

## Answer on Question #67021 – Math – Statistics and Probability

### Question

If  $P(A) = 0.50$ ,  $P(B) = 0.40$  and  $P(A \cup B) = 0.70$ , find  $P(A | B)$  and  $P(c(A \cup B))$ , where  $c A$  is the complement of  $A$ . State whether  $A$  and  $B$  are independent. Justify your answer.

### Solution

By General Addition Rule for probabilities,

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

Therefore,

$$P(A \cap B) = P(A) + P(B) - P(A \cup B) = 0.50 + 0.40 - 0.70 = 0.20.$$

By the definition of conditional probability,

$$P(A | B) = \frac{P(A \cap B)}{P(B)} = \frac{0.20}{0.40} = 0.50.$$

By the complementary rule,

$$P(c(A \cup B)) = 1 - P(A \cup B) = 1 - 0.70 = 0.30.$$

For the given events  $A$  and  $B$ ,  $P(A \cap B) = 0.20$  and  $P(A)P(B) = 0.50 \cdot 0.40 = 0.20$ . Hence,  $P(A \cap B) = P(A)P(B)$  and events  $A$  and  $B$  are independent.

**Answer:**  $P(A | B) = 0.50$ ,  $P(c(A \cup B)) = 0.30$ , events  $A$  and  $B$  are independent.