Describing Data: Center, Spread, and Shape

Center, spread, and shape: Mistakes and missing information

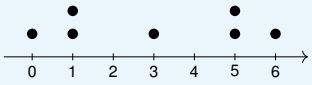
Name _____ **Date** _____ **Score** _____ / 6

QUICK REVIEW

Describe center (a typical value), spread (how far values vary), and shape (the pattern). A symmetric plot has equal counts at every pair of positions equally far from its center. If the right tail reaches much farther, the distribution may be right-skewed. A high extreme can pull the mean above the median.

Worked example

Describe center, range, and shape. Data: $0, 1, 1, 3, 5, 5, 6$.

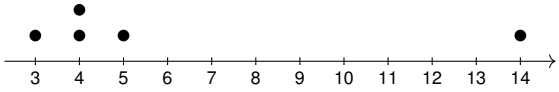


1. Sum $= 0 + 1 + 1 + 3 + 5 + 5 + 6 = 21$; mean $= 21/7 = 3$.
2. Sorted data: $0, 1, 1, 3, 5, 5, 6$; median $= 3$.
3. Range $= 6 - 0 = 6$.
4. At equal distances from median 3, the frequencies match: 0 with 6 (1 each); 1 with 5 (2 each). The center can mirror onto itself.
Answer: Mean 3; median 3; range 6. Symmetric.

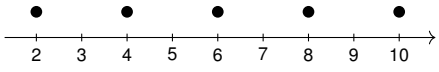
Practice Problems

Show your thinking.

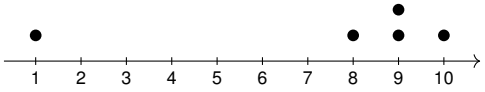
1. A student calls range a measure of center. Give mean, median, range, and shape. Data: $3, 4, 4, 5, 14$.



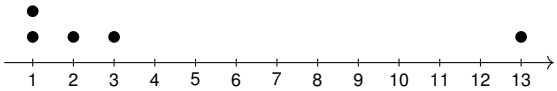
2. Recover the center and spread from the balanced values. Data: $2, 4, 6, 8, 10$.



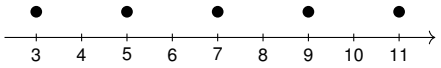
3. A student says the tail points toward the crowded high values. Correct the shape. Data: $1, 8, 9, 9, 10$.



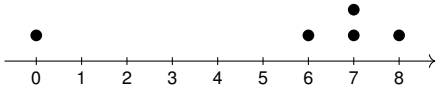
4. A student treats the mean as if it must be an observed value. Compute and correct the description. Data: $1, 1, 2, 3, 13$.



5. Design a short data description using three numerical summaries. Data: $3, 5, 7, 9, 11$.



6. Explain which side has the longer tail after computing center and range. Data: $0, 6, 7, 7, 8$.



Answer Key

1. Mean 6; median 4; range 11. Right-skewed.
2. Mean 6; median 6; range 8. Symmetric.
3. Mean $\frac{37}{5}$; median 9; range 9. Left-skewed.
4. Mean 4; median 2; range 12. Right-skewed.
5. Mean 7; median 7; range 8. Symmetric.
6. Mean $\frac{28}{5}$; median 7; range 8. Left-skewed.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Sum $= 3 + 4 + 4 + 5 + 14 = 30$; mean $= 30/5 = 6$.
2. Sorted data: $3, 4, 4, 5, 14$; median $= 4$.
3. Range $= 14 - 3 = 11$.
4. The high end 14 lies 10 above the median, while the low end is only 1 below it; the longer tail is right.

Problem 2

1. Sum $= 2 + 4 + 6 + 8 + 10 = 30$; mean $= 30/5 = 6$.
2. Sorted data: $2, 4, 6, 8, 10$; median $= 6$.
3. Range $= 10 - 2 = 8$.
4. At equal distances from median 6, the frequencies match: 2 with 10 (1 each); 4 with 8 (1 each). The center can mirror onto itself.

Problem 3

1. Sum $= 1 + 8 + 9 + 9 + 10 = 37$; mean $= 37/5 = \frac{37}{5}$.
2. Sorted data: $1, 8, 9, 9, 10$; median $= 9$.
3. Range $= 10 - 1 = 9$.
4. The low end 1 lies 8 below the median, while the high end is only 1 above it; the longer tail is left.

Problem 4

1. Sum $= 1 + 1 + 2 + 3 + 13 = 20$; mean $= 20/5 = 4$.
2. Sorted data: $1, 1, 2, 3, 13$; median $= 2$.
3. Range $= 13 - 1 = 12$.
4. The high end 13 lies 11 above the median, while the low end is only 1 below it; the longer tail is right.

Problem 5

1. Sum $= 3 + 5 + 7 + 9 + 11 = 35$; mean $= 35/5 = 7$.
2. Sorted data: $3, 5, 7, 9, 11$; median $= 7$.
3. Range $= 11 - 3 = 8$.
4. At equal distances from median 7, the frequencies match: 3 with 11 (1 each); 5 with 9 (1 each). The center can mirror onto itself.

Problem 6

1. Sum $= 0 + 6 + 7 + 7 + 8 = 28$; mean $= 28/5 = \frac{28}{5}$.
2. Sorted data: $0, 6, 7, 7, 8$; median $= 7$.
3. Range $= 8 - 0 = 8$.
4. The low end 0 lies 7 below the median, while the high end is only 1 above it; the longer tail is left.

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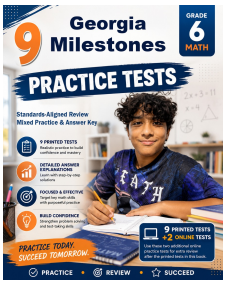

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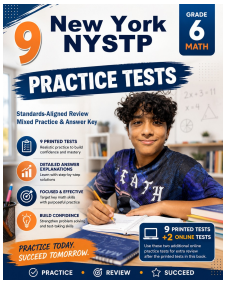

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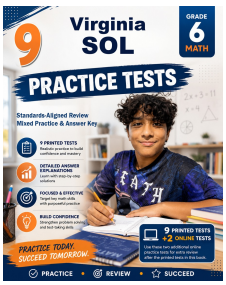

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