Practice Problem Solutions

Problems 1 through 4.

Type of Shape

Triangle		**Pentagon**		**Octagon**		**Dodecagon**	
X_1	X_1^2	X_2	X_2^2	X_3	X_3^2	X_4	X_4^2

$\sum X_1 = 9 \qquad \sum X_2 = 19 \qquad \sum X_3 = 25 \qquad \sum X_4 = 35$

$\sum X_1^2 = 15 \qquad \sum X_2^2 = 63 \qquad \sum X_3^2 = 111 \qquad \sum X_4^2 = 207$

1. $Ho: \ \mu_1 - \mu_2 - \mu_3 - \mu_4 = 0$
   $H_1: \ \mu_1 - \mu_2 - \mu_3 - \mu_4 \neq 0$

2. a & b) $SS_{bg} = \left[\frac{(9)^2}{6} + \frac{(19)^2}{6} + \frac{(25)^2}{6} + \frac{(35)^2}{6}\right] - \left[\frac{(9+19+25+35)^2}{24}\right] = 59.33$

$SS_{wg} = [15 + 63 + 111 + 207] - \left[\frac{(9)^2}{6} + \frac{(19)^2}{6} + \frac{(25)^2}{6} + \frac{(35)^2}{6}\right] = 14.00$

$SS_{TOT} = 59.33 + 14.00 = 73.33$

c) $df_{bg} = 4 - 1 = 3$ $df_{wg} = (6\text{-}1) + (6\text{-}1) + (6\text{-}1) + (6\text{-}1) = 20$ $df_{TOT} = 24 - 1 = 23$

d) $\text{MS}_{wg} = \frac{59.33}{3} = 19.778$ $\text{MS}_{bg} = \frac{14.00}{20} = 0.70$ e) $\text{F} = \frac{59.33}{14.00} = 28.254$

Source Table for Shape of Object Data					
Source	Sums of Squares	*df*	Mean Square	F	*p*
Between	59.33	3	19.778	28.254	< .05
Within	14.00	20	0.700		
Total	73.33	23			

f) Critical value for $F_{(3, 20)} = 3.10$ $\alpha = .05$ Reject the null hypothesis.

3. $\text{HSD} = 3.96 \cdot \sqrt{\frac{.70}{6}} = 1.353$

$\bar{X}_1 = 1.50$ $\bar{X}_2 = 3.167$ $\bar{X}_3 = 4.167$ $\bar{X}_4 = 5.833$

$S_1 = .548$ $S_2 = .753$ $S_3 = 1.169$ $S_4 = .753$

Triangle 1.50 – Pentagon 3.167 = 1.667 **
Triangle 1.50 – Octagon 4.167 = 2.667 **
Triangle 1.50 – Dodecagon 5.833 = 4.333**
Pentagon 3.167 – Octagon 4.167 = 1.00
Pentagon 3.167 – Dodecagon 5.833 = 2.666**
Octagon 4.167 – Dodecagon 5.833 = 1.666**

4. Results indicate that a significantly different number of fixations are required depending on the shape. A Tukey HSD post-hoc analysis reveals that all conditions significantly differed from each other with the exception of the pentagon/octagon. The highest number of fixations is required for the decadagon while the lowest number of fixations is required for the triangle.

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Problems 5 through 8.

Dosage condition

A		**B**		**C**	
X_1	X_1^2	X_2	X_2^2	X_3	X_3^2

$\sum X_1 = 105$ $\sum X_2 = 74$ $\sum X_3 = 33$

$\sum X_1^2 = 2263$ $\sum X_2^2 = 1110$ $\sum X_3^2 = 235$

5. $Ho: \mu_1 - \mu_2 - \mu_3 = 0$
$H_1: \mu_1 - \mu_2 - \mu_3 \neq 0$

6. a & b) $SS_{bg} = \left[\frac{(105)^2}{5} + \frac{(74)^2}{5} + \frac{(33)^2}{5}\right] - \left[\frac{(105+74+33)^2}{15}\right] = 521.733$

$SS_{wg} = \left[2263 + 1110 + 235\right] - \left[\frac{(105)^2}{5} + \frac{(74)^2}{5} + \frac{(33)^2}{5}\right] = 90.00$

$SS_{total} = 521.733 + 90.00 = 611.733$

c) df_{bg} = 3 - 1 = 2 df_{wg} = (5 - 1) + (5 - 1) + (5 - 1) = 12 df_{total} = 15 -1 = 14

d) $MS_{bg} = \frac{521.733}{2} = 260.867$ $MS_{wg} = \frac{90}{12} = 7.50$

Source Table for Dosage Data					
Source	Sums of Squares	*df*	Mean Square	F	*p*
Between	521.733	2	260.867	34.782	< .05
Within	90.000	12	7.50		
Total	611.733	14			

e) $F = \frac{260.867}{7.5} = 34.782$ f) Critical value $F_{(2, 12)}$ = 3.89 alpha = .05

Reject the null hypothesis

7. $\text{HSD} = 3.77 \cdot \sqrt{\frac{7.50}{5}} = 4.617$

$\bar{X}_1 = 21.00$ $\bar{X}_2 = 14.8$ $\bar{X}_3 = 6.60$

$S_1 = 3.808$ $S_2 = 1.924$ $S_3 = 1707$

Dosage A 21.00 – Dosage B 14.8 = 6.20 **
Dosage A 21.00 - Dosage C 6.60 = 14.40 **
Dosage B 14.8 - Dosage C 6.60 = 8.20**

8. There are significant differences in the average number of expressed delusions as a function of the dosage condition. A HSD post-hoc analysis reveals all conditions differed significantly from each other. However, patients taking Dosage C expressed the least number of delusions followed by those taking Dosage B and Dosage A.