KING FAHD UNIVERSITY OF PETROLEUM & MINERALS

DEPARTMENT OF MATHEMATICS & STATISTICS

DHAHRAN, SAUDI ARABIA

STAT 212: BUSINESS STATISTICS II

Semester 111
Major Two
Wednesday Nov 23, 2011
Allowed time 110 minutes

Please **circle** your:

Instructor	**section number**	
Musawar Malik	Sec 3: (9:00 –9:50)	
Mohammad Saleh	Sec 4: (10:00 – 10:50)	Sec 5 : (11:00 – 11:50)

Name: Student ID#: Serial #:

Directions:

1) You must **show all work** to obtain full credit for questions on this exam.
2) **DO NOT round** your answers at each step. Round answers only if necessary at **your final step to 4 decimal places**.

Question No	Full Marks	Marks Obtained
Q1	20	
Q2	10	
Q3	10	
Q4	20	
Q5	10	
Total	60	

Question One (20 points)

According to an article in Marketing News, fewer checks are being written at grocery store checkout stands than in the past. To determine whether there is a difference in the proportion of shoppers who pay by check among three consecutive years at a 0.05 level of significance, the results of a survey of 500 shoppers in three consecutive years are obtained and presented below.

	Year		
Check Written	Year 1	Year 2	Year 3
Yes	225	175	125
No	275	325	375

1. Is there evidence of a significant difference in the proportion of shoppers who pay by check among three consecutive years? What is the correct conclusion?

2. What the assumptions needed to perform the test? Are the assumptions satisfied?

3. If appropriate, use the Marascuilo procedure and $\alpha = 0.05$ to determine which proportions years are different. Discuss your results.

Question Two (10 points):

The director of the MBA program of a state university wanted to know if a one week orientation would change the proportion among potential incoming students who would perceive the program as being good. Given below is the result from 215 students' view of the program before and after the orientation.

	After the Orientation	
Before the Orientation	Good	Not Good
Good	93	37
Not Good	71	14

What should be the director's conclusion?

Question Three (2 each = 10 points):

A large national bank charges local companies for using their services. A bank official reported the results of a regression analysis designed to predict the bank's charges (Y) -- measured in dollars per month -- for services rendered to local companies. One independent variable used to predict service charge to a company is the company's sales revenue (X) -- measured in millions of dollars. Data for 21 companies who use the bank's services were used to fit the model:

$$E(Y) = \beta_0 + \beta_1 X$$

The results of the simple linear regression are provided below.

$$\hat{y} = -2,700 + 20X \text{ , } S_\varepsilon = 65, \text{ two-tailed } p \text{ value} = 0.034 \text{ (for testing } \beta_1)$$

1. Interpret the estimate of β_0, the Y-intercept of the line.

2. Interpret the estimate of β_1, the Y-intercept of the line.

3. Interpret the estimate of σ, the standard deviation of the random error term (standard error of the estimate) in the model.

4. Interpret the p-value for testing whether β_1 exceeds 0.

5. A 95% confidence interval for β_1 is (15, 30). Interpret the interval.

Question four (2+3+2+2+2+9=20 points):

A candy bar manufacturer is interested in trying to estimate how sales are influenced by the price of their product. To do this, the company randomly chooses 6 small cities and offers the candy bar at different prices. Using candy bar sales as the dependent variable, the company will conduct a simple linear regression on the data below:

City	River Falls	Hudson	Ellsworth	Prescott	Rock Elm	Stillwater
Price ($)	1.3	1.6	1.8	2	2.4	2.9
Sales	100	90	90	40	38	32

You may use the following information's

$\Sigma x = 12, \Sigma y = 390, \Sigma xy = 700, \Sigma x^2 = 25.66, \Sigma y^2 = 30268$

1. What is the estimated average change in the sales of the candy bar if price goes up by $1.00?

2. If the price of the candy bar is set at $2, then estimate the average sales.

3. What percentage of the total variation in candy bar sales is explained by prices?

4. What is the standard error of the estimate for the data?

5. What is the standard error of the regression slope estimate, S_{b_1} ?

6. Test whether a change in price will have any impact on average sales? Use $\alpha = 0.05$.

Question five (10 points):

Part a) Choose the correct answer

1. If an estimated regression line has a *y*-intercept of 10 and a slope of 4, then when $x = 2$ the actual value of *y* is:
- **a.** 18.
- **b.** 15.
- **c.** 10.
- **d.** Unknown.

2. Which value of the coefficient of correlation *r* indicates a stronger correlation than 0.65?
- **a.** 0.55.
- **b.** – 0.75.
- **c.** 0.60.
- **d.** – 0.45.

3. If the coefficient of determination is 0.975, then the slope of the regression line:
- **a.** must be positive.
- **b.** must be negative.
- **c.** could be either positive or negative.
- **d.** None of the above answers if correct.

4. Which of the following statistics and procedures can be used to determine whether a linear model should be employed?
- **a.** The standard error of estimate
- **b.** The coefficient of determination
- **c.** The *t*-test of the slope
- **d.** All of the above are correct answers.

5. The Pearson coefficient of correlation *r* equals 1 when there is no:
- **a.** explained variation
- **b.** unexplained variation
- **c.** *y*-intercept in the model
- **d.** outliers

Part b) which of the following true and which false?

1. In testing the difference between two proportions using the normal distribution, we may use either a one-tailed Chi-square test or two-tailed *Z* test.

2. The squared difference between the observed and theoretical frequencies should be large if there is no significant difference between the proportions.

3. A test for the difference between two proportions can be performed using the chi-square distribution.

4. A test for whether one proportion is higher than the other can be performed using the chi-square distribution.

5. When using the χ^2 tests for independence, one should be aware that expected frequencies that are too small will lead to too big a type I error.

For question 5, write your answer in the table

Multiple choice

1	2	3	4	5

True or False

1	2	3	4	5