

Answer on Question #83804 – Math – Statistics and Probability

Question

In a certain city district, the need for money to buy drugs is stated as the reason for 75% of all thefts. Find the probability that among the next 5 theft cases reported in this district,

- (a) exactly 2 resulted from the need for money to buy drugs;
- (b) at most 3 resulted from the need for money to buy drugs.

Solution

Let X denotes the number of theft resulted from the need for money to buy drugs. Trials are independent. Then $X \sim B(n, p)$.

$$P(X = x) = \binom{n}{x} p^x (1 - x)^{n-x}$$

$$p = 0.75, n = 5$$

$$X \sim B(5, 0.75)$$

$$P(X = x) = \binom{n}{x} p^x (1 - x)^{n-x}$$

(a)

$$P(X = 2) = \binom{5}{2} 0.75^2 (1 - 0.75)^{5-2} = \frac{5!}{2!(5-2)!} 0.75^2 (0.25)^3 \approx 0.08789$$

(b)

$$\begin{aligned} P(X \leq 3) &= P(X = 0) + P(X = 1) + P(X = 2) + P(X = 3) \\ &= \binom{5}{0} 0.75^0 (0.25)^5 + \binom{5}{1} 0.75^1 (0.25)^4 + \binom{5}{2} 0.75^2 (0.25)^3 + \binom{5}{3} 0.75^3 (0.25)^2 \\ &= (0.25)^5 + 5(0.75)(0.25)^4 + 10(0.75)^2(0.25)^3 + 10(0.75)^3(0.25)^2 \\ &\approx 0.36719 \end{aligned}$$

Answer: (a) 0.08789; (b) 0.36719.