Solution for HW2(25 points)

STA113, ISDS

In our blackboard, there is a item 'id#' for each person. Please make sure you provide yours and your partners' 'id#' at the beginning of each homework. For our convenience, please follow the format attached to this solution.

In the following text, $C_n^m = \binom{n}{m} = \frac{n!}{m!(n-m)!}$.

3.36(2points)

hint(a): The supplier most likely for the chip will be the one that yields the largest value for $P(S_i)P(defective|S_i)$.

hint(b): If all $P(defective|S_i) = .0005$, the suppliers that are most frequently used would yield the largest values.

3.40(2points)

hint(a): Use permutation rule.

hint(b): Use multiplicative rule.

3.47(2points)

hint(a): If the dealer gets a blackjack, then he need to have one ace(A)(choose one from four) and one Face(F)(choose one from sixteen). $C_4^1 C_{16}^1$ is the total number of the different blackjacks he can get, and the whole space has C_{52}^2elements(choose two from 52).

hint(b): The dealer will win with blackjack, which means the player cannot get a blackjack. Denote event D as the dealer gets a blackjack and P as the player gets a blackjack. We want to know $P(D \bigcap P^c)$. $P(D) = P(D \bigcap P) + P(D \bigcap P^c)$. From (a), we know that $P(D) = C_4^1 C_{16}^1 / C_{52}^2$. And $P(D \bigcap P) = C_{16}^1 C_4^1 C_3^1 C_{15}^1 / C_{52}^2 C_{50}^2$. Hence $P(D \bigcap P^c) = P(D) - P(D \bigcap P) = C_4^1 C_{16}^1 / C_{52}^2 - C_{16}^1 C_4^1 C_3^1 C_{15}^1 / C_{52}^2 C_{50}^2$ (The dealer chose 1F and 1A, the player chose 1F,1A afterwards.)

3.69(3points)

hint(a): $P(A) = C_4^1 C_{13}^5 / C_{52}^5$,(You choose a suit from the four suits, and then choose five cards from that suit).

hint(b): $P(B) = C_{10}^1 4^{10} / C_{52}^5$.(A straight can begin from 1 to 10. So there are ten different sequence. And given a certain sequence, you have four choices in each position.)

hint(c): $P(A \bigcap B) = C_{10}^1 C_4^1 / C_{52}^5$. (Choose one suit and choose one sequence.)

4.41(2points)

hint(a): $C_{10}^2 C_8^4 0.25^2 0.3^4 0.45^4$,(A multinomial distribution(10, 0.25, 0.3, 0.45).

hint(b): For a multinomial distribution, $\mu_i = np_i$ and $\sigma_i^2 = np_i(1 - p_i)$. This result means path2 will be passed for 3 times in average, and the average range is 2.1.

4.56(6points)

hint: for the hypergeometric distribution:

$$
\begin{aligned}
\mu &= nr/N \\
\sigma^2 &= r(N - r)n(N - n)/(N - 1)N^2
\end{aligned}
$$

4.84(2points)

hint: let y be the number of engineers you choose in the sample with experience. y follows a hypergeometric distribution with $N = 5$, $r = 2$, and $n = 2$.

4.91(3points)

hint(a): If the manufacturer's claim is correct, y follows a geometric distribution with $p = 0.001$.

hint(b): Calculate$P(5)$.

hint(c): Let X_n be the events that at least one misread occurs within n readings. $P(X_3) = 0.02940399$. So we see, the probability of X_3 is too small under the assumption that $p = 0.001$. Therefore the claim is not valid. (You can check $P(X_{99}) = 0.6239677$. This events would probably happen under the assumption that $p = 0.001$).

4.97(3points)

hint: The number of breakdowns follows a poisson distribution, with$\lambda = 1.5$. For(a), you just put $y = 2$ to $p(y)$. For(b), calculate$p(0) + p(1) + p(2)$. And (c), calculate $p(0)^3$. Note $e^{-1.5} = 0.2231302$.

Homework Format

Please provide your hw#, your name, id#, your partners' name and their id# on the top left side of your homework. An example is provided below.

$Sta113Homework\#$

$Name: Alexander, John(jda6)(ID\# :1)$

$Partner1: Baker, Kyle(kbb3)(ID\#, 2)$

$Partner4: Barbas, Andrew(asb12)(ID\#, 3)$

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