

## Chapter 24 Problems

1a.  $s_h = a / \sum (1/s_a) = 3 / (1/6 + 1/7 + 1/7) = 6.63$

	$\bar{a}_1$	$\bar{a}_2$	$\bar{a}_3$
Group means:	4.83	2.14	6.00

	$A_1^*$	$A_2^*$	$A_3^*$	$T^*$
Adjusted group sums:	32.05	47.37	39.79	119.21

$$[A^*] = \sum (A^*)^2 / s_h = 4854.34 / 6.63 = 732.00$$

$$[T^*] = (T^*)^2 / [(a)(s_h)] = 14211.15 / (3 \cdot 6.63) = 714.32$$

Source	SS	df	MS	F
A $[A^*] - [T^*] = 17.69$	17.69	$a - 1 = 2$	8.84	4.21*
S/A $\sum (y_{aj} - \bar{y}_a)^2 = 35.69$	35.69	$N - a = 17$	2.10	

\*:  $p < .05$ ;  $F_{crit}(2, 17) = 3.59$

1b. From SPSS output:

Source	SS	df	MS	F
A	17.26	2	8.63	4.11*
S/A	35.69	17	2.10	

\*:  $p < .05$ ;  $F_{crit}(2, 17) = 3.59$

1c. From SPSS output:

Source	$R^2$	df	$\bar{R}^2$	F
A	.326	$a - 1 = 2$	.163	4.12*
S/A	$1 - .326 = .674$	$N - a = 17$	.0396	

\*:  $p < .05$ ;  $F_{crit}(2, 17) = 3.59$

$$2a. s_h = a / \sum(s_a) = 6 / (1/6 + 1/7 + 1/7 + 1/7 + 1/7 + 1/7) = 6.81$$

Treatment means:	$a_1$	$a_2$	$a_3$
$b_1$	4.83	7.14	6.00
$b_2$	16.86	14.43	15.57

Adjusted sums:	$a_1$	$a_2$	$a_3$	B
$b_1$	32.92	48.65	40.86	122.43
$b_2$	114.81	98.27	106.05	319.14
A	147.73	146.92	146.92	441.57

$$[T^*] = (T^*)^2 / [(a)(b)(s_h)] = 194981.92 / (3 \cdot 2 \cdot 6.81) = 4771.38$$

$$[A^*] = \sum(A^*)^2 / [(b)(s_h)] = 64994.41 / (2 \cdot 6.81) = 4771.42$$

$$[B^*] = \sum(B^*)^2 / [(a)(s_h)] = 116836.93 / (3 \cdot 6.81) = 5718.21$$

$$[AB^*] = \sum(AB^*)^2 / s_h = 39206.31 / 6.81 = 5756.48$$

Source	SS	df	MS	F
A	$[A^*] - [T^*] = 0.03$	$a-1 = 2$	0.02	0.01
B	$[B^*] - [T^*] = 946.83$	$b-1 = 1$	946.83	306.91*
A x B	$[AB^*] - [A^*] - [B^*] + [T^*] = 38.24$	$(a-1)(b-1) = 2$	19.12	6.20*
S/AB	$\sum(Y - \bar{y}_{ab})^2 = 107.98$	$N - ab = 35$		

$$* p < .05; F_{crit}(2, 35) = 3.32; F_{crit}(1, 35) = 4.17$$

2b. From SPSS output:

Source	$R^2$	df	$\bar{R}^2$	F
A	$R^2_{Y,A,B,AB} - R^2_{Y,B,AB} = .000$	$a-1 = 2$	.000	0.00
B	$R^2_{Y,A,B,AB} - R^2_{Y,A,AB} = .874$	$b-1 = 1$	.874	305.59*
A x B	$R^2_{Y,A,B,AB} - R^2_{Y,A,B} = .035$	$(a-1)(b-1) = 2$	.0175	6.12*
S/AB	$1 - R^2_{Y,A,B,AB} = .100$	$N - ab = 35$	.00286	

$$* p < .05; F_{crit}(2, 35) = 3.32; F_{crit}(1, 35) = 4.17$$

# Univariate Analysis of Variance - Weighted Means

## Descriptive Statistics

Dependent Variable: Number of errors

ANOVA code	Mean	Std. Deviation	N
None	6.0000	1.73205	7
Praise	4.8333	1.47196	6
Reproof	7.1429	1.06904	7
Total	6.0500	1.66938	20

## Tests of Between-Subjects Effects

Dependent Variable: Number of errors

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	17.260 <sup>a</sup>	2	8.630	4.111	.035
Intercept	714.317	1	714.317	340.242	.000
anova	17.260	2	8.630	4.111	.035
Error	35.690	17	2.099		
Total	785.000	20			
Corrected Total	52.950	19			

a. R Squared = .326 (Adjusted R Squared = .247)

## Regression

### Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.571 <sup>a</sup>	.326	.247	1.44894

a. Predictors: (Constant), a2, a1

### ANOVA<sup>b</sup>

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	17.260	2	8.630	4.111	.035 <sup>a</sup>
	Residual	35.690	17	2.099		
	Total	52.950	19			

a. Predictors: (Constant), a2, a1

b. Dependent Variable: Number of errors

## Regression - Effect of A

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.949 <sup>a</sup>	.900	.892	1.70854
2	.949 <sup>b</sup>	.900	.886	1.75643

**Model Summary**

Model	Change Statistics				
	R Square Change	F Change	df1	df2	Sig. F Change
1	.900	111.437	3	37	.000
2	.000	.005	2	35	.995

a. Predictors: (Constant), a2b1, b1, a1b1

b. Predictors: (Constant), a2b1, b1, a1b1, a2, a1

## Regression - Effect of B

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.164 <sup>a</sup>	.027	-.081	5.41296
2	.949 <sup>b</sup>	.900	.886	1.75643

**Model Summary**

Model	Change Statistics				
	R Square Change	F Change	df1	df2	Sig. F Change
1	.027	.248	4	36	.909
2	.874	306.910	1	35	.000

a. Predictors: (Constant), a2b1, a2, a1b1, a1

b. Predictors: (Constant), a2b1, a2, a1b1, a1, b1

## Regression - Effect of A x B

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.930 <sup>a</sup>	.866	.855	1.98434
2	.949 <sup>b</sup>	.900	.886	1.75643

**Model Summary**

Model	Change Statistics				
	R Square Change	F Change	df1	df2	Sig. F Change
1	.866	79.423	3	37	.000
2	.035	6.113	2	35	.005

a. Predictors: (Constant), b1, a2, a1

b. Predictors: (Constant), b1, a2, a1, a2b1, a1b1

## Regression - R-squared MAX

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.949 <sup>a</sup>	.900	.886	1.75643

**Model Summary**

Model	Change Statistics				
	R Square Change	F Change	df1	df2	Sig. F Change
1	.900	63.268	5	35	.000

a. Predictors: (Constant), a2b1, a2, b1, a1b1, a1