# 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 $Q_1$, median, $Q_3$. [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 $Q_1 = 12$ and $Q_3 = 20$. [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 $Q_3 - Q_1$.

**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.