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BS (CS) - 4A

Question # 1

$P(MB) = \frac{40}{100}$

$P(HD) = \frac{30}{100}$

$P(MB \cap HD) = \frac{15}{100}$

$P(MB^c \cup HD^c) = ?$

As we know.

$P(A^c B^c) = 1 - P(A \cup B)$

$= 1 - P(A) + P(B) - P(AB) \quad -(1)$

Putting the values in eq (1).

$P(MB^c \cup HD^c) = 1 - P(MB) + P(HD) - P(MB \cap HD).$

$= 1 - (0.4 + 0.3 - 0.15)$

$= 0.75$ Ans.

P.T.O

Question # 2

Let A = error found by test 1
B = error found by test 2
C = error found by test 3.

So given that

$P(A) = 0.2$, so $P(A^c) = 0.8$
$P(B) = 0.3$, so $P(B^c) = 0.7$
$P(C) = 0.5$, so $P(C^c) = 0.5$

As the tests are independent so

$$P(A^c B^c C^c) = P(A^c) \times P(B^c) \times P(C^c)$$

$$= 0.8 \times 0.7 \times 0.5$$
$$= 0.28$$

Now let.

D = found by at least one test, so

$$P(D) = 1 - P(D^c).$$

$$P(D^c) = 0.28.$$

$$P(D) = 1 - 0.28$$

$$P(D) = 0.82$$

P(found by at least one test) = 0.82 Ans.

Question # 3

$P(\bar{T}|G) = 0.80$

$P(\bar{T}|B) = 0.30$

$P(G) = 0.60$

$P(B) = 0.40$

$P(\bar{T}) = ?$

$P(\bar{T}) = P(\bar{T}G) + P(\bar{T}B)$

$P(\bar{T}) = P(\bar{T}|G)P(G) + P(\bar{T}|B)P(B)$

$= (0.80)(0.60) + (0.30)(0.40)$

$P(\bar{T}) = 0.60$

The probability that your flight will arrive on time.

Question # 4

$P(I) = 70\%$
$P(E) = 30\%$

$P(D|I) = 0.6$
$P(D|E) = 0.8$

$P(D) = ?$

So

$$P(D) = P(D|I)\,P(I) + P(D|E)\,P(E)$$

$$= (0.6)(0.7) + (0.8)(0.3)$$

$$= 0.66.$$

The spyware is detected 66% of the time.

Question #5

a) A^c & B

By defination

$$P(A \cap B) = P(A)(P(B))$$

And $P(A) = 1 - P(A^c)$

$$= [1 - P(A^c)]\,P(B).$$

$$= P(B) - P(A^c)P(B)$$

So,

$$P(B)P(A^c) = P(B) - P(A'B) \quad -(1)$$

P.T.O

Since

$A' \cap B = B - A \cap B \qquad (A \cap B \subseteq A)$

from 1 we say that

$P(A' \cap B) = P(A')P(B)$.

b) A^c & B^c

$P(A \cap B) = P(A)P(B)$.

$P(A^c \cup B^c) = 1 - P(A \cup B)$

Apply $P(A \cup B) = P(A) + P(B) - P(AB)$.

$= 1 - [P(A) + P(B) - P(A)P(B)]$

$= 1 - [P(A)[1 - P(B)] + P(B)]$

$= 1 - [P(A)P(B^c) + P(B)]$

$= P(B^c) - P(A)P(B^c)$

$= P(B^c)[1 - P(A)]$.

$= P(B^c)P(A^c)$.

So

$P(A^c \cap B^c) = P(A^c)P(B^c)$.