.38 793.739 -3255.7 2740.97	-3e-12 9221.98 -34836 34835.9	-1905.5 1004.01 -5698.1 1887.14	-3e-12 3533 -13346 13345.9	-735 1229.66 -5380 3910.01	-1114 804.998 -4154.9 1926.87	-874.67 784.87 -3839.5 2090.17	-2750.7 916.531 -6212.9 711.52	-286 1229.66 -4931 4359.01	-664.5 1004.01 -4457.1 3128.14	-1940.7 804.998 -4981.6 1100.16	-1111 784.87 -4075.8 1853.84	-211 1229.66 -4856 4434.01	-298.75 869.497 -3583.3 2985.77	-1242.2 819.77 -4338.8 1854.51	-1751 1229.66 -6396 2894.01	2e-12 1229.66 -4645 4645.01
	3,1	-630.62 349.712 -1951.7 690.415	-469.09 349.712 -1790.1 851.945	-178.28 344.97 -1481.4 1124.84	-519.5 561.258 -2639.6 1600.65	-886.3 514.402 -2829.4 1056.85	-644.25 336.755 -1916.3 627.839	356.5 631.675 -2029.6 2742.65	356.5 753.007 -2488 3200.98	0 0 0 0	-882.5 321.44 -2096.7 331.736	209.318 393.245 -1276.2 1694.8	99.125 434.749 -1543.1 1741.38	356.5 9149.96 -34207 34920.4	-1549 753.007 -4393.5 1295.48	356.5 3470.02 -12751 13464.5	-378.5 1034.91 -4287.9 3530.86	-757.5 454.98 -2476.2 961.184	-518.17 418.337 -2098.4 1062.1	-2394.2 631.675 -4780.3 -8.019	70.5 1034.91 -3838.9 3979.86	-308 753.007 -3152.5 2536.48	-1584.2 454.98 -3302.9 134.47	-754.5 418.337 -2334.8 825.765	145.5 1034.91 -3763.9 4054.86	57.75 561.258 -2062.4 2177.9	-885.67 480.633 -2701.3 929.919	-1394.5 1034.91 -5303.9 2514.86	356.5 1034.91 -3552.9 4265.86
	3,2	251.882 315.622 -940.38 1444.14	413.412 315.622 -778.85 1605.67	704.222 310.36 -468.16 1876.6	363 540.675 -1679.4 2405.4	-3.8 491.862 -1861.8 1854.2	238.25 301.203 -899.54 1376.04	1239 613.46 -1078.3 3556.34	1239 737.793 -1548 4026.01	882.5 321.44 -331.74 2096.74	0 0 0 0	1091.82 363.264 -280.41 2464.05	981.625 407.83 -558.95 2522.2	1239 9133.01 -33261 35738.9	-666.5 737.793 -3453.5 2120.51	1239 3455.1 -11813 14290.6	504 1023.89 -3363.7 4371.74	125 429.332 -1496.8 1746.8	364.333 390.289 -1110 1838.65	-1511.7 613.46 -3829 805.672	953 1023.89 -2914.7 4820.74	574.5 737.793 -2212.5 3361.51	-701.71 429.332 -2323.5 920.085	128 390.289 -1346.3 1602.31	1028 1023.89 -2839.7 4895.74	940.25 540.675 -1102.1 2982.65	-3.1667 456.429 -1727.3 1720.99	-512 1023.89 -4379.7 3355.74	1239 1023.89 -2628.7 5106.74
	3,3	-839.94 388.504 -2307.5 627.636	-678.41 388.504 -2146 789.165	-387.6 384.241 -1839.1 1063.87	-728.82 586.215 -2943.2 1485.6	-1095.6 541.522 -3141.2 949.977	-853.57 376.884 -2277.2 570.106	147.182 653.95 -2323.1 2617.47	147.182 771.788 -2768.2 3062.6	-209.32 393.245 -1694.8 1276.16	-1091.8 363.264 -2464 280.409	0 0 0 0	-110.19 466.523 -1872.5 1652.09	147.182 9144.64 -34397 34691	-1758.3 771.788 -4673.7 1157.1	147.182 3500.43 -13076 13370	-587.82 1048.65 -4549.1 3373.46	-966.82 485.432 -2800.5 866.898	-727.48 451.269 -2432.1 977.178	-2603.5 653.95 -5073.8 -133.19	-138.82 1048.65 -4100.1 3822.46	-517.32 771.788 -3432.7 2398.1	-1793.5 485.432 -3627.2 40.1833	-963.82 451.269 -2668.5 740.845	-63.818 1048.65 -4025.1 3897.46	-151.57 586.215 -2366 2062.85	-1095 509.554 -3019.8 829.851	-1603.8 1048.65 -5565.1 2357.46	147.182 1048.65 -3814.1 4108.46
