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.

Note: Step by step solutions using R may be found on imathesis.com