Question

A shipment of 6 computers contains three that are slightly defective. if a retailer receives three of these computers at random.

Let X be the random variable representing the three slightly defective computers purchased by the retailer. Construction the Discrete Probability Distribution of the Random Variable X.

Solution

We know that $\binom{3}{0}=\binom{3}{3}=1$, $\binom{3}{1}=\binom{3}{2}=3$, $\binom{6}{0}=\binom{6}{6}=1$, $\binom{6}{1}=\binom{6}{5}=6$, $\binom{6}{2}=\binom{6}{4}=15$, $\binom{6}{3}=20$

out of total 6 computers, 3 are defective, retailer receives 3 computers.

X = number of defective computers which retailer receives

X can be 0 , 1 , 2 or 3;

$$P\ (X=0) = P\ (\ 0\ \text{defective and 3 non-defective}) = \frac{\binom{3}{0}\times\binom{3}{3}}{\binom{6}{3}} = \frac{1}{20}$$

$$P\ (X=1) = P\ (\ 1\ \text{defective and 2 non-defective}) = \frac{\binom{3}{1}\times\binom{3}{2}}{\binom{6}{3}} = \frac{3\times3}{20} = \frac{9}{20}$$

$$P\ (X=2) = P\ (\ 2\ \text{defective and 1 non-defective}) = \frac{\binom{3}{2}\times\binom{3}{1}}{\binom{6}{3}} = \frac{3\times3}{20} = \frac{9}{20}$$

$$P(X=3) = P(\text{3 defective and 0 non-defective}) = \frac{\binom{3}{3} \times \binom{3}{0}}{\binom{6}{3}} = \frac{1}{20}$$

Probability distribution of random variable X

X =	0	1	2	3
P(x) =	$\frac{1}{20}$	$\frac{9}{20}$	$\frac{9}{20}$	$\frac{1}{20}$