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 STAT 600
 Dr. Claussen
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Exercise 1.

Obs	_TYPE_	_FREQ_	_STAT_	Instrument_1	Instrument_2	Instrument_3	Instrument_4	Instrument_5
1	0	5	N	5	5	5	5	5
2	0	5	MIN	196.124	196.0422	196.0343	195.9885	196.0052
3	0	5	MAX	196.3403	196.3825	196.2889	196.2795	196.2119
4	0	5	MEAN	196.24308	196.2443	196.16702	196.14814	196.14324
5	0	5	STD	0.0874732931	0.1379749796	0.0937241271	0.1042267384	0.0884479678

Exercise 1.

Normal Dist - Confidence Bounds for instrument 1 observations

lower_bound	upper_bound
196.16641	196.31975

Normal Dist - Confidence Bounds for instrument 2 observations

lower_bound	upper_bound
196.12336	196.36524

Normal Dist - Confidence Bounds for instrument 3 observations

lower_bound	upper_bound
196.08487	196.24917

Normal Dist - Confidence Bounds for instrument 4 observations

lower_bound	upper_bound
196.05678	196.2395

Normal Dist - Confidence Bounds for instrument 5 observations

lower_bound	upper_bound
196.06571	196.22077

Exercise 2.

Obs	Rotation	Fertilizer	_TYPE_	_FREQ_	mean	sum	std	n
1			0	27	1.5377777778	41.52	0.2363599493	27
2		HNPk	1	9	1.6933333333	15.24	0.2346832972	9
3		NPK	1	9	1.46	13.14	0.2069480611	9
4		none	1	9	1.46	13.14	0.2069480611	9
5	C-C		2	9	1.3393333333	12.054	0.1985925477	9
6	C-O(S)		2	9	1.575	14.175	0.1558901857	9
7	C-O-H		2	9	1.699	15.291	0.2066899852	9
8	C-C	HNPk	3	3	1.526	4.578	0.0465188134	3
9	C-C	NPK	3	3	1.246	3.738	0.196458647	3
10	C-C	none	3	3	1.246	3.738	0.196458647	3
11	C-O(S)	HNPk	3	3	1.6683333333	5.005	0.2433152961	3
12	C-O(S)	NPK	3	3	1.5283333333	4.585	0.095928793	3
13	C-O(S)	none	3	3	1.5283333333	4.585	0.095928793	3
14	C-O-H	HNPk	3	3	1.8856666667	5.657	0.2459925473	3
15	C-O-H	NPK	3	3	1.6056666667	4.817	0.126433118	3
16	C-O-H	none	3	3	1.6056666667	4.817	0.126433118	3

