AP STATISTICS • HOLIDAY HOMEWORK 假期作业

8 The chi-square test – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)
chi-square	卡方	

Recall

In Part A you compared observed counts with expected counts. Now measure the total gap with one number:

- We need a single value for "how far off" the observed counts are.
- That value is the chi-square statistic.

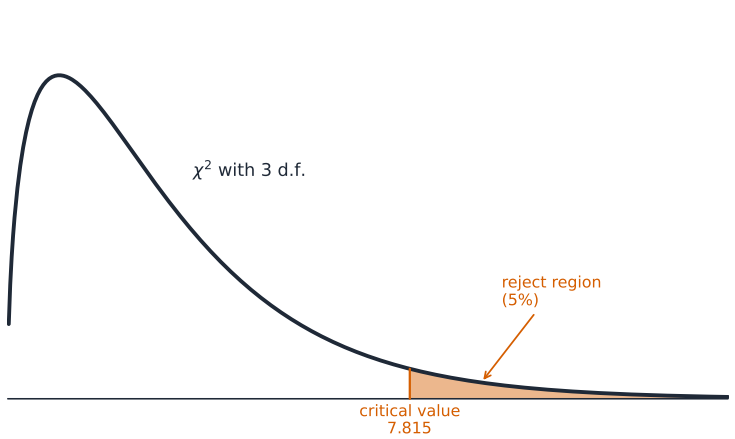
Each idea has a worked example before the Practice.

New ideas

1 The chi-square statistic

The **chi-square** 卡方 statistic adds up the (observed minus expected) gaps, squared and scaled:

$$\chi^2 = \sum \frac{(O-E)^2}{E}.$$



A **bigger** χ^2 means the observed counts are further from expected.

2 A worked example

Worked example. A cross predicts 60 dominant and 20 recessive, but you observe 55 and 25:

$$\chi^2 = \frac{(55-60)^2}{60} + \frac{(25-20)^2}{20} = \frac{25}{60} + \frac{25}{20} = 0.42 + 1.25 = 1.67.$$

3 Making a decision

Compare χ^2 with a **critical value** from a table. If χ^2 is **smaller**, the differences are within chance (do not reject); if **larger**, they are a real effect (reject).

4 In the example

With 1 degree of freedom the critical value at the 0.05 level is 3.84. Since $1.67 < 3.84$, the deviation is within chance – the data fit the predicted ratio.

Watch out: always divide by the **expected** count E (not the observed) in each term. And a small χ^2 means the data **fit** the claim – it does not mean "no data".

Practice

Try these in order. The methods are all above.

2.1 Write the formula for the chi-square statistic. [2]

2.2 State what a large chi-square value tells you. [2]

2.3 For one category, observed $= 18$ and expected $= 12$. Find its term $\dfrac{(O-E)^2}{E}$. [3]

2.4 A test gives $\chi^2 = 1.2$ and the critical value is 3.84. State the decision. [2]

2.5 State what you divide by in each term of the chi-square sum. [1]