Exercise walk-through

3.8
Fieldwork: geographic inquiry and statistics

International Baccalaureate · IB Diploma · Geography · HL

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

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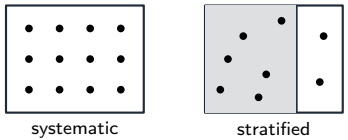
$$r_s = 1 - \frac{6\sum d^2}{n(n^2-1)}$$

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

Exercises 2.3·2.4

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

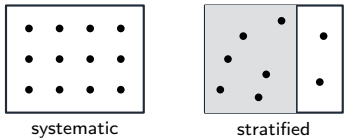


2.4 Suggest a suitable way to present each set of data: (A) pedestrian counts at 8 distances from a square; (B) the percentage of each land use along a street; (C) where 50 shoppers travelled from. [3]

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

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Exercise 2.5

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



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2.5

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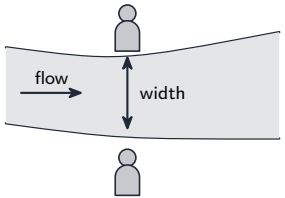
(a) there is no relationship between channel width and distance downstream

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).

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distance downstream (m)	0	500	1,000	1,500	2,000	2,500	3,000	3,500
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(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]

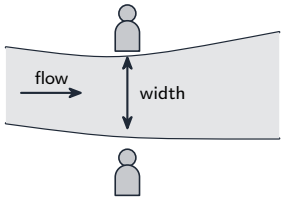


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(b) ranks of width (1 = narrowest): 1, 3, 2, 4, 6, 5, 7, 8; d: 0, −1, 1, 0, −1, 1, 0, 0; $\sum d^2 = 4$; $r_s = 1 - \frac{6 \times 4}{8 \times 63} = 1 - \frac{24}{504} \approx \mathbf{0.95}$; $0.95 > 0.738$: a significant positive relationship, so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