

# 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:**

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

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

CDF of binomial distribution is: (2)

$$p(X \leq k) = \sum_{k=0}^k \binom{n}{k} p^k (1-p)^{n-k} \quad k = 0, 1, 2, \dots, 7 \quad (3)$$

Probability of Hitting the target atleast twice is  $= p(X \geq 2)$  (4)

$$p(X \geq 2) = 1 - p(X \leq 1) \quad (5)$$

$$= 1 - \left\{ \sum_{k=0}^1 \binom{7}{k} \left(\frac{1}{4}\right)^k \left(\frac{3}{4}\right)^{7-k} \right\} \quad \text{Using CDF} \quad (6)$$

$$= 1 - \left\{ \left(\frac{1}{4}\right)^0 \left(\frac{3}{4}\right)^7 + 7 \left(\frac{1}{4}\right)^1 \left(\frac{3}{4}\right)^6 \right\} \quad (7)$$

$$= 1 - \left(\frac{3}{4}\right)^6 \frac{10}{4} \quad (8)$$

$$= 1 - \left(\frac{729}{1096}\right) \frac{10}{4} \quad (9)$$

$$= 1 - \frac{7290}{16384} \quad (10)$$

$$= \frac{9094}{16384} \quad (11)$$

$$= 0.5550 \quad (12)$$

$$(13)$$

Hence, the probability of hitting the target atleast twice is 0.5550