Binomial probabilities and cumulative probabilities

6 questions | 12 marks

Equivalent correct methods earn the corresponding marks.

1. $X \sim \text{Bin}(4, 1/2)$. Find P(X = 2). [2 marks]

$\binom{4}{2}(1/2)^4 = 6/16 = 3/8$.

Answer: 3/8.

2. $X \sim \text{Bin}(3, 0.2)$. Find P(X = 0). [2 marks]

All three trials fail: $0.8^3 = 0.512$.

Answer: 0.512.

3. $X \sim \text{Bin}(4, 0.1)$. Find P(X ≥ 1). [2 marks]

Use $1 - \text{P}(X = 0)$.

$1 - 0.9^4 = 0.3439$.

Answer: 0.3439.

4. $X \sim \text{Bin}(5, 1/2)$. Find P(X ≤ 1). [2 marks]

$(\binom{5}{0} + \binom{5}{1})/2^5 = 6/32 = 3/16$.

Answer: 3/16.

5. $X \sim \text{Bin}(4, 1/2)$. Find P(1 ≤ X ≤ 3). [2 marks]

The excluded values are 0 and 4.

$1 - 1/16 - 1/16 = 14/16 = 7/8$.

Answer: 7/8.

6. $X \sim \text{Bin}(10, 0.3)$. Write a cumulative-probability expression for P(3 ≤ X ≤ 7). [2 marks]

The total to 7 includes all desired values.

Remove the values 0, 1 and 2, not the total to 3.

Answer: $P(X \leq 7) - P(X \leq 2)$.