

Answer on Question #69191 – Math – Statistics and Probability

Question

Let A, B, C be three events such that $P(A)=0.4$, $P(C)=0.3$, $P((A \cap B) \cup C)=0.2$ and $P(A \cap B)=0.1$ and $(A \cup B) \cap C = \emptyset$.

Find:

a) $P(A \cup B \cup C)$

b) $P(\overline{A} \cup \overline{B})$

Solution

a) Since, $(A \cup B) \cap C = \emptyset$,

$$\begin{aligned} P(A \cup B \cup C) &= P(A \cup B) + P(C) = P(A) + P(B) - P(A \cap B) + P(C) \\ &= P(A) + P((A \cap B) \cup (\overline{A} \cap B)) - P(A \cap B) + P(C) \\ &= P(A) + P(A \cap B) + P(\overline{A} \cap B) - P(A \cap B \cap \overline{A} \cap B) - P(A \cap B) \\ &\quad + P(C) = P(A) + P(\overline{A} \cap B) - P(\emptyset) + P(C) \\ &= P(A) + P(\overline{A} \cap B) + P(C) = \end{aligned}$$

$$= 0.4 + 0.2 + 0.3 = 0.9,$$

$$\text{so } P(A \cup B \cup C) = 0.9.$$

b)

$$P(\overline{A} \cup \overline{B}) = P(\overline{A \cap B}) = 1 - P(A \cap B) = 1 - 0.1 = 0.9,$$

$$\text{So } P(\overline{A} \cup \overline{B}) = 0.9.$$

Answer: a) $P(A \cup B \cup C) = 0.9$; **b)** $P(\overline{A} \cup \overline{B}) = 0.9$.