

KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICAL SCIENCES
DHAHRAN, SAUDI ARABIA

STAT 212: BUSINESS STATISTICS II

Semester 061

Second Major Exam **A (SOLUTIONS)**

Tuesday November 7, 2006

6:00 pm – 7:15 pm

Please **circle** your instructor's name:

Marwan Al-Momani

Raid Anabosi

Name:

ID#:

Section:

Serial:

Question No	Full Marks	Marks Obtained
1	10	
2	10	
3	12	
4	13	
Total	45	

Q1. A sample of eight earnings per share estimates for 1998 is shown below:

Company	AT&T	Caterpillar	Kodak	Exxon	hp	IBM	McDonalds	Wal-Mart
Estimated Earnings per Share	2.92	4.65	4.27	3.09	3.57	7.04	2.64	1.74

Based on 10% significance level, do the data provide sufficient evidence to conclude that the standard deviation, in the earnings per share estimates, exceeds 1.5?

The hypotheses: $H_0: \sigma^2 \leq (1.5)^2 = 2.25$ $H_A: \sigma^2 > (1.5)^2 = 2.25$	② pts
The assumption: population is normally distributed.	① pt
The test statistic: $\bar{x} = \frac{\sum x_i}{n} = \frac{29.92}{8} = 3.74, \quad S^2 = \frac{\sum (x_i - \bar{x})^2}{n-1} = 2.6190$ $\chi_c^2 = \frac{(n-1)S^2}{\sigma_0^2} = \frac{(8-1)(2.6190)}{2.25}$ $= 8.1480$	① ② ③ pts
The critical value: $\chi_{\alpha, n-1}^2 = \chi_{.10, 7}^2 = 12.0170$	① pt
The decision rule & decision: Reject H_0 if $\chi_c^2 > \chi_{\alpha, n-1}^2$ $8.1480 \not> 12.0170$ \therefore Do NOT reject H_0	② pts
Conclusion: Based on the sample data, there is no sufficient evidence to conclude that the standard deviation in the earnings per share estimates exceeds 1.5.	

Q2. Media Matrix and Jupiter Communications gathered data on the time adults and the time teens spend online during a month. The study concluded that on average, adults spend more time online than teens. Assume that a follow-up study sampled 25 adults and 31 teens. The standard deviations of the time online during a month were 94 minutes for adults and 58 minutes for teens. Do the sample results support the conclusion that adults have greater variation in online time than teens? Use a 1% significance level.

Adults $\rightarrow n_1$ Teens $\rightarrow n_2$

The hypotheses: $H_0: \sigma_1^2 \leq \sigma_2^2$ ($\sigma_1^2 - \sigma_2^2 \leq 0$) $H_A: \sigma_1^2 > \sigma_2^2$ ($\sigma_1^2 - \sigma_2^2 > 0$) ② pts

The assumptions: 1. The two populations are normally distributed.
2. The two sample variances are independent. ② pts

The test statistic:

$$F_c = \frac{S_1^2}{S_2^2} = \frac{(94)^2}{(58)^2}$$

$$= \frac{8836}{3364}$$

$$= 2.6266$$

② pts

The critical value:

$$F_{\alpha, n_1-1, n_2-1} = F_{0.01, 24, 30} = 2.409 \quad \} \quad ① \text{ pt}$$

The decision rule & decision:

$$\text{Reject } H_0 \text{ if } F_c > F_{\alpha, n_1-1, n_2-1}$$

$$2.6266 > 2.409 \quad \checkmark$$

$$\therefore \text{Reject } H_0$$

② pts

Conclusion:

Based on the sample data, adults have greater variation in online time than teens. ① pt

Q3. Consumer panel preferences for three proposed displays follow:

Display type	A	B	C	Total
Number of preferences	43	53	39	135

Test that there are no differences in the preferences among the three types of displays, using a 2.5% level of significance.

OR: Types of displays are uniformly distributed H_A : Not uniformly distributed

The hypotheses: H_0 : There are no differences among the three types of displays H_A : There are differences among the three types of displays (2 pts)

The assumption: $e_i \geq 5$ } (1 pt)

The test statistic:

$$e_1 = \frac{135}{3} = 45 = e_2 = e_3 \rightarrow (2 \text{ pts})$$

$$\chi_c^2 = \sum_{i=1}^k \frac{(o_i - e_i)^2}{e_i} = \frac{(43-45)^2}{45} + \frac{(53-45)^2}{45} + \frac{(39-45)^2}{45}$$

$$= 0.0889 + 1.4222 + 0.8000 \quad (3 \text{ pts})$$

$$= 2.3111$$

The critical value:

$$\chi_{\alpha, k-1}^2 = \chi_{0.025, 2}^2 = 7.3778 \quad (1 \text{ pt})$$

The decision rule & decision:

$$\text{Reject } H_0 \text{ if } \chi_c^2 > \chi_{\alpha, k-1}^2$$

$$2.3111 \not> 7.3778$$

$$\therefore \text{DO NOT reject } H_0 \quad (2 \text{ pts})$$

Conclusion:

There are no differences among the three types of displays (1 pt)

OR: Types of displays are uniformly distributed.

Q4. A study of educational levels of voters and their political party affiliations yielded the following results

Party Affiliation	Educational Level			
	Less than High School	High School Degree	College Degree	
Democratic	40 (30)	30 (32.5)	30 (37.5)	100
Republican	20 (30)	35 (32.5)	45 (37.5)	100
	60	65	75	200

③ pts
for e_{ij}

Using a 5% level of significance, do you think that the Educational Level and the Party Affiliation are not related to each other?

The hypotheses: H_0 : Educational Level and the Party Affiliation are independent.
 H_A : Educational Level and the Party Affiliation are not independent

② pts

The assumption: $e_{ij} \geq 5$

① pt

The test statistic:

$$\chi_c^2 = \sum_{i=1}^r \sum_{j=1}^c \frac{(O_{ij} - e_{ij})^2}{e_{ij}}$$

$$= \frac{(40-30)^2}{30} + \frac{(30-32.5)^2}{32.5} + \frac{(30-37.5)^2}{37.5} + \frac{(20-30)^2}{30} + \frac{(35-32.5)^2}{32.5} + \frac{(45-37.5)^2}{37.5}$$

$$= 3.3333 + 0.1923 + 1.500 + 3.3333 + 0.1923 + 1.5000$$

$$= 10.0512.$$

③ pts

The critical value:

$$\chi_{\alpha, (r-1)(c-1)}^2 = \chi_{0.05, (2-1)(3-1)}^2 = \chi_{0.05, 2}^2 = 5.9915$$

① pt

The decision rule & decision:

$$\text{Reject } H_0 \text{ if } \chi_c^2 > \chi_{\alpha, (r-1)(c-1)}^2$$

$$10.0512 > 5.9915 \checkmark$$

$$\therefore \text{Reject } H_0$$

② pts

Conclusion:

The educational level and the party affiliation are NOT indep.

① pt

With Our Best Wishes