Math 220 : Elementary Statistics Kane Nashimoto
Final Exam - All chapters
Fall 2005 Name : _____

Directions: This exam contains eight problems worth a total of 150 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. There are 20 candidates for a job position, of whom 13 are women and 7 are men. The hiring committee will randomly select 3 candidates and interview them one by one. Of course, a candidate can be interviewed only once.

   (a) What is the probability that the second interview will be given to a woman, given that the first interview was a given to another woman? (10 pts.)

   (b) What is the probability that all three interviews will be given to men? (10 pts.)

2. The administrator of a four-year college wishes to estimate the proportion of the senior students who intend to pursue a graduate degree.

   (a) To estimate the proportion of interest, how many senior students should the administrator survey in order for the obtained estimate to be within .075 of the true value with 90% certainty? (10 pts.)

   (b) In a random sample of 200 senior students at this college, 20.5% indicated that they intended to pursue a graduate degree. Construct a 95% confidence interval for the corresponding true proportion. (10 pts.)

3. For a particular species of a flower, 40% have smooth leaves and 60% have hairy leaves. Suppose that you randomly pick 15 flowers of this species.

   (a) Compute the probability that exactly 5 flowers will have smooth leaves. (10 pts.)

   (b) Compute the probability that more than 8 flowers will have hairy leaves. (10 pts.)

4. The stem-and-leaf diagram below features numbers of soda drinks consumed by seven students in the last three weeks. Note that the maximum value is 32.

Stem	Leaf
0	19
1	448
2	0
3	2

   (a) Using the space next to the diagram, compute the sample variance. (10 pts.)

   (b) Comment on the skewness of the distribution of the data. (5 pts.)

5. Eighty clinically depressed individuals voluntarily signed up for an experiment in which the efficacy of a new antidepressant was investigated. The researcher divided the 80 participants into two groups. In doing so, she selected the first 40 on the sign-up list and assigned them to the experimental group and the last 40 to the placebo group. After two weeks of the corresponding treatments, the researcher measured the levels of depression for the two groups of participants.

   (a) There is a major methodological shortcoming in this experiment. What is it? Give a short answer. (10 pts.)

   (b) The design of this experiment is single-blind. What is necessary for it to be double-blind? Give a short answer. (5 pts.)

6. The number of paperclips contained in a box labeled "100 Office Paperclips" has mean $\mu = 103.7$ and standard deviation $\sigma = 1.4$. You will count the actual numbers of paperclips contained in randomly selected 50 boxes and compute the sample mean.

   (a) What distribution will the sample mean have, and what theorem assures such a result? (10 pts.)

   (b) Compute the probability that the sample mean will be less than 103.5. (10 pts.)

7. Academic staff members at a college were cross-classified according to gender and political affiliation. The two-way table below shows the results.

	Political affiliation	
Gender	Democrat	Republican
Male	39	18
Female	87	24

(a) Does it appear that one's political affiliation depends on gender? Conduct a test at a significance level of .01. (15 pts.)

H_0:

H_a:

Compute the test statistic and define the rejection rule.

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

(b) Does the test conducted in (a) satisfy the assumption about expected cell counts? Justify your answer. (10 pts.)

8. In a large introductory psychology course, 15 students took part in a study in which levels of interest in the course were assessed at the beginning of the semester and eight weeks into the semester. Participants' responses were obtained using a Likert-type scale ranging from 1 (not interested at all) to 7 (very interested). It was hypothesized that students' levels of interest in the course would increase over time.

The obtained data were analyzed using SPSS. The results of the analysis are shown on the following page.

(over)

Figure 1. SPSS output for Problem 8.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Beginning	3.67	12	1.723	.497
	Eight weeks	4.75	12	1.658	.479

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Beginning & Eight weeks	12	.541	.069

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Beginning - Eight weeks	-1.083	1.621	.468	-2.113	-.053	-2.315	11	.041

For this analysis, provide a summary of the results. If necessary, use a significance level of .05. (15 pts.)

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