

Name: _____

Directions: This exam contains eight problems worth a total of 100 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. Consider the following data.

$$X: \{33, 14, 25, 18, 7, 24, 33, 27, 36, 20\}$$

- (a) Construct a stem-and-leaf display using a stem width of 10. (6 pts.)

- (b) Based on the stem-and-leaf display in (a), how would you describe the skewness of the distribution of the data? (4 pts.)

- (c) Compute the sample mean and the sample standard deviation of the data. (10 pts.)

2. Describe an example of a scientific study in which two (or more) factors are *confounded*. (6 pts.)

3. For a random sample of 25 beers, the observed mean alcohol content was 4.22% with a standard deviation of 0.27%. Assume that the distribution of the alcohol content is approximately normal.

(a) Estimate the true mean alcohol content of all beers using a 95% confidence interval. (6 pts.)

(b) Conduct a test of hypotheses to determine whether the true mean alcohol content of all beers is higher than 4.20%. Use $\alpha = .05$. (8 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

4. Fish in an aquarium are trained so that they will turn right at a T-intersection of a maze with probability .80. Suppose that 20 fish will be run through the maze.

(a) What is the probability that exactly 12 fish will turn right at a T-intersection? (6 pts.)

(b) What is the probability that less than 15 fish will turn right at a T-intersection? (6 pts.)

5. The manager of a clothing store claims that, during a 3-day summer sale, the number of customers on each of the last two days is twice as large as the number of customers on the first day. Featured below are numbers of customers at the store during a recent 3-day summer sale. Do these data refute the store manager's claim? Conduct a test at the significant level of .10. (10 pts.)

Day		
First	Second	Last
183	327	360

H_0 :

H_a :

Compute the test statistic and define the rejection rule.

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

6. The retail price of 12-pack soda can be characterized as having a normal distribution with a mean of \$3.00 and a standard deviation of \$0.25.

(a) What percent of the 12 packs are priced higher than \$3.15? (6 pts.)

(b) Below what price do you find 30 percent of the 12 packs? (6 pts.)

7. Of all the residents of a city, 45% of them own a domestic car, 76% own a four-door sedan, and 28% own a domestic four-door sedan. You just met one resident of this city.
- (a) What is the probability that the person you met owns a domestic car, a four-door sedan, or a domestic four-door sedan? (6 pts.)

 - (b) Given that the person you met owns a domestic car, what is the probability that his or her car is a four-door sedan? (6 pts.)

 - (c) Suppose that you select two residents of the city independently. What is the probability that both of them will be owners of a four-door sedan? (6 pts.)
8. To assess the effectiveness of providing lecture notes in enhancing students' understanding of the course material, an instructor conducted an experiment. In the experiment, the instructor provided his lecture notes to all students in one section of his math course, but he wrote all his notes on the chalkboard in another section. At the end of the term, the instructor gave an exam, identical in content, to all students. The instructor believes that the students in the two sections were roughly homogeneous in terms of their background prior to the commencement of the experiment.

The obtained data (exam scores) 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										
Condition		N	Mean	Std. Deviation	Std. Error Mean					
Exam score	With notes	13	76.00	11.525	3.197					
	Without notes	15	73.13	16.966	4.381					

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Exam score	Equal variances assumed	2.715	.111	.514	26	.611	2.867	5.573	-8.589	14.322
	Equal variances not assumed			.529	24.706	.602	2.867	5.423	-8.309	14.042

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 observed significance level.
- State the decision (reject or retain H_0).
- Interpret the results in the context of the problem.