TUTORS MAY NOT HELP!!!

Exam #5: Chapters 10 - 11 NAME Answer Key

Math 160, Section 7963 *DUE: Tuesday, May 18, 2010*

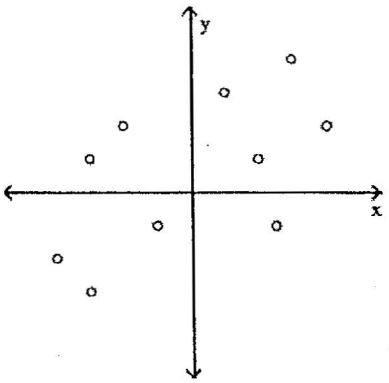
Spring 2010: Michael Orr

100 points. Show all work to receive full credit. You may use a calculator. CHECK YOUR WORK!!!!

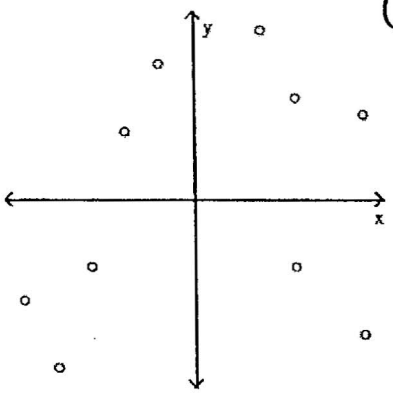
Write down all formulas or calculator commands used to receive credit!!!!!!!!

1. (4 pts) Determine which plot shows the strongest linear correlation. Circle the letter of your choice.

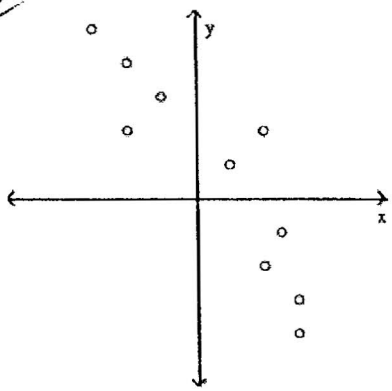
A.



B.



C



2. (5 pts) Given the linear correlation coefficient ***r*** and the sample size ***n***, determine the critical values of r and use your findings to state whether or not the given ***r*** represents a significant linear correlation. Use a significance level of 0.05. JUSTIFY YOUR ANSWER!!!

$r = -0.275,\ n = 15$ FOR $n=15$, CV = 0.514. SINCE $|r| < CV$ THERE IS NOT A SIGNIFICANT LINEAR CORRELATION.

3. (10 pts) A study was conducted to compare the average time spent in the computer lab each week versus course grade for computer programming students. The results are recorded in the table below.

Number of hours spent in lab	Grade (percent)
10	95
11	51
16	62
9	58
7	89
15	81
16	46
10	51

L_1 L_2

A. Find the value of the linear correlation coefficient ***r***. (Identify the steps used to determine this value). USING LINREG TEST $r = -0.335$

B. Based on the results from Part A, is there a significant linear correlation between the number of hours spent in the lab and the grade in the course? JUSTIFY YOUR ANSWER!!!

$n=8$ CV = 0.707 SINCE $|r| < CV$ THERE IS NOT A SIGNIFICANT LINEAR CORRELATION

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4. (10 pts) Based on the data from six students, the regression equation relating the number of hours of preparation (x) and the test score (y) is $\hat{y} = 67.3 + 1.07x$. The same data yield $r = 0.224$ and $\bar{y} = 75.2$. What is the best predicted test score for a student who spent 5 hours preparing for the test? Explain your reasoning. SINCE $n = 6$, CV = 0.811 FOR $\alpha = 0.05$ THERE IS NOT A SIGNIFICANT LINEAR CORRELATION. SINCE NO LINEAR CORRELATION, BEST PREDICTED VALUE IS AVERAGE.

