Binomial probabilities and cumulative probabilities

6 questions | 12 marks

Equivalent correct methods earn the corresponding marks.

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

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

Answer: $\frac{3}{8}$.

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 $P(X \geq 1)$. [2 marks]

Use $1 - P(X = 0)$.

$1 - 0.9^4 = 0.3439$.

Answer: 0.3439.

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

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

Answer: $\frac{3}{16}$.

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

The excluded values are 0 and 4.

$1 - \frac{1}{16} - \frac{1}{16} = \frac{14}{16} = \frac{7}{8}$.

Answer: $\frac{7}{8}$.

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

The total to 7 includes all desired values.

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

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