A Problem On Total Probability Theorem

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Outline

1. Question
2. Solution

Question

Q15 [12^{th} CBSE Probability Exercise 13.5]:

The probability that a student is not a swimmer is $\frac{1}{5}$. Then the probability that out of five students, four are swimmers is?

Solution

Let X be the number of students and given that the probability of a student being swimmer is $\frac{1}{5}$
Then X has the binomial distribution

$$\Pr(X = k) = {}^{n}C_k p^k (1-p)^{n-k} \tag{1}$$

Here,

$$p = \frac{1}{5} \tag{2}$$

$$n = 5 \tag{3}$$

$$k = 4 \tag{4}$$

$\therefore$ The required probability is ${}^{5}C_4 \left(\frac{4}{5}\right)^4 \left(\frac{1}{5}\right)$