

Center, Spread and Data Displays Compared

Grade 9 – Algebra 1 math · Worksheet Answer Key · Standards: S-ID.A.1, S-ID.A.2, S-ID.A.3

Each answer shows the sorted data, the summary values and the final conclusion in bold. For quartiles, the median is left out of both halves when the count is odd. Standard deviations use the population formula and are rounded to the nearest hundredth.

Standards: S-ID.A.1, S-ID.A.2, S-ID.A.3 · **Level:** Grade 9 Algebra 1

Problem 1 Mean of Five Values

Sum: $17 + 21 + 14 + 19 + 24 = 95$. Divide by 5: 19.

19 miles

Problem 2 Median, Odd Count

Sorted: 36, 38, 39, 41, 43, 45, 50. The middle (4th) value is 41.

41

Problem 3 Median, Even Count

Sorted: 7, 9, 10, 11, 12, 15. The two middle values are 10 and 11, and their mean is 10.5.

10.5

Problem 4 Range and IQR from a Summary

Range: $52 - 14 = 38$. IQR: $35 - 22 = 13$.

Range 38; IQR 13

Problem 5 Read a Dot Plot

The data are 6, 7, 7, 7, 8, 8, 8, 8, 9, 9, 10, 12. The tallest stack is at 8, so the mode is 8. The 6th and 7th values are both 8, so the median is 8. Range: $12 - 6 = 6$.

Mode 8; median 8; range 6

Problem 6 Read a Histogram

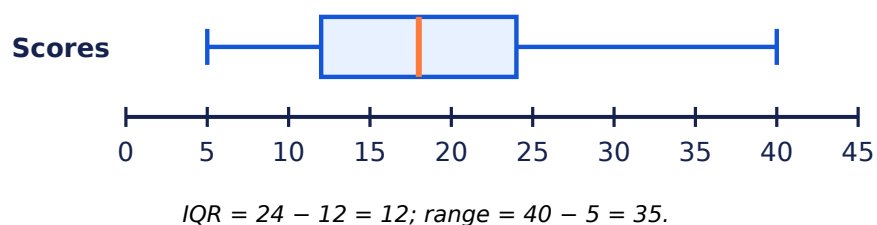
The tallest bar is 20 to 40 (8 students). The last two bars are 60 to 80 (2) and 80 to 100 (1): 3 students. $3 \div 20 = 0.15$.

20 to 40 minutes; 3 students; 15%

Problem 7 Read a Box Plot

Range: $40 - 5 = 35$. IQR: $24 - 12 = 12$. The box holds the middle half of the data: 50%.

Outlier fence: $24 + 1.5(12) = 42$. Since $40 < 42$, it is not an outlier.



Range 35; IQR 12; 50%; 40 is not an outlier

Problem 8 Five-Number Summary, Odd Count

The data are sorted and $n = 11$. The median is the 6th value, 12. Lower half: 4, 6, 7, 9, 10 gives $Q1 = 7$. Upper half: 13, 15, 18, 20, 26 gives $Q3 = 18$.

$IQR = 18 - 7 = 11$.

Min 4, Q1 7, median 12, Q3 18, max 26; IQR 11

Problem 9 Five-Number Summary and Outliers

$n = 10$. Median: $(30 + 31) \div 2 = 30.5$. Lower half 21, 24, 24, 27, 30 gives $Q1 = 24$. Upper half 31, 33, 35, 39, 58 gives $Q3 = 35$. $IQR = 11$.

Upper fence: $35 + 1.5(11) = 51.5$. Lower fence: $24 - 16.5 = 7.5$. Only 58 lies outside.

Min 21, Q1 24, median 30.5, Q3 35, max 58; the value 58 is an outlier

Problem 10 Outlier and the Mean

Before: mean $86 \div 5 = 17.2$; median 17. After: $14 + 16 + 17 + 19 + 70 = 136$, so the mean is

27.2; the median is still 17.

The mean rose by 10, but the median did not change.

Mean 17.2 → 27.2; median 17 → 17

Problem 11 Compare Spread with Standard Deviation

Both means are $20 \div 4 = 5$. Set A: squared distances 4, 0, 0, 4 sum to 8; variance $8 \div 4 = 2$; $\sigma = \sqrt{2} \approx 1.41$.

Set B: 16, 0, 0, 16 sum to 32; variance 8; $\sigma = \sqrt{8} \approx 2.83$.

