Math 220 : Elementary Statistics — Kane Nashimoto
Final Exam - All chapters
Fall 2008 — Name : _____

Directions: This exam contains nine problems worth a total of 120 points. For each computational problem, you must first write the formula to be used and present all your subsequent work in order to receive full or partial credit. Circle your final answers.

1. At a four-way intersection of the major roads in a city, 40% of the northbound traffic goes straight, 25% turns right, 30% turns left, and 5% makes a U-turn. Suppose that you observe randomly selected 10 cars at this intersection.

   (a) Find the probability that exactly 5 cars will go straight. (8 pts.)

   (b) Find the probability that more than 2 of the 10 cars will turn right. (8 pts.)

   (c) Find the expected number of the cars that will turn left. (8 pts.)

2. In a large introductory physics course, the midterm exam had a mean of 61.3 and a standard deviation of 14.1. The median was 64.8.

   (a) What do the mean and median scores tell you about the skewness of the midterm-score distribution for the physics course? (6 pts.)

   (b) The instructor of the course felt that the midterm scores were lower than anticipated and decided to apply a "curve" by adding 10 points to every student. What would the resulting mean and standard deviation be? Note: No computation is required to answer this question. (6 pts.)

3. The alcohol content of a certain brand of wine should be 13.50%. As part of the quality control, 50 bottles of the wine were taken at random from the production line and their alcohol contents measured. The mean alcohol content was 13.52% with a standard deviation of 0.08. Conduct a test to determine whether the true mean alcohol content differs from 13.50%. Use a significance level of .01. (10 pts.)

H_0: _____ vs. H_a: _____

Compute the test statistic and approximate the p-value.

Should the null hypothesis be rejected? Circle one. Yes No

4. A survey was conducted in a suburban area. It asked whether the federal government should provide financial assistance to the major automakers. Of the 638 people surveyed, 229 said "yes."

   (a) Estimate the true proportion of the people who support the financial assistance for the automakers by the government using a 99% confidence interval. (8 pts.)

   (b) In order for the estimate of the proportion of interest to be within .04 of the true value with 95% certainty, how many people should be surveyed? (8 pts.)

5. Of all the members of an honor society, 45% have exceptionally high GPAs (> 3.80), 65% plan on going to graduate schools, and 35% have exceptionally high GPAs and plan on going to graduate schools.

   (a) Suppose that you randomly select one member of this honor society. What is the probability that the selected member has an exceptionally high GPA given that he or she plans on going to a graduate school? (6 pts.)

   (b) Are the events "selected member has an exceptionally high GPA" and "selected member plans on going to a graduate school" independent? Justify your answer. (6 pts.)

   (c) Suppose that you select three members independently. What is the probability that at least one member plans on going to a graduate school? (6 pts.)

6. The price of a USDA Choice ribeye steak cut can be characterized as having a normal distribution with a mean of \$9.50 per pound and a standard deviation of \$0.35.

   (a) If you check the price of a steak cut at a randomly selected store, what is the probability that the price will be higher than \$9.75 per pound? (8 pts.)

   (b) Suppose that you check the prices of steak cuts at randomly selected 20 stores. Find the probability that the mean price will be lower than \$9.40 per pound. (8 pts.)

7. The table below shows numbers of traditional and non-traditional (age over 25) students at two community colleges.

	Status	
School	Traditional	Non-traditional
A	941	9
B	859	21

With an alpha level of .05, conduct a test to determine whether the proportions of non-traditional students differ between the two schools. (10 pts.)

H_0:

H_a:

Compute the test statistic and approximate the p-value.

Should the null hypothesis be rejected? Circle one. Yes No

8. Briefly, but clearly, describe an example of a study in which two explanatory variables are confounded. (6 pts.)

9. A total of nine high school students were asked how much education their parents have had. Each student responded by indicating the total numbers of years spent in school for the farther and mother. The obtained data were analyzed using SPSS. The results of the analysis are shown below. It is of interest to determine whether fathers and mothers have had different amounts of education.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Father's	13.89	9	3.516	1.172
	Mother's	14.33	9	3.873	1.291

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Father's & Mother's	9	.545	.129

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	Father's - Mother's	-.444	3.539	1.180	-3.165	2.276	-.377	8	.716

For this analysis, provide a summary of the results. If necessary, use a significance level of .05. (8 pts.)

- State the null and alternative hypotheses.
- Report the test statistic.
- Report the p-value of the test.
- State the decision (reject or retain H_0).
- Interpret the results in the context of the problem.