Past Year JEE Questions

Questions

Quetion: 01

Consider the data on x taking the values
0, 2, 4, 8,....., 2^n with frequencies
$^nC_0$, $^nC_1$, $^nC_2$,...., ^nC_n respectively. If the
mean of this data is $\frac{728}{2^n}$, then n is equal to _____ .

Solutions

Solution: 01

Answer

Correct Answer is **6**

Explanation

Mean = $\frac{\sum x_i f_i}{\sum f_i}$

= $\frac{0.{}^nC_0+2.{}^nC_1+2^2.{}^nC_2+\ldots+2^n.{}^nC_n}{{}^nC_0+{}^nC_1+\ldots+{}^nC_n}$

We know,

$(1 + x)^n = {}^nC_0 + {}^nC_1x + {}^nC_2x^2+\ldots+{}^nC_nx^n$ ...(1)

Put x = 2, at (1) we get

$\Rightarrow 3^n - 1 = 2.{}^nC_1 + 2^2.{}^nC_2+\ldots+2^n.{}^nC_n$

And Putting x = 1 in (1), we get

$2^n = {}^nC_0 + {}^nC_1+\ldots+{}^nC_n$

$\therefore$ Mean = $\frac{3^n-1}{2^n}$

According to question,

$\frac{3^n-1}{2^n} = \frac{728}{2^n}$

$\Rightarrow 3^n = 729$

$\Rightarrow n = 6$