

### 3.1 Measures of Central Tendency & Spread

#### A: Mean, Median, Mode, Range

	Definition	How?
<b>Mean</b>	The average value of the data.	<ul style="list-style-type: none"> <li>• add all the data values</li> <li>• divide the sum by the total # of data values</li> </ul>
<b>Median</b>	The data value that occurs in the middle of the data. (same # of values are above and below the median)	<ul style="list-style-type: none"> <li>• Order the data from least to greatest</li> <li>• if the # of data is odd, the median is the middle number</li> <li>• if the # of data is even, the median is the average of the 2 numbers in the middle</li> </ul>
<b>Mode</b>	The data value that occurs most frequently.	<ul style="list-style-type: none"> <li>• examine your data and determine which number occurs most often</li> <li>• if all data values occur with the same frequency then there is No Mode</li> <li>• there can be multiple values for the mode</li> </ul>
<b>Range</b>	The # of data values between the highest value and lowest value	<ul style="list-style-type: none"> <li>• subtract the lowest value from the highest value</li> </ul>

Ex. 1 Determine the mean, median, mode and range.

a) ~~5, 8, 7, 9, 2, 8, 5~~

$$\text{Mean} = \frac{5+8+7+9+2+8+5}{7}$$

$$= 6.3$$

Median

2, 5, 5, 7, 8, 8, 9

Median = 7

Mode = 5, 8

Range = 9 - 2

= 7

b) ~~25, 18, 17, 17, 12, 19~~

$$\text{Mean} = \frac{25+18+17+17+12+19}{6}$$

$$= 18$$

12, 17, 17, 18, 19, 25

Median

$$\text{Median} = \frac{17+18}{2}$$

$$= 17.5$$

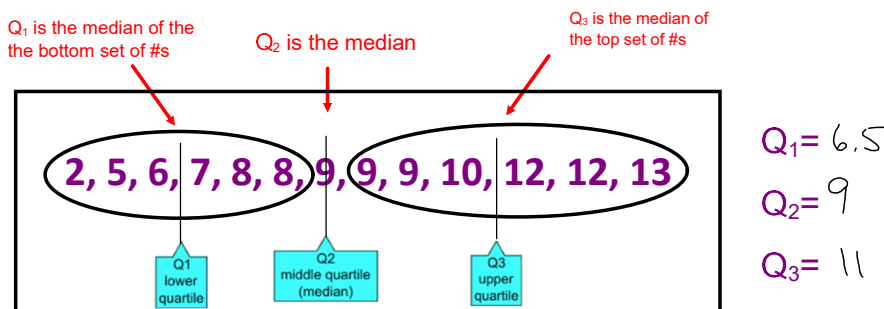
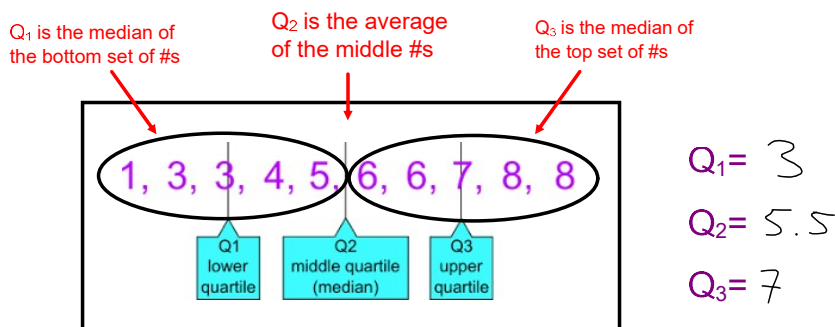
Range = 25 - 12

= 13

Mode = 17

**B: Quartiles, Inter-quartile Range**

- Quartiles**
- divides the data into 4 quarters (4 parts)
  - $Q_2$  is the median (divides the data into 2 parts)
  - $Q_1$  divides the bottom 1/4 from the top 3/4 of data also called the lower quartile or 25<sup>th</sup> percentile
  - $Q_3$  divides the bottom 3/4 from the top 1/4 of data also called the upper quartile or 75<sup>th</sup> percentile

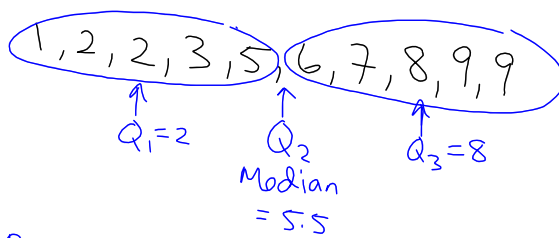


**Inter-Quartile Range**

- the difference between  $Q_1$  and  $Q_3$
- IQ Range =  $Q_3 - Q_1$

Ex. 2 Determine the quartiles and inter-quartile range for the data set below.