Mean 5 for both; $\sigma \approx 1.41$ for A and ≈ 2.83 for B, so B is more spread out

Problem 12 Mean or Median?

Mean: $(210 + 225 + 230 + 240 + 250 + 1900) \div 6 = 3055 \div 6 \approx 509.2$. Median: $(230 + 240) \div 2 = 235$.

The 1,900 pulls the mean far above every other price.

Mean about \$509,200; median \$235,000; the median is the better description

Problem 13 Describe a Histogram

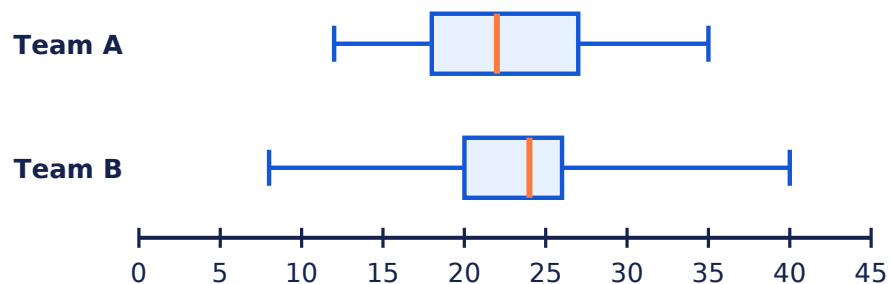
Most students sent 5 to 15 messages, and a long tail extends to the right: the distribution is skewed right.

The few high values pull the mean up, so the mean is greater than the median.

Skewed right; mean greater than median

Problem 14 Compare Two Box Plots

Medians: A 22, B 24. IQRs: A $27 - 18 = 9$; B $26 - 20 = 6$. Ranges: A $35 - 12 = 23$; B $40 - 8 = 32$.



A: IQR 9, range 23. B: IQR 6, range 32.

Team B has the higher median and the smaller IQR, so its typical games are more consistent, even though one extreme game makes its range larger.

B: higher median, smaller IQR (6 vs 9); more consistent in the middle half

Problem 15 Mean from a Frequency Table

Total pets: $0(5) + 1(8) + 2(4) + 3(2) + 4(1) = 0 + 8 + 8 + 6 + 4 = 26$. Mean: $26 \div 20 = 1.3$.

The 10th and 11th values lie in the group of 1 pet (cumulative counts 5, then 13). The median is 1.

Mean 1.3 pets; median 1 pet

Problem 16 Find the Missing Score

Five quizzes need a total of $5 \times 86 = 430$. The first four add to 341.

$430 - 341 = 89$.

89

Problem 17 Adding a Seventh Value

The original sum is $6 \times 14 = 84$. New sum: $84 + 28 = 112$. New mean: $112 \div 7 = 16$.

A new value equal to the current mean, 14, adds 14 to the sum and 1 to the count, so the mean stays 14.

New mean 16; adding 14 leaves it unchanged

Problem 18 Two Bakeries

Medians: X 60, Y 58, so X is higher. IQRs: X $70 - 52 = 18$; Y $62 - 55 = 7$, so Y is more consistent.

Fence for X: $70 + 1.5(18) = 97$. Since $95 < 97$, there is no outlier.

X has the higher median; Y is more consistent; no outlier in X

Problem 19 Consistent Runner

Both means are 25. P: squared distances 1, 0, 1 sum to 2; variance $2 \div 3$; $\sigma \approx 0.82$. Q: 9, 0, 9 sum to 18; variance 6; $\sigma \approx 2.45$.

P has the smaller standard deviation, so the times of P cluster more tightly around 25 minutes.

$\sigma \approx 0.82$ for P and ≈ 2.45 for Q; P is more consistent

Problem 20 Shifting and Scaling Data

Original mean: 5.

(a) The set becomes 12, 14, 16, 18. The mean is 15, and the distances from the mean do not change, so $\sigma = \sqrt{5} \approx 2.24$.

(b) The set becomes 4, 8, 12, 16. The mean is 10, and every distance doubles, so $\sigma = 2\sqrt{5} \approx 4.47$.

Adding a constant shifts the center only; multiplying scales both the center and the spread.

(a) mean 15, $\sigma \approx 2.24$; (b) mean 10, $\sigma \approx 4.47$