Math 220 : Elementary Statistics Kane Nashimoto
Final Exam - All chapters
Summer 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. Rats are trained to turn right at a T-intersection of a maze with probability .80. Fourteen rats will be run through a maze. Assume that rats behave independently.

   (a) What is the probability that exactly 10 rats will turn right at the first T-intersection? (10 pts.)

   (b) What is the probability that all 14 rats will turn right at the first T-intersection? (10 pts.)

2. Among all users of a gym facility, 70% of them use the treadmill regularly, 45% use the swimming pool regularly, and 35% use both the treadmill and swimming pool regularly. Suppose that you just met a person who uses the gym facility.

   (a) What is the probability that the person whom you met regularly uses the treadmill, swimming pool, or both? (8 pts.)

   (b) What is the probability that the person whom you met is a regular user of the swimming pool, given that he or she uses the treadmill regularly? (8 pts.)

   (c) Are the two events, "the person you met regularly uses the treadmill" and "the person you met regularly uses the swimming pool" independent? Justify your answer. (8 pts.)

3. Briefly, but clearly, describe an example of a study where there is a potential non-response bias. (8 pts.)

4. The following data show numbers of parking tickets received within the past six months for a sample of seven drivers.

$$X: \{2, 6, 0, 1, 4, 0, 2\}$$

(a) Compute the sample mean. (8 pts.)

(b) Compute the sample standard deviation. (10 pts.)

5. It is of interest to estimate the mean number of calls coming in to an office. On randomly chosen 30 days, the numbers of calls were recorded between 8:00 a.m. and 5:00 p.m. The data yielded a mean of 32.7 with a standard deviation of 3.8.

(a) Construct a 95% confidence interval for the true mean number of calls. (10 pts.)

(b) Conduct a test to determine whether the true mean number of calls is less than 34.0. Use a significance level of .05. (15 pts.)

$H_0$: _____ vs. $H_a$: _____

Compute the test statistic and define the rejection rule.

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

6. The height of a tree will be measured using a clinometer. For this device, the measurement error has a normal distribution with mean $\mu = 0.00$ meter and standard deviation $\sigma = 0.04$. If the tree is exactly 35 meters tall, what is the probability that the clinometer will indicate a value less than 34.95 meters? (10 pts.)

7. Featured below are numbers of male and female flies for two species of citrus flies.

| | Sex | |
|---|---|---|
| Species | Male | Female |
| A | 152 | 128 |
| B | 103 | 117 |

(a) For Species A, conduct a test to determine whether the proportions of the male and female flies are equal. Use $\alpha = .05$. (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) At a significance level of .10, test whether the relative proportions of male and female flies are homogeneous for the two species of flies. (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

8. A nurse measured resting pulse rates (in beats per minute) for 10 women and 9 men. Of interest to the nurse was whether women had higher pulse rates.

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.

**Group Statistics**

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Pulse rate | Male | 9 | 72.78 | 6.037 | 2.012 |
| | Female | 10 | 76.50 | 6.737 | 2.130 |

**Independent Samples Test**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Pulse rate | Equal variances assumed | .176 | .680 | -1.262 | 17 | .224 | -3.722 | 2.948 | -9.943 | 2.499 |
| | Equal variances not assumed | | | -1.270 | 17.000 | .221 | -3.722 | 2.931 | -9.905 | 2.461 |

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.