Math 107 – Test 5
April 27, 2007
(101 points)

Pledged KEY

25 pts **1.** A survey is taken in 3 cities to determine soft drink preferences. The results are given below. At $\alpha = .05$, test the claim that the proportion who prefer Coke is the same in each city.

	City A		City B		City C	
Coke	45	(56)	60	(56)	63	(56)
Pepsi	55	(44)	40	(44)	37	(44)

Check the assumptions $E \geq 5$ for each entry in table

Null Hypothesis $p_A = p_B = p_C$

Test Statistic $\chi^2 = 7.55$

$$\chi^2 = \frac{(45-56)^2}{56} + \frac{(60-56)^2}{56} + \frac{(63-56)^2}{56}$$
$$+ \frac{(55-44)^2}{44} + \frac{(40-44)^2}{44} + \frac{(37-44)^2}{44} \approx 7.55$$

Critical Value $\chi^2_{crit} = 5.991$

Decision Reject H_0 since $7.55 > 5.991$.

Statement: There is sufficient evidence to reject the claim that the proportion who prefer Coke is the same in each city.

25 pts **2.** Prices (in dollars) of women's, men's and children's athletic shoes are shown below. Test the claim that there is a difference in athletic shoe prices using the Kruskal-Wallis test with $\alpha = .05$.

Women's		Men's		Children's	
36	(1.5)	40	(4)	36	(1.5)
44	(6)	48	(9.5)	40	(4)
48	(9.5)	59	(14.5)	40	(4)
49	(11)	65	(16)	45	(7)
50	(12)	66	(17)	46	(8)
59	(14.5)	70	(18)	56	(13)
$R_1 = 54.5$		$R_2 = 79$		$R_3 = 37.5$	

Check the assumptions $n_1, n_2, n_3 = 6 \geq 5$

Null Hypothesis There is no difference in athletic shoe prices.

Test Statistic $H = 5.09$

$$H = \frac{12}{18(19)}\left(\frac{54.5^2}{6} + \frac{79^2}{6} + \frac{37.5^2}{6}\right) - 3(19)$$

$$\approx$$

Critical Value $\chi^2_{crit} = 5.991$

Decision Fail to reject H_0 since $5.09 < 5.991$.

Statement: There is not enough evidence to support the claim that there is a difference in athletic shoe prices.

Why is it inappropriate to follow this test with pairwise Wilcoxon tests?

Sample sizes are less than 10.

or Failed to reject H_0.

25 pts **3.** Using the ANOVA test with $\alpha = .05$, test the claim that there is a difference in the mean prices of the 3 types of athletic shoes.

Women's (1)	Men's (2)	Children's (3)
36	40	36
44	48	40
48	59	40
49	65	45
50	66	46
59	70	56

What are the assumptions for this test? (Do not check them yourself.)

Populations are normal or approximately normal; independent samples; population variances are equal.

Null Hypothesis $\mu_1 = \mu_2 = \mu_3$

Test Statistic $F_{test} = 3.99$

Show the ANOVA table:

Source	SS	d.f.	MS	F
Between	644.33	2	322.17	3.99
Within	1212.17	15	80.81	
Total	1856.50	17		

Critical Value $F_{crit} = 3.68$

Decision Reject H_0 since $3.99 > 3.68$.

Statement: There is enough evidence to support the claim that there is a difference in the mean prices of the 3 types of athletic shoes.

20 pts **4.** Do pairwise Scheffé tests to determine where the difference in shoe prices lies.

Critical Value for the Scheffé Test $F' = 2 \times 3.68 = 7.36$

Test Statistic comparing Women's and Men's is $F_s = 3.96$. Decision Fail to reject $\mu_1 = \mu_2$

Test Statistic comparing Men's and Children's is $F_s = 7.45$. Decision Reject $\mu_2 = \mu_3$

Test Statistic for Women's and Children's: $F_s =$ .55 Decision Fail to reject $\mu_1 = \mu_3$

$\bar{x}_1 = 47.67 \quad \bar{x}_3 = 43.83$

$$F_s = \frac{(47.67 - 43.83)^2}{\underbrace{80.81}_{s_w^2}\left(\frac{1}{6} + \frac{1}{6}\right)} \approx .547$$

Overall statement: There is a difference in the mean prices of athletic shoes for men versus children. However, there is not a significant difference in the mean prices for athletic shoes between men and women, and between women and children.

6 pts **5. Fill-in-the-blank.**

The correlation coefficient has values in the interval $[-1, 1]$.

When the correlation is not significant, the best predictor of y is $\bar{y}$.

When correlation is due to an unknown third variable, that variable is called a lurking variable.