NCERT 12.13.3.27

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Question 12.13.3.27:A biased die is such that $\Pr(4) = \frac{1}{10}$ and other scores being equally likely. The die is tossed twice. If X is the 'number of fours seen', find the variance of the random variable X.

Solution: Since, X = number of fours seen on tossing a die twice, X={0, 1, 2}
Also,

$$\Pr(4) = \frac{1}{10} \tag{1}$$

$$\Pr(4') = \frac{9}{10} \tag{2}$$

So,

$$p_X(k) = \begin{cases} \Pr(4')\Pr(4') = \frac{81}{100} & k = 0 \\ \Pr(4)\Pr(4') + \Pr(4')\Pr(4) = \frac{18}{100} & k = 1 \\ \Pr(4)\Pr(4) = \frac{1}{100} & k = 2 \end{cases} \tag{3}$$

$$Var(X) = E(X^2) - (E(X))^2 \tag{4}$$

$$Var(X) = \sum k^2 p_X(k) - \left(\sum k p_X(k)\right)^2 \tag{5}$$

$$= \left(0 + \frac{18}{100} + 4\frac{1}{100}\right) - \left(0 + \ \right) \tag{6}$$

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