STAT 511 **Assignment 7** **NAME ________________**
Spring 2002

Reading Assignment: Rencher, Chapters 13 and 14. Also read Neter, Kutner, Nachtsheim.Wasserman, Chapter 22. Next we will examine models with random effects. To prepare for this you can read Chapter 16 in Rencher and Chapter 24 in NKNW.

Written Assignment: On-Campus: Due Wednesday, April 3, in class
Distance Students: Due Thursday, April 10, in class

1. In a study to examine the effect of 4 drugs on 3 experimentally induced diseases in dogs, each drug-disease combination was given to six randomly selected dogs. The measurement (Y) to be analyzed was the increase in systolic blood pressure (mm Hg) due to treatment. Unfortunately, some dogs were unable to complete the experiment. The data (Kutner, 1974) are shown in the following table.

	Disease		
Drug	**j=1**	**j=2**	**j=3**
i=1	42, 44, 36, 13, 19, 22	33, 26, 33, 21	31, -3, 25, 25, 24
i-2	28, 23, 24, 42, 13	34, 33, 31, 36	3, 26, 28, 32, 3, 16
i=3	1, 29, 19	11, 9, 7, 1, -6	21, 1, 9, 3
i=4	24, 9, 22, -2, 15	27, 12, 12, -5, 16, 15	22, 7, 25, 5, 12

Consider the model $Y_{ijk} = m + a_i + b_j + g_{ij} + e_{ijk}$ where $\varepsilon_{ijk} \sim NID(0, \sigma^2)$ and Y_{ijk} denotes the change in systolic blood pressure (mm Hg) for the k-th dog given the j-th disease and treated with the i-th drug.

(a) The file dogs.ssc contains S-PLUS code for applying ℓm( ) and anova( ) functions to these data. Data are posted in the file dogs.dat. Note that this application of the ℓm ( ) function imposes some restrictions to solve the normal equations. What are the restrictions?

(b) Using the solution to the normal equations provided by this application of the of ℓm ( ) function, report estimates of the following quantities:

$$\mu, \; \alpha_1, \; \beta_3, \; \gamma_{23}, \; \alpha_2 - \alpha_3, \; \gamma_{22} - \gamma_{23} - \gamma_{32} + \gamma_{33},$$

$$m + a_2 + b_3 + g_{23}, \quad (a_2 - a_3) + \frac{1}{3}(g_{21} + g_{22} + g_{23} - g_{31} - g_{32} - g_{33})$$

Give an interpretation of each quantity with respect to the restricted model and the mean change in systolic blood pressure.

(c) The are many ways to put linear restrictions on parameters in the original model to obtain a solution to the normal equations. Would the least squares estimates of any of the linear combinations of parameters in part (b) have the same value for all such solutions to the normal equations? Which ones? Explain.

(d) Examine two ANOVA tables, one corresponding to the R(μ), R($\mathbf{a}|\mu$), R($\mathbf{b}|\mu, \mathbf{a}$), R($\mathbf{g}|\mu, \mathbf{a}, \mathbf{b}$) partition of the sums of squares and another ANOVA table corresponding to the R(μ), R($\mathbf{b}|\mu$), R($\mathbf{a}|\mu, \mathbf{b}$), R($\mathbf{g}|\mu, \mathbf{a}, \mathbf{b}$) partition. State any useful inferences that can be obtained from these two ANOVA tables. (Do not report the ANOVA tables.)

(e) Denote the mean change in systolic blood pressure for the i-th drug used with the j-th induced disease (a cell mean) as

$$m_{ij} = m + a_i + b_j + g_{ij} \, .$$

Let $\overline{Y}_{ij\bullet}$ denote the average of the n_{ij} observations obtained from dogs induced with the j-th disease and treated with the i-th drug, and let S^2 denote the sum of squared residuals divided by its degrees of freedom. Use Results 4.7 and 4.8 from the course notes to show that

$$F = \frac{\sum_{j=1}^{3} (n_{1j}^{-1} + n_{3j}^{-1})^{-1} (\overline{Y}_{1j\bullet} - \overline{Y}_{3j\bullet})^2}{3S^2}$$

has a non-central F-distribution. Report the degrees of freedom for this distribution and describe the null hypothesis that can be tested with this statistic in terms of the cell means.

(f) Evaluate the test statistic in part (e). Report a p-value and state your conclusion.

