

University of Puerto Rico at Aguadilla  
 Department of Mathematics  
 Statistics with Computer Skills  
 Examination II

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.

1. Arches National Park is located in southern Utah. The park is famous for its beautiful desert landscape and its many natural sandstone arches. Park Ranger Edward McCarrick started an inventory (not yet complete) of natural arches within the park that have an opening of at least 3 feet. The following table is based on information taken from the book *Canyon Country Arches and Bridges*, by F.A. Barnes. The height of the arch opening is rounded to the nearest foot.

Height of arch, feet	3-9	10-29	30-49	50-74	75 and higher
Number of arches in park	116	100	27	31	6

For an arch chosen at random in Arches National Park, use the preceding information to estimate the probability that the height of the arch opening is each of the following. (Enter your answers to 2 decimal places.)

(a) 3 to 9 feet tall.

(b) 30 feet or taller.

(c) 3 to 49 feet tall.

(d) 10 to 74 feet tall.

(e) 75 feet or taller.

2. In a sales effectiveness seminar, a group of sales representatives tried two approaches to selling a customer a new automobile: the aggressive approach and the passive approach. For 1160 customers, the following record was kept.

	Sale	No Sale	Row Total
Aggressive	267	313	580
Passive	487	93	580
Column Total	754	406	1160

Suppose a customer is selected at random from the 1160 participating customers. Let us use the following notation for events:  $A$  = aggressive approach,  $Pa$  = passive approach,  $S$  = sale,  $N$  = no sale. So,  $P(A)$  is the probability that an aggressive approach was used, and so on.

(a) Compute  $P(S)$ ,  $P(S | A)$ , and  $P(S | Pa)$ .

(b) Compute  $P(A \text{ and } S)$  and  $P(Pa \text{ and } S)$ . (Use 3 decimal places.)

3. 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 +	104	26	130
Test Result −	22	48	70
Column Total	126	74	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)  $P(\text{condition present and } -)$ .

4. The University of Montana ski team has **ten** entrants in a men's downhill ski event. The coach would like the first, second, and third places to go to the team members. In how many ways can the **ten** team entrants achieve first, second, and third places?

5. One professor grades homework by randomly choosing **7** out of **11** homework problems to grade.

**STEP 1:** How many different groups of **7** problems can be chosen from the **11** problems?

**STEP 2:** *Probability extension:* Jerry did only **7** problems of one assignment. What is the probability that the problems he did comprised the group that was selected to be graded? (Use 4 decimal places.)

**STEP 3:** Silvia did **9** problems. How many different groups of **7** did she complete?

**STEP 4:** What is the probability that one of the groups of **7** she completed comprised the group selected to be graded? (Use 4 decimal places.)

5. In a batch of 50 refrigerators 6 are damaged and 44 are good. Two refrigerators are random select, one by one and without replacement. What is the probability that

a) Both refrigerators are damaged ?

b) Just one are damaged?

c) At least one are damaged?

d) The second one is damaged?

6. A meteorologist says that the probability of rain on Saturday is 25%, the probability of rain on Sunday is 20% and the chance of rain both days is 15%. What is the probability of rain during the weekend?

**Bono (10 pts) The Power Of The Modal Bacter**

a) Using the statistical concept of left wall and variability, briefly explain the path of evolution that resulted in the human species.

b) Why the process of evolution of the species is not linear and why the right wall never appears?

c) Gould point out that evolution started with minimal complexity and that implies the existence the left wall . Why is this concept (left wall) is so important in evolution and how the basic statistic can explain it?

d) “We are glorius accidents of an unpredictable process with no drive to complexity.” How we explain that quote using our basic statistics?

e) Why the variability is the message and not the median? ( If we cut the variability what would happened?)