Statistics topic test 5 - design, evidence and limitations

Name: _____ Date: _____

10 questions | 40 marks | 65 minutes

A progressive original paper on investigation design, numerical summaries and evidence-based interpretation.

A scientific calculator may be used.

1. A student investigates whether paid-work status is associated with school-night sleep in Year 11. [4 marks]

(a) Define a comparison question and the two variables. [2 marks]

(b) Why will a survey not establish that work caused any sleep difference? [2 marks]

2. The cohort contains 120 students with paid work and 280 without. Select 80 proportionally. [4 marks]

(a) Find allocations. [2 marks]

(b) Describe selection and one remaining limitation. [2 marks]

3. Sleep records include 7 h 30, 7.5, blank and 0. [4 marks]

(a) Give a consistent numeric coding rule. [2 marks]

(b) Why check zero rather than automatically deleting it? [2 marks]

4. Sleep A: 5, 6, 6, 7, 7, 8, 8, 9. Sleep B: 4, 6, 7, 7, 8, 8, 9, 11. [4 marks]

(a) Find both means and medians. [2 marks]

(b) Find IQRs using medians of halves. [2 marks]

5. Another group records 6, 7, 8 hours with frequencies 3, 4, 3. [4 marks]

Hours	6	7	8
Frequency	3	4	3

(a) Calculate weighted mean. [2 marks]

(b) Find percentage reporting at least 8 hours. [2 marks]

6. A school-night sample has $Q_1 = 6$ hours, $Q_3 = 8$ hours. [4 marks]

(a) Find both 1.5-IQR fences. [2 marks]

(b) Is 12 hours flagged, and what should be checked? [2 marks]

7. Two samples have mean 7 hours and sample SDs 0.8 and 1.6 hours. [4 marks]

(a) Compare typical level and variability. [2 marks]

(b) Must their medians also be equal? [2 marks]

8. A bar chart compares 6.8 and 7.2 hours with a vertical axis starting at 6.7. [4 marks]

(a) Calculate the actual difference in hours and minutes. [2 marks]

(b) Suggest a less misleading presentation. [2 marks]

9. Of 60 respondents, 20 have paid work. In the 400-person population, 120 have paid work. [4 marks]

(a) Compare sample and population percentages. [2 marks]

(b) Does the difference alone prove sampling bias? [2 marks]

10. The study uses 60 respondents at one school in one week. Group medians differ by 0.5 hour; no direction is supplied. [4 marks]

(a) Write the main finding without inventing direction or causation. [2 marks]

(b) Give two limits and one practical next step. [2 marks]