(g) Examine type III sums of squares for these data (do not submit these sums of squares).

i) State the null hypothesis associated with the F-test for interaction. What can you conclude from the results of this test?

ii) Specify the C matrix needed to write the null hypothesis associated with the F-test for drug effects in the form $\mathbf{H}_0 : \mathbf{C}\,\underset{\sim}{b} = \underset{\sim}{0}$, where

$$\underset{\sim}{b} = (m,\ a_1\ a_2\ a_3\ a_4,\ b_1\ b_2\ b_3, g_{11}, g_{21}, g_{31}, g_{41}, g_{12}, g_{22}, g_{32}, g_{42}, g_{13}, g_{23}, g_{33,}\ g_{43})^{\mathbf{T}}.$$

What can you conclude from the results of this test?

iii) Specify the C matrix needed to write the null hypothesis associated with the F-test for disease effects in the form H_0: $C\ \underset{\sim}{m} = 0$, where

$\underset{\sim}{m} = (m_{11},\ m_{21}, m_{31}, m_{41}, m_{12}, m_{22}, m_{32}, m_{42}, m_{13}, m_{23}, m_{33}, m_{43})^{\mathbf{T}}$ is the vector of cell

means, i.e., $\mu_{ij} = \mu + \alpha_i + \beta_j + \gamma_{ij} = E(Y_{ijk})$. What can you conclude from the results of this test?

2. A two way classification is said to have proportional subclass numbers if

$$\frac{n_{ij}}{n_{\bullet j}} = \frac{n_{i\bullet}}{n_{\bullet\bullet}} \quad \text{for all } j = 1, ..., b, \text{ and all } i = 1, ..., a.$$

Here n_{ij} denotes the number of observations taken at the i-th level of the first factor and the j-th level of the second factor, $n_{i\bullet}$ denotes the total number of observations taken at the i-th level of the first factor, $n_{\bullet j}$ denotes the total number of observations taken at the j-th level of the second factor, and $n_{\bullet\bullet}$ denotes the total number of observations. An equivalent way to state this condition is

$$\frac{n_{ij}}{n_{i\bullet}} = \frac{n_{\bullet j}}{n_{\bullet\bullet}} \quad \text{for all } j = 1, ..., b, \text{ and all } i = 1, ..., a.$$

Another way to state this condition is

$$n_{ij} = \frac{n_{i\bullet}\, n_{\bullet j}}{n_{\bullet\bullet}} \quad \text{for all } j = 1, ..., b, \text{ and all } i = 1, ..., a.$$

Consider the normal-theory Gauss-Markov model with

$$Y_{ijk} = \mu + \alpha_i + \beta_j + \gamma_{ij} + \varepsilon_{ijk}$$

where $\varepsilon_{ijk} \sim NID(0,\sigma^2)$, $i=1, ..., a$, $j = 1, ..., b$, $k = 1, ..., n_{ij}$, and $n_{ij} = n_{i\bullet} n_{\bullet j} / n_{\bullet\bullet}$. For proportional subclass numbers, it can be shown that $R(\mathbf{b}|\mu,\mathbf{a}) = R(\mathbf{b}|\mu) = \sum_{j=1}^{b} n_{\bullet j}(\bar{Y}_{\bullet j \bullet} - \bar{Y}_{\bullet\bullet\bullet})^2$ and $R(\mathbf{a}|\mu,\mathbf{b}) = R(\mathbf{a}|\mu) = \sum_{j=1}^{a} n_{i\bullet}(\bar{Y}_{i\bullet\bullet} - \bar{Y}_{\bullet\bullet\bullet})^2$. (You do not have to show this.)

(a) Report the null hypotheses associated with the F-tests based on each of the following sums of squares: $R(\mu)$, $R(\alpha|\mu) = R(\alpha|\mu,\beta)$, $R(\beta|\mu) = R(\beta|\mu,\alpha)$. $R(\gamma|\mu,\alpha,\beta)$. (This could be achieved by substituting $n_{ij} = (n_{i.}n_{.j})/n_{..}$ into the formulas presented in the lecture notes.

(b) In a study of battery performance, batteries make from three different materials (called material A, material B, and material C) were operated under three different temperatures. There were 10 batteries made from material A, 5 batteries made from material B, and 5 batteries made from material C. The batteries were randomly assigned to the temperatures in a proportional manner as shown in the following table. The lifetime (in hours) was measured for each battery. (Montgomery, 1991)

	Temperature (°F)		
Material	**15**	**70**	**125**
A	138 146 168 160	174 142 150 139	96 104
B	159 188	136 115	25
C	130 155	65 88	70

Use SAS or S-PLUS to convince yourself that Type I and Type II sums of squares are the same for these data, but Type III sums of squares are different (do not submit your numerical results for this exercise). Code is posted in the files batteries.sas and batteries.ssc on the course web page, and the data are posted as batteries.dat.