	3,4	-729.74 430.465 -2355.8 896.337	-568.21 430.465 -2194.3 1057.87	-277.4 426.622 -1889 1334.16	-618.62 614.828 -2941.1 1703.88	-985.42 572.373 -3147.6 1176.71	-743.38 420.007 -2329.9 843.198	257.375 679.717 -2310.3 2825	257.375 793.739 -2741 3255.72	-99.125 434.749 -1741.4 1543.13	-981.63 407.83 -2522.2 558.951	110.193 466.523 -1652.1 1872.48	0 0 0 0	257.375 9160.28 -34346 34860.3	-1648.1 793.739 -4646.5 1350.22	257.375 3479.09 -12885 13399.6	-477.62 1064.91 -4500.3 3545.07	-856.63 519.624 -2819.5 1106.25	-617.29 487.861 -2460.2 1225.6	-2493.3 679.717 -5060.9 74.3348	-28.625 1064.91 -4051.3 3994.07	-407.13 793.739 -3405.5 2591.22	-1683.3 519.624 -3646.2 279.536	-853.62 487.861 -2696.5 989.265	46.375 1064.91 -3976.3 4069.07	-41.375 614.828 -2363.9 2281.13	-984.79 542.227 -3033 1063.47	-1493.6 1064.91 -5516.3 2529.07	257.375 1064.91 -3765.3 4280.07
	4,1	-987.12 9149.35 -35549 33574.5	-825.59 9129.89 -35314 33662.5	-534.78 9142.69 -35071 34001.7	-876 9180.89 -35557 33804.7	-1242.8 9172.66 -35892 33406.8	-1000.8 9131.35 -35494 33492.9	2.3e-13 9157.99 -34594 34594.2	2.7e-12 9221.98 -34836 34835.9	-356.5 9149.96 -34920 34207.4	-1239 9133.01 -35739 33260.9	-147.18 9144.64 -34691 34396.6	-257.38 9160.28 -34860 34345.5	0 0 0 0	-1905.5 9056.53 -36116 32305.5	0 8428.4 -31838 31838.2	-735 9303.6 -35879 34409.3	-1114 9163.23 -35728 33500	-874.67 9121.23 -35330 33580.7	-2750.7 9157.99 -37345 31843.6	-286 9303.6 -35430 34858.3	-664.5 8831.12 -34024 32695	-1940.7 9334.5 -37202 33320.3	-1111 9145.75 -35659 33437	-211 8511.43 -32363 31940.8	-298.75 9180.89 -34979 34382	-1242.2 9112.01 -35663 33178.4	-1751 9194.61 -36484 32981.6	4.8e-12 9303.6 -35144 35144.3
	4,2	918.382 750.542 -1916.8 3753.55	1079.91 750.542 -1755.3 3915.08	1370.72 748.344 -1456.1 4197.59	1029.5 869.497 -2255 4314.02	662.7 840.014 -2510.4 3835.85	904.75 744.593 -1907.9 3717.44	1905.5 916.531 -1556.7 5367.69	1905.5 1004.01 -1887.1 5698.14	1549 753.007 -1295.5 4393.48	666.5 737.793 -2120.5 3453.51	1758.32 771.788 -1157.1 4673.74	1648.13 793.739 -1350.2 4646.47	1905.5 9056.53 -32305 36116.5	0 0 0 0	1905.5 3387.34 -10890 14701.1	1170.5 1229.66 -3474.5 5815.51	791.5 804.998 -2249.4 3832.37	1030.83 784.87 -1934 3995.67	-845.17 916.531 -4307.4 2617.02	1619.5 1229.66 -3025.5 6264.51	1241 1004.01 -2551.6 5033.64	-35.214 804.998 -3076.1 3005.66	794.5 784.87 -2170.3 3759.34	1694.5 1229.66 -2950.5 6339.51	1606.75 869.497 -1677.8 4891.27	663.333 819.77 -2433.3 3760.01	154.5 1229.66 -4490.5 4799.51	1905.5 1229.66 -2739.5 6550.51
