

# Box Plots and Interquartile Range

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_ / 30

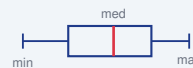
## Quick Review and Helpful Hints

A *box plot* shows five numbers: minimum, first quartile  $Q_1$ , median, third quartile  $Q_3$ , and maximum. The *interquartile range* is  $IQR = Q_3 - Q_1$ , the spread of the middle half of the data. The *range* is maximum - minimum.

▶ **Example:** A data set has  $Q_1 = 4$  and  $Q_3 = 10$ . Find the IQR.

**Work:**  $IQR = Q_3 - Q_1 = 10 - 4$ .

★ **Answer:** 6



$IQR = Q_3 - Q_1$ .

### Practice Problems

Find the requested value.

- |                                  |       |                                  |       |
|----------------------------------|-------|----------------------------------|-------|
| 1. IQR when $Q_1 = 3, Q_3 = 9$   | _____ | 8. IQR when $Q_1 = 12, Q_3 = 20$ | _____ |
| 2. IQR when $Q_1 = 10, Q_3 = 25$ | _____ | 9. Median of 3, 3, 4, 8, 9       | _____ |
| 3. Median of 2, 4, 6, 8, 10      | _____ | 10. IQR when $Q_1 = 0, Q_3 = 10$ | _____ |
| 4. Median of 1, 3, 5, 7          | _____ | 11. Median of 10, 20, 30, 40, 50 | _____ |
| 5. Min of 5, 8, 2, 10, 7         | _____ | 12. Range from 6 to 31           | _____ |
| 6. Max of 5, 8, 2, 10, 7         | _____ | 13. IQR when $Q_1 = 5, Q_3 = 5$  | _____ |
| 7. Range of 4, 9, 15             | _____ | 14. Median of 2, 4, 4, 6         | _____ |

### Word Problems

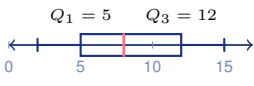
15. A data set has  $Q_1 = 15$  and  $Q_3 = 35$ . Find the IQR. \_\_\_\_\_
16. Test scores run from a minimum of 60 to a maximum of 100. Find the range. \_\_\_\_\_
17. The middle 50% of data spans  $Q_1 = 20$  to  $Q_3 = 28$ . Find the IQR. \_\_\_\_\_
18. A counselor records five GED practice times: 5, 10, 15, 20, 25 minutes. What is the median practice time? \_\_\_\_\_



**◆ Illustrated Practice**


Use each picture. Read the five-number summary, box plot, or dot plot carefully.

$Q_1 = 5$     $Q_3 = 12$    **19. Find the IQR.** \_\_\_\_\_



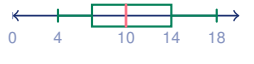
A horizontal number line from 0 to 15 with tick marks at 0, 5, 10, and 15. A box plot is drawn with a minimum at 0, a first quartile at 5, a median at 10, a third quartile at 12, and a maximum at 15. The labels  $Q_1 = 5$  and  $Q_3 = 12$  are placed above the box.

**25. Which half has the larger spread?** \_\_\_\_\_



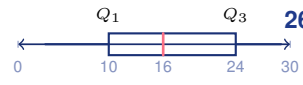
A horizontal number line from 0 to 16 with tick marks at 0, 4, 6, 14, and 16. A box plot is drawn with a minimum at 0, a first quartile at 4, a median at 6, a third quartile at 14, and a maximum at 16. The left side of the box is labeled 'short' and the right side is labeled 'long'.

**20. Find the range.** \_\_\_\_\_



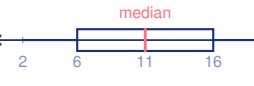
A horizontal number line from 0 to 18 with tick marks at 0, 4, 10, 14, and 18. A box plot is drawn with a minimum at 0, a first quartile at 4, a median at 10, a third quartile at 14, and a maximum at 18.

**26. Find the IQR.** \_\_\_\_\_



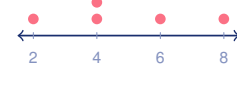
A horizontal number line from 0 to 30 with tick marks at 0, 10, 16, 24, and 30. A box plot is drawn with a minimum at 0, a first quartile at 10, a median at 16, a third quartile at 24, and a maximum at 30. The labels  $Q_1$  and  $Q_3$  are placed above the box.

**21. Find the median.** \_\_\_\_\_



A horizontal number line from 2 to 21 with tick marks at 2, 6, 11, 16, and 21. A box plot is drawn with a minimum at 2, a first quartile at 6, a median at 11, a third quartile at 16, and a maximum at 21. The label 'median' is placed above the vertical line.

**27. Find the median.** \_\_\_\_\_

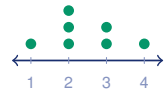


A horizontal number line from 2 to 8 with tick marks at 2, 4, 6, and 8. There are four red dots: one at 2, two at 4, one at 6, and one at 8.

**22. Find  $Q_1$ .** \_\_\_\_\_

min	$Q_1$	med	$Q_3$	max
3	7	10	14	20

**28. Find the mode.** \_\_\_\_\_



A horizontal number line from 1 to 4 with tick marks at 1, 2, 3, and 4. There are four green dots: one at 1, three at 2, two at 3, and one at 4.


**23. Find  $Q_3$ .** \_\_\_\_\_

min	$Q_1$	med	$Q_3$	max
6	9	12	18	22

**29. Find the maximum.** \_\_\_\_\_

min	$Q_1$	med	$Q_3$	max
12	18	24	30	36

**24. Find the range.** \_\_\_\_\_



A horizontal number line from 1 to 16 with tick marks at 1, 5, 9, 13, and 16. A box plot is drawn with a minimum at 1, a first quartile at 5, a median at 9, a third quartile at 13, and a maximum at 16.

