Solution 12.13.3.22

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Question 22 The Probability of a man hitting target is 0.25.He shoots 7 times. What is the probability of his hitting atleast twice?

Solution:

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TABLE 0
RANDOM VARIABLE AND PROBABILITY TABLE

Random independent variable	value of R.V	Description
n	7	Total no. of trials
X	$0 \leq X \leq 7$	no. of times he hits the target

$$\text{Let the probability of hitting the targets correctly be } p = \frac{1}{4} = 0.25 \tag{1}$$

$$\text{CDF of binomial distribution is:} \tag{2}$$

$$F_X(k) = \sum_{k=0}^{n} \binom{n}{k} p^k (1-p)^{n-k} \qquad \text{k} = 0, 1, 2, ..7 \tag{3}$$

$$\text{Probability of Hitting the target atleast twice is} = \Pr(X \geq 2) \tag{4}$$

$$\Pr(X \geq 2) = 1 - \Pr(X \leq 1) \tag{5}$$

$$= F_X(7) - F_X(1) \tag{6}$$

$$= 1 - \left\{ \sum_{k=0}^{1} \binom{7}{k} \left(\frac{1}{4}\right)^k \left(\frac{3}{4}\right)^{7-k} \right\} \tag{7}$$

$$= 0.55505 \tag{8}$$

Hence, the probability of hitting the target atleast twice is 0.55505

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