

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. Much psychological research has suggested that people tend to become more evening type than morning type as they age. In a class survey with 75 students, 59 identified themselves as evening type, while only 16 identified themselves as morning type.

- (a) Does this observation confirm the hypothesis that more than half of the students are evening type? Use  $\alpha = .01$ . (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

- (b) The test in (a) *should* reject the null hypothesis. If the same test were conducted at  $\alpha = .05$ , would it reject or retain the null hypothesis? No computation is necessary to answer this question. (5 pts.)

2. Shown below are data on number of absences for a sample of six students in a class.

$$X: \{2, 5, 0, 1, 3, 0\}$$

- (a) Compute the sample median of  $X$ . (5 pts.)
- (b) Using the space below, compute the sample mean and sample variance of  $X$ . (15 pts.)

3. Of all the students at a college, 75% are out-of-state students, 65% receive financial aid, and 55% are out-of-state students who receive financial aid.
- (a) If you select one student at random from this college, what is the probability that the selected student will be a recipient of financial aid, given that he or she is an out-of-state student? (10 pts.)
  
  - (b) Are the two events “selected student is an out-of-state student” and “selected student is a recipient of financial aid” independent? Justify your answer. (10 pts.)
4. A skeptical consumer wonders about the actual weights of onions in a 3-pound bag. He has measured the weights of his onions every time he bought them for the past 10 years. Based on his observations, he determined that the weights of 3-pound bags were approximately normally distributed with mean  $\mu = 3.18$  and standard deviation  $\sigma = 0.13$ . Assume that these values are correct.
- (a) What percent of the time has this consumer bought a bag that weighed more than 3.00 pounds? (10 pts.)
  
  
  
  
  
  
  
  
  
  
  - (b) The consumer has bought a bag that weighed less than  $x$  pounds 10% of the time. Find the value of  $x$ . (10 pts.)
5. A college professor wants to know the mean number of visible scratches on chalkboards. He examined randomly chosen 30 chalkboards and tabulated the numbers of visible scratches. The mean number was 9.51 with a standard deviation of 1.71.
- (a) Construct a 95% confidence interval for the true mean number of visible scratches. (10 pts.)
  
  
  
  
  
  
  
  
  
  
  - (b) What does the obtained confidence interval in (a) imply about the conjecture that the true mean number of visible scratches is 10? (5 pts.)

6. You will select 10 cards at random from a standard deck of cards with replacement. Let  $X$  be the number of Hearts. Compute the following probabilities. (10 pts. ea.)

(a)  $P(X \leq 2)$

(b)  $P(3 < X < 7)$

7. According to Mars Inc., 13% of the M&M's candies are brown and the rest is colored (yellow, red, blue, orange, or green). Table below shows the numbers of brown and colored candies in a random sample of 250 M&M's. Conduct a test to determine whether the observed counts contradict the manufacturer's claim. Use  $\alpha = .10$ . (20 pts.)

Surface	
Brown	Colored
29	221

$H_0$ :

$H_a$ :

Compute the test statistic and define the rejection rule.

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

8. For regular unleaded gasoline, prices (in cents per gallon) were obtained from randomly chosen 11 gas stations in the East coast and 8 gas stations in the West coast. It is of interest to investigate whether the mean prices are different between the two regions.

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					
	Region	N	Mean	Std. Deviation	Std. Error Mean
Gas price	East coast	11	295.27	10.882	3.281
	West coast	8	302.63	11.057	3.909

  

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
Gas price	Equal variances assumed	.024	.878	-1.444	17	.167	-7.352	5.090	-18.092	3.387
	Equal variances not assumed			-1.441	15.093	.170	-7.352	5.104	-18.225	3.520

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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.