Solutions

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

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

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

2.2

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

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

2.4

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

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

3.1

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

(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

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

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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

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