

Exercise walk-through

4.10

Introduction to the Binomial Distribution

AP Statistics

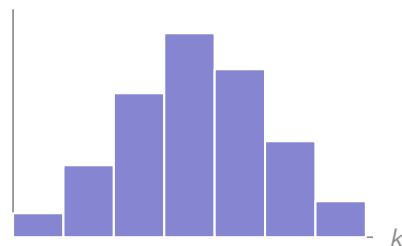
The binomial distribution

The **binomial setting** counts successes – remember **BINS**: **B**inary, **I**ndependent, fixed **N**umber, **S**ame p .

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

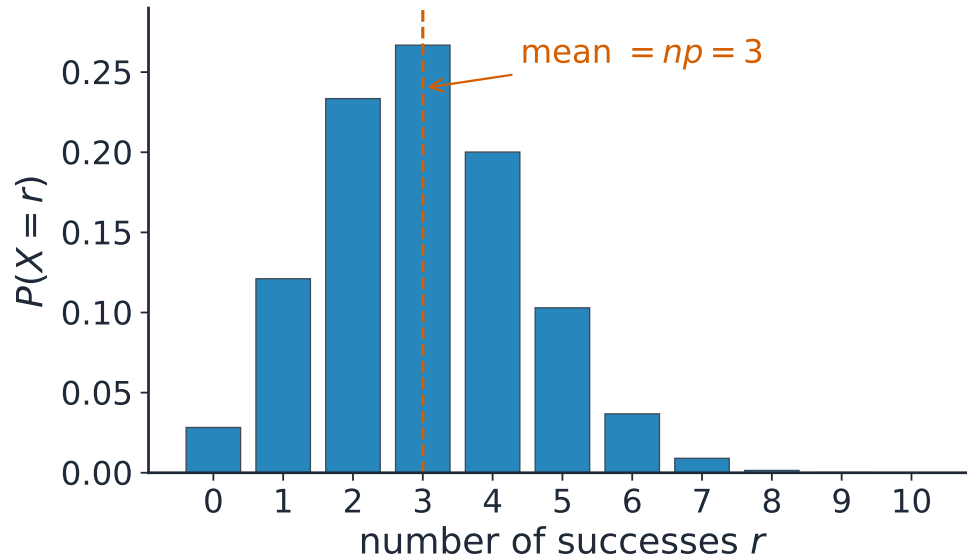
$$\mu_X = np \quad \sigma_X = \sqrt{np(1 - p)}$$

Shape: symmetric at $p = 0.5$, skewed otherwise; more bell-shaped as n grows.



Binomial: count of successes.

Introduction to the Binomial Distribution



The binomial distribution, with mean n times p

Worked example – binomial by hand

A free-throw shooter makes 80%. In $n = 10$ attempts, find $P(X = 8)$ and describe the distribution's centre and spread.

$$P(X = 8) = \binom{10}{8} (0.8)^8 (0.2)^2$$

$$= 45(0.1678)(0.04) \approx 0.302$$

$$\mu = np = 10(0.8) = 8 \text{ makes}$$

$$\sigma = \sqrt{10(0.8)(0.2)} \approx 1.26$$

$\binom{10}{8} = 45$ counts **which** 8 shots dropped – forget it and you find one single ordering (0.0067), not the event. Check **BINS** first: without independence it is not binomial at all.

Exercises 2.1-2.3

2.1 State the four conditions of a binomial setting. [2]

2.2 Write the binomial probability formula. [1]

2.3 For $n = 4$, $p = 0.5$, find $P(X = 4)$. [2]

Exercises 2.1-2.3

2.1 State the four conditions of a binomial setting.

[2]

2.1

- fixed number of trials; two outcomes; independent trials; constant p
-

2.2 Write the binomial probability formula.

[1]

2.2

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

2.3 For $n = 4$, $p = 0.5$, find $P(X = 4)$.

[2]

2.3

- $P(X = 4) = \binom{4}{4} (0.5)^4 = (0.5)^4 = 0.0625$

Exercises 3.1-3.2

3.1 A binomial random variable counts the number of

[1]

☐

A trials

B successes in n trials

C failures only

D outcomes

3.2 In a binomial setting, the probability of success p is

[1]

☐

A changing each trial

B constant across trials

C zero

D exactly 1

Exercises 3.1-3.2

3.1 A binomial random variable counts the number of

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B successes in n trials

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D outcomes

3.1 B

- successes in n trials.

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3.2 B

- constant across trials.

Exercise 3.3 (a)

3.3 A fair coin is flipped 3 times; X = number of heads.

(a) State n and p .

[1]

Exercise 3.3 (a)

3.3 A fair coin is flipped 3 times; X = number of heads.

(a) State n and p .

[1]

(a)

- $n = 3, p = 0.5$

Exercise 3.3 (b)

3.3 A fair coin is flipped 3 times; X = number of heads.

(b) Find $P(X = 0)$.

[2]

Exercise 3.3 (b)

3.3 A fair coin is flipped 3 times; X = number of heads.

(b) Find $P(X = 0)$.

[2]

(b)

- $P(X = 0) = (0.5)^3 = 0.125$

Exercise 3.3 (c)

3.3 A fair coin is flipped 3 times; X = number of heads.

(c) Name the distribution.

[1]

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[1]

(c)

- binomial