$\boxed{\bar{y} = 75.2 = \text{BEST PREDICTED TEST SCORE}}$

5. (15 pts) Managers rate employees according to job performance and attitude. The results for several randomly selected employees are given below. (Assume that the first values are the x-values and the second are the y-values).

Performance	59	63	65	69	58	77	76	69	70	64
Attitude	72	67	78	82	75	87	92	83	87	78

A. Use the given data to find the equation of the regression line. Round the final values to three significant digits, if necessary. (Identify the steps used to determine this value).

$\hat{y} = 11.659 + 1.022X$

$\boxed{\hat{y} = 11.7 + 1.02X}$

PERFORMANCE $\Rightarrow L_1$
ATTITUDE $\Rightarrow L_2$
LINREG T TEST

B. Is there a significant linear correlation between performance and attitude? JUSTIFY YOUR ANSWER!!!

$r = 0.863$ $n = 10$ CV = 0.632

SINCE $|r| > CV$, THERE IS A SIGNIFICANT LINEAR CORRELATION.

C. Given a performance score of 72, what is the best prediction for attitude?

$\hat{y} = 11.7 + 1.02(72)$

$\boxed{\hat{y} = 85.1}$

85.243 USING $11.659 + 1.022X$

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6. (14 pts) A company manager wishes to test a union leader's claim that absences occur on the different days of the week with the same frequencies. Test this claim at the 0.05 level of significance if the following sample data have been compiled.

Day	Mon	Tue	Wed	Thur	Fri	
Absences	37	15	12	23	43	L1
EXPECTED	26	26	26	26	26	L2

$n = 130$

$(L_1 - L_2)^2 / L_2 \rightarrow L_3$

$\chi^2 = \text{sum}(L_3)$
$= 28.308$

dof $= 5 - 1 = 4$

(2) H_0: PROPORTIONS ARE THE SAME (CLAIM)

(2) H_1: AT LEAST ONE PROPORTION IS DIFFERENT

(4) Test statistic: $\chi^2 = 28.308$

(2) Critical value(s): $\chi^2_{0.05,4} = 9.488$

(2) Null Hypothesis conclusion: REJECT THE NULL

(2) Conclusion on claim: THERE IS SUFFICIENT EVIDENCE TO REJECT THE CLAIM THAT ABSENCES OCCUR ON DIFFERENT DAYS OF WEEK WITH SAME FREQUENCIES.

7. (14 pts) In studying the responses to a multiple-choice test question, the following sample data were obtained. At the 0.05 significance level, test the claim that the responses occur with the same frequency.

Response	A	B	C	D	E
Frequency, L1	12	15	16	18	19
EXPECTED, L2	16	16	16	16	16

$n = 80$

$(L_1 - L_2)^2 / L_2 \rightarrow L_3$

$\chi^2 = \text{SUM}(L_3)$
$= 1.875$

(2) H_0: PROPORTIONS ARE SAME (CLAIM)

(2) H_1: AT LEAST ONE PROPORTION IS DIFFERENT

(4) Test statistic: $\chi^2 = 1.875$

(2) Critical value(s): $\chi^2_{0.05,4} = 9.488$

(2) Null Hypothesis conclusion: FAIL TO REJECT Ho

(2) Conclusion on claim:
THERE IS NOT SUFFICIENT EVIDENCE TO WARRANT REJECTION OF THE CLAIM THAT RESPONSES TO A MULTIPLE-CHOICE TEST QUESTION OCCUR W/ SAME FREQUENCY

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8. (14 pts) 160 students who were majoring in either math or English were asked a test question, and the researcher recorded whether they answered the question correctly. The sample results are given below. At the 0.10 significance level, test the claim that response and major are independent.

