A Problem On Total Probability Theorem

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May 17, 2022

Outline

Question

Q15 [12th 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

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

Here,

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

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

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

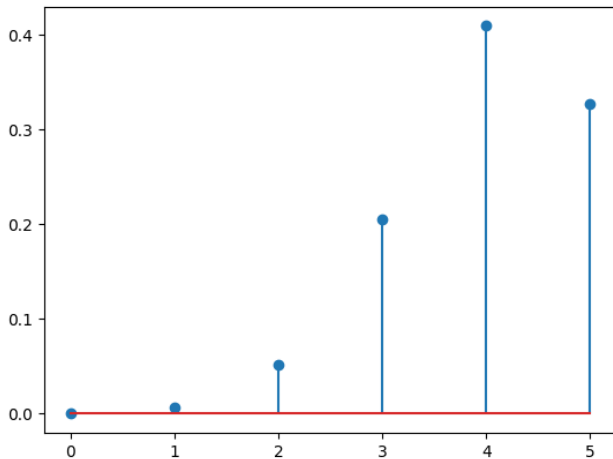$\therefore$ The required probability is ${}^{5}C_{4}\left(\frac{4}{5}\right)^{4}\left(\frac{1}{5}\right)$

Solution

Figure: pmf of this distribution