Chapter 14 Problems

1a.

Source	SS	df	MS	F
A at b_1	16.095	a-1=2	8.048	2.65
A at b_2	20.667	a-1=2	10.333	3.41 *
B at a_1	492.071	b-1=1	492.071	162.29 *
B at a_2	185.786	b-1=1	185.786	61.28 *
B at a_3	320.643	b-1=1	320.643	105.75 *
S/AB	109.143	N-ab=36	3.032	

*: $p < .05$; $F_{crit}(2,36) = 3.26$; $F_{crit}(1,36) = 4.12$; All SS are from SPSS output.

1b.

Source	R^2	df	MS	F
A at b_1	.015	a-1=2	.0075	2.73
A at b_2	.019	a-1=2	.0095	3.45 *
A at b_3	.444	b-1=1	.444	161.45 *
B at a_1	.168	b-1=1	.168	61.09 *
B at a_2	.289	b-1=1	.289	105.09 *
S/AB	.099	N-ab=36	.00275	

*: $p < .05$; $F_{crit}(2,36) = 3.26$; $F_{crit}(1,36) = 4.12$; All R^2 are from SPSS output.

Univariate Analysis of Variance - Omnibus Analysis

Descriptive Statistics

Dependent Variable: Number of errors

ANOVA code A -	ANOVA code	Mean	Std. Deviation	N
None	Adult	15.5714	2.07020	7
	Children	6.0000	1.73205	7
	Total	10.7857	5.29410	14
Praise	Adult	16.8571	1.86445	7
	Children	5.0000	1.41421	7
	Total	10.9286	6.35446	14
Reproof	Adult	14.4286	2.07020	7
	Children	7.1429	1.06904	7
	Total	10.7857	4.09838	14
Total	Adult	15.6190	2.15583	21
	Children	6.0476	1.62715	21
	Total	10.8333	5.19811	42

Tests of Between-Subjects Effects

Dependent Variable: Number of errors

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	998.690[a]	5	199.738	65.882	.000
Intercept	4929.167	1	4929.167	1625.851	.000
anova_a	.190	2	.095	.031	.969
anova_b	961.929	1	961.929	317.285	.000
anova_a * anova_b	36.571	2	18.286	6.031	.006
Error	109.143	36	3.032		
Total	6037.000	42			
Corrected Total	1107.833	41			

a. R Squared = .901 (Adjusted R Squared = .888)

Univariate Analysis of Variance - A at b1

Descriptive Statistics

Dependent Variable: Number of errors

ANOVA code A -	Mean	Std. Deviation	N
None	6.0000	1.73205	7
Praise	5.0000	1.41421	7
Reproof	7.1429	1.06904	7
Total	6.0476	1.62715	21

Tests of Between-Subjects Effects

Dependent Variable: Number of errors

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	16.095[a]	2	8.048	3.930	.038
Intercept	768.048	1	768.048	375.093	.000
anova_a	16.095	2	8.048	3.930	.038
Error	36.857	18	2.048		
Total	821.000	21			
Corrected Total	52.952	20			

a. R Squared = .304 (Adjusted R Squared = .227)

Univariate Analysis of Variance - A at b2

Descriptive Statistics

Dependent Variable: Number of errors

ANOVA code A -	Mean	Std. Deviation	N
None	15.5714	2.07020	7
Praise	16.8571	1.86445	7
Reproof	14.4286	2.07020	7
Total	15.6190	2.15583	21

Tests of Between-Subjects Effects

Dependent Variable: Number of errors

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	20.667[a]	2	10.333	2.573	.104
Intercept	5123.048	1	5123.048	1275.700	.000
anova_a	20.667	2	10.333	2.573	.104
Error	72.286	18	4.016		
Total	5216.000	21			
Corrected Total	92.952	20			

a. R Squared = .222 (Adjusted R Squared = .136)

Univariate Analysis of Variance - B at a1

Descriptive Statistics

Dependent Variable: Number of errors

ANOVA code	Mean	Std. Deviation	N
Adult	16.8571	1.86445	7
Children	5.0000	1.41421	7
Total	10.9286	6.35446	14

