ASSIGNMENT 6 : CBSE PROBABILITY CLASS- 12 EXAMPLE - 25

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Outline

Question

Find the probability distribution of number of doublets in three throws of a pair of dice.

Solution

Let X=$\{0, 1, 2, 3\}$ be a random variable representing the number of doublets.

Event	Description
$X = 0$	no dublet in three throws
$X = 1$	one dublet in three throws
$X = 2$	two doublets in three throws
$X = 3$	all three throws are doublets

Table 1: Random Variables

For a single throw the possible doublets are :

$$(1,1)\ ,\ (2,2),\ (3,3),\ (4,4),\ (5,5),\ (6,6)$$

$\Rightarrow$ Probability of getting a doublet $= \frac{1}{6}$

Let **p** be the probability of getting a doublet in one throw and Let **q** be the probability of not getting a doublet in one throw.

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

$$q = \frac{5}{6} \tag{2}$$

From the binomial distribution :

1.
$$\Pr\{X=0\} = \binom{3}{0} \times p^0 \times q^3 \tag{3}$$
$$= 1 \times \left[\frac{1}{6}\right]^0 \times \left[\frac{5}{6}\right]^3 \tag{4}$$
$$= \frac{125}{216} \tag{5}$$

2.
$$\Pr\{X=1\} = \binom{3}{1} \times p^1 \times q^2 \tag{6}$$
$$= 3 \times \left[\frac{1}{6}\right]^1 \times \left[\frac{5}{6}\right]^2 \tag{7}$$
$$= 3 \times \frac{25}{216} \tag{8}$$
$$= \frac{75}{216} \tag{9}$$

3

$$\Pr\{X=2\} = \binom{3}{2} \times p^2 \times q^1 \tag{10}$$

$$= \binom{3}{2} \times \left[\frac{1}{6}\right]^2 \times \left[\frac{5}{6}\right]^1 \tag{11}$$

$$= 3 \times \frac{5}{216} \tag{12}$$

$$= \frac{15}{216} \tag{13}$$

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$$\Pr\{X=3\} = \binom{3}{3} \times p^3 \times q^0 \tag{14}$$

$$= \binom{3}{3} \times \left[\frac{1}{6}\right]^3 \times \left[\frac{5}{6}\right]^0 \tag{15}$$

$$= \frac{1}{216} \tag{16}$$

Probability Distribution Table

$\Rightarrow$ The Probability distribution of number of doublets in three throws of a pair of dice is :

X	0	1	2	3
P(X)	$\frac{125}{216}$	$\frac{75}{216}$	$\frac{15}{216}$	$\frac{1}{216}$

Table 2: Probability Distribution