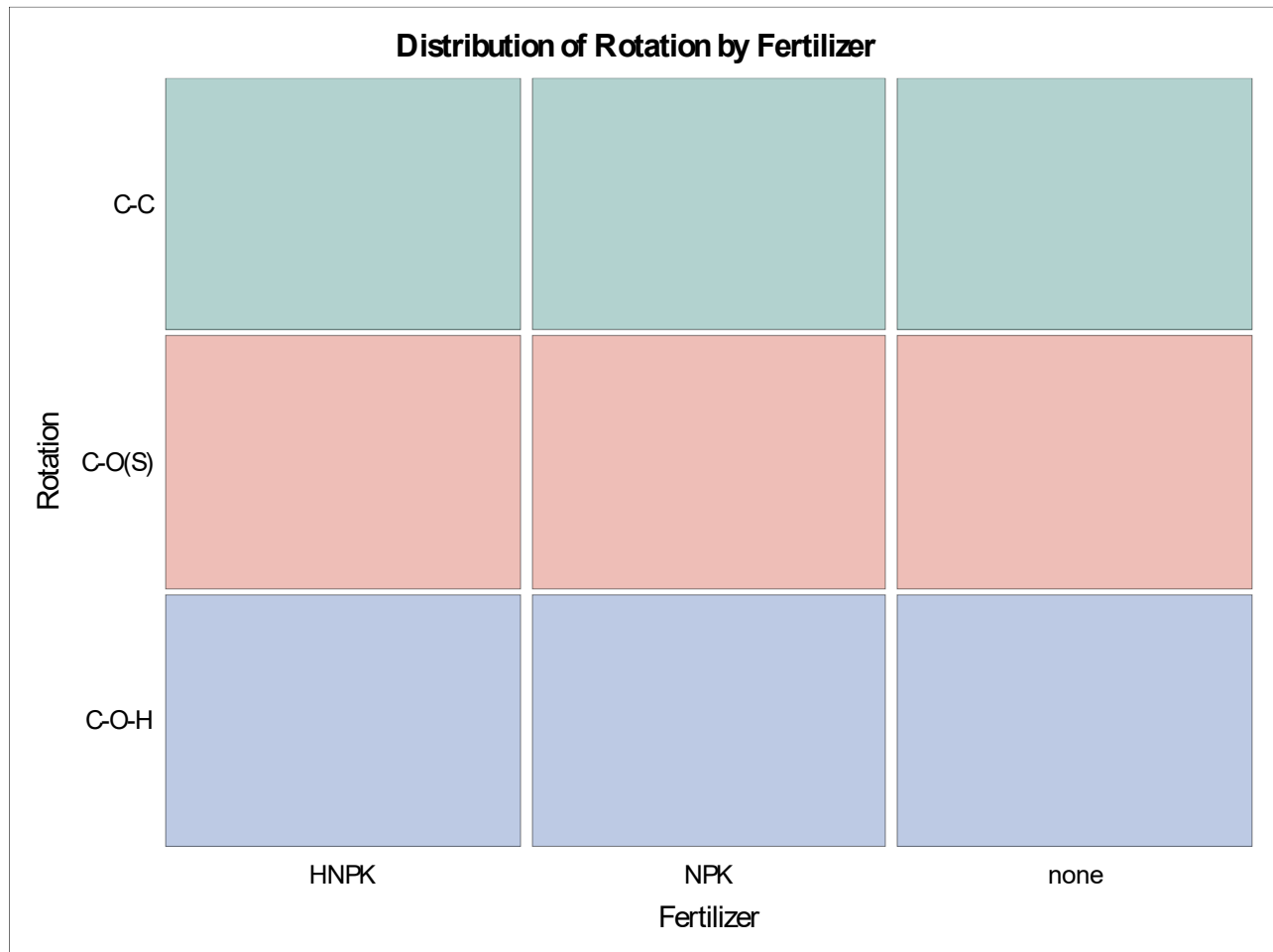
*Exercise 2.**The MEANS Procedure*

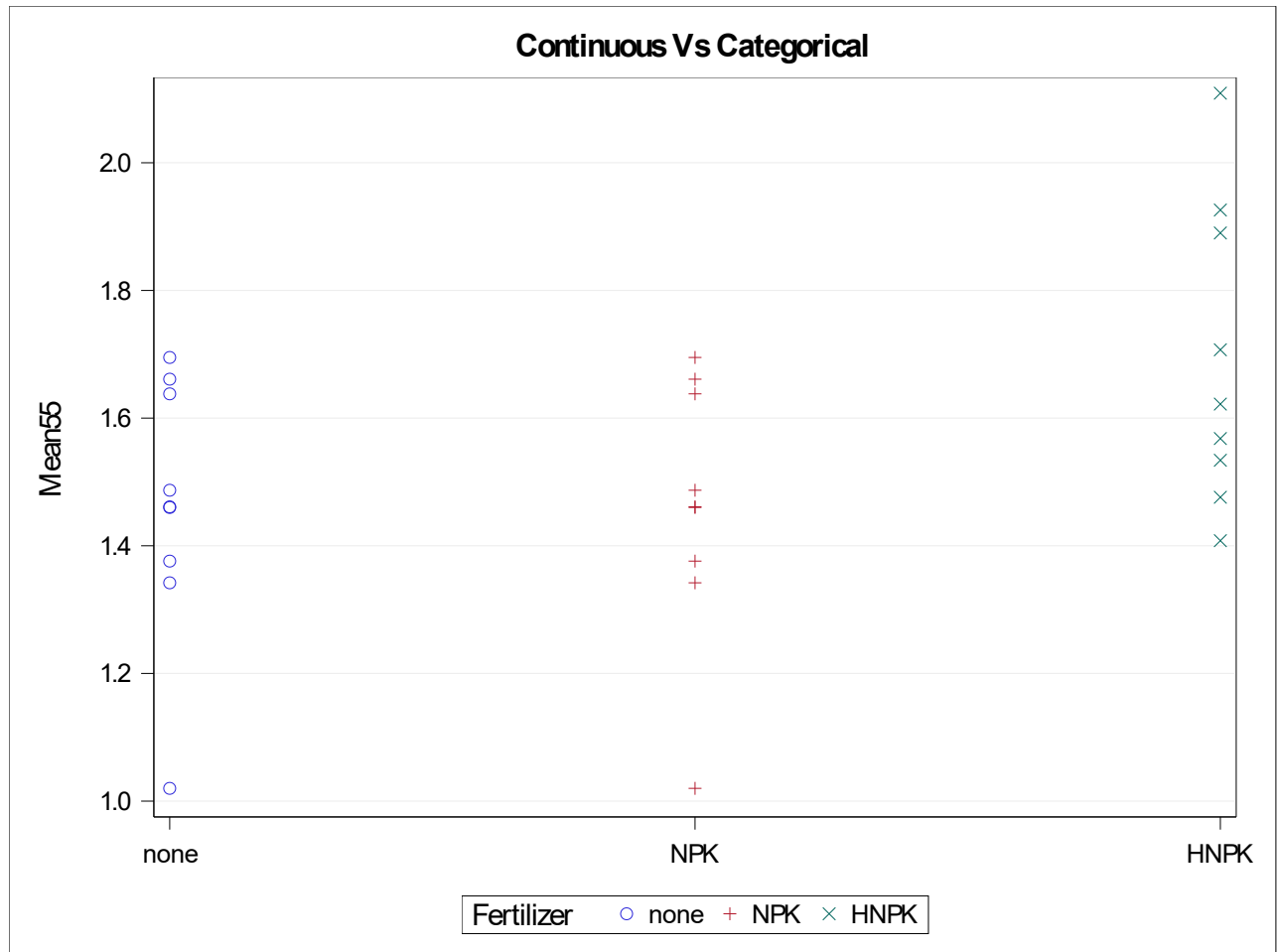
Variable	N	Mean	Std Dev	Minimum	Maximum
Mean55	27	1.5377778	0.2363599	1.0200000	2.1090000
Mean05	27	1.3251852	0.2586691	0.7510000	1.8870000
SD05	27	0.0085185	0.0028605	0.0040000	0.0140000
Diff	27	-0.2125926	0.1443365	-0.5020000	0.0130000