**30. Find the range.** \_\_\_\_\_

min	$Q_1$	med	$Q_3$	max
52	61	70	81	88



## Answer Keys

- |                                     |                                     |   |
|-------------------------------------|-------------------------------------|---|
| 1. <input type="text" value="6"/>   | 11. <input type="text" value="30"/> | 21. <input type="text" value="11"/>         |
| 2. <input type="text" value="15"/>  | 12. <input type="text" value="25"/> | 22. <input type="text" value="7"/>          |
| 3. <input type="text" value="6"/>   | 13. <input type="text" value="0"/>  | 23. <input type="text" value="18"/>         |
| 4. <input type="text" value="4"/>   | 14. <input type="text" value="4"/>  | 24. <input type="text" value="15"/>         |
| 5. <input type="text" value="2"/>   | 15. <input type="text" value="20"/> | 25. <input type="text" value="upper half"/> |
| 6. <input type="text" value="10"/>  | 16. <input type="text" value="40"/> | 26. <input type="text" value="14"/>         |
| 7. <input type="text" value="11"/>  | 17. <input type="text" value="8"/>  | 27. <input type="text" value="4"/>          |
| 8. <input type="text" value="8"/>   | 18. <input type="text" value="15"/> | 28. <input type="text" value="2"/>          |
| 9. <input type="text" value="4"/>   | 19. <input type="text" value="7"/>  | 29. <input type="text" value="36"/>         |
| 10. <input type="text" value="10"/> | 20. <input type="text" value="14"/> | 30. <input type="text" value="36"/>         |

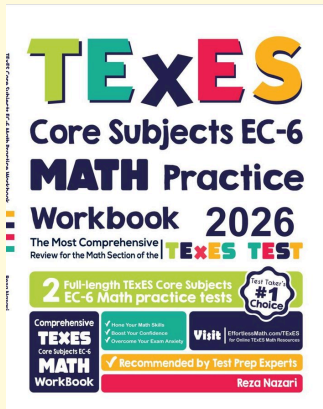
### Step-by-Step Explanations

1. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is  $9 - 3 = 6$ . So the final answer is 6.
2. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is  $25 - 10 = 15$ . So the final answer is 15.
3. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The middle value is 6. So the final answer is 6.
4. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Average the middle two:  $\frac{3+5}{2} = 4$ . So the final answer is 4.
5. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The smallest value is 2. So the final answer is 2.
6. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The largest value is 10. So the final answer is 10.
7. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is  $15 - 4 = 11$ . So the final answer is 11.
8. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is  $20 - 12 = 8$ . So the final answer is 8.
9. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is In order 3, 3, 4, 8, 9, the middle is 4. So the final answer is 4.
10. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is  $10 - 0 = 10$ . So the final answer is 10.
11. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The middle value is 30. So the final answer is 30.
12. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is  $31 - 6 = 25$ . So the final answer is 25.
13. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is  $5 - 5 = 0$ . So the final answer is 0.
14. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Average the middle two:  $\frac{4+4}{2} = 4$ . So the final answer is 4.
15. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is  $IQR = 35 - 15 = 20$ . So the final answer is 20.
16. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is  $100 - 60 = 40$ . So the final answer is 40.
17. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is  $28 - 20 = 8$ . So the final answer is 8.
18. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is The middle value is 15. So the final answer is 15.
19. The picture gives  $Q_1 = 5$  and  $Q_3 = 12$ . The IQR measures the middle half of the data, so subtract the quartiles:  $12 - 5 = 7$ .
20. For range, use only the smallest and largest values on the whiskers. The minimum is 4 and the maximum is 18, so  $18 - 4 = 14$ .
21. The median is the line inside the box. In this box plot, that line is at 11, so the median is 11.
22. Read the labeled five-number summary from left to right. The value under  $Q_1$  is 7, so the first quartile is 7.
23. In a five-number summary,  $Q_3$  is the fourth value shown. The card under  $Q_3$  shows 18, so  $Q_3 = 18$ .
24. Range is maximum minus minimum. The whiskers run from 1 to 16, and  $16 - 1 = 15$ .
25. Compare the two sides of the box around the median. The lower half goes from 4 to 6 (spread 2), while the upper half goes from 6 to 14 (spread 8), so the upper half is larger.
26. Use the same IQR rule:  $Q_3 - Q_1$ . The box starts at 10 and ends at 24, so  $24 - 10 = 14$ .
27. The dot plot shows the data values 2, 4, 4, 6, 8. The middle value in order is 4, so the median is 4.
28. The mode is the value that appears most often. The tallest stack of dots is over 2, so the mode is 2.
29. The maximum is the last value in the five-number summary. The last card is 36, so the maximum is 36.
30. Use maximum minus minimum. The smallest value is 52 and the largest is 88, so  $88 - 52 = 36$ .



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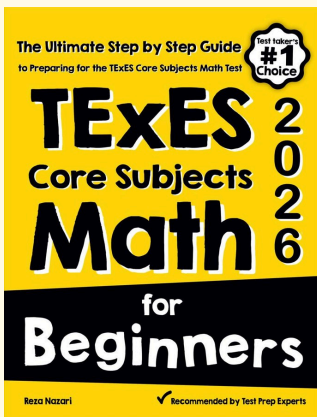
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