AP STATISTICS • EXERCISE SHEET

8.2 Setting Up a Chi-Square Goodness of Fit Test

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

KEY WORDS chi-square 卡方 • degrees of freedom 自由度

Objective

Build the skills to answer exam questions on **setting up a chi-square goodness-of-fit test**.

You must be able to:

- state the hypotheses for a goodness-of-fit test
- calculate **expected counts** as $n \cdot p_i$
- write the statistic $\chi^2 = \sum \dfrac{(O-E)^2}{E}$

1 Worked examples

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

■ **Hypotheses**

- **Null** H_0: the distribution **matches** the claimed proportions.
- **Alternative** H_a: at least one proportion is different.

■ **Expected counts and the statistic**

The expected count in a category is $E = n \cdot p_i$. The test statistic is

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

with degrees of freedom = (number of categories) − 1.

2 Practice

2.1 State the null hypothesis for a goodness-of-fit test. [1]

2.2 Write the formula for an expected count. [1]

2.3 For $n = 200$ and a claimed proportion of 0.25, find the expected count. [2]

3 Exam-style questions

3.1 The expected count for a category is [1]

- **A** n
- **B** $n \cdot p_i$
- **C** $O - E$
- **D** $\sqrt{n}$

3.2 The chi-square statistic is [1]

- **A** $\sum \dfrac{(O-E)^2}{E}$
- **B** $\sum (O-E)$
- **C** $\sum \dfrac{O}{E}$
- **D** $\sqrt{O-E}$

3.3 A fair die is rolled 120 times.

(a) State the expected count for each face. [2]

(b) Write the chi-square statistic formula. [1]

Solutions

2.1 the distribution matches the claimed proportions.

2.2 $E = n \cdot p_i$.

2.3 $E = 200 \times 0.25 = 50$.

3.1 **B**.

3.2 **A**.

3.3 (a) $120 \times \frac{1}{6} = 20$. (b) $\chi^2 = \sum \frac{(O-E)^2}{E}$.