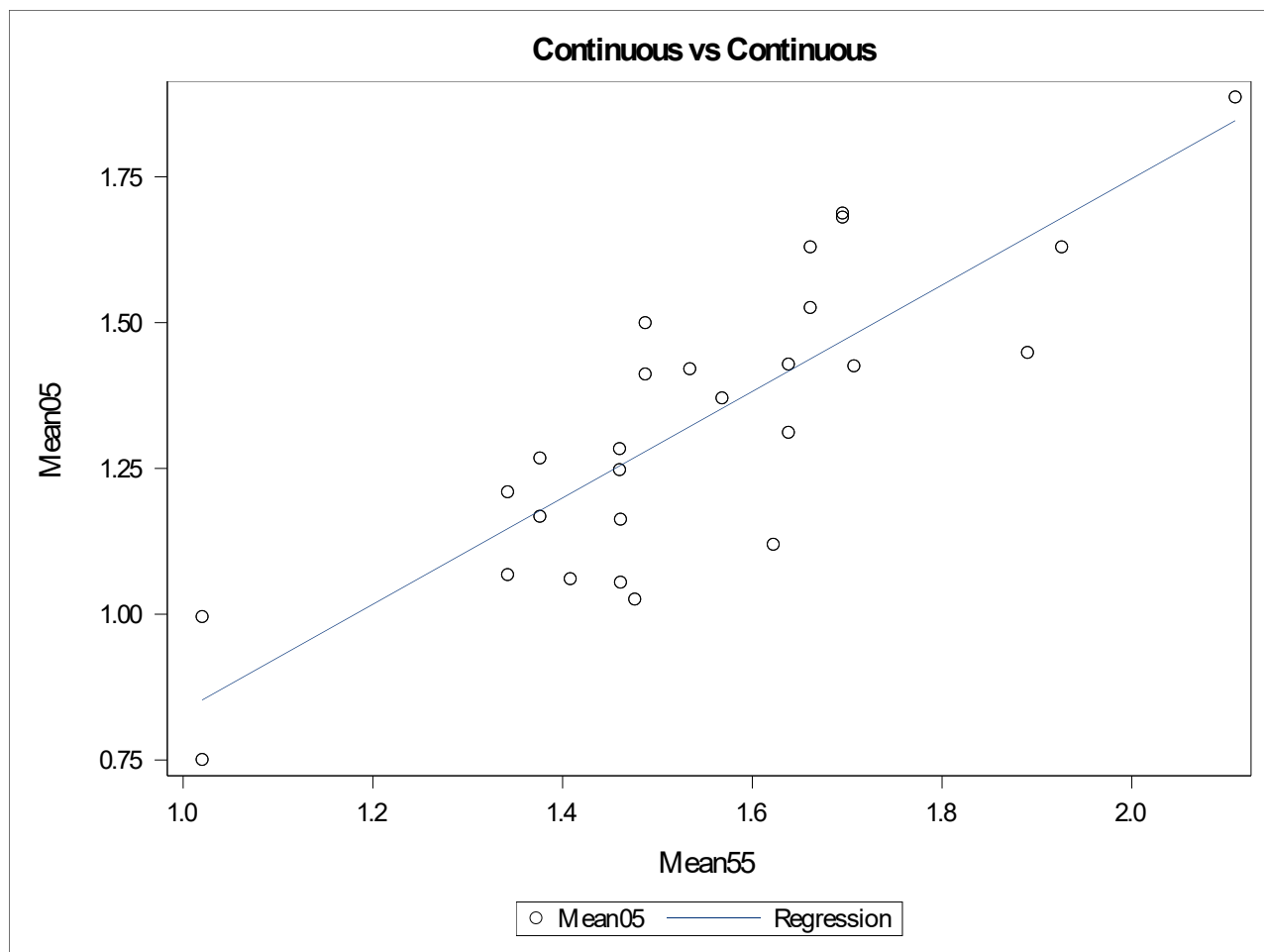
Categorical Vs Categorical

The FREQ Procedure

Table of Rotation by Fertilizer				
Rotation	Fertilizer			
Frequency Percent Row Pct Col Pct	HNPK	NPK	none	Total
C-C	3 11.11 33.33 33.33	3 11.11 33.33 33.33	3 11.11 33.33 33.33	9 33.33
C-O(S)	3 11.11 33.33 33.33	3 11.11 33.33 33.33	3 11.11 33.33 33.33	9 33.33
C-O-H	3 11.11 33.33 33.33	3 11.11 33.33 33.33	3 11.11 33.33 33.33	9 33.33
Total	9 33.33	9 33.33	9 33.33	27 100.00

*Categorical Vs Categorical**The FREQ Procedure*





Do you notice anything unusual about the data?

Yes, NPK fertilizer and no fertilizer always have the same results, making it seem like there's an issue with the fertilizer.

Exercise 3.

ANOVA GLM Results for Testing

Exercise 3.

