

University of Puerto Rico at Aguadilla  
Department of Mathematics  
Statistic with Programming skills Math 3026  
Final Examination

Name \_\_\_\_\_  
Student ID. \_\_\_\_\_  
Section: \_\_\_\_\_

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**Instructions:** Please solve each one of the exercises of the possible clearest form. Make an interpretation of the numerical results.

**Part I. Value 4pts ea.**

1. Richard has just been given a 6-question multiple-choice quiz in his history class. Each question has five answers, of which only one is correct. Since Richard has not attended class recently, he doesn't know any of the answers. Assuming that Richard guesses on all six questions, find the indicated probabilities.

(a) What is the probability that he will answer all questions correctly? (Use 5 decimal places.)

(b) What is the probability that he will answer all questions incorrectly? (Use 3 decimal places.)

(c) What is the probability that he will answer at least one of the questions correctly? Compute this probability two ways. First, use the rule for mutually exclusive events and the probabilities shown in Table 3 of Appendix II. (Use 3 decimal places.)

2. A research team at Cornell University conducted a study showing that approximately 18% of all businessmen who wear ties wear them so tightly that they actually reduce blood flow to the brain, diminishing cerebral functions. At a board meeting of 20 businessmen, all of whom wear ties, what are the following probabilities?

(a) At least one tie is too tight. (Use 3 decimal places.)

(b) More than two ties are too tight. (Use 3 decimal places.)

(c) No tie is too tight. (Use 3 decimal places.)

(d) At least 18 ties are *not* too tight. (Use 3 decimal places.)

3. A machine is design to make a board correctly 90% of the time. The assembling line have 3 attempts to make right.

a. What is the expected value?

b. What is the probability of making right in at most 3 attempts?

4. There are **five** wires which need to be attached to a circuit board. A robotic device will attach the wires. The wires can be attached in any order, and the production manager wishes to determine which order would be fastest for the robot to use. Use the multiplication rule of counting to determine the number of possible sequences of assembly that must be tested.

5. Diagnostic tests of medical conditions can have several types of results. The test result can be positive or negative, whether or not a patient has the condition. A positive test (+) indicates that the patient has the condition. A negative test (-) indicates that the patient does not have the condition. Remember, a positive test does not prove the patient has the condition. Additional medical work may be required. Consider a random sample of 200 patients, some of whom have a medical condition and some of whom do not. Results of a new diagnostic test for the condition are shown.

	Condition Present	Condition Absent	Row Total
Test Result +	109	21	130
Test Result -	21	49	70
Column Total	130	70	200

Assume the sample is representative of the entire population. For a person selected at random, compute the following probabilities. (Use 3 decimal places.)

(a)  $P(+ | \text{condition present})$ ; this is known as the *sensitivity* of a test.

(b)  $P(- | \text{condition present})$ ; this is known as the *false-negative rate*.

(c)  $P(- | \text{condition absent})$ ; this is known as the *specificity* of a test.

(d)  $P(+ | \text{condition absent})$ ; this is known as the *false-positive rate*.

(e)  $P(\text{condition present and } +)$ ; this is the *predictive value* of the test.

(f)  $P(\text{condition present and } -)$ .

6. Visit <http://math.uprag.edu/sand.MTW> (25pts)

Throughout the world, natural ocean beaches are beautiful sights to see. If you have visited natural beaches, you may have noticed that when the gradient or drop off is steep, the grains of sand tend to be larger. In fact, a man-made beach with “wrong” size of granules of sand tend to be washed away and eventually replaced when the proper size grain is selected by the action of the ocean and the gradient of the bottom. Since man-made beaches are expensive, grain size is an important consideration.

Use the data set with

$x$  = median diameter of granules of sand

$y$  = gradient of beach slope in degrees on natural ocean beaches.

- a) Calculate the Pearson correlation and create a scatterplot and explain it.
- b) Create the linear regression model.
- c) Explain the R-square
- d) Use the residual analysis to check the model.
- e) If we have a truck of sand of .38mm. What is the slope that the model predicts?

7. In Minitab open the following worksheet <C:\\programs files\\minitab\\english\\sample data\\marriage.MTW>

- a) Use the variable Marriage to construct a boxplot by hand. It's allowed to use Minitab to order the data. Please to give an analysis.
- b) Use Minitab to create a histogram of the percent of divorce (Divorce).

c) Calculate the descriptive statistics for the Marriage and Divorce (Use Minitab).

d) Which have the most variability, Marriage or Divorce.

**Bonus:** Explain your favorite reading during the class. Tell me how the reading impact your life. 5pts