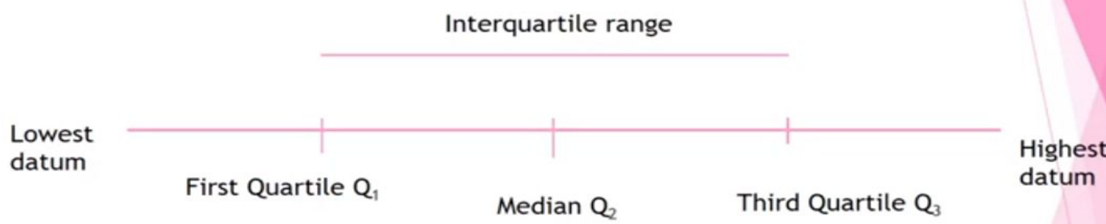
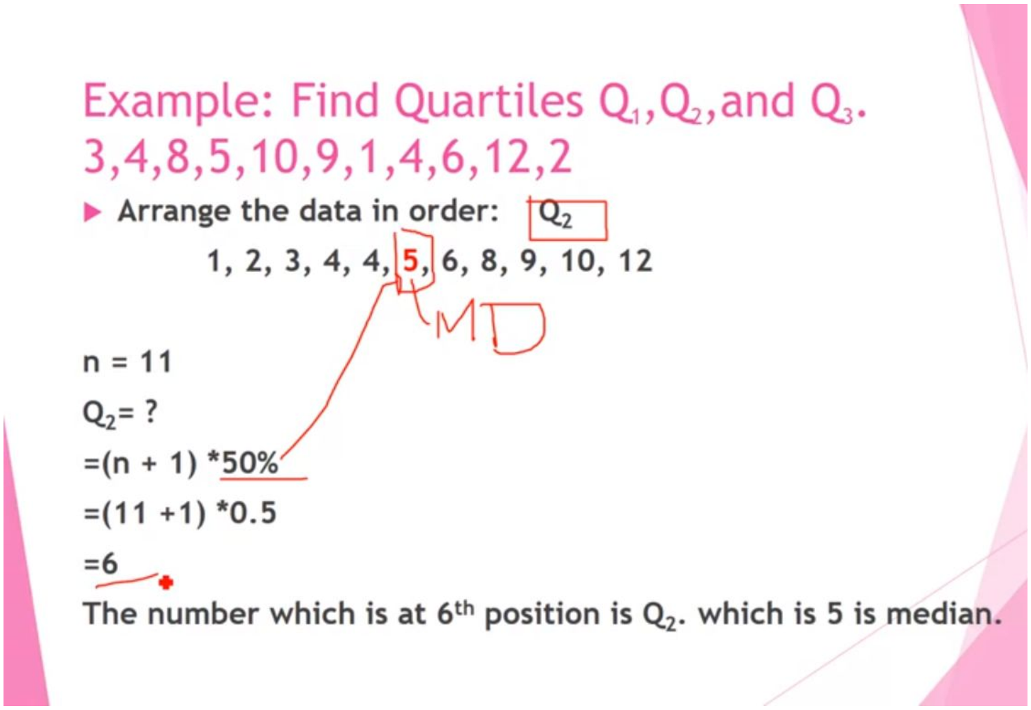
Quartiles

- Quartiles divide the data into 4 equal groups, and represented by Q_1, Q_2, and Q_3.



Steps to find Quartiles:

1. **Arrange the data in order from lowest to highest.**
2. **Find the median of the data values. This is the value for Q_2.**
3. **Find the median of the data values that fall below Q_2. This is the value for Q_1.**
4. **Find the median of the data values that fall above Q_2. This is the value for Q_3.**



Q2==>median=(n+1)/2 if n==odd

Q2=(n+1)*50%   50% means 50/100

Q2=12/2 ==>6th position ==>5

1,2,3,4,4   6,8,9,10,12

- Arrange the data in order: Q_1

  1, 2, 3, 4, 4, 5, 6, 8, 9, 10, 12

  Q_1 Q_3

n = 11

Q_1 = ?

=(n + 1) *25%

=(11 +1) *0.25

= 3

The number which is at 3rd position is Q_1. which is 3.