(i) Construct a profile plot of the estimated mean lifetimes versus temperature for the three materials (do not submit this plot). What does this plot indicate?

(ii) State the conclusions you can reach from F-tests computed from the Type III sums of squares.

(iii) How do the hypotheses associated with the F-tests based on Type II sums of squares differ from the hypotheses associated with F-tests based on Type III sums of squares?

(iv) Within each temperature level, perform an F-test of the null hypothesis that the mean lifetimes are the same for all three materials (use the pooled estimate of the error variance). If any F-test is significant, use t-tests to determine which materials have different mean lifetimes at that operating temperature. State your conclusions.

2. The following data come from an experiment in which female rat pups were given to foster mothers for nursing. Weight gains (in grams) were measured after 28 days. The two factors in this study are the genotype of the pup and the genotype of the foster mother.

Genotype of Litter	**Genotype of Foster Mother**			
	A	**F**	**I**	**J**
A	61.5 68.2 64.0 65.0 57.7	55.0 42.0 60.2	5.25 61.8 49.5 52.7	42.0 54.0 61.0 48.2 39.6
F	60.3 51.7 49.3 48.0	50.8 64.7 61.7 64.0 62.0	56.5 59.0 47.2 53.0	–
I	37.0 36.3 68.0	56.3 69.8 67.0	39.7 46.0 61.3 55.3 55.7	50.0 42.8 54.5
J	59.0 57.4 54.0 47.0	–	45.2 57.0 61.4	44.8 51.5 53.0 42.0 54.0

The data displayed in the previous table are posted in the file rats.dat on the course web page. Note that two combinations of genotypes for pups and foster mothers were not used in this study. Analyze these data. Briefly describe the graphs, tests or analyses that you used. Clearly summarize your results and conclusions.

4. Suppose the experiment in Problem 1 was actually done at six different veterinary clinics, with one dog randomly assigned to each of the 12 combinations of drug and induced disease at each clinic. The data are as follows:

		Clinic					
Drug	**Disease**	**k=1**	**k=2**	**k=3**	**k=4**	**k=5**	**k=6**
i=1	j=1	42	44	36	13	19	22
	2	33	-	33	-	21	26
	3	31	25	-	-3	24	25
i=2	j=1	42	-	28	13	23	24
	2	-	34	36	-	31	33
	3	26	28	32	3	3	16
i=3	j=1	-	-	29	1	-	19
	2	-	11	9	-6	1	7
	3	21	9	-	1	3	-
i=4	j=1	24	-	22	-2	9	15
	2	27	16	15	-5	12	12
	3	22	25	12	-	5	7

Consider a model that includes additive block effects to model the difference between clinics,

$$Y_{ijk} = \mu + \alpha_i + \beta_j + \gamma_{ij} + \tau_k + \varepsilon_{ijk}$$

where $\varepsilon_{ijk} \sim NID(0, \sigma^2)$ and Y_{ijk} is the observed change in systolic blood pressure for the dog subjected to the i-th drug and the j-th disease at the k-th clinic.

(a) The missing data results in partial confounding between the block (clinic) effects and the drug and disease effects. Consequently, it is prudent to examine drug and disease effects after adjusting for block effects. An ANOVA table based on Type I sums of squares is shown on the following pages. We also used the GLM procedure in SAS to compute estimable functions. Use this information to determine the null hypothesis for the F-tests corresponding to $R(\mathbf{t}|\mu)$, $R(\mathbf{b}|\mu,\mathbf{t})$, $R(\mathbf{a}|\mathbf{m}, \mathbf{t}, \mathbf{b})$, and $R(\mathbf{g}|\mu, \mathbf{t}, \mathbf{a}, \mathbf{b})$. Summarize the “useful” information, if any, provided by each test.

(b) An ANOVA table based on Type III sums of squares is also provided on the following pages along with descriptions of corresponding estimable functions. For each line in this ANOVA table, state the null hypothesis and summarize the "useful" information, if any, provided by the F-test.

(c) A second analysis was run where the combinations of drugs and induced disease were treated as a single factor with 12 levels. The ANOVA and t-tests for comparing means are attached. What does this analysis suggest?

