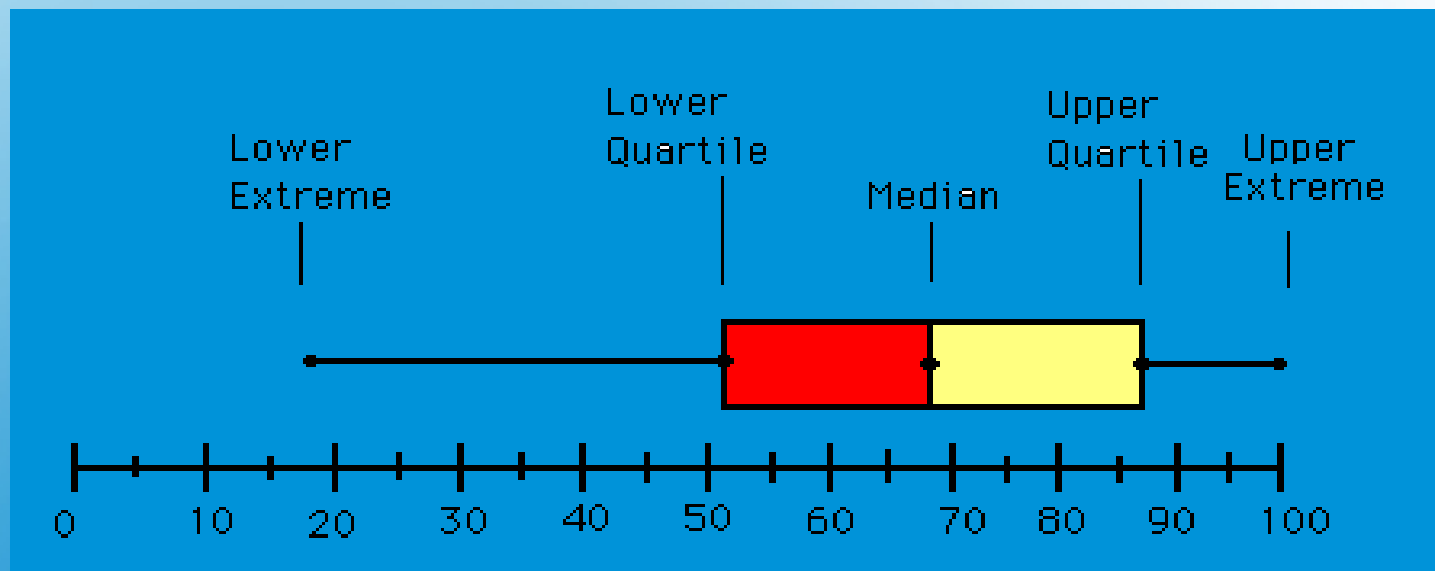


# ***BOX-AND-WHISKER PLOT***



A **box-and-whisker** plot can be useful for handling many data values.



**Box-and-whisker** plot allow people to explore data .

It helps to draw informal conclusions **when two or more variables** are present.

It shows only certain statistics rather than all the data.

**Five-number summary** is another name for the visual representations of the box-and-whisker plot.

The five-number summary consists of the **median, the quartiles, and the smallest and greatest values in the distribution.**

## **First Step:**

**The first step in constructing a box-and-whisker plot is to first find the**

**Median**

**Lower quartile**

**Upper quartile**

**of a given set of data**

# Median



1. Alice has got the following Marks for the 7 subjects in a test. Find the Median for the following list of Marks.

90 75 82 100 87 96 69

**Solution:**

To find the Median first arrange the data from least to greatest.

69 75 82 87 90 96 100





The median is the value exactly in the middle of an ordered set of numbers.

There are 7 numbers in the list, so the middle one will be the  $(7+1) \div 2 = 8 \div 2 = 4\text{th}$  number

**87 is the median**



2. Following are the number of ingredients needed to make a candy. Find the median of them.

13, 18, 13, 14, 13, 16, 14, 21

**Solution:**

To find the Median first arrange the data from least to greatest.

13, 13, 13, 13, 14, 14, 16, 18, 21



13, 13, 13, 13, 14, 14, 16, 18, 21

The median is the value exactly in the middle of an ordered set of numbers.

But there is no "middle" number, because there are an even number of numbers.

In this case, the median is:  $(13 + 14) \div 2 = 27 \div 2 = 13.5$

**Lower  
and  
Upper  
quartile**



**The following are the collected data on the weights of the players of the football team. Compute the lower and upper quartile of the set of weights given below:**

60, 70, 68, 72, 65, 58, 62, 63, 59, 64, 67



## Solution:

To find the Lower and upper quartile, First arrange the data from least to greatest.

58, 59, 60, 62, 63, 64, 65, 67, 68, 70, 72

There are 11 numbers in the list, so the median will be the  $(11+1) \div 2 = 12 \div 2 = 6\text{th number} = 64$ .

58, 59, 60, 62, 63, **64**, 65, 67, 68, 70, 72

Next, we consider only the values to the left of the median:  
58, 59, 60, 62, 63

We now find the median of this set of numbers.

Remember, the median is the value exactly in the middle of an ordered set of numbers. Thus **60** is the median and therefore is the **lower quartile**.



Now consider only the values to the right of the median: 65, 67, 68, 70, 72.

We now find the median of this set of numbers. The median **68** is therefore called the **upper quartile**.



