AP STATISTICS • EXERCISE SHEET

8.4 Expected Counts in Two-Way Tables

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

Objective

Build the skills to answer exam questions on **expected counts in two-way tables**.

You must be able to:

- calculate an expected count as $E = \dfrac{(\text{row total})(\text{column total})}{\text{grand total}}$
- explain that expected counts assume **no association** between the variables

1 Worked examples

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

■ Expected counts

For each cell of a two-way table, if the two variables were **not associated** (the null hypothesis):

$$E = \frac{(\text{row total})(\text{column total})}{\text{grand total}}.$$

■ Example

A cell with row total 40, column total 50, and grand total 200: $E = \dfrac{40 \times 50}{200} = 10$.

2 Practice

2.1 Write the formula for an expected count in a two-way table. [1]

2.2 A cell has row total 60, column total 80, grand total 240. Find the expected count. [2]

2.3 State what expected counts assume. [1]

3 Exam-style questions

3.1 The expected count in a two-way table cell is [1]

- **A** $\dfrac{(\text{row})(\text{column})}{\text{grand total}}$
- **B** row + column
- **C** the observed count
- **D** grand total $\div 2$

3.2 Expected counts are computed assuming [1]

- **A** an association
- **B** no association (the null hypothesis)
- **C** bias
- **D** unequal sample sizes

3.3 In a table, a cell has row total 50, column total 100, grand total 250.

(a) Find the expected count. [2]

(b) State the assumption behind it. [1]

Solutions

2.1 $E = \dfrac{\text{(row total)(column total)}}{\text{grand total}}$.

2.2 $E = \dfrac{60 \times 80}{240} = 20$.

2.3 that there is no association between the two variables.

3.1 **A**.

3.2 **B**.

3.3 (a) $E = \dfrac{50 \times 100}{250} = 20$. (b) no association between the variables.