Exercise walk-through

3.8
Fieldwork: geographic inquiry and statistics

International Baccalaureate · IB Diploma · Geography · SL

Extreme environments

- **Extreme environments** are cold (high mountains, polar and glacial areas) or dry (hot deserts).
- Ice erodes valleys into a U shape and leaves piles of rock called **moraines** .
- In hot deserts, wind builds dunes and rare flash floods cut steep valleys called wadis.
- People see these places as both **opportunities** (minerals, tourism, solar energy, scientific research) and **challenges** (cold or heat, little water, poor access, a fragile environment).

Geophysical hazards

- The Earth's surface is broken into **tectonic plates** that move a few centimetres a year.
- Most volcanoes and earthquakes happen at **plate margins** :
- **Hazard risk** grows with three things: how strong and frequent the hazard is, how many people and buildings are in its path (**exposure**), and how easily they are harmed (**vulnerability**).
- Poverty, weak buildings and poor warning systems raise **vulnerability**.

$$\text{risk} = \text{hazard} \times \text{exposure} \times \text{vulnerability}$$

Fieldwork: geographic inquiry and sampling

- The fieldwork report is worth 25% at SL and 20% at HL.
- It is a report of up to 2,500 words, marked out of 25, on **primary data** that you collect yourself in the field.
- You cannot measure everything, so you take a sample:
- **Worked example.** Question: *Does the number of pedestrians fall with distance from the central square?* **Hypothesis**: pedestrian numbers fall as distance increases.

$$r_s = 1 - \frac{6\sum d^2}{n(n^2-1)} = 1 - \frac{6 \times 158}{8 \times 63} = 1 - \frac{948}{504} \approx -0.88$$

Exercises 2.1·2.2

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]

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Exercises 2.1·2.2

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no relationship — null hypothesis

2.1

hypothesis: a testable statement that a relationship exists, e.g. "river width increases downstream"; null hypothesis: the statement that there is **no** relationship, which a statistical test can reject

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

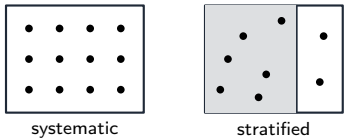
2.2

$r_s = 1 - \dfrac{6 \times 30}{10 \times 99} = 1 - \dfrac{180}{990} \approx \mathbf{0.82}$; $0.82 > 0.648$, so a significant positive relationship: reject the null hypothesis

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Exercises 2.3·2.4

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

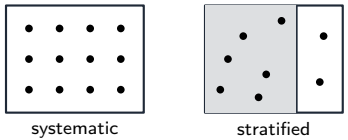


2.4 Suggest a suitable way to present each set of data: (A) pedestrian counts at 8 distances from a square; (B) the percentage of each land use along a street; (C) where 50 shoppers travelled from. [3]

A B C

Exercises 2.3·2.4

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



2.3

systematic: samples at regular intervals, e.g. every 100 m along a street or every tenth person; stratified: the number of samples in each zone is in proportion to the size of the zone, so every zone is represented

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2.4

A: scatter graph; B: divided bar chart or pie chart; C: desire-line or flow map

Exercise 2.5

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



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any two, explained: count at several times and on different days, so one unusual hour does not distort the result; repeat counts at each site and take the mean, which reduces random error; use the same length of count (e.g. 5 minutes) and a clicker counter at every site, so results are comparable; use more sites or several streets, so the pattern is not caused by one street's shops

Exercise 3.1 (a)

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]

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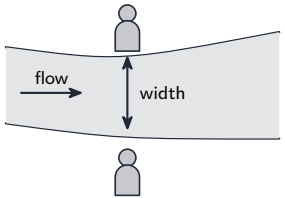
(a) there is no relationship between channel width and distance downstream

Exercise 3.1 (b)

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

(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]

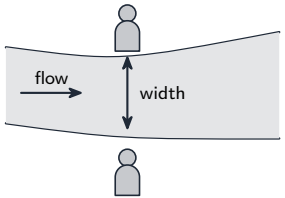


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(b) ranks of width (1 = narrowest): 1, 3, 2, 4, 6, 5, 7, 8; d: 0, −1, 1, 0, −1, 1, 0, 0; $\sum d^2 = 4$; $r_s = 1 - \dfrac{6 \times 4}{8 \times 63} = 1 - \dfrac{24}{504} \approx \mathbf{0.95}$; $0.95 > 0.738$: a significant positive relationship, so reject the null hypothesis

Exercise 3.2

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

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3.2

Mark with the markbands: [9-10] focused on the command term, detailed and accurate knowledge, well-developed explanation, specific named examples (places, dates, numbers), balanced evaluation and a supported conclusion; [7-8] mostly focused, good knowledge and examples, some evaluation; [5-6] relevant knowledge and examples, explanation partly developed, little evaluation; [3-4] general knowledge, few examples, mostly description; [1-2] little that is relevant. Points that may be included: strength: systematic sampling every 500 m covers the whole stretch evenly; the method is simple and easy to repeat; a statistical test gives an objective judgement; limitation: only one width measurement per site, so a narrow or wide spot can distort the result; only 8 sites; more sites would give a more reliable test; width depends on the water level, which changes with rain, so all sites should be measured on the same day in similar weather; bends, bridges or channel works can change width locally; improvements: measure three widths at each site and use the mean; add depth and velocity to calculate discharge; carry out a risk assessment and never enter deep or fast water; conclusion: a sound simple method whose reliability would improve with repeated measurements and more sites