The GLM Procedure

Class Level Information		
Class	Levels	Values
Fertilizer	3	HNPK NPK none

Number of Observations Read	27
Number of Observations Used	27

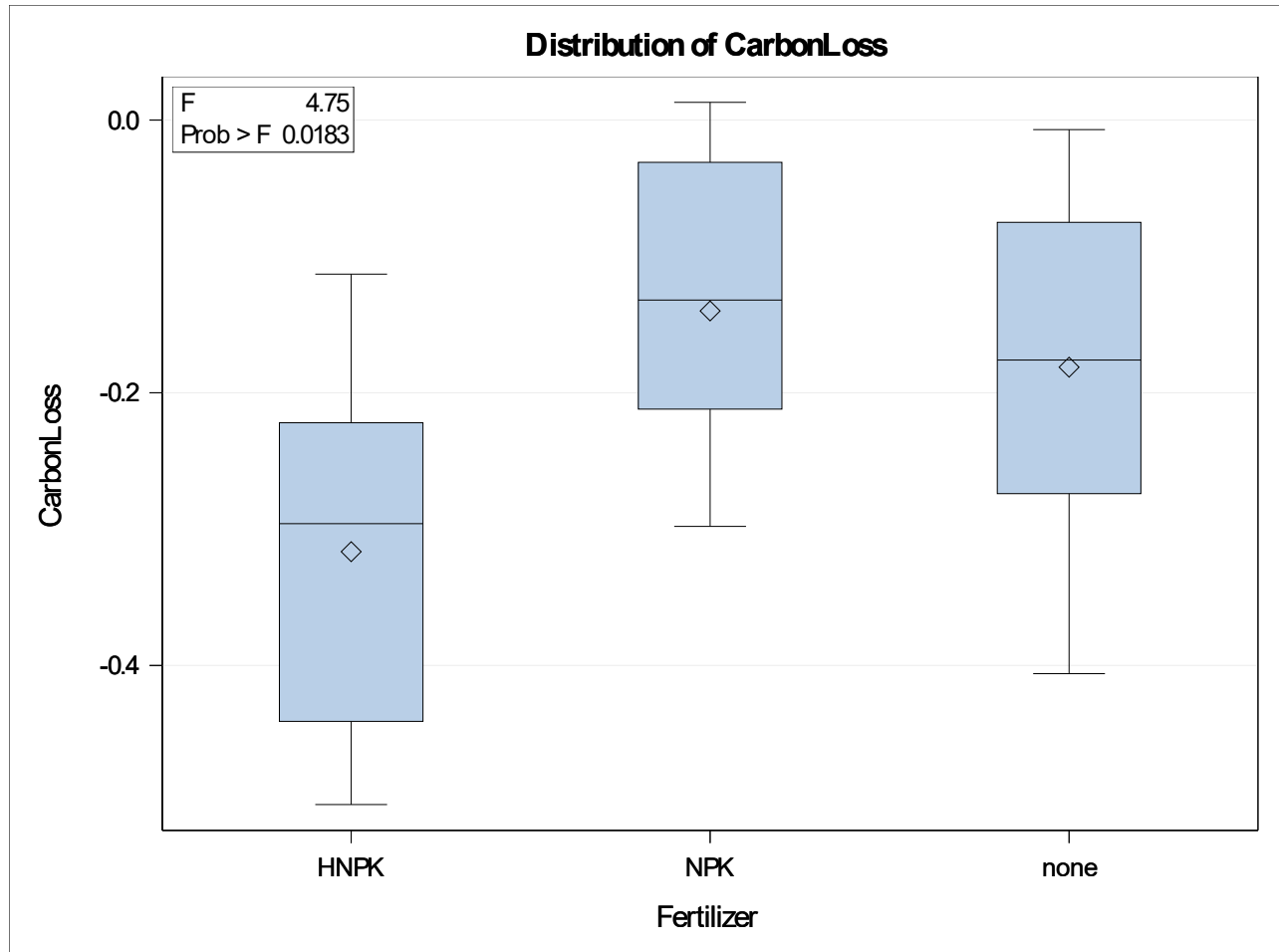
*Exercise 3.**The GLM Procedure**Dependent Variable: CarbonLoss*

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	0.15355874	0.07677937	4.75	0.0183
Error	24	0.38809978	0.01617082		
Corrected Total	26	0.54165852			

R-Square	Coeff Var	Root MSE	CarbonLoss Mean
0.283497	-59.81608	0.127165	-0.212593

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Fertilizer	2	0.15355874	0.07677937	4.75	0.0183

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Fertilizer	2	0.15355874	0.07677937	4.75	0.0183

*Exercise 3.**The GLM Procedure**Dependent Variable: CarbonLoss*

Exercise 3.

part A

Exercise 3.

Obs	Fertilizer	Treatment_Val
1	HNPK	-2.849
2	NPK	-1.260
3	none	-1.631

Exercise 3.

Obs	Fertilizer	Observations_Val
1	HNPK	9
2	NPK	9
3	none	9

Exercise 3.

Obs	GrandTotal_Val	Mean05	Mean55
1	-5.74	1.168	1.376
2	-5.74	1.068	1.342
3	-5.74	0.996	1.02
4	-5.74	1.268	1.376
5	-5.74	1.21	1.342
6	-5.74	0.751	1.02
7	-5.74	1.421	1.534
8	-5.74	1.371	1.568
9	-5.74	1.026	1.476
10	-5.74	1.412	1.487
11	-5.74	1.312	1.638
12	-5.74	1.284	1.46
13	-5.74	1.5	1.487
14	-5.74	1.429	1.638
15	-5.74	1.248	1.46
16	-5.74	1.449	1.89
17	-5.74	1.426	1.707
18	-5.74	1.061	1.408
19	-5.74	1.688	1.695
20	-5.74	1.526	1.661
21	-5.74	1.055	1.461
22	-5.74	1.681	1.695
23	-5.74	1.63	1.661
24	-5.74	1.163	1.461
25	-5.74	1.887	2.109
26	-5.74	1.63	1.926
27	-5.74	1.12	1.622

Exercise 3.

Correction_val
1.2202815

Total_SS_Val
8.7037176

treatments_SS_Val
-31.18566

Residual_SS_Val
39.889378

MSB	MSW
-3.898208	2.2160765

f_Ratio	p_Value
-1.759058	1

The press release associated with this paper (<https://aces.illinois.edu/news/study-reveals-nitrogen-fertilizersdeplete-soil-organic-carbon>) claims that “Study Reveals that Nitrogen Fertilizers Deplete Soil Organic Carbon”. Do these data support that claim?

Yes, according to the correct calculations given by the glm proc in SAS, as their p value is below .01, indicating a significant change in the means of the data.

Exercise 4.