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	5,1	126.882 450.889 -1576.3 1830.11	288.412 450.889 -1414.8 1991.64	579.222 447.221 -1110.2 2268.6	238 629.296 -2139.2 2615.16	-128.8 587.888 -2349.5 2091.94	113.25 440.916 -1552.3 1778.81	1114 692.832 -1503.2 3731.17	1114 804.998 -1926.9 4154.87	757.5 454.98 -961.18 2476.18	-125 429.332 -1746.8 1496.8	966.818 485.432 -866.9 2800.53	856.625 519.624 -1106.3 2819.5	1114 9163.23 -33500 35728	-791.5 804.998 -3832.4 2249.37	1114 3481.68 -12038 14266	379 1073.33 -3675.5 4433.5	0 0 0 0	239.333 505.973 -1672 2150.64	-1636.7 692.832 -4253.8 980.501	828 1073.33 -3226.5 4882.5	449.5 804.998 -2591.4 3490.37	-826.71 536.665 -2854 1200.53	3 505.973 -1908.3 1914.31	903 1073.33 -3151.5 4957.5	815.25 629.296 -1561.9 3192.41	-128.17 558.579 -2238.2 1981.86	-637 1073.33 -4691.5 3417.5	1114 1073.33 -2940.5 5168.5
	5,2	-112.45 413.884 -1675.9 1450.99	49.0784 413.884 -1514.4 1612.52	339.889 409.885 -1208.4 1888.23	-1.3333 603.334 -2280.4 2277.76	-368.13 560.01 -2483.6 1747.3	-126.08 402.996 -1648.4 1396.23	874.667 669.339 -1653.8 3403.09	874.667 784.87 -2090.2 3839.51	518.167 418.337 -1062.1 2098.43	-364.33 390.289 -1838.6 1109.98	727.485 451.269 -977.18 2432.15	617.292 487.861 -1225.6 2460.18	874.667 9121.23 -33581 35330	-1030.8 784.87 -3995.7 1934.01	874.667 3444.71 -12138 13887	139.667 1058.32 -3858.1 4137.46	-239.33 505.973 -2150.6 1671.98	0 0 0 0	-1876 669.339 -4404.4 652.424	588.667 1058.32 -3409.1 4586.46	210.167 784.87 -2754.7 3175.01	-1066 505.973 -2977.4 845.261	-236.33 473.294 -2024.2 1551.53	663.667 1058.32 -3334.1 4661.46	575.917 603.334 -1703.2 2855.01	-367.5 529.159 -2366.4 1631.39	-876.33 1058.32 -4874.1 3121.46	874.667 1058.32 -3123.1 4872.46
	5,3	1763.55 628.735 -611.49 4138.59	1925.08 628.735 -449.96 4300.12	2215.89 626.11 -149.24 4581.01	1874.67 766.825 -1022 4771.34	1507.87 733.225 -1261.9 4277.62	1749.92 621.621 -598.25 4098.09	2750.67 819.77 -346.01 5847.34	2750.67 916.531 -711.52 6212.85	2394.17 631.675 8.01902 4780.31	1511.67 613.46 -805.67 3829.01	2603.48 653.95 133.193 5073.78	2493.29 679.717 -74.335 5060.92	2750.67 9157.99 -31844 37344.9	845.167 916.531 -2617 4307.35	2750.67 3603.62 -10862 16363.3	2015.67 1159.33 -2363.7 6395.03	1636.67 692.832 -980.5 4253.83	1876 669.339 -652.42 4404.42	0 0 0 0	2464.67 1159.33 -1914.7 6844.03	2086.17 916.531 -1376 5548.35	809.952 692.832 -1807.2 3427.12	1639.67 669.339 -888.76 4168.09	2539.67 1159.33 -1839.7 6919.03	2451.92 766.825 -444.76 5348.59	1508.5 709.942 -1173.3 4190.3	999.667 1159.33 -3379.7 5379.03	2750.67 1159.33 -1628.7 7130.03
