Assignment 4 11th Class

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Download all python codes from

https://github.com/GunjitMittal/Assignment4/tree/main/Assignment4/codes

Download all latex codes from

https://github.com/GunjitMittal/Assignment4/tree/main/Assignment4

1 Question

In a relay race there are five teams A, B, C, D and E.

(a) What is the probability that A, B and C finish first, second and third, respectively.

(b) What is the probability that A, B and C are first three to finish (in any order)

(Assume that all finishing orders are equally likely)

2 Solution

Solution: Let us consider five random variables X_A, X_B, X_C, X_D and $X_E \in \{1,2,3,4,5\}$ where $X_Y = i$ represents that Y team finished in i_{th} place and all the X_Y are distinct

(a) A, B and C finsishing first, second and third respectively is represented by $X_A = 1, X_B = 2$ and $X_C = 3$
Total number of finishing orers $= 5! = 120$
Fixing $X_A, X_B and X_C$the number of possible orders will become $\frac{5!}{5\times4\times3} = \frac{120}{60} = 2 \therefore \Pr(X_A = 1, X_B = 2 \text{ and } X_C = 3) = \frac{2}{120} = \frac{1}{60}$

(b) A, B and C finishing in top 3 irrespective of order is represented by $X_A, X_B, X_C \in \{1,2,3\}$
$\therefore \Pr(X_A, X_B, X_C \in \{1,2,3\}) = \frac{1}{60} \times 3! = \frac{1}{10}$