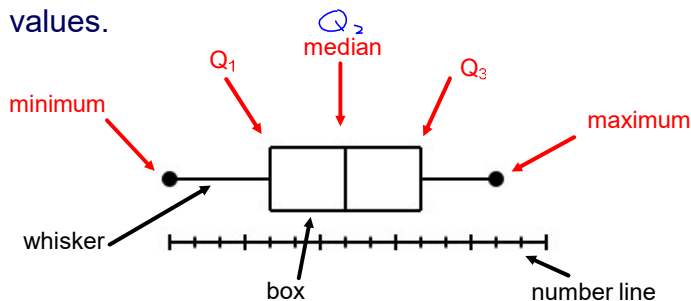
9, 6, 3, 9, 2, 1, 7, 8, 2, 5



IQ Range =  $Q_3 - Q_1$   
 =  $8 - 2$   
 = 6

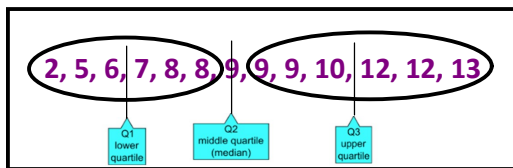
**C: Box & Whisker Plots**

- A Box Plot or Box and Whisker Plot is a diagram to show how the data is spread out using quartiles on a number line.
- The box starts at  $Q_1$  and ends at  $Q_3$ . The median is shown as a line inside the box.
- The whiskers show the lowest (minimum) and highest (maximum) data values.

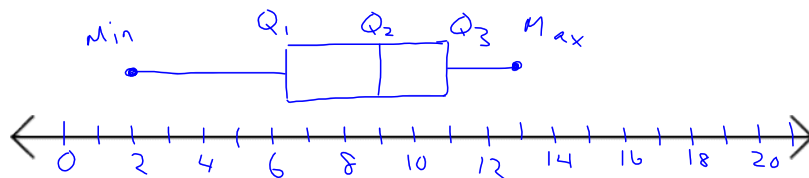


Ex. 3 Draw a box plot for the data show below.

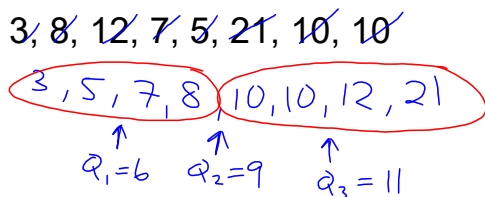
a)



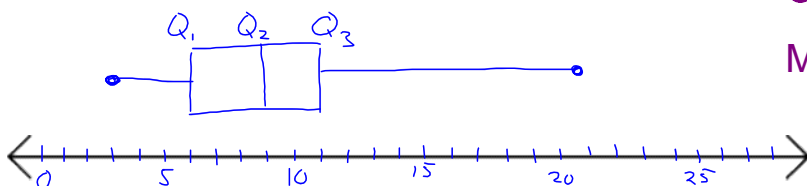
min. = 2  
 $Q_1 = 6.5$   
 $Q_2 = 9$   
 $Q_3 = 11$   
 max. = 13



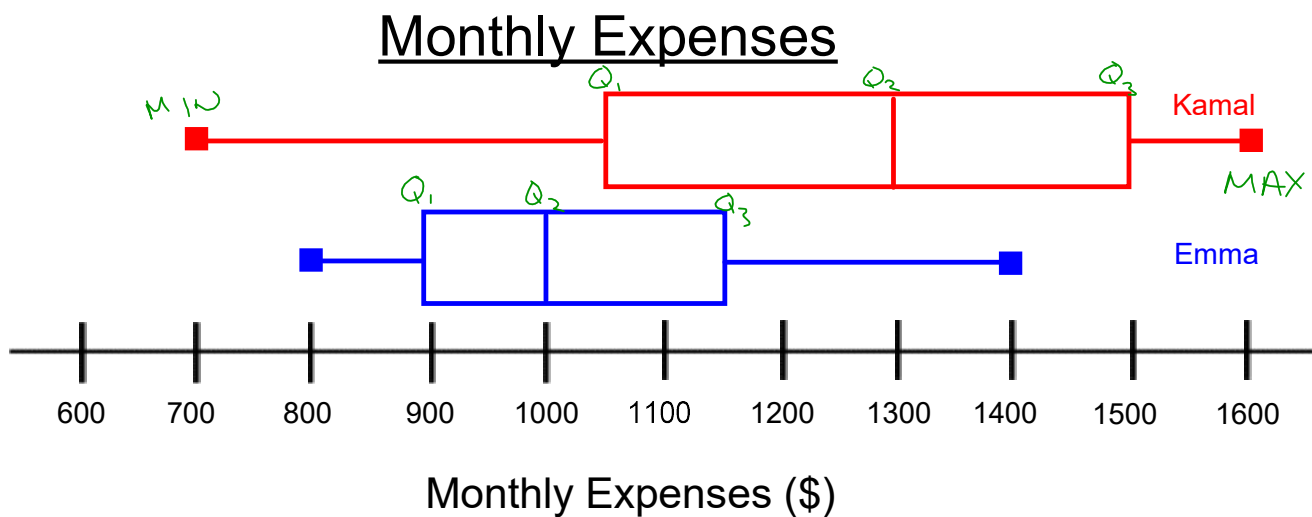
b)



Min = 3  
 $Q_1 = 6$   
 $Q_2 = 9$   
 $Q_3 = 11$   
 Max = 21



Ex. 4 Emma and Kamal tracked their monthly spending for a year. The data they collected are displayed in the box plots below.



a) Who has the higher average monthly spending? *Kamal*

b) Who spent the most/least during a single month? *Kamal for both*

c) Whose monthly spending is most consistent? *Emma*

d) Describe how Emma's diagram would change if she reduced her spending for her 3 most expensive months?

*Will change the max, and could change other quartiles*

e) Who has the largest interquartile range?

*$IQ = Q_3 - Q_1$  Kamal*

f) If Kamal had \$1550 each month would they have enough?

*For at least some months, \$1550 would not be enough (max was \$1600)*