	5,4	-701.12 1033.12 -4603.7 3201.47	-539.59 1033.12 -4442.2 3363	-248.78 1031.52 -4145.3 3647.79	-590 1122.52 -4830.3 3650.3	-956.8 1099.84 -5111.4 3197.82	-714.75 1028.8 -4601 3171.55	286 1159.33 -4093.4 4665.36	286 1229.66 -4359 4931.01	-70.5 1034.91 -3979.9 3838.86	-953 1023.89 -4820.7 2914.74	138.818 1048.65 -3822.5 4100.1	28.625 1064.91 -3994.1 4051.32	286 9303.6 -34858 35430.3	-1619.5 1229.66 -6264.5 3025.51	286 3603.62 -13327 13898.7	-449 1419.88 -5812.6 4914.6	-828 1073.33 -4882.5 3226.5	-588.67 1058.32 -4586.5 3409.12	-2464.7 1159.33 -6844 1914.69	0 0 0 0	-378.5 1229.66 -5023.5 4266.51	-1654.7 1073.33 -5709.2 2399.78	-825 1058.32 -4822.8 3172.79	75 1419.88 -5288.6 5438.6	-12.75 1122.52 -4253 4227.55	-956.17 1084.45 -5052.7 3140.35	-1465 1419.88 -6828.6 3898.6	286 1419.88 -5077.6 5649.6
	6,1	-322.62 750.542 -3157.8 2512.55	-161.09 750.542 -2996.3 2674.08	129.722 748.344 -2697.1 2956.59	-211.5 869.497 -3496 3073.02	-578.3 840.014 -3751.4 2594.85	-336.25 744.593 -3148.9 2476.44	664.5 916.531 -2797.7 4126.69	664.5 1004.01 -3128.1 4457.14	308 753.007 -2536.5 3152.48	-574.5 737.793 -3361.5 2212.51	517.318 771.788 -2398.1 3432.74	407.125 793.739 -2591.2 3405.47	664.5 8831.12 -32695 34024	-1241 1004.01 -5033.6 2551.64	664.5 3533 -12681 14010.4	-70.5 1229.66 -4715.5 4574.51	-449.5 804.998 -3490.4 2591.37	-210.17 784.87 -3175 2754.67	-2086.2 916.531 -5548.4 1376.02	378.5 1229.66 -4266.5 5023.51	0 0 0 0	-1276.2 804.998 -4317.1 1764.66	-446.5 784.87 -3411.3 2518.34	453.5 1229.66 -4191.5 5098.51	365.75 869.497 -2918.8 3650.27	-577.67 819.77 -3674.3 2519.01	-1086.5 1229.66 -5731.5 3558.51	664.5 1229.66 -3980.5 5309.51
	6,2	953.597 450.889 -749.63 2656.83	1115.13 450.889 -588.1 2818.36	1405.94 447.221 -283.44 3095.31	1064.71 629.296 -1312.4 3441.87	697.914 587.888 -1522.8 2918.65	939.964 440.916 -725.59 2605.52	1940.71 692.832 -676.45 4557.88	1940.71 804.998 -1100.2 4981.59	1584.21 454.98 -134.47 3302.9	701.714 429.332 -920.08 2323.51	1793.53 485.432 -40.183 3627.25	1683.34 519.624 -279.54 3646.21	1940.71 9334.5 -33320 37201.7	35.2143 804.998 -3005.7 3076.09	1940.71 3721.58 -12118 15998.9	1205.71 1073.33 -2848.8 5260.21	826.714 536.665 -1200.5 2853.96	1066.05 505.973 -845.26 2977.36	-809.95 692.832 -3427.1 1807.21	1654.71 1073.33 -2399.8 5709.21	1276.21 804.998 -1764.7 4317.09	0 0 0 0	829.714 505.973 -1081.6 2741.02	1729.71 1073.33 -2324.8 5784.21	1641.96 629.296 -735.2 4019.12	698.548 558.579 -1411.5 2808.58	189.714 1073.33 -3864.8 4244.21	1940.71 1073.33 -2113.8 5995.21
	6,3	123.882 413.884 -1439.6 1687.33	285.412 413.884 -1278 1848.85	576.222 409.885 -972.11 2124.56	235 603.334 -2044.1 2514.09	-131.8 560.01 -2247.2 1983.63	110.25 402.996 -1412.1 1632.56	1111 669.339 -1417.4 3639.42	1111 784.87 -1853.8 4075.84	754.5 418.337 -825.76 2334.76	-128 390.289 -1602.3 1346.31	963.818 451.269 -740.84 2668.48	853.625 487.861 -989.26 2696.51	1111 9145.75 -33437 35659	-794.5 784.87 -3759.3 2170.34	1111 3278.11 -11272 13494	376 1058.32 -3621.8 4373.79	-3 505.973 -1914.3 1908.31	236.333 473.294 -1551.5 2024.2	-1639.7 669.339 -4168.1 888.757	825 1058.32 -3172.8 4822.79	446.5 784.87 -2518.3 3411.34	-829.71 505.973 -2741 1081.59	0 0 0 0	900 1058.32 -3097.8 4897.79	812.25 603.334 -1466.8 3091.34	-131.17 529.159 -2130.1 1867.73	-640 1058.32 -4637.8 3357.79	1111 1058.32 -2886.8 5108.79
