

Name: _____

Directions: This exam contains five 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. It is estimated that 30% of all adults have myopia (nearsightedness). Let us assume that this estimate is reasonably accurate. Consider a random sample of 20 adults taken from the respective population.
 - (a) Compute the probability that 6 or fewer adults in the sample will have myopia. (8 pts.)
 - (b) Compute the probability that more than 12 adults in the sample will have myopia. (8 pts.)
 - (c) Compute the probability that exactly 10 adults in the sample will have myopia. (8 pts.)
2. For a certain model vehicle, failure for the engine to start is due to (i) an electrical problem 57% of the time, (ii) a mechanical problem 31% of the time, and (iii) both electrical and mechanical problems 8% of the time.
 - (a) If the engine of this model vehicle fails to start, what is the probability that it is due to an electrical problem, a mechanical problem, or both? (8 pts.)
 - (b) If it has been determined that the failure for the engine to start was due, in part, to a mechanical problem, what is the probability that it is also due to an electrical problem? (8 pts.)
 - (c) Are the two events “electrical problem causing the engine to not start” and “mechanical problem causing the engine to not start” independent? Justify your answer. (8 pts.)

3. Presented below are stress levels on a 6-point scale (1 = “not stressful at all”; 6 = “very stressful”) indicated by six students at the beginning and in the middle of a semester.

Beginning	3	2	2	4	1	3
Middle	5	5	3	4	4	5

- (a) Use your calculator’s built-in function to obtain the least-squares regression equation for predicting the stress level in the middle of the semester (Y) from the stress level at the beginning of the semester (X). (8 pts.)
- (b) Use your calculator’s built-in function to compute the Pearson correlation coefficient between the two sets of stress levels. (8 pts.)

For (a) and (b), if you prefer, you may perform computation by hand. Take as given:

$$\sum x = 15; \sum y = 26; \sum x^2 = 43; \sum y^2 = 116; \sum xy = 66$$

Show your work on the backside of page 3.

4. The measurement error for a household scale has a normal distribution with mean $\mu = 0.00$ pound and standard deviation $\sigma = 0.02$. Suppose that an object known to weigh exactly 50.00 pounds will be repeatedly weighed using this scale. Note that the distribution of the scale readings will be normal with $\mu = 50.00$ and $\sigma = 0.02$.
- (a) What percent of the time will the scale reading be higher than 50.03 lb.? (10 pts.)
- (b) Twenty percent of the time the scale reading will be less than x pounds. Find the value of x . (10 pts.)
5. Featured on page 3 are the results of a regression analysis on the data for Ex. 5.42 of the textbook. In the analysis, $Y =$ crop yield (in tons per hectare) is modeled as a function of $X =$ crop duration (in days) for soybeans.
- (a) How confident would you be in the accuracy of your prediction using the obtained regression equation? Justify your answer. (8 pts.)
- (b) What is the value of the Pearson correlation coefficient between X and Y in this case? Be cautious with the sign. (8 pts.)

Figure 1. SPSS output for Problem 5.

Variables Entered/Removed ^a			
Model	Variables Entered	Variables Removed	Method
1	Crop duration ^a	.	Enter

a. All requested variables entered.
b. Dependent Variable: Crop yield

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.940 ^a	.883	.868	.2044

a. Predictors: (Constant), Crop duration

ANOVA ^b						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.522	1	2.522	60.341	.000 ^a
	Residual	.334	8	.042		
	Total	2.856	9			

a. Predictors: (Constant), Crop duration
b. Dependent Variable: Crop yield

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.207	.471		11.047	.000
	Crop duration	-.034	.004	-.940	-7.768	.000

a. Dependent Variable: Crop yield