Binomial mean/variance

6 questions | 14 marks

Equivalent correct methods earn the corresponding marks.

1. $X \sim \text{Bin}(12, 0.25)$. Find its mean and variance. [2 marks]

np = 12 × 0.25 = 3.

np(1 − p) = 3 × 0.75 = 2.25.

Answer: Mean 3; variance 2.25.

2. $X \sim \text{Bin}(100, 0.6)$. Find SD(X). [2 marks]

Variance = 100 × 0.6 × 0.4 = 24.

Take its positive square root.

Answer: $\sqrt{24} \approx 4.8990$.

3. A binomial variable has mean 8 and variance 4. Find n and p. [3 marks]

1 − p = 4/8 = 0.5.

p = 0.5 and n = 8/0.5 = 16.

Answer: n = 16, p = 0.5.

4. Can a binomial variable have exact mean 5 and exact variance 6? Explain. [2 marks]

Variance/mean would give $1 - p = 6/5$.

This would require $p = -0.2$, which is not a probability.

Answer: No.

5. $X \sim \text{Bin}(40, 0.3)$. Find the variance of the proportion X/40. [3 marks]

Var(X) = $40 \times 0.3 \times 0.7 = 8.4$.

Var(X/40) = $8.4/40^2 = 0.00525$.

Answer: 0.00525.

6. A binomial variable has p = 1 and mean 7. State n and describe its spread. [2 marks]

$np = n = 7$.

All seven trials succeed with certainty, so there is no variation.

Answer: n = 7; variance and SD are zero.