

Name: _____

Directions: This exam contains nine problems worth a total of 120 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. According to a study, 90% of the time people turn to the right after entering a grocery store. Suppose that you observe 12 people chosen at random at the entrance of a grocery store and record to which direction they turn.

(a) What is the probability that exactly 10 people will turn right? (8 pts.)

(b) What is the probability that less than 7 people will turn right? (8 pts.)

(c) What is the probability that more than 5 people will turn right? (8 pts.)

2. Featured below are cumulative grade point averages for a sample of five college students. Compute the sample mean and the sample standard deviation. Show your work. (10 pts.)

$$X: \{3.21, 2.86, 2.43, 3.71, 2.40\}$$

3. A consumer support group obtained data on retail price of a particular model digital camera, whose MSRP was \$649.99. The observed mean price was \$643.39 with a standard deviation of \$17.71. The sample size was 60. Conduct a test to determine whether the true mean retail price is less than the MSRP. Use $\alpha = .05$. (10 pts.)

H_0 : _____ vs. H_a : _____

Compute the test statistic and approximate the p -value.

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

4. In a small rural community, 67% of all households consider themselves to health conscious, 42% regularly buy organic vegetables, and 31% consider themselves to health conscious and regularly buy organic vegetables. Suppose that you select one household at random from this community.

(a) Find the probability that the selected household regularly buys organic vegetables, given that it considers itself health conscious. (6 pts.)

(b) Find the probability that the selected household regularly buys organic vegetables, considers itself health conscious, or both. (6 pts.)

(c) Are the events “selected household regularly buys organic vegetables” and “selected household considers itself health conscious” independent? Justify your answer. (6 pts.)

5. The administrators of a college wanted to estimate the proportion of their students who are regular smokers. They distributed a survey to a random sample of students. Of the 271 students who replied, 76 of them indicated that they were regular smokers.
- (a) Estimate the proportion of regular smokers at this college using a 99% confidence interval. (8 pts.)
- (b) In order for the estimate of the proportion of interest to be within .05 of the true value with 90% certainty, how many responses must be obtained? (8 pts.)
6. When an object known to weigh exactly 100 kilograms is put on a certain scale, the scale shows a measurement error, whose distribution is normal with a mean of 0.32 kilogram and a standard deviation of 0.04. That is, the distribution of the scale reading is normal with $\mu = 100.32$ and $\sigma = 0.04$.
- (a) If you put an object that weighs exactly 100 kilograms on this scale, what is the probability that the scale reading will be less than 100.35? (8 pts.)
- (b) If you repeatedly put the same 100-kilogram object on this scale, 60% of the time the scale reading will be more than x . Find the value of x . (8 pts.)

7. Briefly, but clearly, describe an example of a study (with context), in which two explanatory variables are *confounded*. (8 pts.)

8. A total of 103 microwavable ready-to-eat meal packages are cross-classified according to sodium content (low; high) and price (low; high).

Sodium	Price	
	Low	High
Low	11	24
High	39	29

With an alpha level of .10, conduct a test to determine whether the price of a meal package depends on the sodium content. (10 pts.)

H_0 :

H_a :

Compute the test statistic and approximate the p -value.

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

9. Are people getting taller generation after generation? For a sample of 17 young male adults, their heights and fathers' heights (both in inches) were obtained. The data were analyzed using SPSS. The results of the analysis are shown on the following page.

(over)

Figure 1. SPSS output for Problem 9.

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Respondent's Ht	66.00	17	5.050	1.225
	Father's Ht	64.59	17	4.154	1.008

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	Respondent's Ht & Father's Ht	17	.590	.013

Paired Samples Test									
		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	Respondent's Ht - Father's Ht	1.412	4.244	1.029	-.770	3.594	1.372	16	.189

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 p -value of the test.
- State the decision (reject or retain H_0).
- Interpret the results in the context of the problem.