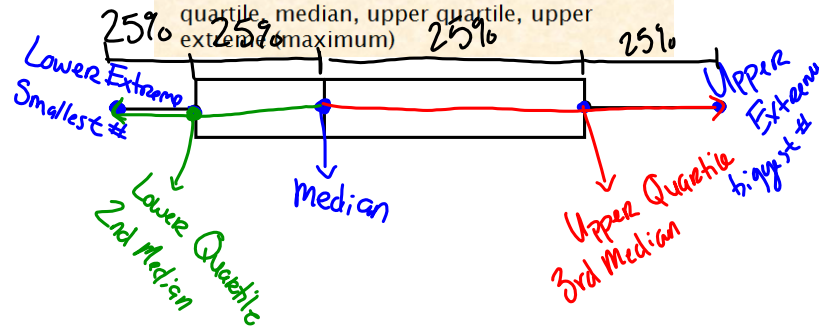


13.8 Interpret Box-and-whisker Plots

Box-and-whisker Plots: Organizes data into 4 quartiles; the upper and lower half is divided by the median; the median of the lower half is the lower quartile; the median of the upper half is the upper quartile

5 points used: lower extreme (minimum), lower quartile, median, upper quartile, upper extreme (maximum)



Important Terms:

Inter-Quartile Range: The difference between the upper and lower quartile.

$$UQ - LQ = I-Q \text{ Range}$$

Outlier: A value that is widely separated by the rest of the data.

Greater than the upper quartile by 1.5 times more than the inter-quartile range.

OR

Less than the lower quartile by 1.5 times more than the inter-quartile range.



EXAMPLE 1

GUIDED PRACTICE for Example 1

1. Make a box-and-whisker plot of the ages of eight family members: 60, 15, 25, 20, 55, 70, 40, 30.

EXAMPLE 1 Make a box-and-whisker plot

SONG LENGTHS The lengths of songs (in seconds) on a CD are listed below. Make a box-and-whisker plot of the song lengths.

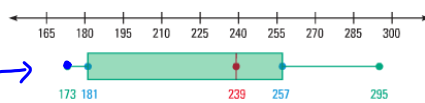
173, 206, 179, 257, 198, 251, 239, 246, 295, 181, 261

Solution

STEP 1 Order the data. Then find the median and the quartiles.

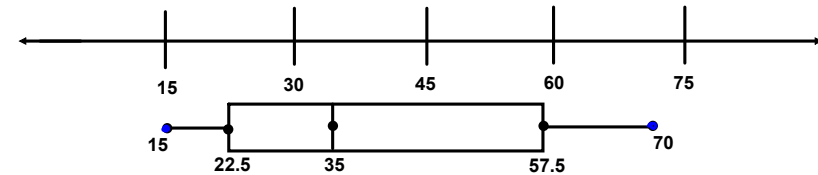
Lower half	Median	Upper half
173, 179, 181, 198, 206	239	246, 251, 257, 261, 295
Lower quartile		Upper quartile

STEP 2 Plot the median, the quartiles, the maximum value, and the minimum value below a number line.

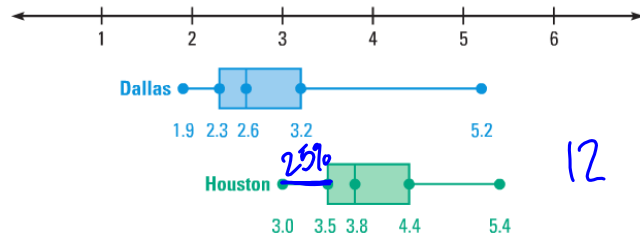


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 1 Order 5 #'s
 2
 3

15, 20, 25, 30, 40, 55, 60, 70
 22.5 35 57.5



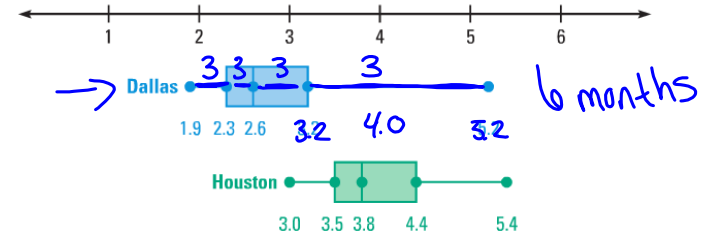
a. For how many months is Houston's precipitation less than 3.5 inches?



a. For Houston, the lower quartile is 3.5. A whisker represents 25% of the data, so for 25% of 12 months, or 3 months Houston has less than 3.5 inches of precipitation.

✓ **GUIDED PRACTICE** for Example 2

2. **PRECIPITATION** In Example 2, for how many months was the precipitation in Dallas more than 2.6 inches?



EXAMPLE 3 Standardized Test Practice

The normal monthly amounts of precipitation (in inches) in Dallas are: 1.9, 2.4, 3.1, 3.2, 5.2, 3.2, 2.1, 2.0, 2.4, 4.1, 2.6, 2.6. These data were used to create the box-and-whisker plot in Example 2. Which value, if any, is an outlier?

- (A) 1.9 (B) 5.2 (C) 1.9 and 5.2 (D) No outlier

Solution

From Example 2, you know the interquartile range of the data is 0.9 inch. Find 1.5 times the interquartile range: $1.5(0.9) = 1.35$.

From Example 2, you also know that the lower quartile is 2.3 and the upper quartile is 3.2. A value less than $2.3 - 1.35 = 0.95$ is an outlier. A value greater than $3.2 + 1.35 = 4.55$, is an outlier. Notice that $5.2 > 4.55$.

► The correct answer is B. (A) (B) (C) (D)

✓ **GUIDED PRACTICE** for Example 3

3. Which value, if any, is an outlier in the data set?

- (A) 3.0 (B) 5.4 (C) 3.0 and 5.4 (D) No outlier

$1.5(I-QR) = \text{Outlier Range}$

$[3.0, 3.2, 3.4] | 3.6, 3.7, 3.7 | [3.8, 4.2, 4.3] | 4.5, 5.2, 5.4]$

3.5 (LQ) 3.75 (Median) 4.4 (UQ)

$3.5 - 1.35$ $1.5(0.9) = 1.35$ $4.4 + 1.35$