data is arranged if ungroup
total data (count them)
tell us 50% data existance

even
e.g. 10
average value will be median

odd
e.g. 9
mid value will be median

Median : (mid value)

The median is defined as:
"a value which divides the data set that have been ordered, into two equal parts, one part comprising of observations greater than the other part smaller than it"

OR more precisely:
"a median is value at or below which 50% of the ordered data lie"

Thus the sample median of 'n' observations $x_1, x_2, x_3, \ldots, x_n$ when arranged in ordered form smallest to largest is the middle value if 'n' is odd. And the average of two middle values if 'n' is even.

Quartile	Q_1	Q_2	Q_3	Q_4
	25%	50%	75%	100%

⇒ Q_1 and Q_3 are more used.
25% 75%

$$\boxed{Q_1 = N/4}$$

⇒ Quartiles divide data into 4%

$$\boxed{Q_3 = 3N/4}$$

Deciles :

$D_1, D_2, \ldots\ldots, D_{10}$

⇒ Deciles divide data into 10%

Percentiles :

$P_1, P_2, \ldots\ldots, P_{100}$

Percentiles divide data into 100%

Example : (ungroup data)

Given below are the marks obtained by 9 students: calculate median from given data

data	Arranged form
45	32
32	36
37	36
46	37
39	$\boxed{39}$ = median (mid value)
36	41
41	45
48	46
36	48

MEDIAN = (for grouped data)

$$\text{Median} = \tilde{x} = l + \frac{h}{f}\left(\frac{n}{2} - c\right)$$

$n = \sum f$

h = width of class boundary

f = f aggainst the commulative frequency

l = lower class boundary of highlighted interval

c = commulative frequency

Question: (Grouped data)

Find the median, the Quartiles and the eighth deciles for the distribution of Examination marks given below;

Marks	No. of students	class boundary	midpoint x_i	f	commulative frequency F
30-39	8	29.5 - 39.5	34.5	8	8
40-49	87	39.5 - 49.5	44.5	87	95
50-59	190	49.5 - 59.5	54.5	190	285 C.F
60-69	304	59.5 - 69.5	64.5	304 f	589 Median
70-79	211	69.5 - 79.5	74.5	211	800
80-89	85	79.5 - 89.5	84.5	85	885
90-99	20	89.5 - 99.5	94.5	20	905

$\sum f = 905$

Median = $\tilde{x} = l + \frac{h}{f}\left(\frac{n}{2} - C\right)$

$$\tilde{x} = 59.5 + \frac{10}{304}\left(\frac{905}{2} - 285\right)$$

$$\tilde{x} = 59.5 + \frac{10}{304}\left(452.5 - 285\right)$$

$$\tilde{x} = 59.5 + \frac{10}{304}\left(167.5\right)$$

$$\tilde{x} = 59.5 + \frac{1675}{304}$$

$$\tilde{x} = 59.5 + 5.5$$

$$\boxed{\tilde{x} = 65}$$ Ans

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Advantages of Median :

1 It is easily calculated and understood
2 It is located even when the values are not capable of quantitati measurement.
3 It is not affected by extreme values. It can be computed when a frequency distribution involves "open end" classes like those of income and prices.
4 It is highly skewed distribution. median is an appropriate average to use.

Disadvantages of Median :

1 It is not rigorously defined.
2 It is not capable of lending itself to further statistical treatment.
3 It necessitates the arrangement of data into an array which can be tedious and time consuming for large body of data

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