

Answer on Question #62254 – Math – Statistics and Probability

Question

Let A and B be any two events defined on the same sample space. Suppose $P(A) = 0.3$ and $P(A \cap B) = 0.6$. Find $P(B)$ such that A and B are independent.

Solution

Definition: Two events A and B are independent if $P(A \cap B) = P(A)P(B)$.

Equivalently: $P(A|B) = P(A)$, $P(B|A) = P(B)$.

Therefore

$P(B) = P(A \cap B) / P(A) = 0.6 / 0.3 = 2$, which is false, because $2 > 1$.

Thus, the problem has no solution.

Answer: the problem has no solution.

Question

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Solution

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

If two events A and B are independent, then $P(A \cap B) = P(A)P(B)$.

Therefore

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

$0.6 = 0.3 + P(B) - 0.3 P(B)$;

$0.7 P(B) = 0.3$;

$P(B) = 0.3 / 0.7 = 3/7$.

Answer: $P(B) = 3/7$.