

# Box Plots

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_ / 24

## Q Quick Review

A **box plot** (or box-and-whisker plot) shows data using five numbers: the **minimum**,  $Q_1$ , the **median**,  $Q_3$ , and the **maximum**. The **box** stretches from  $Q_1$  to  $Q_3$  and holds the middle half of the data; a line inside marks the median. The **whiskers** reach from the box out to the minimum and maximum. The width of the box is the **IQR** =  $Q_3 - Q_1$ , and the whole plot's width is the **range**. A box plot makes it easy to compare center and spread.

◇ **Example:** For the data 4, 6, 8, 10, 12, 14, 16, give the five-number summary.  
 ⇒ The data is already in order, which makes this easier. The minimum is 4 and the maximum is 16. With 7 values, the median is the 4th one, 10. The lower half is 4, 6, 8, so  $Q_1$  is its middle, 6. The upper half is 12, 14, 16, so  $Q_3 = 14$ . That gives the five-number summary: minimum 4,  $Q_1 = 6$ , median 10,  $Q_3 = 14$ , maximum 16.

**Answer:** 4, 6, 10, 14, 16

## PRACTICE

Find the requested value from each data set or box plot summary.

- |   |       |   |       |
|---|-------|---|-------|
| 1. Median of 4, 6, 8, 10, 12, 14, 16  | _____ | 13. Same box plot: min 20, max 44. Find the range.          | _____ |
| 2. $Q_1$ of 4, 6, 8, 10, 12, 14, 16   | _____ | 14. Same box plot: what value is the median?                | _____ |
| 3. $Q_3$ of 4, 6, 8, 10, 12, 14, 16   | _____ | 15. Median of 20, 24, 28, 32, 36, 40, 44                    | _____ |
| 4. IQR of 4, 6, 8, 10, 12, 14, 16   | _____ | 16. $Q_1$ of 20, 24, 28, 32, 36, 40, 44                     | _____ |
| 5. Range of 4, 6, 8, 10, 12, 14, 16   | _____ | 17. $Q_3$ of 20, 24, 28, 32, 36, 40, 44                     | _____ |
| 6. Minimum of 5, 7, 9, 11, 13, 15, 17, 19   | _____ | 18. A box plot has $Q_1 = 6$ and $Q_3 = 18$ . Find the IQR. | _____ |
| 7. Maximum of 5, 7, 9, 11, 13, 15, 17, 19   | _____ | 19. A box plot has min 2 and max 22. Find the range.        | _____ |
| 8. Median of 5, 7, 9, 11, 13, 15, 17, 19  | _____ | 20. Range of 20, 24, 28, 32, 36, 40, 44                     | _____ |
| 9. $Q_1$ of 5, 7, 9, 11, 13, 15, 17, 19   | _____ |   |       |
| 10. $Q_3$ of 5, 7, 9, 11, 13, 15, 17, 19  | _____ |   |       |
| 11. IQR of 5, 7, 9, 11, 13, 15, 17, 19  | _____ |   |       |
| 12. A box plot has min 20, $Q_1 = 24$ , median 32, $Q_3 = 40$ , max 44. Find the IQR. | _____ |   |       |

## ◆ Word Problems

21. The number of minutes 11 students practiced piano were 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22. Give the five-number summary.  
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22. A box plot of jump-rope counts shows minimum 5,  $Q_1 = 8$ , median 12,  $Q_3 = 16$ , maximum 19. What is the IQR, and what does it represent?  
 \_\_\_\_\_
23. Two box plots compare quiz scores. Class X has median 32 and IQR = 16. Class Y has median 32 and IQR = 8. Which class has scores that are more spread out?  
 \_\_\_\_\_
24. A box plot of plant heights shows minimum 20 cm,  $Q_1 = 24$ , median 32,  $Q_3 = 40$ , maximum 44. Between which two values do the middle half of the plants fall?  
 \_\_\_\_\_



## Answer Keys

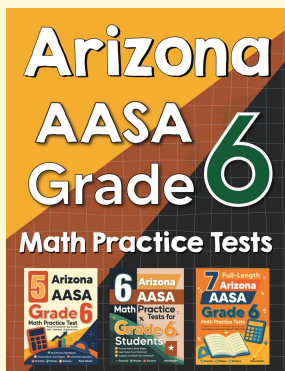
- |   |  |
|---|--|
| <p>1. 10</p> <p>2. 6</p> <p>3. 14</p> <p>4. 8</p> <p>5. 12</p> <p>6. 5</p> <p>7. 19</p> <p>8. 12</p> <p>9. 8</p> <p>10. 16</p> <p>11. 8</p> <p>12. 16</p> | <p>13. 24</p> <p>14. 32</p> <p>15. 32</p> <p>16. 24</p> <p>17. 40</p> <p>18. 12</p> <p>19. 20</p> <p>20. 24</p> <p>21. 2, 6, 12, 18, 22</p> <p>22. IQR = 8</p> <p>23. Class X</p> <p>24. between 24 cm and 40 cm</p> |
|---|--|

### Step-by-Step Explanations

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|---|---|
| <p>1. With 7 ordered values, the median is the 4th one: 10.</p> <p>2. The lower half is 4, 6, 8, and its middle value is 6.</p> <p>3. The upper half is 12, 14, 16, and its middle value is 14.</p> <p>4. <math>IQR = Q_3 - Q_1 = 14 - 6 = 8</math>.</p> <p>5. Maximum minus minimum: <math>16 - 4 = 12</math>.</p> <p>6. The smallest value listed is 5.</p> <p>7. The largest value listed is 19.</p> <p>8. With 8 values, average the 4th and 5th: <math>(11 + 13) \div 2 = 12</math>.</p> <p>9. The lower half is 5, 7, 9, 11; its median is <math>(7 + 9) \div 2 = 8</math>.</p> <p>10. The upper half is 13, 15, 17, 19; its median is <math>(15 + 17) \div 2 = 16</math>.</p> <p>11. <math>IQR = Q_3 - Q_1 = 16 - 8 = 8</math>.</p> <p>12. <math>IQR = Q_3 - Q_1 = 40 - 24 = 16</math>.</p> <p>13. Range is maximum minus minimum: <math>44 - 20 = 24</math>.</p> <p>14. The median is given directly in the five-number summary: 32.</p> <p>15. With 7 ordered values, the median is the 4th: 32.</p> | <p>16. The lower half is 20, 24, 28; its middle value is 24.</p> <p>17. The upper half is 36, 40, 44; its middle value is 40.</p> <p>18. <math>IQR = 18 - 6 = 12</math> — the width of the box.</p> <p>19. Range is <math>22 - 2 = 20</math>.</p> <p>20. Maximum minus minimum: <math>44 - 20 = 24</math>.</p> <p>21. The minimum is 2 and the maximum is 22. With 11 values, the median is the 6th, 12. The lower half 2, 4, 6, 8, 10 has median <math>Q_1 = 6</math>, and the upper half 14, 16, 18, 20, 22 has median <math>Q_3 = 18</math>.</p> <p>22. <math>IQR = Q_3 - Q_1 = 16 - 8 = 8</math>. It represents the spread of the middle half of the jump-rope counts — the width of the box.</p> <p>23. Both classes have the same median, so we compare spread. Class X has the larger IQR (<math>16 &gt; 8</math>), so its middle half of scores is more spread out.</p> <p>24. The box of a box plot stretches from <math>Q_1</math> to <math>Q_3</math>, and that box holds the middle half of the data. So the middle half of the plants are between 24 cm and 40 cm.</p> |
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