

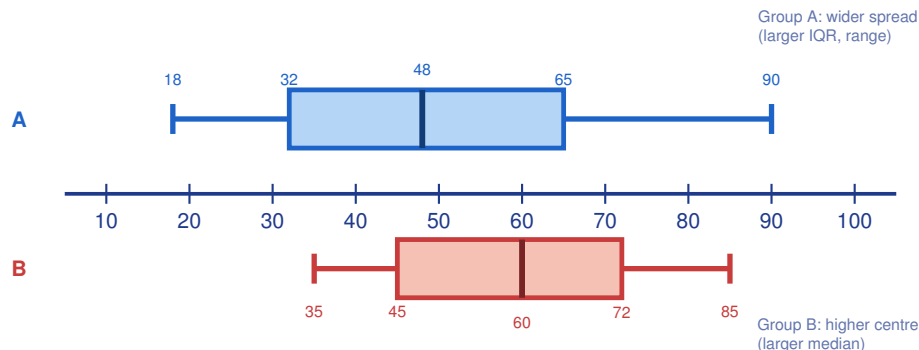
# Comparing Two Data Distributions

Name: \_\_\_\_\_

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When you compare two data sets, one number is never enough—you need to look at both the *center* and the *spread*! Two groups can have similar averages but very different consistency, or different medians but similar spread. By comparing plots and summary measures *together*, you can draw much stronger statistical conclusions. This is where statistics really starts to feel like detective work!



## Key Concepts & Quick Review

**Compare centres:** Which group has a higher mean or median? **Compare spreads:** Which group has a larger IQR, MAD, or range?

**Overlap:** Do the boxes share a common region? More overlap = more similar distributions.

**Complete comparison:** always mention BOTH centre and spread in any written comparison.

## Examples

① Class A test scores: 60, 65, 70, 70, 75, 80, 90. Class B scores: 50, 55, 70, 75, 80, 85, 90. Compare using median and IQR.

**Think It Through:** Find the centre and spread for each class. Class A has median 70, Q1 65, and Q3 80, so its IQR is 15. Class B has median 75, Q1 55, and Q3 85, so its IQR is 30. A complete comparison should mention both facts: Class B has the higher centre, but Class A is more consistent because its middle 50% is less spread out.

**Answer:** *B higher centre (med 75 vs 70); A more consistent (IQR 15 vs 30)*

② Group X: mean = 42, MAD = 3. Group Y: mean = 38, MAD = 12. Write a complete comparison sentence.

**Think It Through:** The mean compares centre, and MAD compares spread. Since  $42 > 38$ , Group X has larger values on average. Since  $3 < 12$ , Group X is also much more consistent because its data cluster closer to the mean. A strong comparison sentence always names one measure of centre and one measure of spread.



 **Answer:** *X higher & more consistent; Y lower mean & more spread out*

 **Practice Problems**

Compare the two data sets or answer the comparison question.

1. A: 10, 20, 30, 40, 50; B: 20, 25, 30, 35, 40. Compare medians and IQRs. \_\_\_\_\_
2. A: mean = 15, MAD = 2. B: mean = 15, MAD = 8. Which is more consistent? \_\_\_\_\_
3. A: 5, 6, 7, 8, 9; B: 3, 5, 7, 9, 11. Compare ranges and medians. \_\_\_\_\_
4. Box plot A: Q1 = 10, Q3 = 30. Box plot B: Q1 = 20, Q3 = 50. Compare IQRs. \_\_\_\_\_
5. A: 40, 45, 50, 55, 60; B: 20, 35, 50, 65, 80. Compare medians and spreads. \_\_\_\_\_
6. A: med = 72, IQR = 8. B: med = 68, IQR = 24. Which is better for consistent performance? \_\_\_\_\_
7. Heights (cm) — Boys: 150, 155, 160, 162, 165. Girls: 148, 152, 160, 165, 168. Compare medians. \_\_\_\_\_
8. A: min = 5, max = 45. B: min = 20, max = 35. Which has more variability? \_\_\_\_\_
9. A MAD = 4.5, B MAD = 4.5, A mean = 60, B mean = 72. What can you conclude? \_\_\_\_\_
10. Two stores' daily customers: Store A mean = 120, IQR = 40; Store B mean = 90, IQR = 10. Compare. \_\_\_\_\_
11. Dot plot A clusters near 8; dot plot B is spread from 3 to 15. Which has larger MAD? \_\_\_\_\_
12. A: 12, 14, 16, 18, 20; B: 11, 14, 16, 18, 21. Are the medians the same? Compare IQRs. \_\_\_\_\_
13. A med = 50, IQR = 12. B med = 50, IQR = 30. What does the same median but different IQR mean? \_\_\_\_\_
14. State one claim about centre and one about spread for: A: 60, 65, 70, 75, 80; B: 40, 55, 70, 85, 100. \_\_\_\_\_
15. A: mean = 25, MAD = 5. B: mean = 30, MAD = 2. Write a full 2-sentence comparison. \_\_\_\_\_

**Study Tips**

-  A complete comparison always has **two parts**: a statement about centre (median or mean) and a statement about spread (IQR or MAD).
-  Two groups can have the same median but very different spreads — they are not the same distribution! Always check both.
-  **No overlap** between box plots  $\Rightarrow$  the groups are clearly different. **Total overlap**  $\Rightarrow$  the groups are very similar.

