

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. An object known to weigh exactly 1.00 kg was weighed 30 times by a household scale. The mean of the 30 scale readings was 0.99 kg with a standard deviation of 0.03 kg. With an alpha level of .05, conduct a test for the accuracy of the scale. (10 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

2. A study showed that 90% of the customers would turn right immediately after entering a grocery store. Suppose that you will observe 25 customers chosen at random in a typical grocery store.

(a) What is the probability that exactly 23 customers will turn right immediately after entering the store? (5 pts.)

(b) What is the probability that between 15 and 20 customers (inclusive) will turn right immediately after entering the store? (5 pts.)

3. The number of pages printed by a large-format laser printer is best characterized as having a normal distribution with mean  $\mu = 12,000$  and standard deviation  $\sigma = 900$  per month. The operating cost will go over budget if more than 153,000 pages are printed per year.
- (a) Find the probability that less than 10,000 pages will be printed by this printer next month. (5 pts.)
  
  
  
  
  
  
  
  
  
  
  - (b) What mean numbers of pages printed per month will cause the operating cost to go over budget? (5 pts.)
  
  
  
  
  
  
  
  
  
  
  - (c) Find the probability that the operating cost will go over budget for the next year. (10 pts.)
4. A public university recently raised tuition in order to supplement the reduction in budget provided by the state. One semester after the tuition increase, a student organization contacted randomly selected students and asked whether the tuition increase was justifiable. The total number of responses was 237, of which 108 was “yes,” 116 was “no,” and 13 was “don’t know.”
- (a) Estimate the true proportion of the students who felt that the tuition increase was justifiable using a 99% confidence interval. (5 pts.)
  
  
  
  
  
  
  
  
  
  
  - (b) In order for the 99% confidence interval in (a) to be no wider than .15, how many students must be surveyed? (5 pts.)

5. A restaurant offers three kinds of sauces for Hot Wings with different levels of spiciness: “Mild,” “Hot,” and “Suicidal.” The owner of the restaurant believes that 40% of the customers order the Mild sauce, 50% order the Hot sauce, and 10% order Suicidal. On randomly chosen 10 days, orders of Hot Wings were recorded. Shown below are the total counts for the three sauces. At  $\alpha = .05$ , conduct a test to determine whether these numbers agree with the restaurant owner’s belief. (10 pts.)

Level of spiciness		
Mild	Hot	Suicidal
119	162	29

$H_0$ :

$H_a$ :

Compute the test statistic and define the rejection rule.

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

6. Featured below are average expenses for lunch on a typical day (rounded to whole dollars) for a sample of 10 college students.

$$X: \{5, 4, 4, 7, 6, 3, 8, 6, 4, 5\}$$

(a) Compute the mean and the median of the expenses. (5 pts.)

(b) What do the relative locations of the mean and median tell you about the skewness of the distribution of the expenses? (5 pts.)

7. At a college, 70% of all students have checking accounts, 35% have savings accounts, and 20% have both checking and savings accounts. You just met a student attending this college.
- (a) What is the probability that the student you met has a checking account, a savings account, or both? (5 pts.)
  
  - (b) What is the probability that the student you met has a checking account, given that he or she has a savings account? (5 pts.)
  
  - (c) What is the probability that the student you met has neither type of account? (5 pts.)
  
  - (d) Are the two events “student having a checking account” and “student having a savings account” independent? Justify your answer. (5 pts.)
8. The question “Should the government provide more financial support to the students attending private colleges?” was anchored with the responses 1 (definitely no) to 7 (definitely yes). Respondents of the survey were random samples of 25 students attending private colleges and 30 students attending public universities. It is of interest to determine whether the students attending private colleges and those attending public universities have different opinions on the issue.

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					
Type of school	N	Mean	Std. Deviation	Std. Error Mean	
Survey response Private	25	5.08	.640	.128	
Public	30	4.63	1.159	.212	

  

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	
Survey response	Equal variances assumed	10.992	.002	1.719	53	.091	.447	.260	-.075	.968
	Equal variances not assumed			1.806	46.579	.077	.447	.247	-.051	.944

For this analysis, provide a summary of the results. If necessary, use a significance level of .10. (10 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.