Boxplot help:

Example: A dentist is researching the average time that people brush their teeth. A sample of 21 brushing times is collected and listed below (in seconds).

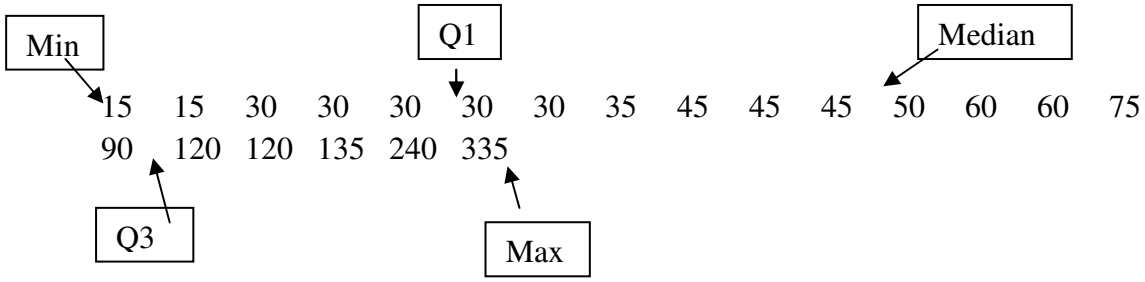
15 30 35 90 60 45 135 75 120 15 30 30 45 60 30
120 45 30 335 240 50

1. Order the observations:

15 15 30 30 30 30 30 35 45 45 45 50 60 60 75 90
120 120 135 240 335

2. Find the five-number summary: minimum, Q1, median, Q3, and maximum.

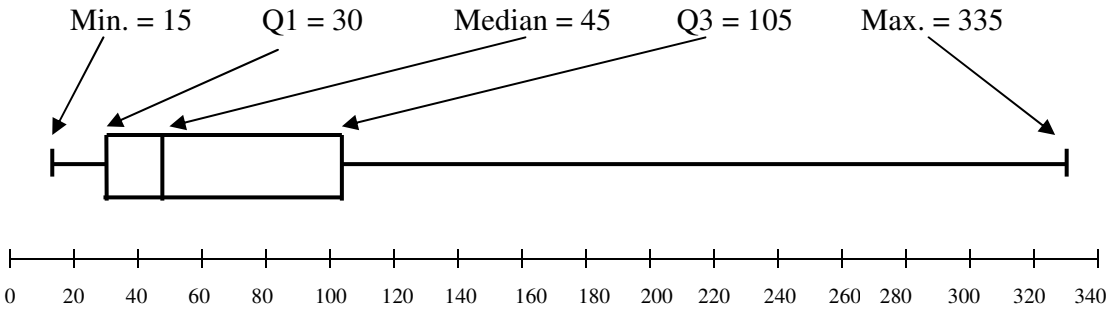
It's easy to see that the minimum is 15, and the maximum is 335.
The median is the value in the middle, in this case it's the 11^{th} value, 45
The first quartile, Q1, is the median value of the first half of the ordered data, that is the average of the 5^{th} and the 6^{th} values in this example, (30 + 30)/2 = 30
The third quartile, Q3, is the median value of the second half of the ordered data, that is the average of the 16^{th} and 17^{th} values in this example, (90 + 120)/2 = 105.



Thus, the five-number summary is:
Min. = 15 Q1 = 30 Median = 45 Q3 = 105 Max. = 335

Boxplot (here I show you how to create a horizontal boxplot, but in a similar way you can create a vertical one—check OLI)**:**

3. Draw a number line from the minimum value to the maximum value.
Mark the five-number summary with lines above the number line.
Connect Q1, the median, and Q3 with lines to form a box.
Connect the minimum to the box with a line, and similarly the maximum to the box (whiskers).



Outliers:
We can use the 1.5(IQR) rule to identify any outliers:

The IQR is Q3 – Q1 = 105 – 30 = 75
1.5(IQR) = 1.5 (75) = 112.5

Ask yourself the following two questions:

1. Are there any observations BELOW Q1 – 1.5(IQR)? That is, are there any observations below 30 – 112.5 = - 82.5?
   No. There are no values in the list below – 82.5.
2. Are there any observations ABOVE Q3 + 1.5(IQR)? That is, are there any observations above 105 + 112.5 = 217.5
   Yes, there are two values above 217.5: 240 minutes and 335 minutes.
   Thus, 240 minutes and 335 minutes are considered outliers according to the 1.5(IQR) rule.

Modified boxplot:
In a modified boxplot the outliers are marked by *s.