

## Two Binomial probability experiments

**Question I.** A multiple choice test has 10 questions. Each question has four answer choices. What is the probability that a student, choosing answers at random:

- a. Gets 7 questions correct (exactly 7). **Ans:** 0.0031
- b. Has at least one question correct? **Ans:** 0.9437
- c. Has at least 3 questions correct? **Ans:** 0.4744
- d. Has at most 1 question correct? **Ans:** 0.2440
- e. Has at most 4 questions correct? **Ans:** 0.9219
- f. Has all questions correct? **Ans:** 0.0000
- g. Has all questions wrong? **Ans:** 0.0563
- h. What is the mean number of correct questions the student may expect? **Ans:** 2.5
- i. What is the standard deviation of the variable *number of questions correct* ? **Ans:** 1.4
- j. What is the minimum and maximum usual values of correct questions the student may expect?  
**Ans:** Min value = - 0.23 or zero correct. Max value = 5.2
- k. May we consider 6 as a usual number of correct questions under the conditions of this experiment?  
**Ans:** The range of usual values is from 0 to 5. Any result above 5 will be *unusual* or exceptionally high.

**Question II.** A shooter hits the target 70% of the time. Today he will shoot 6 times. Assume each shot is independent of the others. What is the probability that:

- a. He hits the target at least once? **Ans:** 0.9993
- b. The probability that the shooter misses all six shots is 0.000729. Verify this calculation and comment about the assumption of the shooting accuracy of 70%. **Ans:** calculation is correct. The assumption that the shooter hits the target 70% is in question. The probability that he misses all shot is very low.  
*Rare Event Rule for Inferential Statistics: if under a given assumption, the probability of a particular observed event is extremely rare, we conclude that the assumption is probably incorrect.*
- c. He hits the target at least three times? **Ans:** 0.9295
- d. He hits the target at most 2 times? **Ans:** 0.0705
- e. What is the mean number of hits he may expect? **Ans:** 4.2
- f. What are the minimum and maximum usual values of hits the shooter may expect?  
**Ans:** Min = 1.96, or = 2. Max = 6.4 or just 6.