If you're finding the median in an ordered set with an **even number of values**, you must take the average of the two middle numbers.



## Example:

3, 5, 7, **10, 13**, 16, 18, 20.

Here the median is:

$$(10+13)/2 = 11.5$$

The values to the left of the median,

3, 5, 7, 10

Now find the median of this set of numbers  
 $= (5+7)/2 = 6$  is the lower quartile.

The values to the right of the median,

13, 16, 18, 20

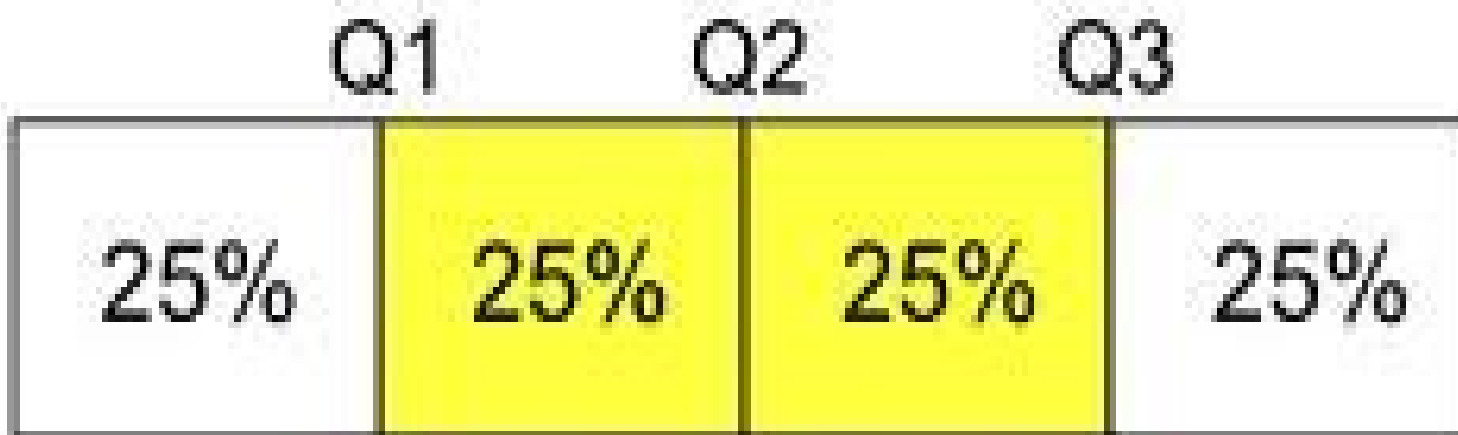
Now find the median of this set of numbers  
 $= (16+18)/2 = 17$  is the upper quartile.



You are now ready to find the interquartile range (**IQR**). The interquartile range is the difference between the upper quartile and the lower quartile. In our case the  
$$\text{IQR} = \text{Upper Quartile} - \text{Lower Quartile}$$



The IQR is a very useful measurement. It is useful because it is less influenced by extreme values, it limits the range to the middle **50% of the values.**



Interquartile Range  
 $= Q3 - Q1$

Compute the lower and upper quartile and plot the whiskers graph for the given data.

3, 5, 4, 2, 1, 6, 8, 11, 14, 13, 6, 9, 10, 7

**Solution:**

• First, order your numbers from least to greatest:

1, 2, 3, 4, 5, 6, 6, 7, 8, 9, 10, 11, 13, 14



## Let's Now see how to plot a whisker Graph

- Then find the median (from the ordered list)
- Cross off one number from each side until you reach the middle number (or numbers)

1, 2, 3, 4, 5, 6, **6, 7**, 8, 9, 10, 11, 13, 14

- If there are two numbers in the middle, Add those 2 middle numbers together

$$6 + 7 = 13$$

- Then divide by 2,

$$13 \div 2 = 6.5$$

- The median is 6.5



- Then split the numbers on left and right sides of the median

1, 2, 3, 4, 5, 6, 6, | 7, 8, 9, 10, 11, 13, 14

- Find the median for each half

1, 2, 3, 4, 5, 6, 6 | 7, 8, 9, 10, 11, 13, 14  
1, 2, 3, **4**, 5, 6, 6 | 7, 8, 9, **10**, 11, 13, 14

Left Median = 4

Right Median = 10

• The left median is called the **LOWER QUARTILE**.

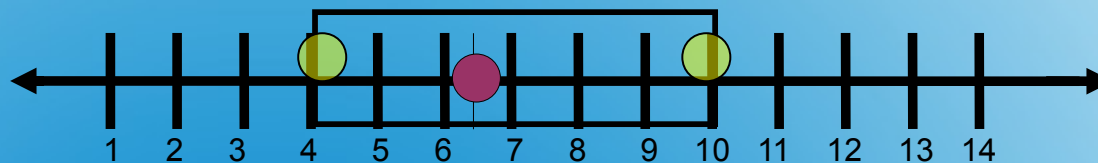
The right median is called the **UPPER QUARTILE**.

1, 2, 3, **4**, 5, 6, 6 | 7, 8, 9, **10**, 11, 13, 14

• Draw a number line from the smallest to the largest number without skipping any numbers.



- Draw a box connecting the circles at the LOWER and UPPER Quartiles.
- Put a circle at the median (6.5)
- Draw a line connecting the median to the box
- Draw lines that connect the high and low points to the box.



## Here is the completed Box and Whisker Plot!

