Box Plots

Box plots: Applications and decisions

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

QUICK REVIEW

A box plot uses minimum, Q_1, median, Q_3, maximum. Sort data, find the median, then find medians of the lower and upper halves; omit the overall median for an odd count. For $2, 4, 6, 8, 10, 12$, the summary is $2, 4, 7, 10, 12$. IQR $= 10 - 4 = 6$; the box covers the middle half, not the full range.

Worked example

Construct a box plot. Data: $2, 4, 6, 8, 10, 12$. Draw the box plot and state the five-number summary, IQR, and range.

1. Sort: $2, 4, 6, 8, 10, 12$. Average positions 3 and 4: $(6 + 8)/2 = 7$.

2. Lower half $2, 4, 6$ gives $Q_1 = 4$; upper half $8, 10, 12$ gives $Q_3 = 10$.

3. The whiskers end at $2, 12$; box width $= 10 - 4 = 6$ and full range $= 12 - 2 = 10$.

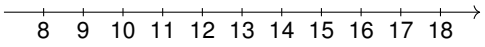
Answer: Min 2, $Q_1 = 4$, median 7, $Q_3 = 10$, max 12; IQR 6; range 10.



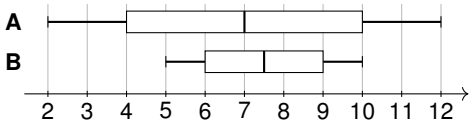
Practice Problems

Show your thinking.

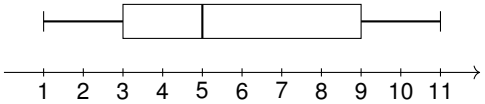
1. Build a display for daily delivery times in minutes. Data: $8, 10, 12, 14, 16, 18$. Draw the box plot and state the five-number summary, IQR, and range.



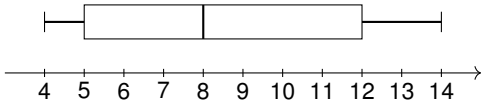
2. Two delivery teams record minutes. Read the two box plots. Find each median and IQR, then choose the team that is more consistent by IQR.



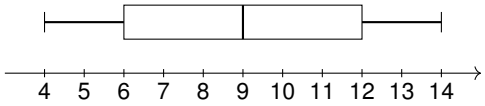
3. Read a class exercise-time display. Read the five-number summary, IQR, and range from the box plot.



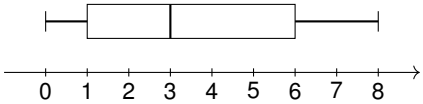
4. A report says the full range equals the box width. Correct it. Read the five-number summary, IQR, and range from the box plot.



5. A reading-time box plot has five-number summary $4, 6, 9, 12, 14$ minutes. Recover one possible sorted list of six observations. Check its quartiles and median.



6. Explain the middle-half width and full spread of wait times. Read the five-number summary, IQR, and range from the box plot.



Answer Key

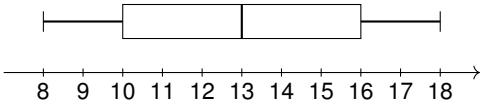
1. Min 8, $Q_1 = 10$, median 13, $Q_3 = 16$, max 18; IQR 6; range 10.
2. A: median 7, IQR 6 minutes. B: median 7.5, IQR 3 minutes. B is more consistent by IQR.
3. Min 1, $Q_1 = 3$, median 5, $Q_3 = 9$, max 11; IQR 6; range 10.
4. Min 4, $Q_1 = 5$, median 8, $Q_3 = 12$, max 14; IQR 7; range 10.
5. One answer: $4, 6, 8, 10, 12, 14$ minutes.
6. Min 0, $Q_1 = 1$, median 3, $Q_3 = 6$, max 8; IQR 5; range 8.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. Sort: $8, 10, 12, 14, 16, 18$. Average positions 3 and 4: $(12 + 14)/2 = 13$.
2. Lower half $8, 10, 12$ gives $Q_1 = 10$; upper half $14, 16, 18$ gives $Q_3 = 16$.
3. The whiskers end at $8, 18$; box width $= 16 - 10 = 6$ and full range $= 18 - 8 = 10$.



Problem 2

1. A has $Q_1 = 4$, median 7, $Q_3 = 10$, so IQR $= 10 - 4 = 6$ minutes.
2. B has $Q_1 = 6$, median 7.5, $Q_3 = 9$, so IQR $= 9 - 6 = 3$ minutes.
3. $3 < 6$, so B has less middle-half variation, although its median is 0.5 minute higher.

Problem 3

1. The whisker tips mark minimum 1 and maximum 11. Read the median line at 5.
2. The left box edge is $Q_1 = 3$; the right edge is $Q_3 = 9$.
3. IQR $= 9 - 3 = 6$. Full range $= 11 - 1 = 10$.

Problem 4

1. The whisker tips mark minimum 4 and maximum 14. Read the median line at 8.
2. The left box edge is $Q_1 = 5$; the right edge is $Q_3 = 12$.
3. IQR $= 12 - 5 = 7$. Full range $= 14 - 4 = 10$.

Problem 5

1. Choose middle values $8, 10$ because $(8 + 10)/2 = 9$, the required median.
2. Lower half $4, 6, 8$ has median 6 and upper half $10, 12, 14$ has median 12.
3. The endpoints $4, 14$ and the three middle markers match the given summary. Other valid lists may also work.

Problem 6

1. The whisker tips mark minimum 0 and maximum 8. Read the median line at 3.
2. The left box edge is $Q_1 = 1$; the right edge is $Q_3 = 6$.
3. IQR $= 6 - 1 = 5$. Full range $= 8 - 0 = 8$.

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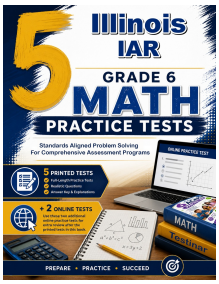

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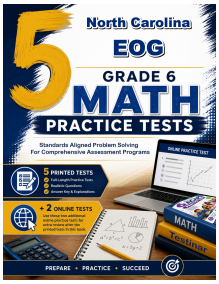

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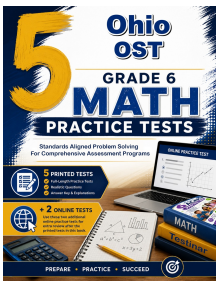

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