Marking guide | Statistics and data analysis

Statistics and data analysis - Practice test 2

16 questions | 43 marks | 55 minutes

A progressive review of summaries, displays, paired data and fair conclusions.

Equivalent correct methods earn the corresponding marks.

1. A data set has 7 measurements with mean 12. Four sum to 46 and the other two known values are 10 and 15. Find the seventh. [3 marks]

Total $7 \times 12 = 84$.

$84 - 46 - 10 - 15 = 13$.

Answer: 13

2. Find median, Q_1 and Q_3 for 4, 6, 7, 9, 10, 13, 14, 17, 20 using median-of-halves. [2 marks]

Exclude the median.

Lower half 4, 6, 7, 9; upper 13, 14, 17, 20.

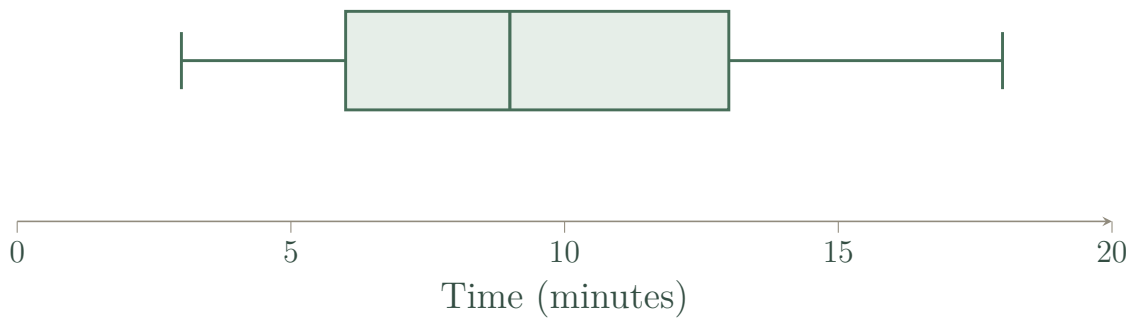
Answer: Median 10; $Q_1 = 6.5$; $Q_3 = 15.5$.

3. Find the range and IQR of the data in Question 2. [2 marks]

$20 - 4 = 16$; $15.5 - 6.5 = 9$.

Answer: Range 16; IQR 9.

4. Draw a labelled box plot for the five-number summary 3, 6, 9, 13, 18 minutes. [3 marks]



Choose a common linear scale.

Place the five summary values accurately.

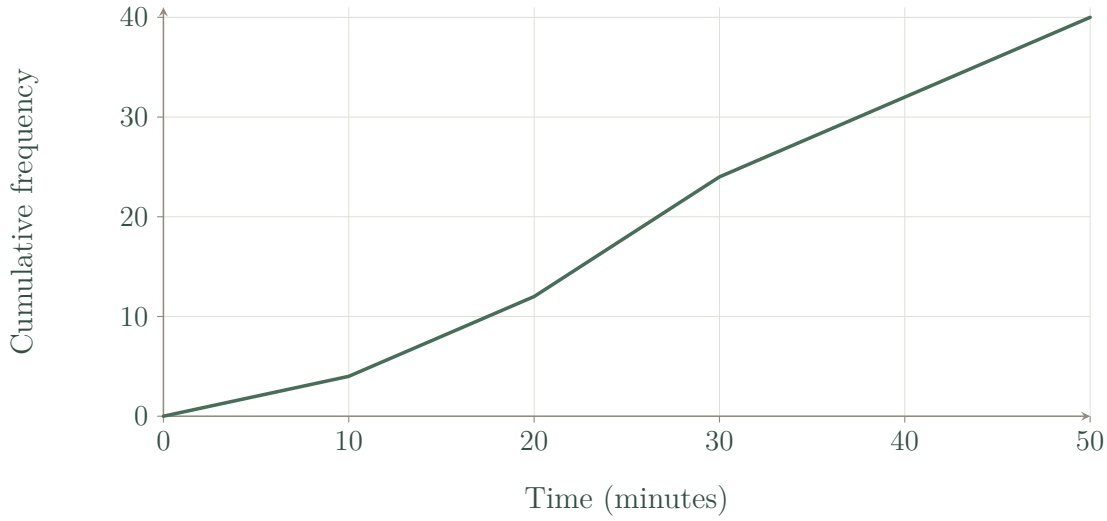
Answer: Whiskers 3 and 18, box 6 to 13, median 9.

5. An ordered sample has 25 values. Which nearest-rank position gives P_{90}? [2 marks]

$\lceil 0.90 \times 25 \rceil = \lceil 22.5 \rceil = 23.$

Answer: 23rd

6. Use the cumulative graph to estimate the 25th percentile. [3 marks]



25% of $40 = 10$.

