Probability Assignment 1 (12.13.5.12)

Pallala Rishitha (BT22BTECH11011)

Question

Find the probability of throwing at most 2 sixes in 6 throws of a single die.

Solution

Let X denote the number of sixes obtained after the 6 trials. Clearly, X has the binomial distribution with $n = 6$ and p being the probability of obtaining a six ,

$$p = \frac{1}{6} \tag{1}$$

Now, since X has the binomial distribution, the probability mass function is given by

$$P_X(r) = {}^{n}C_r \left(\frac{1}{6}\right)^{r} \left(\frac{5}{6}\right)^{n-r} \tag{2}$$

Substituting the values of r as 0,1,2 :

$$P_X(0) = {}^{6}C_0 \left(\frac{1}{6}\right)^{0} \left(\frac{5}{6}\right)^{6-0} \tag{3}$$

$$= \frac{15625}{46656} \tag{4}$$

$$P_X(1) = {}^{6}C_1 \left(\frac{1}{6}\right)^{1} \left(\frac{5}{6}\right)^{6-1} \tag{5}$$

$$= \frac{18750}{46656} \tag{6}$$

$$P_X(2) = {}^{6}C_2 \left(\frac{1}{6}\right)^{2} \left(\frac{5}{6}\right)^{6-2} \tag{7}$$

$$= \frac{9375}{46656} \tag{8}$$

Hence, the probability of throwing at most 2 sixes is

$$P_X(<= 2) = P_X(0) + P_X(1) + P_X(2) \tag{9}$$

$$= \frac{21875}{23328} \tag{10}$$