Obs	ExpectedFinish	ActualFinish	_TYPE_	_FREQ_	mean	sum	std	n
1			0	329	1378.7764742	453617.46	56.505968919	329
2		AA	1	80	1444.5565	115564.52	50.932854287	80
3		cons 12	1	40	1400.708	56028.32	29.226326751	40
4		cons 16	1	40	1371.7455	54869.82	34.288611846	40
5		cons 24	1	79	1355.13	107055.27	30.951254976	79
6		cons 32	1	80	1333.26975	106661.58	34.085632668	80
7		cons 33	1	10	1343.795	13437.95	28.305876991	10
8	E[AA]		2	80	1451.336125	116106.89	41.049777393	80
9	E[NQ]		2	65	1332.8206154	86633.34	52.692723848	65
10	E[cons 12]		2	36	1395.4422222	50235.92	17.777675103	36
11	E[cons 16]		2	36	1379.4044444	49658.56	13.115927818	36
12	E[cons 24]		2	66	1357.3690909	89586.36	16.022819086	66
13	E[cons 32]		2	46	1334.7041304	61396.39	18.020511224	46
14	E[AA]	AA	3	57	1460.8380702	83267.77	43.105974414	57
15	E[AA]	cons 12	3	13	1430.3792308	18594.93	20.615632605	13
16	E[AA]	cons 16	3	7	1420.9985714	9946.99	23.146888508	7
17	E[AA]	cons 24	3	3	1432.4	4297.2	34.480311774	3
18	E[NQ]	AA	3	6	1441.62	8649.72	73.584323059	6
19	E[NQ]	cons 12	3	3	1392.2166667	4176.65	25.793759581	3
20	E[NQ]	cons 16	3	8	1343.9925	10751.94	25.593999715	8
21	E[NQ]	cons 24	3	12	1326.4541667	15917.45	29.551989153	12
22	E[NQ]	cons 32	3	33	1307.9163636	43161.24	30.84223462	33
23	E[NQ]	cons 33	3	3	1325.4466667	3976.34	21.668886297	3
24	E[cons 12]	AA	3	9	1399.3411111	12594.07	28.175198954	9
25	E[cons 12]	cons 12	3	13	1398.1584615	18176.06	15.904033475	13
26	E[cons 12]	cons 16	3	4	1393.865	5575.46	7.959164529	4
27	E[cons 12]	cons 24	3	8	1386.37	11090.96	7.9619739118	8
28	E[cons 12]	cons 32	3	2	1399.685	2799.37	10.231835124	2
29	E[cons 16]	AA	3	6	1384.7216667	8308.33	19.830834997	6
30	E[cons 16]	cons 12	3	5	1380.396	6901.98	14.232007237	5
31	E[cons 16]	cons 16	3	7	1383.5014286	9684.51	12.402933025	7
32	E[cons 16]	cons 24	3	11	1377.4054545	15151.46	8.5795377074	11
33	E[cons 16]	cons 32	3	6	1373.07	8238.42	13.984818912	6
34	E[cons 16]	cons 33	3	1	1373.86	1373.86	.	1
35	E[cons 24]	AA	3	1	1374.8	1374.8	.	1

Exercise 4.

Obs	ExpectedFinish	ActualFinish	_TYPE_	_FREQ_	mean	sum	std	n
36	E[cons 24]	cons 12	3	6	1363.1166667	8178.7	12.243280062	6
37	E[cons 24]	cons 16	3	8	1357.58	10860.64	20.271388	8
38	E[cons 24]	cons 24	3	29	1356.3837931	39335.13	14.353598208	29
39	E[cons 24]	cons 32	3	17	1356.0058824	23052.1	17.548825836	17
40	E[cons 24]	cons 33	3	5	1356.998	6784.99	21.228325888	5
41	E[cons 32]	AA	3	1	1369.83	1369.83	.	1
42	E[cons 32]	cons 16	3	6	1341.7133333	8050.28	13.991385445	6
43	E[cons 32]	cons 24	3	16	1328.941875	21263.07	15.759997554	16
44	E[cons 32]	cons 32	3	22	1336.8386364	29410.45	17.899548091	22
45	E[cons 32]	cons 33	3	1	1302.76	1302.76	.	1

Exercise 4.

Obs	Weight	Conference	_TYPE_	_FREQ_	mean	sum	std	n
1	.		0	329	1378.7764742	453617.46	56.505968919	329
2	.	ACC	1	40	1377.845	55113.8	52.292651344	40
3	.	Big 12	1	52	1368.4309615	71158.41	45.295064712	52
4	.	Big Ten	1	87	1407.6717241	122467.44	66.775089514	87
5	.	EIWA	1	55	1377.5034545	75762.69	43.382498016	55
6	.	EWL	1	22	1361.5722727	29954.59	44.681376107	22
7	.	MAC	1	34	1358.4820588	46188.39	53.235284083	34
8	.	Pac 12	1	25	1375.4964	34387.41	51.982750334	25
9	.	SoCon	1	14	1327.4807143	18584.73	33.572385279	14
10	125		2	33	1383.1133333	45642.74	58.640708112	33
11	133		2	33	1382.879697	45635.03	47.02196385	33
12	141		2	33	1382.6866667	45628.66	52.119641851	33
13	149		2	33	1382.3236364	45616.68	62.182808156	33
14	157		2	33	1396.6984848	46091.05	48.970399932	33
15	165		2	33	1393.4842424	45984.98	58.775604954	33
16	174		2	33	1389.400303	45850.21	56.583985449	33
17	184		2	33	1360.189697	44886.26	58.236464816	33
18	197		2	32	1357.3528125	43435.29	47.558622517	32
19	285		2	33	1358.9866667	44846.56	62.467214884	33
20	125	ACC	3	3	1378.0466667	4134.14	27.964828505	3
21	125	Big 12	3	7	1366.5042857	9565.53	35.905557999	7
22	125	Big Ten	3	10	1425.912	14259.12	67.46736607	10
23	125	EIWA	3	2	1393.295	2786.59	117.99490858	2
24	125	EWL	3	3	1344.51	4033.53	54.640775983	3
25	125	MAC	3	3	1356.09	4068.27	27.20105145	3
26	125	Pac 12	3	4	1370.24	5480.96	44.153771451	4
27	125	SoCon	3	1	1314.6	1314.6	.	1
28	133	ACC	3	6	1387.7433333	8326.46	47.049123548	6
29	133	Big 12	3	6	1401.12	8406.72	63.339371326	6
30	133	Big Ten	3	8	1381.27375	11050.19	50.612176101	8
31	133	EIWA	3	4	1409.3525	5637.41	35.865025094	4
32	133	EWL	3	1	1372.13	1372.13	.	1
33	133	MAC	3	4	1371.495	5485.98	18.634894687	4
34	133	Pac 12	3	3	1347.9966667	4043.99	35.676028834	3
35	133	SoCon	3	1	1312.15	1312.15	.	1

Exercise 4.

