Student Information

Full Name : Onur Can TIRTIR
Id Number : 2099380

Answer 2.17

Let events :
D=computer at hand has a defected part
X=supplier of computer at hand has been bought from X
Y=supplier of computer at hand has been bought from Y
Z=supplier of computer at hand has been bought from Z

where

$$P(D) = P(D \cap X) + P(D \cap Y) + P(D \cap Z)$$

by total probability since $P(X) + P(Y) + P(Z) = 1$ and events X, Y, Z totally covers D.

Our answer is $P(Z|D)$. By *Bayes Rule*

$$P(Z|D) = \frac{P(Z \cap D)}{P(D)} = \frac{P(Z \cap D)}{P(D \cap X) + P(D \cap Y) + P(D \cap Z)}$$

Hence our answer is

$$\frac{0.06 * 0.40}{0.05 * 0.24 + 0.10 * 0.36 * 0.06 * 0.40} = \frac{1}{3}$$

as each of X, Y, Z are mutually exclusive with D.

Answer 2.29

Let the answer be $P(x >= 2)$. Also our sample space has $C(9, 5)$ many options. Here we choose 5 possible places from 9 for the databases containing given keyword where the order does not matter.

To calculate $P(0)$, we want to choose 5 places from the last 5 places to put databases containing given keyword in only one way($C(5, 5) = 1$). Hence $P(0) = \frac{1}{C(9, 5)}$.

To calculate $P(1)$, we want to choose 4 places from the last 5 places to put databases containing given keyword, which can be done in $C(5, 4) = C(5, 1) = 5$ many ways and 1 place to put our only database containing the keyword in the first 4, which can be done in $C(4, 1) = 4$ many ways. Hence $P(1) = \frac{5 * 4}{C(9, 5)} = \frac{20}{C(9, 5)}$.

Since $P(0), P(1) \ldots P(4)$ are mutually exclusive, then answer is $P(x >= 2) = 1 - (P(0) + P(1)) = \frac{5}{6}$.

Answer 3.6

Let $P(x=i)$ be the probability to counter with i errors where $i=0$ or $i=1$. For $P(0)$, we check to find 0-error block in each tests. In first trial, we have $\frac{5}{6}$ probability for first test and have $\frac{4}{5}$ probability for second test as only one of the blocks has error. Then $P(0) = \frac{5*4}{6*5} = \frac{2}{3}$. For $P(1)$, we search to find 1-error block at first or second test, but not both of them. In first trial, we have $\frac{5}{6}$ probability for first test to be 0-error and have $\frac{1}{5}$ probability for second test to have 1 error, where first and second tests can be replaced. Then $P(1) = 2\frac{5}{6}\frac{1}{5} = \frac{1}{3}$.

$E(X) = 0P(0) + 1P(1) = \frac{1}{3}$

Answer 3.7

Name random variables for distributions of games seperately as $P_{x_1}(x)$, $P_{x_2}(x)$ and for overall home runs as $P_y(x)$.

Compute $P(y)$s for all y values:

$$\begin{aligned}
P_y(0) &= P_{x_1}(0)P_{x_2}(0) && = 0.4^2 \\
P_y(1) &= P_{x_1}(0)P_{x_2}(1) + P_{x_1}(1)P_{x_2}(0) && = 2(0.4^2) \\
P_y(2) &= P_{x_1}(0)P_{x_2}(2) + P_{x_1}(1)P_{x_2}(1) + P_{x_1}(2)P_{x_2}(0) && = 2(0.4)(0.2) + 0.4^2 \\
P_y(3) &= P_{x_1}(1)P_{x_2}(2) + P_{x_1}(2)P_{x_2}(1) && = 2(0.2)(0.4) \\
P_y(4) &= P_{x_1}(2)P_{x_2}(2) && = 0.2^2
\end{aligned}$$

Hence $\mu = E(Y) = 0P_y(0) + 1P_y(1) + 2P_y(2) + 3P(3) + 4P_y(4) = 1.6$.
Then $Var(Y) = \sum_{k=0}^{4}(x_k - \mu)^2 P_y(x_k) = 1.12$