Question 1.

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> #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).
> dbinom(7,10,0.25)
[1] 0.003089905

> #b. Has at least one question correct?
> sum(dbinom(1:10,10,0.25))
[1] 0.9436865
> # OR
> 1-dbinom(0,10,.25)
[1] 0.9436865


> #c. Has at least 3 questions correct?
> sum(dbinom(3:10,10,0.25))
[1] 0.4744072
> 1-pbinom(2,10,0.25) # alternatively
[1] 0.4744072

> #d. Has at most 1 question correct?
> pbinom(1,10,0.25)
[1] 0.2440252


> #e. Has at most 4 questions correct?
> pbinom(4,10,0.25)
[1] 0.9218731

> #f. Has all questions correct?
> dbinom(10,10,0.25)
[1] 9.536743e-07

> #g. Has all questions wrong?
> dbinom(10,10,0.75) # all questions wrong
[1] 0.05631351
> # OR
> dbinom(0,10,0.25) # zero correct
[1] 0.05631351

> #h. What is the mean number of correct questions the student may expect?
> 10*0.25
[1] 2.5

> #i. What is the standard deviation of the variable “number of questions
correct”?
> sqrt(10*0.25*0.75)
[1] 1.369306

> #j. What is the minimum and maximum usual values of correct questions the
student may expect?
> #given by mean-2*sd
> 2.5-2*1.369306 # min usual value
[1] -0.238612
> # given by mean+2*sd
> 2.5+2*1.369306 # max usual value is 5.23
[1] 5.238612
> # Since a negative number of " questions correct " makes no sense, we say
that the min usual value es zero.

> #k. May we consider 6 as a usual number of correct questions under the
conditions of this experiment?
> # 5 is the max usual value; therefore, 6 is an unusual number of questions
correct under the conditions of the experiment
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Question 2:

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> # A shooter hits the target 70% of the time. Today he will shoot 6 times.
What is the probability that:
> # a. He hits the target at least once?
> 1-dbinom(0,6,0.70)
[1] 0.999271

> #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%.
> dbinom(0,6,0.70)
[1] 0.000729
> # The assumption that the shooter hits the target 70% is in question. The
prob that he misses all shot is very low.

> #c. He hits the target at least three times?
> sum(dbinom(3:6,6,0.70))
[1] 0.92953

> #d. He hits the target at most 2 times?
> pbinom(2,6,0.70)
[1] 0.07047

> # e. What is the mean number of hits he may expect?
> 6*0.70 # number of trial * prob of success
[1] 4.2

> #f. What are the minimum and maximum usual values of hits the shooter may
expect?
> mean=4.2; sd=sqrt(6*0.7*0.3)
> mean-2*sd # min expected number of successes
[1] 1.955006
> mean+2*sd # max expected number of successes
[1] 6.444994
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