Permutation and Combination - Class XI

Past Year JEE Questions

Questions

Quetion: 01

Statement - 1: The number of ways of distributing 10 identical balls in 4 distinct boxes such that no box is emply is ${}^{9}C_{3}$.
Statement - 2: The number of ways of choosing any 3 places from 9 different places is ${}^{9}C_{3}$.
A. Statement - 1 is true, Statement - 2 is true, Statement - 2 is not a correct explanation for Statement - 1.
B. Statement - 1 is true, Statement - 2 is false.
C. Statement - 1 is false, Statement - 2 is true.
D. Statement - 1 is true, Statement - 2 is true, Statement - 2 is a correct explanation for Statement - 1.

Solutions

Solution: 01

Explanation

Let XA, X_B, X_C and X_D represent number of balls present in box A, B, C and D respectively.
As no box can be empty so,
$X_A \geq 1$, $X_B \geq 1$, $X_C \geq 1$ and $X_D \geq 1$
$\Rightarrow X_A - 1 \geq 0$, $\Rightarrow X_B - 1 \geq 0$, $\Rightarrow X_C - 1 \geq 0$ and $\Rightarrow X_D - 1 \geq 0$
$t_A \geq 0$, $t_B \geq 0$, $t_C \geq 0$ and $t_D \geq 0$
According to the question,
$X_A + X_B + X_C + X_D = 10$
$\Rightarrow (X_A - 1) + (X_B - 1) + (X_C - 1) + (X_D - 1) = 6$
$\Rightarrow t_A + t_B + t_C + t_D = 6$
Now question becomes, box A, B, C, and D can have none or one or more balls and total balls are 6
From formula we know, n things can be distributed among r people in ${}^{n+r-1}C_{r-1}$ ways where each people can have either 0 or more things.
$\therefore$ 6 balls can be distributed among 4 boxes in ${}^{6+4-1}C_{4-1} = {}^{9}C_{3}$ ways where each box can have either 0 or more balls.
Therefore, Statement 1 is correct. The number of ways of choosing any 3 places from 9 different places is ${}^{9}C_{3}$ ways. But Statement - 2 is not the correct explanation of Statement - 1.