

STEP II, 2004, Q14

- 14 Explain why, if A , B and C are three events,

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

where $P(X)$ denotes the probability of event X .

A cook makes three plum puddings for Christmas. He stirs r silver sixpences thoroughly into the pudding mixture before dividing it into three equal portions. Find an expression for the probability that at least one pudding contains no sixpence. Show that the cook must stir 6 or more sixpences into the mixture if there is to be less than $\frac{1}{3}$ chance that at least one of the puddings contains no sixpence.

Given that the cook stirs 6 sixpences into the mixture and that each pudding contains at least one sixpence, find the probability that there are two sixpences in each pudding.



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