

Name: _____

Directions: This exam contains seven 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. Featured below are noon temperatures (in degrees Fahrenheit) and relative humidities (in percent) for a period of five days.

Variable	Day				
	1	2	3	4	5
Temperature (x)	72	65	81	76	67
Humidity (y)	63	73	58	72	69

- (a) Use your calculator to compute the Pearson correlation coefficient between X and Y and the regression equation for predicting Y from X . (8 pts.)
- (b) Using the regression equation obtained in (a), predict the relative humidity for a day with noon temperature of 20 degrees Fahrenheit. Does the predicted value make sense? Explain what is wrong with this prediction. (6 pts.)
2. The price of a gallon of milk is best characterized as having a normal distribution with a mean of \$2.17 with a standard deviation of \$0.08.
- (a) If you grab a gallon of milk at a nearby grocery store (assume that it is a “random pick”), what is the probability that the price is lower than \$2.30? (8 pts.)
- (b) Fifty-five percent of the one-gallon containers of milk are priced higher than x dollars. Find the value of x . (8 pts.)

3. The table below classifies a total of 200 janitors working at a small school according to gender (male; female) and shift (morning; midday; evening).

Gender	Shift		
	Morning	Midday	Evening
Male	30	56	34
Female	20	41	19

- (a) Compute the conditional proportions of the three shifts for the male and female janitors separately. (8 pts.)

- (b) Based on the conditional proportions obtained in (a), describe the association between gender and shift. (6 pts.)

4. Refer to Problem 3 above. Suppose that you select one janitor at random.

- (a) Given that the selected janitor is female, what is the probability that she works evening shift? (6 pts.)

- (b) What is the probability that the selected janitor is male, works midday shift, or both? (6 pts.)

- (c) Are the events “selected janitor is male” and “selected janitor works morning shift” independent? Justify your answer. (8 pts.)

5. In a very large psychology class, 25% of the students are with double majors. You will randomly select a sample of 20 students from this class. Let X be the number of students with double majors in the sample.
- (a) Compute the expected number students with double majors. (6 pts.)

 - (b) What is the probability that 10 or more students will be with double majors? (6 pts.)

 - (c) What is the probability that more than 2 but less than 7 students will be with double majors? (6 pts.)
6. For a newborn baby, the probability of a boy is .512 and that of a girl is .488. If a married couple has five children, what is the probability that at least one of them is a girl? Assume that genders are independent among the children. Hint: Use complement. (6 pts.)
7. For a sample of 14 passenger vehicles, data on engine size (in liters) and horse power were obtained, which were analyzed using a regression model, treating engine size as the predictor and horse power as the response. The results of the analysis are presented on the following page.
- (a) Interpret the value of the coefficient of determination in the context of the problem. (6 pts.)

 - (b) What engine size (in liters) will give the predicted horse power of 234? (6 pts.)

Figure 1. SPSS output for Problem 7.

Variables Entered/Removed ^b			
Model	Variables Entered	Variables Removed	Method
1	Engine Size ^a		. Enter

a. All requested variables entered.
b. Dependent Variable: Horse Power

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.934 ^a	.872	.861	24.099

a. Predictors: (Constant), Engine Size

ANOVA ^b						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	47476.053	1	47476.053	81.751	.000 ^a
	Residual	6968.876	12	580.740		
	Total	54444.929	13			

a. Predictors: (Constant), Engine Size
b. Dependent Variable: Horse Power

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	65.028	17.904		3.632	.003
	Engine Size	48.279	5.340	.934	9.042	.000

a. Dependent Variable: Horse Power