

Previous Year Question with Solution :

Q) In a bag, there are three tickets numbered 1, 2, 3. A ticket is drawn at random and put back and this is done four times. The probability that the sum of the numbers is even, is ___.

Soln:

The total number of ways of selecting 4 tickets = $3^4 = 81$.

The favourable number of ways = sum of coefficients of x^2, x^4, \dots in $(x + x^2 + x^3)^4$

= sum of coefficients of x^2, x^4, \dots in $x^4 (1 + x + x^2)^4$.

Let $(1 + x + x^2)^4 = 1 + a_1x + a_2x^2 + \dots + a_8x^8$.

Then $3^4 = 1 + a_1 + a_2 + \dots + a_8$,

On putting $x = 1$

$$1 = 1 + a_1 + a_2 + \dots + a_8,$$

On putting $x = -1$

$$3^4 + 1 = 2 [1 + a_1 + a_2 + a_4 + a_6 + a_8]$$

$$\Rightarrow a_2 + a_4 + a_6 + a_8 = 41$$

Thus sum of the coefficients of $x^2, x^4, \dots = 41$

Hence the required probability = $41 / 81$.