NOTE: The analyses done in Problems 1 and 4 were based on the unstated assumption that data on some dogs were "missing at random". This means that responses that would have been observed if the dogs had not dropped out of the study are unrelated to reasons or mechanism for dropping out. If the "missing at random" assumption is not appropriate, the analyses in Problems 1 and 4 could produce biased results.

Type I Sums of Squares

Source of variation	DF	Type I SS	Mean Square	F Value	Pr > F
clinic	5	4634.8946	926.9789	41.99	<.0001
disease	2	663.9183	331.9591	15.04	<.0001
drug	3	2445.2049	815.0683	36.92	<.0001
drug*disease	6	517.2805	86.2134	3.91	0.0036
Residuals	41	905.1155	22.0760		
Corrected Total	57	9166.4138			

Type I Estimable Functions

Effect		Coefficients clinic	Coefficients disease
Intercept		0	
clinic	1	L2	
clinic	2	L3	
clinic	3	L4	
clinic	4	L5	
clinic	5	L6	
clinic	6	-L2-L3-L4-L5-L6	
disease	1	-0.0303*L2-0.2386*L3+0.0364*L4+0.0808*L5-0.0909*L6	L8
disease	2	-0.1414*L2+0.0114*L3+0.0364*L4-0.1414*L5	L9
disease	3	0.1717*L2+0.2273*L3-0.0727*L4+0.0606*L5+0.0909*L6	-L8-L9
drug	1	0.0606*L2-0.0227*L3-0.0727*L4-0.0505*L5	0.08*L8-0.0286*L9
drug	2	-0.0505*L2-0.0227*L3+0.0273*L4-0.0505*L5	-0.0444*L8-0.1034*L9
drug	3	-0.0707*L2+0.0682*L3+0.0182*L4+0.1515*L5	-0.0486*L8+0.065*L9
drug	4	0.0606*L2-0.0227*L3+0.0273*L4-0.0505*L5	0.013*L8+0.067*L9
drug*disease	1 1	0.0202*L2+0.0341*L3+0.0091*L4+0.0202*L5	0.336*L8+0.0076*L9
drug*disease	1 2	0.0202*L2-0.0909*L3+0.0091*L4-0.0909*L5	-0.0085*L8+0.2083*L9
drug*disease	1 3	0.0202*L2+0.0341*L3-0.0909*L4+0.0202*L5	-0.2474*L8-0.2444*L9
drug*disease	2 1	0.0202*L2-0.0909*L3+0.0091*L4+0.0202*L5	0.2612*L8+0.0012*L9
drug*disease	2 2	-0.0909*L2+0.0341*L3+0.0091*L4-0.0909*L5	0.0059*L8+0.2031*L9
drug*disease	2 3	0.0202*L2+0.0341*L3+0.0091*L4+0.0202*L5	-0.3116*L8-0.3078*L9
drug*disease	3 1	-0.0909*L2-0.0909*L3+0.0091*L4+0.0202*L5-0.0909*L6	0.1416*L8-0.0101*L9
drug*disease	3 2	-0.0909*L2+0.0341*L3+0.0091*L4+0.0202*L5	-0.0012*L8+0.262*L9
drug*disease	3 3	0.1111*L2+0.125*L3+0.1111*L5+0.0909*L6	-0.189*L8-0.1869*L9
drug*disease	4 1	0.0202*L2-0.0909*L3+0.0091*L4+0.0202*L5	0.2612*L8+0.0012*L9
drug*disease	4 2	0.0202*L2+0.0341*L3+0.0091*L4+0.0202*L5	0.0037*L8+0.3267*L9
drug*disease	4 3	0.0202*L2+0.0341*L3+0.0091*L4-0.0909*L5	-0.252*L8-0.2609*L9