Obs	Weight	Conference	_TYPE_	_FREQ_	mean	sum	std	n
36	141	ACC	3	4	1379.7375	5518.95	56.595583087	4
37	141	Big 12	3	4	1405.8025	5623.21	63.051810111	4
38	141	Big Ten	3	10	1383.118	13831.18	49.49813056	10
39	141	EIWA	3	4	1413.8575	5655.43	47.773642925	4
40	141	EWL	3	4	1362.8925	5451.57	32.374858944	4
41	141	MAC	3	4	1385.7	5542.8	76.615798632	4
42	141	Pac 12	3	2	1343.265	2686.53	30.158104218	2
43	141	SoCon	3	1	1318.99	1318.99	.	1
44	149	ACC	3	4	1360.5	5442	23.780068685	4
45	149	Big 12	3	7	1356.46	9495.22	48.619901961	7
46	149	Big Ten	3	10	1413.824	14138.24	80.785916567	10
47	149	EIWA	3	5	1381.73	6908.65	55.766138023	5
48	149	EWL	3	2	1368.02	2736.04	72.351165851	2
49	149	MAC	3	3	1397.1266667	4191.38	45.373296479	3
50	149	Pac 12	3	1	1415.73	1415.73	.	1
51	149	SoCon	3	1	1289.42	1289.42	.	1
52	157	ACC	3	4	1413.52	5654.08	47.409417489	4
53	157	Big 12	3	3	1377.1	4131.3	6.4780629821	3
54	157	Big Ten	3	8	1444.9425	11559.54	59.624353785	8
55	157	EIWA	3	7	1377.3371429	9641.36	16.320260123	7
56	157	EWL	3	2	1352.995	2705.99	6.3851742341	2
57	157	MAC	3	4	1374.4675	5497.87	50.958136004	4
58	157	Pac 12	3	4	1387.825	5551.3	35.310975159	4
59	157	SoCon	3	1	1349.61	1349.61	.	1
60	165	ACC	3	3	1394.7566667	4184.27	63.391043794	3
61	165	Big 12	3	6	1370.8016667	8224.81	46.087962601	6
62	165	Big Ten	3	11	1425.2390909	15677.63	64.579249989	11
63	165	EIWA	3	6	1371.9866667	8231.92	29.22791109	6
64	165	EWL	3	2	1452.18	2904.36	25.964961005	2
65	165	MAC	3	2	1339.265	2678.53	37.172603487	2
66	165	Pac 12	3	1	1443.66	1443.66	.	1
67	165	SoCon	3	2	1319.9	2639.8	27.987286399	2
68	174	ACC	3	5	1373.32	6866.6	39.91400005	5
69	174	Big 12	3	5	1385.432	6927.16	31.218633378	5
70	174	Big Ten	3	8	1413.86125	11310.89	78.501077233	8

Exercise 4.

Obs	Weight	Conference	_TYPE_	_FREQ_	mean	sum	std	n
71	174	EIWA	3	7	1368.3585714	9578.51	31.596114439	7
72	174	EWL	3	2	1351.545	2703.09	18.787827176	2
73	174	MAC	3	3	1400.8766667	4202.63	76.798886277	3
74	174	Pac 12	3	2	1452.41	2904.82	96.788776209	2
75	174	SoCon	3	1	1356.51	1356.51	.	1
76	184	ACC	3	3	1402.3733333	4207.12	28.524127214	3
77	184	Big 12	3	5	1343.99	6719.95	27.1530339	5
78	184	Big Ten	3	9	1392.4033333	12531.63	79.896149939	9
79	184	EIWA	3	7	1361.2714286	9528.9	40.10977247	7
80	184	EWL	3	2	1334.08	2668.16	26.148808768	2
81	184	MAC	3	4	1299.12	5196.48	41.726550301	4
82	184	Pac 12	3	1	1301.33	1301.33	.	1
83	184	SoCon	3	2	1366.345	2732.69	38.784806948	2
84	197	ACC	3	2	1419.44	2838.88	17.819090886	2
85	197	Big 12	3	6	1335.87	8015.22	37.131731982	6
86	197	Big Ten	3	6	1371.8566667	8231.14	41.048214902	6
87	197	EIWA	3	7	1388.7342857	9721.14	41.466395976	7
88	197	EWL	3	1	1298.83	1298.83	.	1
89	197	MAC	3	3	1360.0566667	4080.17	46.622271859	3
90	197	Pac 12	3	4	1335.1275	5340.51	36.077384768	4
91	197	SoCon	3	3	1303.1333333	3909.4	38.956227144	3
92	285	ACC	3	6	1323.55	7941.3	75.89679677	6
93	285	Big 12	3	3	1349.7633333	4049.29	24.066527239	3
94	285	Big Ten	3	7	1411.1257143	9877.88	75.895161211	7
95	285	EIWA	3	6	1345.4633333	8072.78	51.276426033	6
96	285	EWL	3	3	1360.2966667	4080.89	35.546463021	3
97	285	MAC	3	4	1311.07	5244.28	10.786457559	4
98	285	Pac 12	3	3	1406.1933333	4218.58	16.252954603	3
99	285	SoCon	3	1	1361.56	1361.56	.	1

*Exercise 4.**The MEANS Procedure*

Analysis Variable : ELO				
N	Mean	Std Dev	Minimum	Maximum
329	1378.78	56.5059689	1227.70	1583.73

Exercise 4.

ANSWER: What are the mean and standard deviations of ELO by ExpectedFinish and by ActualFinish?

Exercise 4.