	6,4	-776.12 1033.12 -4678.7 3126.47	-614.59 1033.12 -4517.2 3288	-323.78 1031.52 -4220.3 3572.79	-665 1122.52 -4905.3 3575.3	-1031.8 1099.84 -5186.4 3122.82	-789.75 1028.8 -4676 3096.55	211 1159.33 -4168.4 4590.36	211 1229.66 -4434 4856.01	-145.5 1034.91 -4054.9 3763.86	-1028 1023.89 -4895.7 2839.74	63.8182 1048.65 -3897.5 4025.1	-46.375 1064.91 -4069.1 3976.32	211 8511.43 -31941 32362.8	-1694.5 1229.66 -6339.5 2950.51	211 3603.62 -13402 13823.7	-524 1419.88 -5887.6 4839.6	-903 1073.33 -4957.5 3151.5	-663.67 1058.32 -4661.5 3334.12	-2539.7 1159.33 -6919 1839.69	-75 1419.88 -5438.6 5288.6	-453.5 1229.66 -5098.5 4191.51	-1729.7 1073.33 -5784.2 2324.78	-900 1058.32 -4897.8 3097.79	0 0 0 0	-87.75 1122.52 -4328 4152.55	-1031.2 1084.45 -5127.7 3065.35	-1540 1419.88 -6903.6 3823.6	211 1419.88 -5152.6 5574.6
	7,1	-688.37 557.947 -2796 1419.27	-526.84 557.947 -2634.5 1580.8	-236.03 554.987 -2332.5 1860.43	-577.25 709.942 -3259 2104.55	-944.05 673.51 -3488.2 1600.13	-702 549.918 -2779.3 1375.31	298.75 766.825 -2597.9 3195.42	298.75 869.497 -2985.8 3583.27	-57.75 561.258 -2177.9 2062.4	-940.25 540.675 -2982.6 1102.15	151.568 586.215 -2062.9 2365.99	41.375 614.828 -2281.1 2363.88	298.75 9180.89 -34382 34979.5	-1606.8 869.497 -4891.3 1677.77	298.75 3497.15 -12912 13509.2	-436.25 1122.52 -4676.5 3804.05	-815.25 629.296 -3192.4 1561.91	-575.92 603.334 -2855 1703.17	-2451.9 766.825 -5348.6 444.757	12.75 1122.52 -4227.5 4253.05	-365.75 869.497 -3650.3 2918.77	-1642 629.296 -4019.1 735.196	-812.25 603.334 -3091.3 1466.84	87.75 1122.52 -4152.5 4328.05	0 0 0 0	-943.42 648.085 -3391.6 1504.72	-1452.3 1122.52 -5692.5 2788.05	298.75 1122.52 -3941.5 4539.05
	7,2	255.049 476.762 -1545.9 2056.01	416.578 476.762 -1384.4 2217.54	707.389 473.294 -1080.5 2495.25	366.167 648.085 -2082 2814.3	-0.6333 607.958 -2297.2 2295.92	241.417 467.341 -1524 2006.79	1242.17 709.942 -1439.6 3923.97	1242.17 819.77 -1854.5 4338.84	885.667 480.633 -929.92 2701.25	3.16667 456.429 -1721 1727.32	1094.98 509.554 -829.85 3019.82	984.792 542.227 -1063.5 3033.05	1242.17 9112.01 -33178 35662.7	-663.33 819.77 -3760 2433.34	1242.17 3436.58 -11739 14223.8	507.167 1084.45 -3589.3 4603.68	128.167 558.579 -1981.9 2238.19	367.5 529.159 -1631.4 2366.39	-1508.5 709.942 -4190.3 1173.3	956.167 1084.45 -3140.3 5052.68	577.667 819.77 -2519 3674.34	-698.55 558.579 -2808.6 1411.48	131.167 529.159 -1867.7 2130.06	1031.17 1084.45 -3065.3 5127.68	943.417 648.085 -1504.7 3391.55	0 0 0 0	-508.83 1084.45 -4605.3 3587.68	1242.17 1084.45 -2854.3 5338.68
