

Probability Review

Klein
carlj.klein@gmail.com

1 Cards

Question1:

Inclusion-Exclusion ID

Hint: $P(A \cup B) = ?$

Answer1:

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

Question2:

Define Mutually Exclusive

Answer2:

If $AB = \emptyset \rightarrow A$ and B are mutually exclusive

Question3:

Conditional Probability and Corollary

Answer3:

Definition: $P(E|F) = \frac{P(EF)}{P(F)}$

Corollary: $P(EF) = P(E) * P(F|E)$

Question4:

Multiplication Rule

Hint: extension of conditional probability: $\rightarrow P(E_1 *** E_n) = ?$

Answer4:

$$P(E_1 *** E_n) = P(E_1) * P(E_2 | E_1) * P(E_3 | E_2 * E_1) *** P(E_n | E_{n-1} *** E_1)$$

Question5:

Law of Total Probability

Hint: Given a mutually exclusive and exhaustive set A , $P(A_1) + \dots + P(A_k) = 1$, what can be deduced about the probability of an event B occurring?

Answer5:

$$P(B)$$

$$\begin{aligned}
&= P(BA_1) + \dots + P(BA_k) \\
&= P(A_1) * P(B \mid A_1) + \dots + P(A_k) * P(B \mid A_k) \\
&= \sum_{i=1}^k P(A_i) * P(B \mid A_i)
\end{aligned}$$

Question6:

Bayes' Theorem

Answer6:

Given a mutually exclusive and exhaustive set A, $P(A_1) + \dots + P(A_k) = 1$, then

$$\begin{aligned}
P(A_j \mid B) &= \\
\frac{P(A_j B)}{P(B)} &= \\
\frac{P(A_j) * P(B \mid A_j)}{\sum_{i=1}^k P(A_i) * P(B \mid A_i)}
\end{aligned}$$