6) Find mean of binomial distribution $B\left(4, \frac{1}{3}\right)$.

Ans: let X be the random variable whose probability distribution is $B\left(4, \frac{1}{3}\right)$.

Here $n = 4$, $p = \frac{1}{3}$, $q = 1 - \frac{1}{3} = \frac{2}{3}$

We know that $P(x = x)$

$$= {}^4C_x \left(\frac{2}{4}\right)^{4-x} \left(\frac{1}{3}\right)^x,$$

$$x = 0, 1, 2, 3, 4$$

i.e., the distribution of X is

x_i	$P(x_i)$	$x_i P(x_i)$	$x_i P(x_i)$
0	${}^4C_0 \left(\frac{2}{3}\right)^4$	0	
1	${}^4C_1 \left(\frac{2}{3}\right)\left(\frac{1}{3}\right)$		${}^4C_1 \left(\frac{2}{3}\right)^3 \frac{1}{3}$
2	${}^4C_2 \left(\frac{2}{3}\right)^2\left(\frac{1}{3}\right)^2$		$2\,{}^4C_2 \left(\frac{2}{3}\right)^2\left(\frac{1}{3}\right)^2$
3	${}^4C_3 \left(\frac{2}{3}\right)\left(\frac{1}{3}\right)^3$		$3\,{}^4C_3 \left(\frac{2}{3}\right)\left(\frac{1}{3}\right)^3$
4	${}^4C_4 \left(\frac{1}{3}\right)^4$		$4\,{}^4C_4 \left(\frac{1}{3}\right)^4$