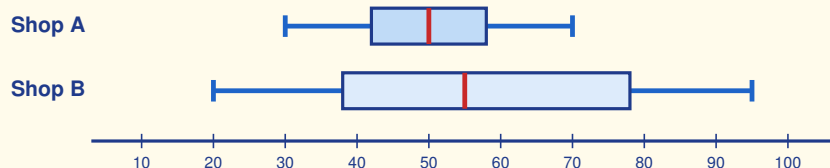


**Word Problems**

**16.** Two pizza restaurants record their delivery times (minutes) for one week: Pizza Palace: 18, 22, 25, 28, 30, 32, 35. Speedy Slice: 15, 16, 24, 25, 26, 34, 45. Find the median and IQR for each restaurant. Write a complete two-sentence comparison. Which restaurant would you recommend for reliability, and why? \_\_\_\_\_

**17.** A running coach records 400 m dash times (seconds) for two groups: Beginners: 65, 72, 68, 80, 75, 69, 88. Advanced: 54, 56, 55, 57, 58, 60, 54. Calculate mean and MAD for each group. Write a full statistical comparison explaining what these numbers reveal about the two groups' performance. \_\_\_\_\_

**18.** This double box plot shows daily customer counts at two coffee shops. Use the plot to read each five-number summary, compute each IQR, and write a two-sentence comparison covering both *center* (median) and *spread* (IQR). \_\_\_\_\_



## Answer Keys

- |  |  |
|--|--|
| <p>1) same median 30; A IQR 30, B IQR 15</p> <p>2) A</p> <p>3) same median 7; B larger range</p> <p>4) A IQR 20; B IQR 30</p> <p>5) same median 50; B more spread</p> <p>6) A</p> <p>7) boys 160; girls 160</p> <p>8) A</p> <p>9) same spread, B higher center</p> <p>10) A higher mean; B more consistent</p> <p>11) B</p> <p>12) Yes; A IQR 6, B IQR 7</p> | <p>13) same center; B more spread</p> <p>14) same center 70; B more spread</p> <p>15) B higher and more consistent</p> <p>16) Palace: median 28, IQR 10; Speedy: median 25, IQR 18; Palace more reliable</p> <p>17) Beginners: mean about 73.9, MAD about 6.1; Advanced: mean about 56.3, MAD about 1.8; Advanced faster and more consistent</p> <p>18) Shop A: min 30, Q1 42, med 50, Q3 58, max 70, IQR 16; Shop B: min 20, Q1 38, med 55, Q3 78, max 95, IQR 40; B higher median, A more consistent</p> |
|--|--|

### Step-by-Step Explanations

**Strategy:** For Volume of Cylinders, find the circular base area with  $\pi r^2$ , then multiply by the height of the cylinder. Volume answers should end in cubic units because a cylinder fills space.

**Practice 1:** Find the volume of a cylinder with radius  $3\text{ cm}$  and height  $7\text{ cm}$ . **Answer:**  $197.82\text{ cm}^3$   
In the first example, use the circular base area  $\pi r^2$ , then multiply by the height.

**Practice 15:** Find the volume of a cylinder with radius  $9\text{ m}$  and height  $1\text{ m}$ . **Answer:**  $254.34\text{ m}^3$   
Toward the end, use the circular base area  $\pi r^2$ , then multiply by the height.

**Word-problem notes:**

**16. Answer:**  $V = 3.14 \times 16 \times 11 = 552.64\text{ cm}^3$ .

Think of the can as a stack of circular layers. The base circle has area  $\pi r^2 = 3.14 \times 4^2 = 50.24\text{ cm}^2$ . Stack those layers  $11\text{ cm}$  high:  $V = 50.24 \times 11 = 552.64\text{ cm}^3$ . That is how much soup the can holds!

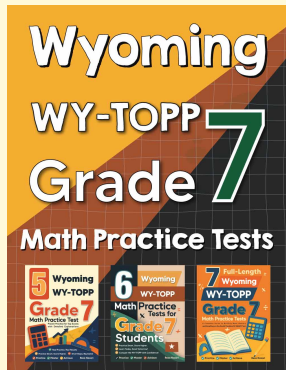
**17. Answer:**  $V = 3.14 \times 9 \times 8 = 226.08\text{ ft}^3$ .

The diameter is  $6\text{ ft}$ , so the radius is  $3\text{ ft}$ . Calculate the base area first:  $3.14 \times 3^2 = 3.14 \times 9 = 28.26\text{ ft}^2$ . Then multiply by the height:  $28.26 \times 8 = 226.08\text{ ft}^3$ . The tank can hold about 226 cubic feet of water.



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