CENG 222

Statistical Methods for Computer Engineering

Spring '2017-2018

Take Home Exam 1

Deadline: May 25, 23:59

Submission: via COW

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Answer 3.8

Table 1: Probability of wrong tries

Number of Tries	P(X)
0	0.25
1	0.25
2	0.25
3	0.25

$E(X) = 0 * 0.25 + 1 * 0.25 + 2 * 0.25 + 3 * 0.25 = 1.5$
$Var(X) = (0 - 1.5)^2 * 0.25 + (1 - 1.5)^2 * 0.25 + (2 - 1.5)^2 * 0.25 + (3 - 1.5)^2 * 0.25 = 1.25$

Answer 3.15

a.

Probability of no failure in both labs is 0.52. Probability of at least one failure is $1 - 0.52 = 0.48$

b.

$P_x(0) = 0.52 + 0.14 + 0.06 = 0.72$ and $P_y(0) = 0.52 + 0.2 + 0.04 = 0.76$

Their multiplication is 0.547, but given value ($P(x, y)$) is 0.52. As they are not same, X and Y are dependent

Answer 3.19

$E(X) = 2 * 0.5 + (-2) * 0.5 = 0$ and $Var(X) = 2^2 * 0.5 + (-2)^2 * 0.5 = 4$
$E(Y) = 4 * 0.2 + (-1) * 0.8 = 0$ and $Var(Y) = 4^2 * 0.2 + (-1)^2 * 0.8 = 4$

a.

$E(100X) = 100 * E(X) = 0$ and $Var(100X) = 100^2 * Var(X) = 40,000$

b.

$E(100Y) = 100 * E(Y) = 0$ and $Var(100Y) = 100^2 * Var(Y) = 40,000$

c.

$E(50X + 50Y) = 50 * E(X) + 50 * E(Y) = 0$ and $Var(50X + 50Y) = 50^2 * Var(X) + 50^2 * Var(Y) = 20,000$

Answer 3.29

A: no accidents last year, B: Being high-risk driver
For high-risk drivers our $\lambda = 1$, for low-risk drivers $\lambda = 0.1$
$P\{B\} = 0.2$, and
$P\{A|B\} = P\{X = 0\} = F_{\lambda=1}(0) = 0.368$, $P\{A|B'\} = P\{X = 0\} = F_{\lambda=0.1}(0) = 0.905$

What we are asked is: $P\{B|A\} =?$

$P\{B|A\} = \frac{P\{A|B\} * P\{B\}}{P\{A|B\} * P\{B\} + P\{A|B'\} * P\{B'\}}$

$P\{B|A\} = \frac{0.368 * 0.2}{0.368 * 0.2 + 0.905 * 0.8} = 0.0923$