8.4 Expected Counts in Two-Way Tables

Name: _____ Class: _____ Date: _____ **Total: 10 marks**

KEY WORDS two-way table • expected count • row total • column total • grand total • association

Objective

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

You must be able to:

- calculate **expected counts** in a two-way table
- explain what the expected counts represent
- compare observed and expected counts to describe an association

1 Key knowledge and worked examples

■ What "no association" would look like

idea	rule
expected count	$\dfrac{\text{row total} \times \text{column total}}{\text{grand total}}$
totals	the expected counts have the same row and column totals as the observed counts
comparing	cells where observed and expected counts differ most show the pattern of the association

Answer shapes: write the row total, column total and grand total in the fraction before simplifying.

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2 Practice

2.1 In a table of 160 students, one row total is 80 and one column total is 60. Find the expected count for that cell. [2]

	column	total
row	?	80
total	60	160

2.2 Explain what an expected count of 30 means in a test for an association between gender and favorite sport. [2]

	football	⋯
boys	observed 40, expected 30	⋯

3 Exam-style questions

3.1 A random sample of 160 students were asked their favorite sport.

(a) Calculate the expected count of boys who choose football. [2]

	football	basketball	swimming	total
boys	40	25	15	80
girls	20	25	35	80
total	60	50	50	160

(b) Calculate the expected count of girls who choose swimming. [2]

(c) Compare the observed and expected counts, and describe the association they suggest. [2]

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Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

2.1

$80 \times 60/160; = 30$

2.2

it is the number of students we would expect in that cell; if gender and favorite sport were not associated

3.1

(a) $80 \times 60/160; = 30$

(b) $80 \times 50/160; = 25$

(c) more boys than expected choose football (40 against 30), and more girls than expected choose swimming (35 against 25); this suggests an association between gender and favorite sport

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