Twenty statistics exercises

Synthetic educational data; questions grouped into four progressive levels.

Question 1: Define descriptive statistics

Learning objective: Distinguish observed-data summaries

Hint: Ask what a measure can legitimately describe.

Question 2: Define inferential statistics

Learning objective: Recognize uncertainty in population conclusions

Hint: Identify the larger target population.

Question 3: Identify the target population

Learning objective: Define scope precisely

Hint: Use the question in the project.

Question 4: Identify the sample

Learning objective: Recognize selected observations

Hint: Locate the source sample CSV.

Question 5: Separate parameter from statistic

Learning objective: Name μ and x-bar

Hint: Which value belongs to all 1,000?

Question 6: Calculate the eight-score mean

Learning objective: Perform an exact mean

Hint: Add the eight scores and divide by eight.

Question 7: Find the eight-score median

Learning objective: Find middle ordered values

Hint: There are eight observations.

Question 8: Find the eight-score mode

Learning objective: Count frequencies

Hint: Find the repeated score.

Question 9: Compute range

Learning objective: Measure simple spread

Hint: Subtract min from max.

Question 10: Compute sample variance and SD

Learning objective: Differentiate n-1 denominator

Hint: Calculate squared deviations from mean 75.

Question 11: Explain simple random sampling

Learning objective: Describe probability design

Hint: All size-100 subsets must be equally probable.

Question 12: Explain sampling variability

Learning objective: Interpret repeated sample means

Hint: Think 2,000 repeated random draws.

Question 13: Calculate the finite-population standard error

Learning objective: Use the correct sampling design

Hint: SE = s/sqrt(n) × sqrt((N-n)/(N-1)).

Question 14: Interpret the 95% confidence interval

Learning objective: Explain long-run coverage

Hint: Interpret the procedure rather than the probability of μ.

Question 15: Define a two-sided test

Learning objective: State H0 and H1

Hint: The benchmark is 65 points.

Question 16: Explain the p-value

Learning objective: Avoid confusing conditional probability

Hint: Ask what is assumed in the probability.

Question 17: Significance versus practical value

Learning objective: Discuss effect size and context

Hint: Compare estimates to meaningful educational criteria.

Question 18: Detect selection bias

Learning objective: Assess sampling-frame coverage

Hint: What if you sample only high-score classes?

Question 19: Correlation versus causation

Learning objective: Avoid unsupported explanations

Hint: Could other factors influence study time and scores?

Question 20: Write a responsible conclusion

Learning objective: Integrate descriptive and inferential evidence

Hint: Name scope, method, uncertainty and limits.