

MAT 222 Final
December 16, 2004

Name : _____

Student Number : _____

1. There are 5 problems and the total of 9 pages in this booklet.
2. Show all of your work and label your answers clearly. Unexplained answers will not get the full credit. Even if you perform all your calculations on your calculator, you **MUST** indicate what formula/procedures you are using.
3. Enjoy your holidays !

Problem	Points
1	
2	
3	
4	
5	
Total	

1. (14 pts) An airline company is about to order some inflatable life jackets for emergency use on its planes. A sample of eight life jackets produced by one company needed an average of 7 seconds to be fully inflated. The standard deviation was 1.86 seconds. A sample of six life jackets produced by a second company needed an average of 6 seconds to be fully inflated. The standard deviation was 2.13 seconds. At a 5% level of significance, is the difference between the mean time required to fully inflate the like jackets produced by the two companies significant?

(a) Assuming that the population standard deviations are not equal, carry out a test. Be sure to state your hypotheses, test statistic with degrees of freedom, and the P-value.

(b) Discuss how your test in (a) would change if you do not assume that the population standard deviations are different. You don't need to conduct an actual testing.

2. (18 pts)

(a) In a recent CBS News poll, 627 of the 1,307 respondents said that the federal government was responsible for insuring that every qualified person gets a college education. Construct a 99% confidence interval for the proportion of Americans who would agree with the above statement.

(b) Based on the confidence interval, can you say that the true proportion is not significantly different from 50%? Explain.

(c) Conduct a hypothesis testing for $H_0 : p = 0.5$ against $H_a : p \neq 0.5$, where p is the proportion of Americans who would agree with the above statement in (a). Use $\alpha = 0.01$. Do you get the same conclusion as in (b)?

3. (20 pts) Are female jurors more liberal than male jurors? A recent study of 284 jurors involved in similar cases produced the following results:

	Liberal	Fair	Vindictive	Total
Male	41	47	55	
Female	52	48	41	
Total				

- (a) Analyze the two-way table by using a chi-square test. State the null and alternative hypotheses and give the test statistic, degrees of freedom, P-value and your conclusion on the claim that female jurors are more liberal.

- (b) The claim that that female jurors are more liberal can also be tested by using a different method. Based on the sample information that 41 out of 143 male jurors showed a tendency of being liberal, while 52 out of 141 female jurors did, test the claim at 0.05 significance level that the proportion of liberal opinions among the female jurors is greater than that of the males.

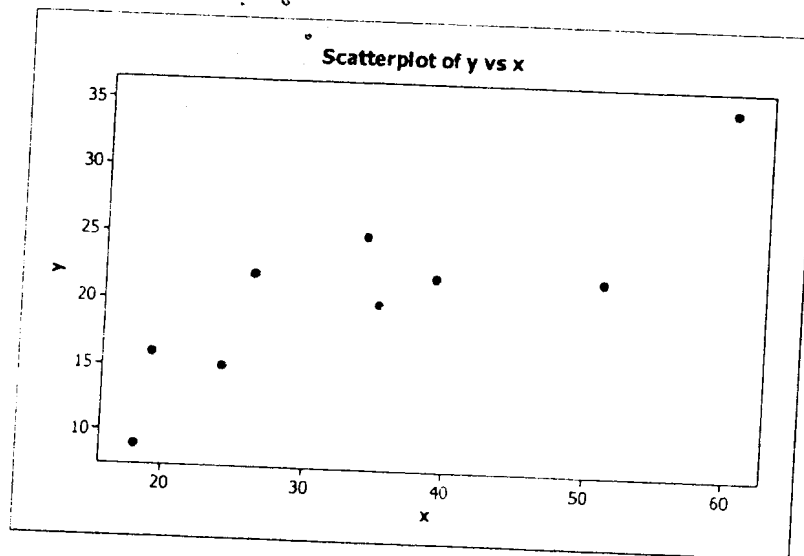
1. (22 pts) The following table gives the performance of nine students on a Take-Home exam, and on an In-Class exam. It has been conjectured that the Take-Home exam score is not strongly related to the In-Class score, since unlimited time is allowed for the Take-Home and students have access to others for help. To investigate this, we plan to perform the following statistical analysis.

Student	A	B	C	D	E	F	G	H	I
In-Class (x)	26	39	35	18	51	31	24	19	60
Take-Home (y)	22	22	20	9	22	25	15	16	35

The summary statistics of the data and the plot are obtained.

$$\bar{x} = 34.00, s_x = 14.30, \sum (x_i - \bar{x})^2 = 1636.0;$$

$$\bar{y} = 20.67, s_y = 7.25; r = 0.849, s = 4.089$$



(a) Describe the relationship between y (Take-Home exam) and x (In-Class exam) based on the scatterplot above. Explain if the correlation coefficient summarizes this relation well.

(b) The least squares line was obtained as $\hat{y} = 6.036 + 0.430x$. Find the test statistic for testing the null hypothesis that the slope of the regression line is zero in the population against the alternative that the slope is positive. Also give the P-value. Do you reject H_0 at the 10% level of significance?

(c) How much of the variation in y explained by this the least squares line?

(d) One student scored 50 on the In-Class exam, but did not submit the Take-Home exam. Find a 95% prediction interval for this student's score on the Take-Home exam.

5. (25 pts) A SUNY Health Science Center researcher is conducting a research on food intake for rats who get nicotine infusion. He wanted to test if the mean food intake is the same for each of the three different levels of nicotine concentration (1mg per Kg Body weight and per day, 5mg, 9mg). He randomly assigned 6 rats for the 1mg group, 8 rats for each of the 5 mg and 9 mg groups, and measured the amount of daily food intake. The following table records the food intake (in grams per day) by these rats after being on this experiment for 5 days.

	1 mg group	5 mg group	9 mg group
	16.88	13.57	15.87
	15.38	17.13	16.58
	18.30	15.57	14.75
	15.40	14.45	14.28
	14.72	16.85	12.97
	11.37	15.34	16.19
		13.94	15.68
		16.65	15.54
\bar{x}	15.342	15.438	15.232
s	2.336	1.366	1.177

- (a) Complete the ANOVA table.

Source	DF	SS	MS	F
Factor			0.08	
Error		50.04		***
Total			***	***

- (b) State the null and alternative hypotheses and carry out a test at $\alpha = 0.05$.

(c) State the assumptions for the above ANOVA test. Is the assumption on standard deviations reasonable here?

(d) Analyze the contrast that compares the 1 mg group and the average of the other two groups. Test the one-sided H_a at $\alpha = 0.05$.