

The value of r for which ${}^{20}C_r \cdot {}^{20}C_0 + {}^{20}C_{r-1} \cdot {}^{20}C_1 + {}^{20}C_{r-2} \cdot {}^{20}C_2 + \dots + {}^{20}C_0 \cdot {}^{20}C_r$ is maximum, is:

(1) 15

(2) 20

(3) 11

(4) 10

Ans. (2)

Solution. Consider the expression ${}^{20}C_r \cdot {}^{20}C_0 + {}^{20}C_{r-1} \cdot {}^{20}C_1 + {}^{20}C_{r-2} \cdot {}^{20}C_2 + \dots + {}^{20}C_0 \cdot {}^{20}C_r$

For maximum value of above expression r should be equal to 20.

$$\begin{aligned} \text{as } & {}^{20}C_{20} \cdot {}^{20}C_0 + {}^{20}C_{19} \cdot {}^{20}C_1 + \dots + {}^{20}C_0 \cdot {}^{20}C_{20} \\ & = ({}^{20}C_0)^2 + ({}^{20}C_1)^2 + \dots + ({}^{20}C_{20})^2 = {}^{40}C_{20} \end{aligned}$$

Which is the maximum value of the expression,

So, r = 20.