Assignment-1

CS22BTECH11006

12.13.5.15 Question : 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

(A) $\binom{5}{4}\left(\frac{4}{5}\right)^4 \frac{1}{5}$

(B) $\left(\frac{4}{5}\right)^4 \frac{1}{5}$

(C) $\binom{5}{1}\frac{1}{5}\left(\frac{4}{5}\right)^4$

(D) None of these

Solution:

X : be number of swimmers

As picking a student is Bernoulli trial

So, X has binomial distribution

$$\Pr(X = x) = \binom{n}{x} p^x q^{n-x} \tag{1}$$

Here, **n** = number of students = 5

Given,

probability that student is not swimmer is $\frac{1}{5}$

So,

$$\mathbf{q} = \frac{1}{5}$$

$$\mathbf{p} = 1 - \mathbf{q} = \frac{4}{5}$$

Probability that out of five students, four are swimmers is $\Pr(X = 4)$

$$\Pr(X = 4) = \binom{5}{4}\left(\frac{4}{5}\right)^4 \left(\frac{1}{5}\right)^{5-4}$$

$$= \binom{5}{4}\left(\frac{4}{5}\right)^4 \frac{1}{5}$$

$$= \binom{5}{1}\frac{1}{5}\left(\frac{4}{5}\right)^4 \quad \left(\binom{5}{4} = \binom{5}{1}\right)$$

Hence, **option (A) and (C) both are correct**