

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

$$P_X(k) = \binom{n}{k} p^k q^{n-k} \quad (1)$$

Given,

$$n = 5$$

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

So,

$$q = \frac{1}{5} \quad (2)$$

$$p = 1 - q = \frac{4}{5} \quad (3)$$

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

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

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

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

Hence, option 1 and 2 both are correct