- Q_3

==(n + 1) *75%

=(11 +1) *0.75

= 9

The number which is at 9th position is Q_3. which is 9.

For Q1==>n=5 means odd (n+1)/4 means (n+1)*25% means 25/100 ==>¼

(11+1)/4 ==>12/14 ==>3rd position ==>3

Q3==>n=5

Q3=(n+1)*75% means 75/100 ⇒ ¾

Q3=12*75/100 ==>9th position

Q3=9

IQR=Q3-Q1 ⇒ 9-3=6

- Arrange the data in order: Q_1

  1, 2, 3, 4, 4, 5, 6, 8, 9, 10, 12

  Q_1 Q_3

$Q3 - Q1$

$9 - 3$

$= 6$

n = 11

Q_1= ?

=(n + 1) *25%

=(11 +1) *0.25

= 3

The number which is at 3rd position is Q_1. which is 3.

- Q_3

==(n + 1) *75%

=(11 +1) *0.75

= 9

The number which is at 9th position is Q_3. which is 9.

Inter-quertile range = Q3-Q1

If n is even then (5+6)/2=5.5

Example: Find Quartiles Q_1,Q_2,and Q_3.

3,4,8,5,10,9,1,4,6,12,2,14

- Arrange the data in order: Q_2

  1, 2, 3, 4, 4, $\boxed{5, 6}$, 8, 9, 10, 12, 14

n = 12

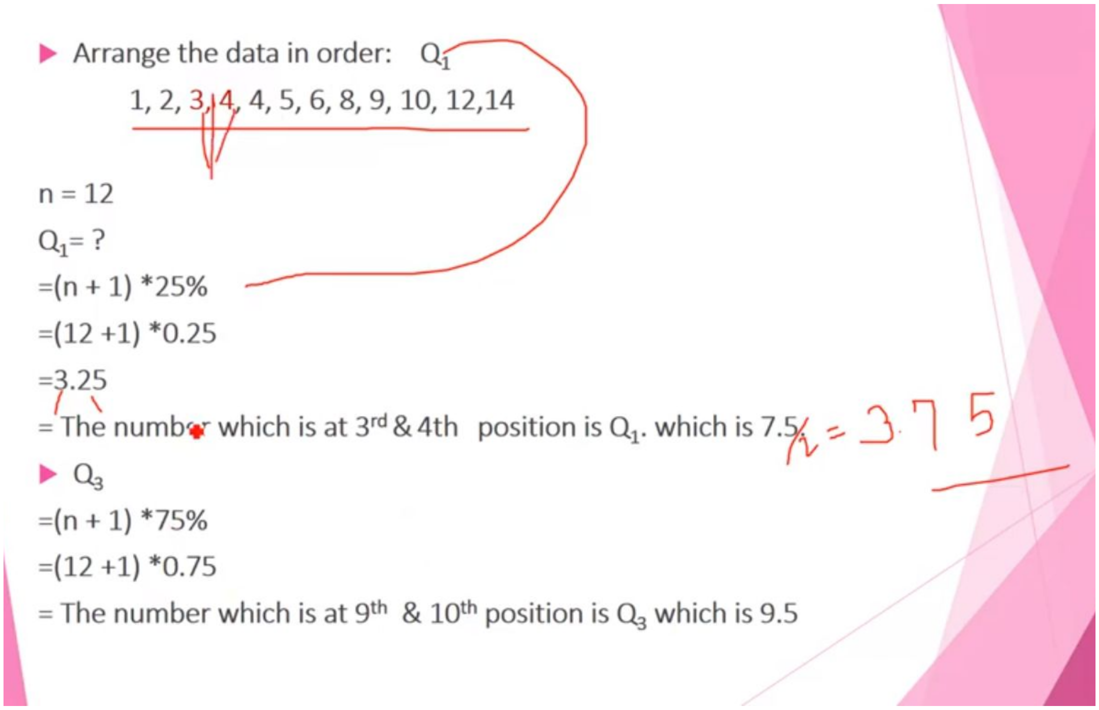
Q_2= ?

