

8.1 Introducing Statistics: Are My Results Unexpected?

Name: _____ Class: _____ Date: _____ Total: 8 marks

KEY WORDS chi-square 卡方 • expected counts 期望计数 • observed counts 观测计数

Objective

Build the skills to answer exam questions on **whether results are unexpected**.

You must be able to:

- explain that a **chi-square** 卡方 test compares **observed** counts to **expected** counts
- describe **observed counts** 观测计数 and **expected counts** 期望计数
- recognise that chi-square tests are for **categorical** data

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ Chi-square tests

A **chi-square** test judges whether **observed** counts differ from what we would **expect** if a claim were true.

- **Observed counts** — what the data actually show in each category.
- **Expected counts** — what we would predict under the null hypothesis.

Large gaps between observed and expected point to a real effect. Chi-square tests are used for **categorical** data (counts).

■ A worked comparison

A die is rolled 60 times. If it is fair, each face is **expected** 10 times. Suppose a six is **observed** 18 times: the gap ($18 - 10$) is large, hinting the die is not fair. Chi-square adds up these gaps across all six faces to give one number.

2 Practice

2.1 State what a chi-square test compares. [1]

2.2 State what “observed counts” are. [1]

2.3 State what “expected counts” are. [1]

3 Exam-style questions

3.1 A chi-square test compares observed counts to [1]

- **A** means
- **B** expected counts
- **C** slopes
- **D** proportions directly

3.2 Chi-square tests are used for _____ data. [1]

- **A** quantitative
- **B** categorical
- **C** continuous
- **D** paired

3.3 A die is rolled 60 times to test whether it is fair.

(a) Name the kind of data collected. [1]

(b) State the expected count for each face. [1]

(c) Name the test comparing observed to expected counts. [1]

Solutions

2.1 observed counts with the counts expected under the null hypothesis.

2.2 the counts that actually occur in each category of the data.

2.3 the counts predicted in each category if the null hypothesis were true.

3.1 B.

3.2 B.

3.3 (a) categorical (counts of each face). (b) $60 \div 6 = 10$. (c) a chi-square (goodness-of-fit) test.