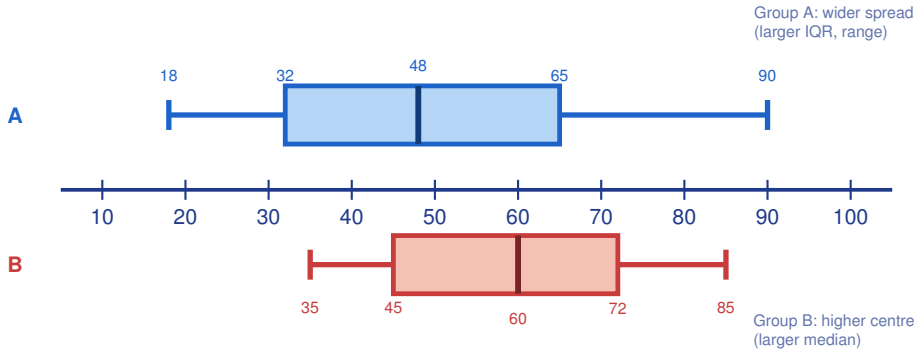
Comparing Two Data Distributions

Name: _____	Date: _____	Score: _____ / 18

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

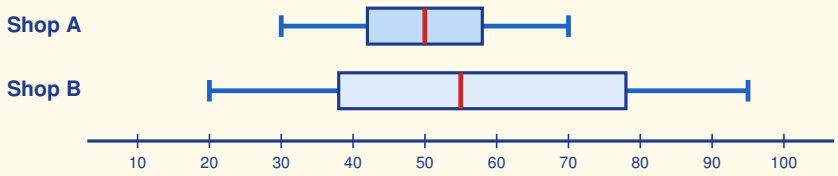
- A complete comparison always has **two parts**: a statement about centre (median or mean) and a statement about spread (IQR or MAD).
- Two groups can have the same median but very different spreads — they are not the same distribution! Always check both.
- **No overlap** between box plots $\Rightarrow$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

1) same median 30; A IQR 30, B IQR 15
2) A
3) same median 7; B larger range
4) A IQR 20; B IQR 30
5) same median 50; B more spread
6) A
7) boys 160; girls 160
8) A
9) same spread, B higher center
10) A higher mean; B more consistent
11) B
12) Yes; A IQR 6, B IQR 7
13) same center; B more spread
14) same center 70; B more spread
15) B higher and more consistent
16) Palace: median 28, IQR 10; Speedy: median 25, IQR 18; Palace more reliable
17) Beginners: mean about 73.9, MAD about 6.1; Advanced: mean about 56.3, MAD about 1.8; Advanced faster and more consistent
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

Step-by-Step Explanations

Strategy: For Volume of Cylinders, find the circular base area with πr^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 $3\ cm$ and height $7\ cm$. **Answer:** $197.82\ cm^3$
In the first example, use the circular base area pi r squared, then multiply by the height.

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

Word-problem notes:

16. Answer: $V = 3.14 \times 16 \times 11 = 552.64\ cm^3$.
Think of the can as a stack of circular layers. The base circle has area $\pi r^2 = 3.14 \times 4^2 = 50.24\ cm^2$. Stack those layers $11\ cm$ high: $V = 50.24 \times 11 = 552.64\ cm^3$. That is how much soup the can holds!

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

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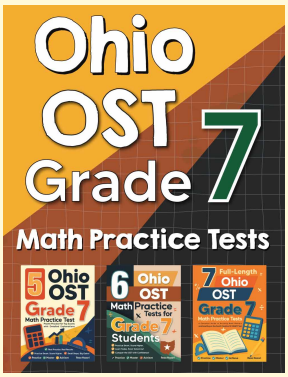

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