Data centres: weights, ordering and choosing a summary — Teacher answers

Year 8, lower volume • text pp. 75–82 • textbook lessons 38–41

Use the two prerequisite checks to choose support. Project the worked and guided tasks, then collect the eight paper core questions. Follow-ups and extensions are optional; accept other complete valid methods. This page does not save learners' paper answers.

Ordinary route: prerequisites 4, short inquiry 5, worked/guided 8, independent 15, correction 5, exit 3 minutes. Advanced route: inquiry 18, organise 4, selected practice 13, exit 5 minutes.

Prerequisites: Fractions, ordering numbers and reading frequency tables.

Ordinary route: use the first fixed case for the five-minute demonstration. Advanced route: complete the full investigation.

1. 3′ Predict whether moving just one extreme value changes the mean and median equally.
2. 8′ In the existing outlier inquiry keep 4,5,6,7 fixed and record fifth values 0,8,40. Sort each set: means 4.4,6,12.4; medians 5,6,6. Record every value, not only the preferred summary.
3. 5′ Choose a summary for a stated purpose and explain its sensitivity. Include the extreme value when describing the data; do not remove it merely to improve a summary.
4. 2′ Individually explain which of these summaries changes most and why, without claiming one is always best.

Worked example 1

Use the given values and weights to find the weighted mean. State the total weight.

Value	Frequency / weight
60	1
80	3

Use the stated conditions and the labelled scales.

Reference answer

75

1. Multiply each value by its weight, add all products, and divide by the sum of the weights.
2. Total weight=4; weighted mean=75.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Guided attempt 2

Find the median of $\{1, 2, 2, 5\}$. Show the relevant ordering or calculation.

1. Ordered data: $1, 2, 2, 5$; number of values = ____.
2. The central positions are ____ and ____; their values are ____ and ____.
3. Median = $\frac{\square+\square}{2} = \square$.

Reference answer

2

1. Sort the original observations from smallest to largest.
2. Use the middle observation, or the mean of the two middle observations, to obtain 2.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Prerequisite 3

Find the mean of $\{2, 4, 6\}$. Show the relevant ordering or calculation.

Reference answer

4

1. Add every observation, then divide by the number of observations.
2. The result is 4.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Prerequisite 4

Find the median of $\{5, 1, 3\}$. Show the relevant ordering or calculation.

Reference answer

3

1. Sort the original observations from smallest to largest.
2. Use the middle observation, or the mean of the two middle observations, to obtain 3.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Independent practice 5

The table shows marks and their frequencies. Find the mean mark and the number of learners.

Value	Frequency / weight
60	1
80	2
100	1

Use the stated conditions and the labelled scales.

Reference answer

80

1. Multiply each value by its weight, add all products, and divide by the sum of the weights.
2. Total weight=4; weighted mean=80.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Independent practice 6

Find the mode or modes of $\{2, 3, 3, 4, 4\}$. Show the relevant ordering or calculation.

Reference answer

Modes: $\{3, 4\}$.

1. Count all occurrences and retain every value tied for greatest frequency.
2. The listed modes all attain the highest repeated frequency.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Independent practice 7

Travel times are 1,2,3,4,100 minutes. Calculate the mean and median; recommend a typical-time summary while still reporting the long journey.

Reference answer

Mean 22, median 3 minutes. The median can describe the central typical time, while the maximum 100 minutes must remain visible; another justified summary is accepted.

1. The total is 110 over 5 observations, so the mean is 22.
2. The middle ordered value is 3. A small central summary should not hide the 100-minute journey.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Independent practice 8

Only the grouped counts are known. Use group midpoints to estimate the mean, and explain why the answer is not necessarily the exact raw-data mean.

Group (lower inclusive, upper exclusive)	Frequency
[10,20)	2
[20,30)	4
[30,40)	2

Use the stated conditions and the labelled scales.

Reference answer

Estimated mean 25; the observations inside each group are unknown.

1. Group midpoints are $\{15, 25, 35\}$.
2. Weight each midpoint by its group frequency and divide by the total count.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Exit question 9

Find the mode or modes of $\{3, 1, 3, 5\}$. Show the relevant ordering or calculation.

Reference answer

Modes: $\{3\}$.

1. Count all occurrences and retain every value tied for greatest frequency.
2. The listed modes all attain the highest repeated frequency.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Exit question 10

Find the median of $\{2, 6, 8, 10\}$. Show the relevant ordering or calculation.

Reference answer

7

1. Sort the original observations from smallest to largest.
2. Use the middle observation, or the mean of the two middle observations, to obtain 7.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Further practice 11

The frequencies include zeros. Find the mean of the observations actually present.

Value	Frequency / weight
10	0
20	2
30	0

Use the stated conditions and the labelled scales.

Reference answer

20

1. Multiply each value by its weight, add all products, and divide by the sum of the weights.
2. Total weight=2; weighted mean=20.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Further practice 12

Two assessment components score 80 and 90 with weights 3 and 2. Find the weighted score; the weights are not already percentages.

Value	Frequency / weight
80	3
90	2

Use the stated conditions and the labelled scales.

Reference answer

84

1. Multiply each value by its weight, add all products, and divide by the sum of the weights.
2. Total weight=5; weighted mean=84.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Further practice 13

For 2,5,8, report the mode using the convention that a mode must be a repeated most-frequent value.

Reference answer

No mode: every value occurs only once under the repeated-value convention used here.

1. Count all occurrences and retain every value tied for greatest frequency.
2. No value is repeated; report no mode under the stated convention.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Further practice 14

Only the grouped counts are known. Use group midpoints to estimate the mean, and explain why the answer is not necessarily the exact raw-data mean.

Group (lower inclusive, upper exclusive)	Frequency
[0,10)	1
[10,30)	2
[30,60)	1

Use the stated conditions and the labelled scales.

Reference answer

Estimated mean $45/2$; the observations inside each group are unknown.

1. Group midpoints are $\{5, 20, 45\}$.
2. Weight each midpoint by its group frequency and divide by the total count.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Extension 15

One group of 3 learners has mean 10 and another group of 2 has mean 20. Find the combined mean and explain why simply averaging 10 and 20 is wrong.

Value	Frequency / weight
10	3
20	2

Use the stated conditions and the labelled scales.

Reference answer

14

1. The group totals are 3×10=30 and 2×20=40.
2. Combined mean=(30+40)/5=14; the group sizes differ.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.

Extension 16

Starting with 1,2,3,4,10, replace only the last value by 1000. Find the new median and explain why it is unchanged.

Reference answer

3

1. The central ordered position is still the third observation.
2. That observation is 3, although the mean changes greatly.

- Use the stated conditions and justify the relation before calculating.
- Give an exact answer where possible, with units and any domain restrictions.