Obs	ExpectedFinish	ActualFinish	_TYPE_	_FREQ_	mean	sum	std	n
1			0	329	1378.7764742	453617.46	56.505968919	329
2		AA	1	80	1444.5565	115564.52	50.932854287	80
3		cons 12	1	40	1400.708	56028.32	29.226326751	40
4		cons 16	1	40	1371.7455	54869.82	34.288611846	40
5		cons 24	1	79	1355.13	107055.27	30.951254976	79
6		cons 32	1	80	1333.26975	106661.58	34.085632668	80
7		cons 33	1	10	1343.795	13437.95	28.305876991	10
8	E[AA]		2	80	1451.336125	116106.89	41.049777393	80
9	E[NQ]		2	65	1332.8206154	86633.34	52.692723848	65
10	E[cons 12]		2	36	1395.4422222	50235.92	17.777675103	36
11	E[cons 16]		2	36	1379.4044444	49658.56	13.115927818	36
12	E[cons 24]		2	66	1357.3690909	89586.36	16.022819086	66
13	E[cons 32]		2	46	1334.7041304	61396.39	18.020511224	46

Exercise 4.

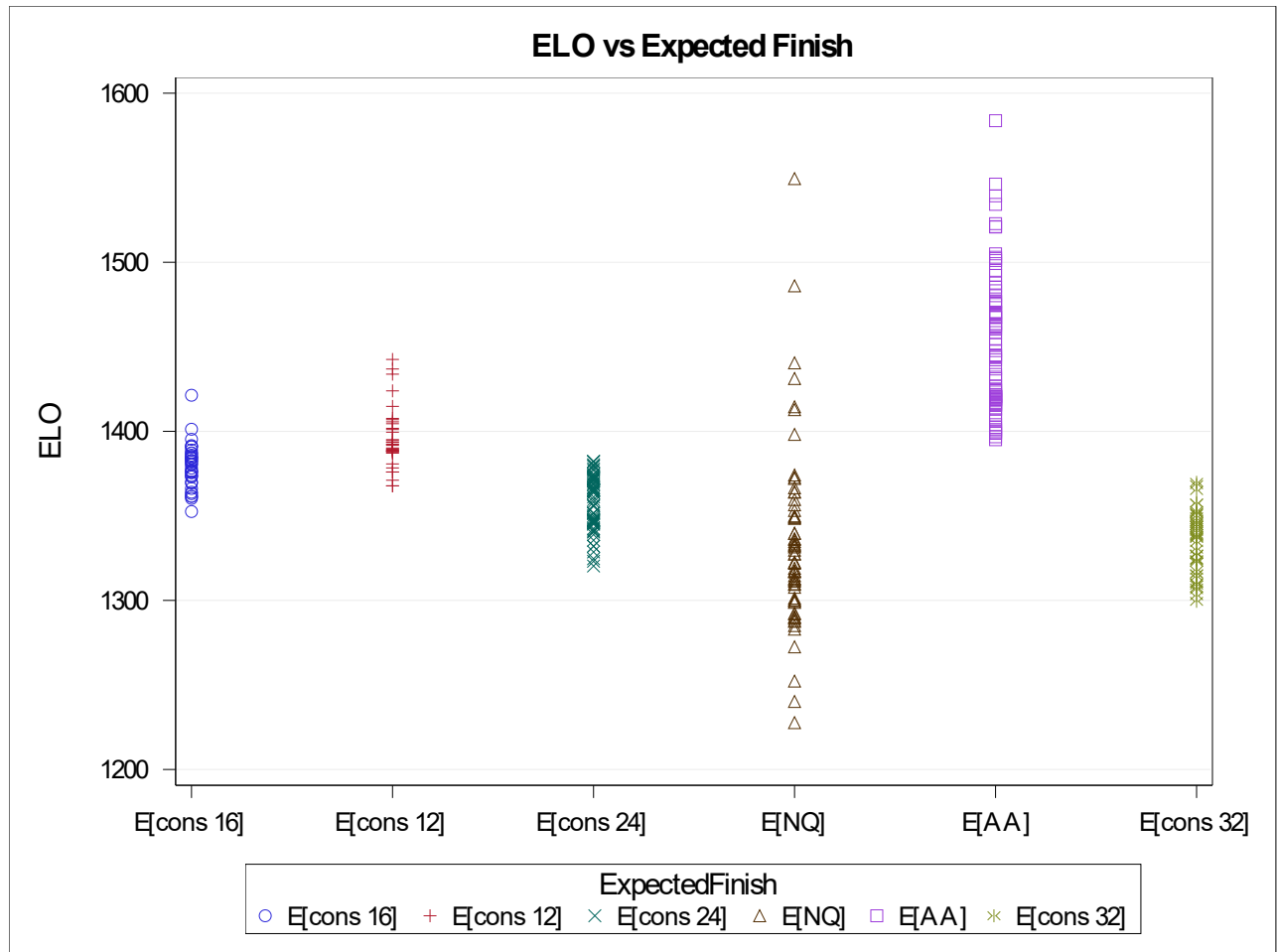
Do all conferences have similar quality, or might we suspect one or more conferences have better wrestlers than the rest? That is, what is the relationship between Conference and ELO?

ANSWER: Big 10 has a higher mean elo, higher standard deviation on their elo, and more players than the other conferences. This shows that that their players have a tendency to be a higher elo than the other conferences. The other conferences are a lot more similar in mean ELO.

Exercise 4.

How well does ELO predict finish? That is, what is the relationship between ExpectedFinish and ActualFinish? Use a contingency table or mosaic plot to show how often, say, an E[AA] finish corresponds to an AA finish.

ANSWER: Going by the results of this mosaic, most players who are expected to get to AA(top 8) tend to actually get their but results seem to be a lot less consistent for lower placings.



ELO vs Expected Finish

ANSWER: Going by this scatter plot results, players in higher ELOs have a tendency to be expected to finish in AA(1st-8th place).

