3.8 Fieldwork: geographic inquiry and statistics

Name: _____ Class: _____ Date: _____ **Total: 30 marks**

KEY WORDS hypothesis • null hypothesis • random sampling • systematic sampling • stratified sampling • Spearman's rank correlation • statistically significant • chi-squared test

Objective

Build the skills for the **fieldwork** internal assessment: a precise fieldwork question, a **hypothesis** and **null hypothesis**, sampling, methods, presenting data, **Spearman's rank correlation** and chi-squared tests, and an honest conclusion and evaluation.

You must be able to:

- write a precise fieldwork question with a hypothesis and a null hypothesis
- choose random, systematic or stratified sampling and justify the choice
- choose graphs and maps that suit the data
- calculate Spearman's rank correlation and test it for significance
- evaluate methods and suggest realistic improvements
- know the six assessment criteria and their marks

1 Key knowledge and worked examples

The inquiry

The fieldwork report is worth 25 % at SL and 20 % at HL: up to 2,500 words, marked out of 25, on **primary data** you collect yourself.

criterion	marks
A fieldwork question and geographic context	3
B method(s) of investigation	3
C quality and treatment of information collected	5
D written analysis	10
E conclusion	2
F formal requirements	2

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- **Hypothesis**: a testable statement ("pedestrian numbers fall as distance from the square increases"). **Null hypothesis**: there is no relationship.
- **Random sampling**: random numbers choose points; no bias from the student, but may miss small areas. **Systematic sampling**: every 100 m or every tenth person; even cover, but may match a regular pattern. **Stratified sampling**: samples in proportion to known zones; every zone represented, but you must know the zones.
- Present data with the right tool: scatter graph (two variables), bar chart or divided bar (categories), flow map (movements), choropleth map (values by area).

Spearman's rank

Rank both variables (1 = smallest in each), find d (difference in ranks) for each site, then

$$r_s = 1 - \frac{6\sum d^2}{n(n^2-1)}$$

r_s near $+1$: strong positive; near -1: strong negative; near 0: no relationship. Compare the size of r_s with the **critical value** (5 % level, two-tailed): $n = 8$: 0.738; $n = 10$: 0.648. If it is bigger, reject the null hypothesis: the relationship is **statistically significant**. Correlation does not prove cause.

For counts in categories use a **chi-squared test** (for a 2×2 table, 1 degree of freedom, critical value 3.84 at 5 %).

Worked example. $n = 8$, $\sum d^2 = 158$: $r_s = 1 - \dfrac{6 \times 158}{8 \times 63} = 1 - \dfrac{948}{504} \approx -0.88$; $0.88 > 0.738$, so the negative relationship is significant.

2 Practice

2.1 Distinguish between a **hypothesis** and a **null hypothesis**. [2]

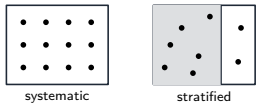
relationship — hypothesis

no relationship — null hypothesis

2.2 A student measured 10 sites and found $\sum d^2 = 30$. Calculate Spearman's rank correlation coefficient, and state whether the result is significant at the 5 % level (critical value 0.648). [3]

$r_s = 1 - \dfrac{6\sum d^2}{n(n^2-1)}$

2.3 Distinguish between **systematic** and **stratified** sampling. [2]



2.4 Suggest a suitable way to present each set of data: (A) pedestrian counts at 8 distances from a square; (B) the percentage of each land use along a street; (C) where 50 shoppers travelled from. [3]

A B C

2.5 Explain **two** ways a student could make pedestrian counts more reliable. [4]



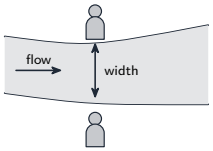
3 Exam-style questions

3.1 A student tested the hypothesis "river channel width increases with distance downstream". They measured width at 8 sites, every 500 m (systematic sampling).

site	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
distance downstream (m)	0	500	1,000	1,500	2,000	2,500	3,000	3,500
channel width (m)	1.2	1.5	1.4	2.1	2.6	2.4	3.3	3.8

(a) Write a null hypothesis for this investigation. [2]

(b) Calculate Spearman's rank correlation coefficient and state whether the result is significant at the 5 % level (critical value for $n = 8$: 0.738). [4]



3.2 Evaluate the methods the student used in 3.1, and suggest improvements. [10]

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