Between $(10, 4)$ and $(20, 12)$: $10 + \frac{6}{8} \times 10 = 17.5$.

Answer: 17.5 minutes

7. Find the population variance and SD of 2, 2, 6, 6. [3 marks]

Mean 4; sum squared deviations 16.

Divide by 4, then square-root.

Answer: Variance 4; SD 2.

8. A sample has $n = 6$ and squared-deviation total 45. Find its sample SD. [2 marks]

Sample variance $\frac{45}{6-1} = 9$.

SD 3.

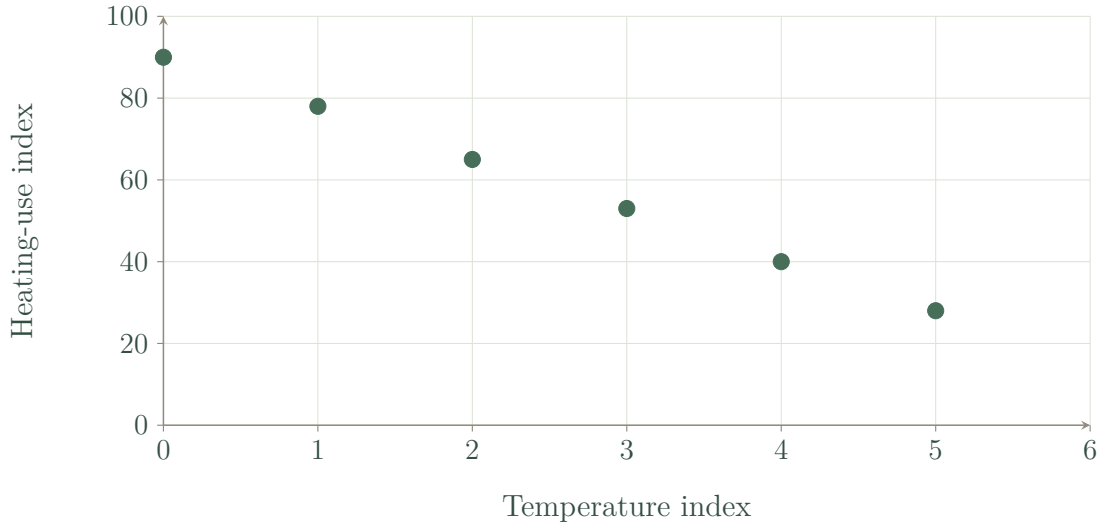
Answer: 3

9. Explain why SD has the original unit whereas variance has a squared unit. [2 marks]

Track the units through each operation.

Answer: Squaring deviations squares the unit; the final square root returns the original unit.

10. Describe the association shown in the plot. [3 marks]



As the horizontal variable rises, the vertical one falls.

Points remain close to a straight decreasing pattern.

Answer: Strong negative, approximately linear.

11. A scatterplot has a strong U-shaped pattern. Is 'no association' an adequate description? [2 marks]

No straight-line trend does not mean no pattern.

Answer: No; there is a strong nonlinear association.

12. A survey links more screen time with less sleep. Give one possible confounder and a cautious conclusion. [3 marks]

Identify another possible influence.

Keep the conclusion within the observational evidence.

Answer: Workload may affect both; screen time and sleep are associated in the sample, but causation is unproven.

13. Complete totals and find the percentage of cyclists who are inB. [4 marks]

Travel

Group	Cycle	Other
A	10	30
B	15	45

A $10+30=40$; B $15+45=60$.

$\frac{15}{25}\times 100=60\%$.

Answer: Totals A 40, B 60, Cycle 25, Other 75, All 100; B is 60% of cyclists.

14. A class's mean rises after one very high score is added. Must the median also rise by the same amount? [2 marks]

Mean depends on the total.

Median depends on ordered middle positions.

Answer: No.

15. A headline says shoplifting fell 50%, from 2 cases to 1. State what is correct and what is missing. [3 marks]

$\frac{2-1}{2}\times 100=50\%$.

Only one fewer case was recorded.

Answer: The 50% decrease is correct and means one fewer case; the period and population context are missing, and the small counts limit the claim.

16. Design a short investigation of height and arm span, stating population, sampling, measurement and a limitation. [4 marks]

Define target and sampling frame.

Standardise and preserve pairs.

State a specific generalisation limit.

Answer: Example: randomly sample Year 10 students, measure paired heights/arm spans in cm consistently, plot a scatterplot; one school may not represent other populations.