Tests of Between-Subjects Effects

Dependent Variable: Number of errors

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	492.071[a]	1	492.071	179.713	.000
Intercept	1672.071	1	1672.071	610.670	.000
anova_b	492.071	1	492.071	179.713	.000
Error	32.857	12	2.738		
Total	2197.000	14			
Corrected Total	524.929	13			

a. R Squared = .937 (Adjusted R Squared = .932)

Univariate Analysis of Variance - B at a2

Descriptive Statistics

Dependent Variable: Number of errors

ANOVA code	Mean	Std. Deviation	N
Adult	14.4286	2.07020	7
Children	7.1429	1.06904	7
Total	10.7857	4.09838	14

Tests of Between-Subjects Effects

Dependent Variable: Number of errors

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	185.786[a]	1	185.786	68.447	.000
Intercept	1628.643	1	1628.643	600.026	.000
anova_b	185.786	1	185.786	68.447	.000
Error	32.571	12	2.714		
Total	1847.000	14			
Corrected Total	218.357	13			

a. R Squared = .851 (Adjusted R Squared = .838)

Univariate Analysis of Variance - B at a3

Descriptive Statistics

Dependent Variable: Number of errors

ANOVA code	Mean	Std. Deviation	N
Adult	15.5714	2.07020	7
Children	6.0000	1.73205	7
Total	10.7857	5.29410	14

Tests of Between-Subjects Effects

Dependent Variable: Number of errors

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	320.643[a]	1	320.643	88.020	.000
Intercept	1628.643	1	1628.643	447.078	.000
anova_b	320.643	1	320.643	88.020	.000
Error	43.714	12	3.643		
Total	1993.000	14			
Corrected Total	364.357	13			

a. R Squared = .880 (Adjusted R Squared = .870)

Regression - Omnibus Analysis

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.949[a]	.901	.888	1.74119

a. Predictors: (Constant), Effect code - Interaction A2*B1, Effect code - Factor B code 1, Effect code - Factor A code 2, Effect code - Interaction A1*B1, Effect code - Factor A code 1

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	998.690	5	199.738	65.882	.000[a]
	Residual	109.143	36	3.032		
	Total	1107.833	41			

a. Predictors: (Constant), Effect code - Interaction A2*B1, Effect code - Factor B code 1, Effect code - Factor A code 2, Effect code - Interaction A1*B1, Effect code - Factor A code 1

b. Dependent Variable: Number of errors

Regression - A at b1

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.121[a]	.015	-.036	5.29087

a. Predictors: (Constant), Simple effect code - A at b1 (2), Simple effect code - A at b1 (1)

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.095	2	8.048	.287	.752[a]
	Residual	1091.738	39	27.993		
	Total	1107.833	41			

a. Predictors: (Constant), Simple effect code - A at b1 (2), Simple effect code - A at b1 (1)

b. Dependent Variable: Number of errors

Regression - A at b2

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.137[a]	.019	-.032	5.27978

a. Predictors: (Constant), Simple effect code - A at b2 (2), Simple effect code - A at b2 (1)

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	20.667	2	10.333	.371	.693[a]
	Residual	1087.167	39	27.876		
	Total	1107.833	41			

a. Predictors: (Constant), Simple effect code - A at b2 (2), Simple effect code - A at b2 (1)

b. Dependent Variable: Number of errors

Regression - B at a1

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.666[a]	.444	.430	3.92352

a. Predictors: (Constant), Simple effect code - B at a1

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	492.071	1	492.071	31.965	.000[a]
	Residual	615.762	40	15.394		
	Total	1107.833	41			

a. Predictors: (Constant), Simple effect code - B at a1

b. Dependent Variable: Number of errors

Regression - B at a2

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.410[a]	.168	.147	4.80117

a. Predictors: (Constant), Simple effect code - B at a2

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	185.786	1	185.786	8.060	.007[a]
	Residual	922.048	40	23.051		
	Total	1107.833	41			

a. Predictors: (Constant), Simple effect code - B at a2

b. Dependent Variable: Number of errors

Regression - B at a3

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.538[a]	.289	.272	4.43619

a. Predictors: (Constant), Simple effect code - B at a3

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	320.643	1	320.643	16.293	.000[a]
	Residual	787.190	40	19.680		
	Total	1107.833	41			

a. Predictors: (Constant), Simple effect code - B at a3

b. Dependent Variable: Number of errors