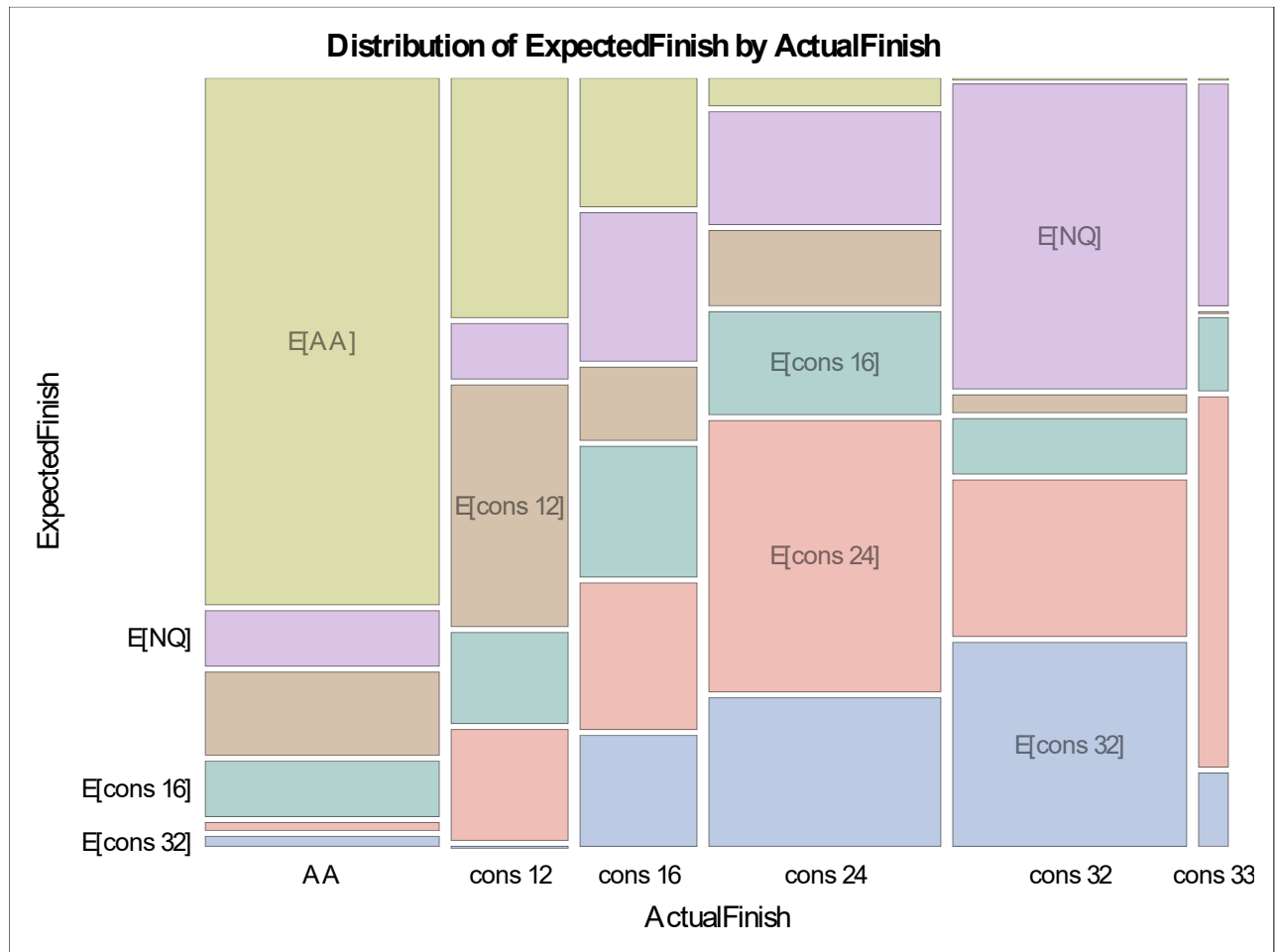
Expected Finish Vs Actual Finish

The FREQ Procedure

Table of ExpectedFinish by ActualFinish							
ExpectedFinish	ActualFinish						
Frequency Percent Row Pct Col Pct	AA	cons 12	cons 16	cons 24	cons 32	cons 33	Total
E[AA]	57 17.33 71.25 71.25	13 3.95 16.25 32.50	7 2.13 8.75 17.50	3 0.91 3.75 3.80	0 0.00 0.00 0.00	0 0.00 0.00 0.00	80 24.32
E[NQ]	6 1.82 9.23 7.50	3 0.91 4.62 7.50	8 2.43 12.31 20.00	12 3.65 18.46 15.19	33 10.03 50.77 41.25	3 0.91 4.62 30.00	65 19.76
E[cons 12]	9 2.74 25.00 11.25	13 3.95 36.11 32.50	4 1.22 11.11 10.00	8 2.43 22.22 10.13	2 0.61 5.56 2.50	0 0.00 0.00 0.00	36 10.94
E[cons 16]	6 1.82 16.67 7.50	5 1.52 13.89 12.50	7 2.13 19.44 17.50	11 3.34 30.56 13.92	6 1.82 16.67 7.50	1 0.30 2.78 10.00	36 10.94
E[cons 24]	1 0.30 1.52 1.25	6 1.82 9.09 15.00	8 2.43 12.12 20.00	29 8.81 43.94 36.71	17 5.17 25.76 21.25	5 1.52 7.58 50.00	66 20.06
E[cons 32]	1 0.30 2.17 1.25	0 0.00 0.00 0.00	6 1.82 13.04 15.00	16 4.86 34.78 20.25	22 6.69 47.83 27.50	1 0.30 2.17 10.00	46 13.98
Total	80 24.32	40 12.16	40 12.16	79 24.01	80 24.32	10 3.04	329 100.00

Expected Finish Vs Actual Finish

The FREQ Procedure



Expected Finish Vs Actual Finish

Does this data set include non-qualifiers? (The NCAA tournament only allows 33 wrestlers per weight class

ANSWER: No, going by the summary results, there are at most 33 players per weight class in this dataset.