Statistics topic test 1

10 questions | 40 marks | 65 minutes

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

Equivalent correct methods earn the corresponding marks.

1. A school surveys 45 randomly selected students from its 360 Year 11 students about weekly leisure reading. [4 marks]

(a) Identify population and sample. [2 marks]

Use the target group and the measured subset.

Answer: Population: 360 Year 11 students; sample: 45 selected students.

(b) Write a clear statistical question. [2 marks]

Specify group, variable, units and period.

Answer: For example: How many minutes did Year 11 students at this school read for leisure in the last seven days?

2. Classify four library-survey variables. [4 marks]

(a) Borrowing-card number and number of books borrowed. [2 marks]

One labels a person; the other counts books.

Answer: Card number: nominal categorical identifier; books: discrete numerical.

(b) Time spent in the library and low/medium/high satisfaction. [2 marks]

One measures time; the other orders categories.

Answer: Time: continuous numerical; satisfaction: ordinal categorical.

3. A researcher selects the first 30 students leaving the gym. [4 marks]

(a) Name the method and a possible bias. [2 marks]

The accessible location selects a particular subgroup.

Answer: Convenience sampling; gym users may differ in activity habits from other students.

(b) Describe a more suitable random selection. [2 marks]

Every eligible student should have a chance of selection.

Answer: Use a complete student list and randomly choose 30 distinct IDs.

4. Travel times are 5, 8, 8, 10, 14, 15 minutes. [4 marks]

(a) Find mean and median. [2 marks]

Total 60 divided by count 6; middle pair 8 and 10 average 9.

Answer: Mean 10 min; median 9 min.

(b) Find range and state its units. [2 marks]

$15 - 5 = 10$.

Answer: 10 minutes.

5. Values 0, 1, 2, 3 have frequencies 2, 4, 3, 1. [4 marks]

Value	0	1	2	3
Frequency	2	4	3	1

(a) Find total frequency and mode. [2 marks]

Frequencies sum 10; value 1 has highest frequency 4.

Answer: 10 observations; mode 1.

(b) Calculate mean. [2 marks]

Weighted total $0(2) + 1(4) + 2(3) + 3(1) = 13$; divide by 10.

Answer: 1.3.

6. Ordered scores are 2, 4, 6, 8, 10, 12, 14, 16. Use medians of halves. [4 marks]

(a) Find Q1, median, Q3. [2 marks]

Average middle values in each half and the full set.

Answer: 5, 9, 13.

(b) Find and interpret IQR. [2 marks]

$13 - 5 = 8$.

Answer: 8 score units; spread of the middle half.

7. A sample has Q1=12 and Q3=20. [4 marks]

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

IQR 8; subtract/add 12.

Answer: 0 and 32.

(b) A recorded value 35 is genuine. Must it be deleted? [2 marks]

Investigate relevance and use a documented defensible treatment.

Answer: No. It is flagged, not automatically invalid.

8. Waiting-time summaries are A(4, 10, 14, 18, 30) and B(6, 11, 12, 15, 22), in minutes. [4 marks]

(a) Compare median and IQR. [2 marks]

Use median and $Q3 - Q1$.

Answer: B median 12 vs 14 min; B IQR 4 vs 8 min.

(b) Is every B time lower than every A time? [2 marks]

Group summaries do not order every individual.

Answer: No. The distributions overlap.

9. A voluntary online poll finds 80% of 200 respondents support later school starts. [4 marks]

(a) Can 80%be assumed to describe the school? [2 marks]

A large count does not remove selection bias.

Answer: No; voluntary respondents may not represent everyone.

(b) Suggest an improvement and one report limitation. [2 marks]

Match the design to the target population.

Answer: Use a random sample; disclose voluntary selection and coverage/non-response concerns.

10. A survey finds higher marks among study-club members and claims the club caused them. [4 marks]

(a) Explain the causal limitation. [2 marks]

The observational design has not isolated the club effect.

Answer: Prior attainment, motivation or support may differ.

(b) Write a cautious conclusion and name useful extra data. [2 marks]

Keep the conclusion within what the design supports.

Answer: Attendance was associated with marks; collect prior marks to examine existing differences.