Marking guide | Statistics

# Statistics - Applications test

16 questions | 50 marks | 60 minutes

Use supplied school and community data to challenge claims and design defensible conclusions.

Equivalent correct methods earn the corresponding marks.

**1.** A museum surveys weekday morning visitors about evening opening. Name one group that may be under-represented. [2 marks]

They may especially value evening opening.

Use several collection times or a suitable broader frame.

**Answer:** People working or studying on weekday mornings.

**2.** A cycling club records route choice and travel time in minutes. Classify each variable. [2 marks]

A route name is a category.

Time is a measured numerical quantity.

**Answer:** Route choice:categorical. Travel time:numerical.

**3.** Cycle times are 12,14,15,15,19 minutes. Find mean, median and range. [3 marks]

**(a)** Calculate the mean. [1 mark]

$\frac{75}{5} = 15.$

**Answer:** 15 min.

**(b)** Find the median and range. [2 marks]

Middle 15; $19 - 12 = 7.$

**Answer:** Median 15 min; range 7 min.

**4.** A random sample finds 27 of 45 residents support a cycle lane. Estimate support among 800 residents. [3 marks]

$\frac{27}{45} = 0.6$.

$0.6 \times 800 = 480$, subject to sampling limits.

**Answer:** About 480 residents.

**5.** A random sample of 30 is taken from 900 students. A student calls it useless because it is not a census. Give a balanced response. [2 marks]

A census is not the only way to learn about a population.

Selection, response quality and size all affect usefulness.

**Answer:** A small random sample can provide useful evidence, but its estimates may vary and require caution.

**6.** The table shows extra practice sessions per week. Calculate mean and median. [4 marks]

| Sessions | Frequency |
|---|---|
| 0 | 5 |
| 1 | 8 |
| 2 | 5 |
| 3 | 2 |

**(a)** Calculate the mean. [2 marks]

Weighted total 24; total frequency 20.

**Answer:** 1.2 sessions.

**(b)** Find the median. [2 marks]

The tenth and eleventh observations are 1.

**Answer:** 1 session.

**7.** Compare A: 12,13,14,16,17 and B: 11,14,15,16,19 using median and range. [4 marks]

Use third ordered values.

Ranges $17-12=5$ and $19-11=8$. The samples overlap.

**Answer:** A median 14/range 5; B median 15/range 8. B has a higher middle and more spread in these samples.

**8.** The ordered values are 14, 15, a two-digit number with tens digit 1 and units digit $x$, 20, 22. The median is 18. Find $x$. [3 marks]

The third of five ordered observations is the median.

The missing value is 18, so its units digit is 8.

**Answer:** $x=8$.

**9.** Ticket sales rise from 120 to 132. A graph starts its vertical axis at 100. Calculate the actual percentage increase. [3 marks]

Increase 12.

$\frac{12}{120}\times 100=10\%$; do not use truncated bar heights as a ratio.

**Answer:** 10%.

**10.** Service A has 12 complaints from 300 orders. B has 10 from 200. A claim says B is better because 10 is less than 12. Assess it. [3 marks]

$\frac{12}{300}=4\%$; $\frac{10}{200}=5\%$.

Order totals differ, so compare proportions.

**Answer:** The raw-count argument misleads. A has the lower complaint rate: 4% versus 5%.

**11.** One sample has 18 supporters out of 40; another has 25 out of 50. Find both percentages and their percentage-point difference. [3 marks]

$\frac{18}{40}\times 100=45\%$.

$\frac{25}{50}\times 100=50\%;\ 50-45=5$.

**Answer:** 45% and 50%; difference 5 percentage points.

**12.** Eight journey times have mean 12 minutes. Two more times,20 and 24 minutes, are added. Find the new mean. [3 marks]

Original total $8 \times 12 = 96$.

New total $96 + 20 + 24 = 140$ for 10 observations, so mean 14.

**Answer:** 14 minutes.

**13.** Masses are 1.2,1.3,1.4,1.5,15 kg. The source confirms the last value should be 1.5 kg. Find the corrected mean and justify the change. [3 marks]

Corrected total $1.2 + 1.3 + 1.4 + 1.5 + 1.5 = 6.9$.

$\frac{6.9}{5} = 1.38$kg. Document the source-confirmed correction.

**Answer:** 1.38 kg; a verified recording error is corrected.

**14.** A: 10,11,12,13,14. B: 10,10,12,14,14. Both means are 12 and ranges 4. Explain why the groups are not identical. [3 marks]

Equal means and ranges do not determine every observation.

A common-scale dot plot would reveal the difference.

**Answer:** Their frequencies differ: A has one of each value; B has two 10 s and two 14 s.

**15.** Give two justified improvements to a voluntary lunchtime survey about a quiet study room, keeping it practical and respectful. [3 marks]

Improve access and selection rather than only increasing numbers.

Reduce response pressure and avoid unnecessary personal information.

**Answer:** Randomly select from the full roll; offer different response times; use neutral wording; collect anonymous responses. Any two justified.

**16.** Waiting times before and after a queue change are supplied. Calculate each mean, median and range, then assess the claim that every visitor now waits less. [6 marks]

Different visitors were observed in the two samples.

| Before(min) | After(min) |
|---|---|
| 8 | 7 |
| 9 | 8 |
| 9 | 8 |
| 10 | 10 |
| 14 | 12 |

**(a)** Summarise the before sample using mean, median and range. [2 marks]

Total 50; middle 9; $14-8=6$.

**Answer:** Mean 10; median 9; range 6 min.

**(b)** Summarise the after sample the same way. [2 marks]

Total 45; middle 8; $12-7=5$.

**Answer:** Mean 9; median 8; range 5 min.

**(c)** Assess the claim that every visitor now waits less. [2 marks]

The smaller typical values describe samples, not every visitor.

Other conditions may differ.

**Answer:** Not established. The samples overlap and are unmatched.