

SOLUTIONS FOR QUIZ 10

Suppose the events E_1 , E_2 , and E_3 are such that $p(E_1) = p(E_2) = p(E_3) = 1/3$, $p(E_1 \cap E_2) = 1/6$, $p(E_1 \cap E_3) = p(E_2 \cap E_3) = 1/12$, and $E_1 \cap E_2 \cap E_3 = \emptyset$. Compute $p(E_1 \cup E_2 \cup E_3)$.

Answer: $p(E_1 \cup E_2 \cup E_3) = 2/3$.

Apply the Inclusion-Exclusion Principle:

$$\begin{aligned} & p(E_1 \cup E_2 \cup E_3) \\ &= p(E_1) + p(E_2) + p(E_3) - (p(E_1 \cap E_2) + p(E_1 \cap E_3) + p(E_2 \cap E_3)) + p(E_1 \cap E_2 \cap E_3) \\ &= \frac{1}{3} + \frac{1}{3} + \frac{1}{3} - \frac{1}{6} - \frac{1}{12} - \frac{1}{12} + 0 = \frac{2}{3}. \end{aligned}$$

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