

Exercise walk-through

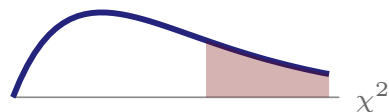
8.3

Carrying Out a Chi-Square Test for Goodness of Fit

AP Statistics

What we will cover

- 1 The chi-square idea
- 2 Goodness-of-fit test
- 3 Two-way tables
- 4 Homogeneity vs independence
- 5 Choosing a procedure



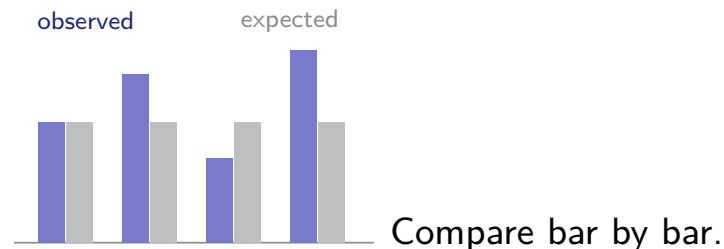
The chi-square idea

The **chi-square** tests compare counts:

- **observed** – what happened
- **expected** – what the null predicts

Big gaps $\Rightarrow$ doubt the claim.

Goodness-of-fit checks
one variable; a **two-way table**
checks two.



Check yourself

- 1 Write the chi-square statistic formula.
- 2 What is the df for a goodness-of-fit with 6 categories?
- 3 How do you find an expected count in a two-way table?
- 4 Several separate samples, one variable: which test?



Answers 1. $\chi^2 = \sum (O - E)^2 / E$ 2. $6 - 1 = 5$ 3. row $\times$ col / grand total 4. homogeneity

Exercises 2.1-2.3

2.1 State the degrees of freedom for a goodness-of-fit test with k categories. [1]

2.2 State what a large chi-square value suggests. [1]

2.3 A goodness-of-fit test gives a p-value of 0.03 at $\alpha = 0.05$. State the decision. [1]

Exercises 2.1-2.3

2.1 State the degrees of freedom for a goodness-of-fit test with k categories. [1]

2.1

- $k - 1$
-

2.2 State what a large chi-square value suggests. [1]

2.2

- a large difference between observed and expected counts (evidence against H_0)
-

2.3 A goodness-of-fit test gives a p-value of 0.03 at $\alpha = 0.05$. State the decision. [1]

2.3

- reject H_0 ($0.03 < 0.05$)

Exercises 3.1-3.2

3.1 The degrees of freedom for a goodness-of-fit test with 6 categories is

[1]

☐

A 6

B 5

C 4

D 1

3.2 A large chi-square statistic gives a _____ p-value.

[1]

☐

A large

B small

C zero

D negative

Exercises 3.1-3.2

3.1 The degrees of freedom for a goodness-of-fit test with 6 categories is

[1]

☐

A 6

B 5

C 4

D 1

3.1 B

- 5.

3.2 A large chi-square statistic gives a _____ p-value.

[1]

☐

A large

B small

C zero

D negative

3.2 B

- small.

Exercise 3.3 (a)

3.3 A goodness-of-fit test of a die (6 faces) gives $\chi^2 = 15$ with $df = 5$ and p-value 0.01.

(a) State the degrees of freedom.

[1]

Exercise 3.3 (a)

3.3 A goodness-of-fit test of a die (6 faces) gives $\chi^2 = 15$ with $df = 5$ and p-value 0.01.

(a) State the degrees of freedom. [1]

(a)

- 5

Exercise 3.3 (b)

3.3 A goodness-of-fit test of a die (6 faces) gives $\chi^2 = 15$ with $df = 5$ and p-value 0.01.

(b) State the decision at $\alpha = 0.05$.

[1]

Exercise 3.3 (b)

3.3 A goodness-of-fit test of a die (6 faces) gives $\chi^2 = 15$ with $df = 5$ and p-value 0.01.

(b) State the decision at $\alpha = 0.05$. [1]

(b)

- reject H_0

Exercise 3.3 (c)

3.3 A goodness-of-fit test of a die (6 faces) gives $\chi^2 = 15$ with $df = 5$ and p-value 0.01.

(c) State the conclusion in context.

[1]

Exercise 3.3 (c)

3.3 A goodness-of-fit test of a die (6 faces) gives $\chi^2 = 15$ with $df = 5$ and p-value 0.01.

(c) State the conclusion in context.

[1]

(c)

- there is convincing evidence the die does not follow the claimed (fair) distribution