2n boys having different heights are randomly divided into two subgroups containing n boys each. The probability that the two tallest boys are in the same group is,

(A) $\frac{n}{2n-1}$ (B) $\frac{n-1}{2n-1}$ (C) $\frac{2n-1}{n^2}$ (D) None of these

Solution

Once the two tallest boys are separated, there are 2n–2 boys left.

Number of ways of dividing 2n–2 boys into two groups containing n & n-2 boys = ${}^{2n-2}C_n$

The 2 tallest boys will join the group having n-2 boys.

Number of ways of diving 2n boys into two groups containing n & n boys = $\frac{{}^{2n}C_n}{2}$

[Division by 2 is used above as the two groups contain equal number of boys]

Required probability P = $\frac{{}^{2n-2}C_n}{\frac{{}^{2n}C_n}{2}} = \frac{\frac{(2n-2)!}{n!(n-2)!}}{\frac{(2n)!}{n!n!}\frac{1}{2}} = \frac{\frac{(2n-2)!}{(n-2)!}}{\frac{(2n)(2n-1)(2n-2)!}{n(n-1)(n-2)!}\frac{1}{2}}$

$\therefore P = \frac{n-1}{2n-1}$

Hence, (B)