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

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

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

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

4) None of these

Solution:

X : be number of swimmers

As picking a student is Bernoulli trial

So, X has binomial distribution

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

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

Given,

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

So,

$$\mathbf{q} = \frac{1}{5} \tag{2}$$

$$\mathbf{p} = 1 - \mathbf{q} = \frac{4}{5} \tag{3}$$

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

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

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

$$= \binom{5}{1}\frac{1}{5}\left(\frac{4}{5}\right)^4 \quad \left(\binom{5}{4} = \binom{5}{1}\right) \tag{6}$$

Hence, **option 1 and 2 both are correct**