

# AI1103 Assignment-1

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Download all python codes from

<https://github.com/vrahul02/AI1103-Probability-and-Random-Variables/tree/main/Assignment-1/Codes>

and latex-tikz codes from

<https://github.com/vrahul02/AI1103-Probability-and-Random-Variables/tree/main/Assignment-1/Assignment-1.tex>

$$\Pr(K = 4) = \binom{5}{4} \times \left(\frac{1}{5}\right)^1 \times \left(\frac{4}{5}\right)^4 \quad (0.0.2)$$

As per the property of permutation and combination,

$$\binom{n}{l} = \binom{n}{n-l} \quad (0.0.3)$$

$$\Rightarrow \Pr(K = 4) = \binom{5}{1} \times \left(\frac{1}{5}\right)^1 \times \left(\frac{4}{5}\right)^4 \quad (0.0.4)$$

## PROBLEM 1.5

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

- a)  $\binom{5}{4} \times \left(\frac{4}{5}\right)^4 \times \left(\frac{1}{5}\right)$
- b)  $\left(\frac{4}{5}\right)^4 \times \left(\frac{1}{5}\right)$
- c)  $\binom{5}{1} \times \left(\frac{4}{5}\right)^4 \times \left(\frac{1}{5}\right)$
- d) None of these

## SOLUTION

Probability of 'non swimmer' =  $q = \frac{1}{5}$   
 Since being 'swimmer' and being 'non swimmer' are mutually exclusive,  
 Probability of 'swimmer' =  $p = 1 - q = \frac{4}{5}$

Let  $K$  be a random variable representing number of students who are 'swimmer' in a given sample. So  $K$  has a binomial distribution :

$$\Pr(K = l) = \binom{n}{l} \times (q)^{n-l} \times (p)^l \quad (0.0.1)$$

Where

- $n$  = Total number of students = 5
- $p$  = Probability that a student is 'swimmer' =  $\frac{4}{5}$
- $q$  = Probability that a student is 'non swimmer' =  $\frac{1}{5}$
- $l$  = Total number of swimmers = 4

$$\Rightarrow \Pr(K = 4) = 0.4096$$

Thus options a) and c) are correct

The probability that 4 students are 'swimmer' out of a random sample of 5 students is 0.4096.