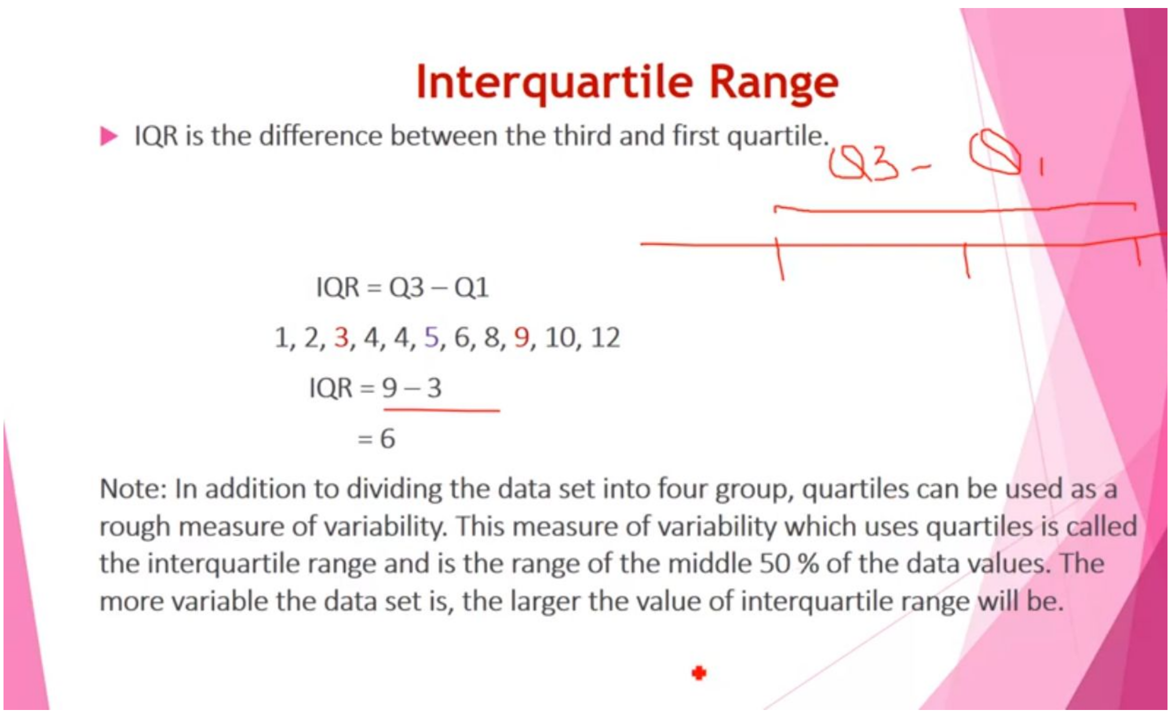
=(n + 1) *50%

=(12 +1) *0.5

=6.5

The number which is at 6th & 7th position is Q_2. which is 5.5 is median.





The Inter-quartile Range

The inter-quartile range is a measure that indicates the extent to which the central 50% of values within the dataset are dispersed. It is based upon, and related to, the median.

In the same way that the median divides a dataset into two halves, it can be further divided into quarters by identifying the upper and lower quartiles. The lower quartile is found one quarter of the way along a dataset when the values have been arranged in order of magnitude; the upper quartile is found three quarters along the dataset. Therefore, the upper quartile lies half way between the median and the highest value in the dataset whilst the lower quartile lies halfway between the median and the lowest value in the dataset. The inter-quartile range is found by subtracting the lower quartile from the upper quartile.

For example, the examination marks for 20 students following a particular module are arranged in order of magnitude.

Lower quartile Median Upper quartile

Student	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
Mark	43	48	50	50	52	53	56	58	59	60	62	65	66	68	70	71	74	76	78	80

The median lies at the mid-point between the two central values (10th and 11th)

= half-way between 60 and 62 = 61

The lower quartile lies at the mid-point between the 5th and 6th values

= half-way between 52 and 53 = 52.5

The upper quartile lies at the mid-point between the 15th and 16th values

= half-way between 70 and 71 = 70.5

The inter-quartile range for this dataset is therefore **70.5 - 52.5 = 18** whereas the range is: **80 - 43 = 37.**

The inter-quartile range provides a clearer picture of the overall dataset by removing/ignoring the outlying values.