	Correct	Incorrect	
Math	27	53	80
English	43	37	80
	70	90	160

EXPECTED

$\frac{(80)(70)}{160} = 35$	$\frac{(80)(90)}{160} = 45$
$\frac{(80)(70)}{160} = 35$	$\frac{(80)(90)}{160} = 45$

H_0: RESPONSE & MAJOR INDEPENDENT (CLAIM)

H_1: RESPONSE & MAJOR DEPENDENT

χ^2-TEST : $\chi^2 = 6.502$

Test statistic: $\chi^2 = 6.502$

Critical value(s): $\chi^2_{0.10,1} = 2.706$

Null Hypothesis conclusion: REJECT NULL

Conclusion on claim: THERE IS SUFFICIENT EVIDENCE TO REJECT THE NULL & THE CLAIM THAT RESPONSE & MAJOR ARE INDEPENDENT

9. (14 pts) A researcher wishes to test the effectiveness of a flu vaccination. 150 people are vaccinated, 180 people are vaccinated with a placebo, and 100 people are not vaccinated. The number in each group who later caught the flu was recorded. The sample results are given below. Use a 0.05 significance level to test the claim that the proportion of people catching the flu is the same in all three groups.

	Vaccinated	Placebo	Control	
Caught the flu	8	19	21	48
Did not catch the flu	142	161	79	382
	150	180	100	430

H_0: PROPORTION OF PEOPLE CATCHING FLU IS SAME

H_1: PROPORTION OF PEOPLE CATCHING FLU IS DIFFERENT

EXPECTED

16.744	20.093	11.163
133.256	159.907	88.837

Test statistic: $\chi^2 = 14.965$

Critical value(s): $\chi^2_{0.05,2} = 5.991$

Null Hypothesis conclusion: REJECT NULL

Conclusion on claim: THERE IS SUFFICIENT EVIDENCE TO REJECT THE CLAIM THAT THE PROPORTION OF PEOPLE CATCHING THE FLU IS THE SAME.

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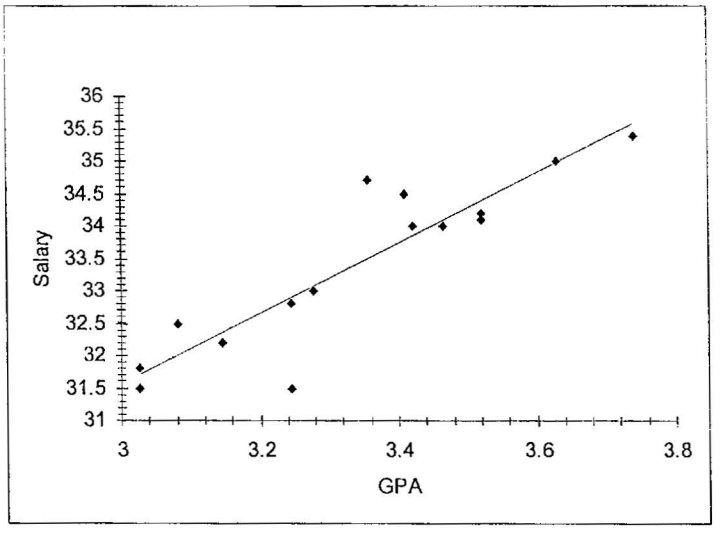
BONUS (10 points)

The Department of Undergraduate Studies conducted a study to see if a student's graduating GPA affected their starting salary. The data collected were from a sample of recent graduates of the business department who graduated with a bachelor's degree in business. The regression equation describing the relationship was ***Salary = 5.4181GPA + 15.315*** (Salary was recorded in thousands of dollars).



1. If a recent graduate that was not part of this study had a graduating GPA of 3.5, what would our regression line predict their starting salary to be?

   a) $18,963.35 b) $101,941.55 c) $35,522.00 d)$34,278.35
   e) None of the above. It's extrapolating to make this prediction

SALARY = 5.4181(3.5) + 15.315 = 34.27835 x1000
= $34,278.35

2. 81.43% of the variability in salary was explained by the relationship with GPA. What would the correlation between these 2 variables be?

   a) 0.902 b) -0.902 c) 0.8143 d) -0.8143 e) 0.663 f) 9.024

$r^2 = 0.8143$

$r = \sqrt{0.8143}$

$r = \pm 0.902$

SINCE POSITIVE LINEAR CORRELATION, $r = +0.902$