Type I Estimable Functions

Effect		Coefficients: drug	Coefficients: drug*disease
Intercept		0	0
clinic	1	0	0
clinic	2	0	0
clinic	3	0	0
clinic	4	0	0
clinic	5	0	0
clinic	6	0	0
disease	1	0	0
disease	2	0	0
disease	3	0	0
drug	1	L11	0
drug	2	L12	0
drug	3	L13	0
drug	4	-L11-L12-L13	0
drug*disease	1 1	0.3748*L11-0.0058*L12+0.014*L13	L15
drug*disease	1 2	0.2951*L11+0.0271*L12+0.002*L13	L16
drug*disease	1 3	0.3301*L11-0.0214*L12-0.016*L13	-L15-L16
drug*disease	2 1	-0.0224*L11+0.3339*L12+0.0207*L13	L18
drug*disease	2 2	0.0242*L11+0.2893*L12-0.0101*L13	L19
drug*disease	2 3	-0.0018*L11+0.3767*L12-0.0106*L13	-L18-L19
drug*disease	3 1	-0.0139*L11-0.0083*L12+0.2594*L13	L21
drug*disease	3 2	0.0243*L11+0.024*L12+0.4052*L13	L22
drug*disease	3 3	-0.0104*L11-0.0157*L12+0.3354*L13	-L21-L22
drug*disease	4 1	-0.3385*L11-0.3199*L12-0.2941*L13	-L15-L18-L21
drug*disease	4 2	-0.3436*L11-0.3405*L12-0.3971*L13	-L16-L19-L22
drug*disease	4 3	-0.318*L11-0.3396*L12-0.3088*L13	L15+L16+L18+L19+L21+L22

Type III Sums of Squares

Source of variation	DF	Type III SS	Mean Square	F Value	Pr > F
clinic	5	4164.8678	832.9736	37.73	<.0001
disease	2	554.3784	277.1892	12.56	<.0001
drug	3	2405.7115	801.9038	36.32	<.0001
drug*disease	6	517.2805	86.2134	3.91	0.0036
Residuals	41	905.1155	22.0760		
Corrected Total	57	9166.4138			

Type III Estimable Functions

Effect		---Coefficients--- clinic	disease	drug
Intercept		0	0	0
clinic	1	L2	0	0
clinic	2	L3	0	0
clinic	3	L4	0	0
clinic	4	L5	0	0
clinic	5	L6	0	0
clinic	6	-L2-L3-L4-L5-L6	0	0
disease	1	0	L8	0
disease	2	0	L9	0
disease	3	0	-L8-L9	0
drug	1	0	0	L11
drug	2	0	0	L12
drug	3	0	0	L13
drug	4	0	0	-L11-L12-L13
drug*disease	1 1	0	0.25*L8	0.3333*L11
drug*disease	1 2	0	0.25*L9	0.3333*L11
drug*disease	1 3	0	-0.25*L8-0.25*L9	0.3333*L11
drug*disease	2 1	0	0.25*L8	0.3333*L12
drug*disease	2 2	0	0.25*L9	0.3333*L12
drug*disease	2 3	0	-0.25*L8-0.25*L9	0.3333*L12
drug*disease	3 1	0	0.25*L8	0.3333*L13
drug*disease	3 2	0	0.25*L9	0.3333*L13
drug*disease	3 3	0	-0.25*L8-0.25*L9	0.3333*L13
drug*disease	4 1	0	0.25*L8	-0.3333*L11-0.3333*L12-0.3333*L13
drug*disease	4 2	0	0.25*L9	-0.3333*L11-0.3333*L12-0.3333*L13
drug*disease	4 3	0	-0.25*L8-0.25*L9	-0.3333*L11-0.3333*L12-0.3333*L13

Type III Estimable Functions

Effect			-----Coefficients------ drug*disease
Intercept			0
clinic	1		0
clinic	2		0
clinic	3		0
clinic	4		0
clinic	5		0
clinic	6		0
disease	1		0
disease	2		0
disease	3		0
drug	1		0
drug	2		0
drug	3		0
drug	4		0
drug*disease	1	1	L15
drug*disease	1	2	L16
drug*disease	1	3	-L15-L16
drug*disease	2	1	L18
drug*disease	2	2	L19
drug*disease	2	3	-L18-L19
drug*disease	3	1	L21
drug*disease	3	2	L22
drug*disease	3	3	-L21-L22
drug*disease	4	1	-L15-L18-L21
drug*disease	4	2	-L16-L19-L22
drug*disease	4	3	L15+L16+L18+L19+L21+L22

ANOVA for part(c) of problem 4

Source of variation	DF	Type II SS	Mean Square	F Value	Pr > F
clinic	5	4164.8678	832.97357	37.73	<.0001
treatments	11	3626.4037	329.6731	14.93	<.0001
Error: MS(Error)	41	905.1155	22.0760		

