

Exercise walk-through

Parameters for a Binomial Distribution ■ 4.11

eXercise

You must be able to

- calculate the **mean** of a binomial, $\mu_X = np$
- calculate the **standard deviation**, $\sigma_X = \sqrt{np(1-p)}$

Method — Binomial parameters

For a binomial random variable with n trials and success probability p :

$$\mu_X = np, \quad \sigma_X = \sqrt{np(1-p)}.$$

Method — Example

$$n = 100, p = 0.2: \mu_X = 100(0.2) = 20 \text{ and } \sigma_X = \sqrt{100(0.2)(0.8)} = \sqrt{16} = 4.$$

Practice 2.1 ■ 1 mark

Write the formula for the mean of a binomial distribution.

Solution 2.1

Worked steps

$$\mu_X = np \quad \text{B1}.$$

Practice 2.2 ■ 2 marks

For $n = 50$, $p = 0.4$, find the mean.

Solution 2.2

Worked steps

$$\mu_X = 50 \times 0.4 = 20 \quad \text{M1} \quad \text{A1}.$$

Practice 2.3 ■ 2 marks

For $n = 100$, $p = 0.5$, find the standard deviation.

Solution 2.3

Worked steps

$$\sigma_X = \sqrt{100(0.5)(0.5)} = \sqrt{25} = 5 \quad \text{M1} \quad \text{A1}.$$

Exam-style 3.1 ■ 1 mark

The mean of a binomial distribution is

A n

B np

C p

D $\sqrt{np}$

Solution 3.1

A n

B np



C p

D $\sqrt{np}$

Worked steps

B.

Exam-style 3.2 ■ 1 mark

The standard deviation of a binomial distribution is

A np

B $\sqrt{np(1-p)}$

C $n(1-p)$

D p

Solution 3.2

A np

B $\sqrt{np(1-p)}$



C $n(1-p)$

D p

Worked steps

B.

Exam-style 3.3 ■ 2 marks

A binomial distribution has $n = 200$ and $p = 0.3$.

- (a) Find the mean.
- (b) Find the standard deviation.

Solution 3.3

Worked steps

(a) $\mu_X = 200 \times 0.3 = 60$ **M1** **A1**. (b) $\sigma_X = \sqrt{200(0.3)(0.7)} = \sqrt{42} \approx 6.5$
M1 **A1**.