	7,3	763.882 1033.12 -3138.7 4666.47	925.412 1033.12 -2977.2 4828	1216.22 1031.52 -2680.3 5112.79	875 1122.52 -3365.3 5115.3	508.2 1099.84 -3646.4 4662.82	750.25 1028.8 -3136 4636.55	1751 1159.33 -2628.4 6130.36	1751 1229.66 -2894 6396.01	1394.5 1034.91 -2514.9 5303.86	512 1023.89 -3355.7 4379.74	1603.82 1048.65 -2357.5 5565.1	1493.63 1064.91 -2529.1 5516.32	1751 9194.61 -32982 36483.6	-154.5 1229.66 -4799.5 4490.51	1751 3873.26 -12880 16382.2	1016 1419.88 -4347.6 6379.6	637 1073.33 -3417.5 4691.5	876.333 1058.32 -3121.5 4874.12	-999.67 1159.33 -5379 3379.69	1465 1419.88 -3898.6 6828.6	1086.5 1229.66 -3558.5 5731.51	-189.71 1073.33 -4244.2 3864.78	640 1058.32 -3357.8 4637.79	1540 1419.88 -3823.6 6903.6	1452.25 1122.52 -2788 5692.55	508.833 1084.45 -3587.7 4605.35	0 0 0 0	1751 1419.88 -3612.6 7114.6
	7,4	-987.12 1033.12 -4889.7 2915.47	-825.59 1033.12 -4728.2 3077	-534.78 1031.52 -4431.3 3361.79	-876 1122.52 -5116.3 3364.3	-1242.8 1099.84 -5397.4 2911.82	-1000.8 1028.8 -4887 2885.55	-5e-12 1159.33 -4379.4 4379.36	-2e-12 1229.66 -4645 4645.01	-356.5 1034.91 -4265.9 3552.86	-1239 1023.89 -5106.7 2628.74	-147.18 1048.65 -4108.5 3814.1	-257.38 1064.91 -4280.1 3765.32	-5e-12 9303.6 -35144 35144.3	-1905.5 1229.66 -6550.5 2739.51	-5e-12 3603.62 -13613 13612.7	-735 1419.88 -6098.6 4628.6	-1114 1073.33 -5168.5 2940.5	-874.67 1058.32 -4872.5 3123.12	-2750.7 1159.33 -7130 1628.69	-286 1419.88 -5649.6 5077.6	-664.5 1229.66 -5309.5 3980.51	-1940.7 1073.33 -5995.2 2113.78	-1111 1058.32 -5108.8 2886.79	-211 1419.88 -5574.6 5152.6	-298.75 1122.52 -4539 3941.55	-1242.2 1084.45 -5338.7 2854.35	-1751 1419.88 -7114.6 3612.6	0 0 0 0

CONCLUSION:

Based on the ANOVA tests conducted, there are a few things that can be taken away. Firstly, the Geographical Region variable consistently had no significance differences among the population means regardless of whether it was in relation to Admissions or Births, which makes Geographical Region a good set of data to use. Secondly, the control variable consistently showed significant differences among the population means regardless of whether it was in relation to Admissions or Births, which makes it not a good set of data to use on its own. Finally when Geographical Region and Control were used in conjunction with each other, there was different effects for Admissions and Births. When the test was conducted for Admissions with Geographical region and Control, there was no significant differences to the population means. When the test was conducted for Births with Geographical region and Control, there was no significant differences to the population means based on the statistical value, but when you look at the Connecting Letter Report it showed a significant difference among the population means.