# QUARTILES

1) A list of 11 numbers is shown below.

   3   5   7   8   10   12   12   15   16   18   19

   a. Work out the median. **12**
   b. Work out the lower quartile. **7**
   c. Work out the upper quartile. **16**
   d. Work out the interquartile range. $16 - 7 = $ **9**

2) A list of 7 numbers is shown below.

   4   6   8   11   13   16   17

   a. Work out the median. **11**
   b. Work out the lower quartile. **6**
   c. Work out the upper quartile. **16**
   d. Work out the interquartile range. $16 - 6 = $ **10**

3) The test scores from a group of students are as shown:

   22   25   27   30   32   35   38   40   41   44   45

   a. Work out the lower quartile of the scores. 27
   b. Work out the upper quartile of the scores. 41
   c. Work out the interquartile range. $41 - 27 = $ **14**

4) A teacher records the number of books read by 9 pupils:

   2   3   4   4   5   6   7   9   12

   a. Work out the lower quartile. $\frac{3+4}{2} = $ **3.5**
   b. Work out the upper quartile. $\frac{7+9}{2} = $ **8**
   c. Work out the interquartile range. $8 - 3.5 = $ **4.5**

5) The heights in cm of some house plants are:

   45   47   50   52   53   55   56   58   60   61   63

   a. Work out the median height. **55 $cm$**
   b. Work out the lower quartile. **50 $cm$**
   c. Work out the upper quartile. **60 $cm$**
   d. What does the IQR suggest about the plants? $60 - 50 = $ **10 $cm$**
   The heights of the middle 50% of plants, lie within a 10 cm range.

6) The number of hours a group of university students spent revising last week are as follows:

   34   10   22   18   11   26   24   30   14

   First order the data: 10   11   14   18   22   24   26   30   34

   a. Work out the median time spent. **22 $hrs$**
   b. Work out the lower quartile. $\frac{11+14}{2} = $ **12.5 $hrs$**
   c. Work out the upper quartile. $\frac{26+3}{2} = $ **28 $hrs$**
   d. Work out the interquartile range. $28 - 12.5 = $ **15.5 $hrs$**

7) The data for the number of goals a footballer scored in 11 matches are as follows:

<div align="center">
Median = 2

Upper Quartile = 5

IQR = 4
</div>

Work out the lower quartile of goals scored.

$$IQR = UQ - LQ$$

$$LQ = UQ - IQR = 5 - 4 = \mathbf{1}$$

8) Two classes sit the same quiz in geography.

<div align="center">
**Class A's scores:**

$12, 13, 14, 15, 15, 17, 18, 20, 21, 23, 25$

**Class B's scores:**

$10, 11, 12, 14, 14, 16, 19, 20, 22, 26, 28$
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a. Work out the IQR for Class A.

$$21 - 14 = \mathbf{7}$$

b. Work out the IQR for Class B.

$$22 - 12 = \mathbf{10}$$

c. Which class has more consistent scores? Explain your answer.

Class A has a lower IQR, therefore there was less variation and more consistent scores.

9) Two groups are asked about their daily allowance for lunch, in pounds.

<div align="center">
**Group X's responses:**

5   6   6   7   8   9   10   10   11   12   14

**Group Y's responses:**

3   4   5   7   8   9   10   11   12   15   20
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Make two comparisons about the data for each group.

The median allowance for both groups is the same. Therefore, they spend roughly the same amount on average.

Group Y has an interquartile range of £7, while Group X has an interquartile range of £5. This means there was more variation in Group Y's daily allowance.

10) Two runners were asked how many kilometres they ran, per day last week. Their data is summarised in the table below.

| Runner | Median | Interquartile Range |
|--------|--------|---------------------|
| A | 5 | 3 |
| B | 6.5 | 2 |

Make two comparisons about the data for each runner.

Runner B has a higher median, therefore they ran more on average per day.

Runner A has a higher interquartile range, therefore they had more variation in the amount of kilometres run per day.

11) An ordered list of 9 numbers is shown.

$$2 \quad x \quad 6 \quad 8 \quad 9 \quad 10 \quad 14 \quad 18 \quad 19$$

a. Write an expression for the lower quartile. $\frac{x+6}{2}$

b. Given that the lower quartile is 7, work out the value of $x$.

$$\frac{x+6}{2} = 7$$

$$x + 6 = 14$$

$$x = \mathbf{8}$$

12) An ordered list of 7 numbers is shown.

$$1 \quad 2x \quad 5 \quad 7 \quad 9 \quad 11 \quad 12$$

Given that the mean of the numbers is 7, work out the interquartile range.

$$\frac{1 + 2x + 5 + 7 + 9 + 11 + 12}{7} = 7$$

$$\frac{2x + 45}{7} = 7$$

$$2x + 45 = 49$$

$$2x = 4$$

$$x = 2$$

$$LQ = 2(2) = 4 \qquad UQ = 11$$

$$IQR = 11 - 4 = \mathbf{7}$$

13) An ordered list of 7 numbers is shown.

$$2 \quad x - 16 \quad 6 \quad 10 \quad 18 \quad 2x - 20 \quad 26$$

Given that the interquartile range is 18, work out the lower quartile and upper quartile.

$$IQR = (2x - 20) - (x - 16) = 18$$
$$x - 4 = 18$$
$$x = 22$$

$$LQ = 22 - 16 = \mathbf{6}$$

$$UQ = 2(22) - 20 = \mathbf{24}$$

**Challenge**

**14)** A list of ordered numbers is as follows

$$2 \qquad \frac{1}{2}(x+y) \qquad 6 \qquad 10 \qquad 14 \qquad 3x+y \qquad 26$$

Given that the lower quartile is 5 and the upper quartile is 16, work out the values of $x$ and $y$. You must show all your working. Do not use trial and error.

**From lower quartile:**
$$\frac{1}{2}x + \frac{1}{2}y = 5$$

**From upper quartile:**
$$3x + y = 16$$

**Multiply the first equation by 2 and solve:**
$$3x + y = 16$$
$$-(x + y = 10)$$
$$2x \quad = 6$$
$$x = 3$$

$$3(3) + y = 16$$
$$9 + y = 16$$
$$y = 7$$

$$x = 3 \quad y = 7$$