

Yahoo Answer dated 10-10-2013

Question: Suppose that A and B are any two events such that, $P(A) = a, P(B) = b$ and $P[(A \cap B^c) \cup (A^c \cap B)] = m$, find $P(A \cup B)$.

Solution: From the Venn-diagram of $A \cup B$, we have, $A \cup B = A \cup (A^c \cap B)$ where A and $A^c \cap B$ are disjoint events, hence $P(A \cup B) = P(A) + P(A^c \cap B)$. ———(1)

Similarly, $A \cup B = B \cup (A \cap B^c)$ where B and $A \cap B^c$ are disjoint events, hence $P(A \cup B) = P(B) + P(A \cap B^c)$ ———(2)

Adding (1) and (2), we get, $2P(A \cup B) = P(A) + P(A^c \cap B) + P(B) + P(A \cap B^c) = P(A) + P(B) + P[(A \cap B^c) \cup (A^c \cap B)]$, since $(A \cap B^c)$ and $(A^c \cap B)$ are disjoint.

Thus $2P(A \cup B) = a + b + m$, which gives $P(A \cup B) = \frac{a+b+m}{2}$..