Least Squares Means

Treatment Drug	Disease	Estimated Mean	Standard Error	Pr > |t|	treatment code
1	1	29.3333333	1.9181583	<.0001	1
1	2	25.8121385	2.3956015	<.0001	2
1	3	21.4760165	2.1198609	<.0001	3
2	1	27.2772728	2.1239696	<.0001	4
2	2	32.1845467	2.3940600	<.0001	5
2	3	18.0000000	1.9181583	<.0001	6
3	1	20.3336424	2.7895176	<.0001	7
3	2	6.5751994	2.1214789	0.0035	8
3	3	9.5342207	2.3918632	0.0003	9
4	1	14.8772728	2.1239696	<.0001	10
4	2	12.8333333	1.9181583	<.0001	11
4	3	10.9724380	2.1216886	<.0001	12

t-tests for H0: Mean(i)=Mean(j) / Pr > |t|

i/j	1	2	3	4	5	6
1		1.147375	2.748399	0.71842	-0.92943	4.177902
		0.2579	0.0089	0.4766	0.3581	0.0002
2	-1.14737		1.349379	-0.46188	-1.88848	2.54557
	0.2579		0.1846	0.6466	0.0661	0.0148
3	-2.7484	-1.34938		-1.92881	-3.3348	1.21587
	0.0089	0.1846		0.0607	0.0018	0.2310
4	-0.71842	0.461884	1.92881		-1.5256	3.241627
	0.4766	0.6466	0.0607		0.1348	0.0024
5	0.929427	1.888476	3.334798	1.5256		4.62382
	0.3581	0.0661	0.0018	0.1348		<.0001
6	-4.1779	-2.54557	-1.21587	-3.24163	-4.62382	
	0.0002	0.0148	0.2310	0.0024	<.0001	
7	-2.65841	-1.49111	-0.3238	-1.99668	-3.22223	0.689331
	0.0111	0.1436	0.7477	0.0525	0.0025	0.4945
8	-7.95719	-5.98352	-4.95873	-6.88033	-8.07288	-3.99459
	<.0001	<.0001	<.0001	<.0001	<.0001	0.0003
9	-6.45764	-4.76285	-3.76807	-5.52064	-6.63433	-2.76118
	<.0001	<.0001	0.0005	<.0001	<.0001	0.0086
10	-5.05118	-3.44722	-2.19396	-4.17284	-5.38058	-1.09113
	<.0001	0.0013	0.0340	0.0002	<.0001	0.2816
11	-6.08253	-4.22912	-3.02311	-5.04694	-6.30803	-1.90463
	<.0001	0.0001	0.0043	<.0001	<.0001	0.0639
12	-6.41939	-4.67484	-3.49558	-5.41857	-6.68718	-2.457
	<.0001	<.0001	0.0012	<.0001	<.0001	0.0183

	i/j	7	8	9	10	11
1	2.658406	7.957193	6.457642	5.051178	6.082533	6.419386
	0.0111	<.0001	<.0001	<.0001	<.0001	<.0001
2	1.491105	5.983522	4.762849	3.447218	4.229119	4.674844
	0.1436	<.0001	<.0001	0.0013	0.0001	<.0001
3	0.323797	4.958727	3.768068	2.19396	3.023111	3.495578
	0.7477	<.0001	0.0005	0.0340	0.0043	0.0012
4	1.996681	6.880332	5.520644	4.172839	5.046943	5.418569
	0.0525	<.0001	<.0001	0.0002	<.0001	<.0001
5	3.222225	8.072882	6.634331	5.38058	6.308029	6.687175
	0.0025	<.0001	<.0001	<.0001	<.0001	<.0001
6	-0.68933	3.994587	2.761183	1.091131	1.904632	2.456995
	0.4945	0.0003	0.0086	0.2816	0.0639	0.0183
7		3.953482	2.895704	1.56901	2.215506	2.651455
		0.0003	0.0060	0.1243	0.0323	0.0113
8	-3.95348		-0.92176	-2.75919	-2.1881	-1.46266
	0.0003		0.3620	0.0086	0.0344	0.1512
9	-2.8957	0.921763		-1.66246	-1.07603	-0.44809
	0.0060	0.3620		0.1040	0.2882	0.6564
10	-1.56901	2.759193	1.662458		0.714185	1.29769
	0.1243	0.0086	0.1040		0.4792	0.2016
11	-2.21551	2.188105	1.076032	-0.71419		0.650611
	0.0323	0.0344	0.2882	0.4792		0.5189
12	-2.65145	1.462657	0.448091	-1.29769	-0.65061	
	0.0113	0.1512	0.6564	0.2016	0.5189	