Median and Quartiles

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a) ungrouped date $Me = \left(\frac{n+1}{2}\right)$ th obs

1.Find the median for following :

93, 32, 47, 55, 78, 65, 55, 47, 32 , 95

sol. 32 32 47 47 55 55

5th 6th

65 78 93, 95

$Me = \left(\frac{n+1}{2}\right)$ th ob. $= 5.5$ th obs.

$= \frac{55+55}{2} = 55$

Find Median for 45, 65, 34, 47, 49, 60, 42, 37, 38, 39

sol. 34 37 38 39 42 45

5th 6th

47 49 60 65

$Me = \left(\frac{n+1}{2}\right)$ th obs. $= 5.5$ th obs.

$= \frac{42+45}{2} = 43.5$

b) For grouped discrete data

Find the median for the following

x	3	4	5	6	7	8	9	10
f	14	20	40	54	40	18	7	7

①

x	f	≤cf
3	14	14
4	20	34

cf

4	20	34
5	40	74
6	54	128
7	40	168
8	18	186
9	7	193
10	7	200

cf

② N = Total freq.
$= \Sigma f = 200$

③ $\frac{N}{2} = \frac{200}{2} = 100$

④ $Me = 6$

Find Median

x	f	$\leq Cf$
10	10	10
20	25	35
30	24	59
40	36	95
50	15	110

$N = \Sigma f = 110$

$\frac{N}{2} = \frac{110}{2} = 55$

$Me = 30$

c) For grouped continuous data

$$Me = l_1 + \frac{(l_2 - l_1)\left(\frac{N}{2} - cf\right)}{f}$$

l_1 = LCI of Me class

l_2 = UCI ----

f = freq. ----

cf = $\leq$ Cum. freq. of previous class of Me class

For the following distribution of weights of 60 students, find Median. — Me class

Weight	100-140	140-180	180-200	200-220	220-240	240-260	260-300
No. of Students	14	45	52	80	32	23	24
$\leq Cf$	14	59	111	191	223	246	270

$\leq cf$ | 14 | 59 | 111 | 191 | 223 | 246 | 270

$N = 270$, $\frac{N}{2} = \frac{270}{2} = 135$

$(200-220) \rightarrow$ me class

$l_1 = 200$, $l_2 = 220$

$f = 80$, $cf = 111$

$$Me = l_1 + \frac{(l_2 - l_1)\left(\frac{N}{2} - cf\right)}{f}$$

$$= 200 + \frac{(220-200)(135-111)}{80}$$

$$= 200 + \frac{20 \times 24}{80}$$

$$= 200 + \frac{480}{80} = 200 + 6 = 206$$

$me = 206$

Find the median for the following data representing heights of 45 students.

Ht. in cms:	158-162	162-166	166-170	170-174	174-178	178-182
No. of students:	3	7	12	15	6	2

$\leq cf$ | 3 | 10 | 22 | 37 | 43 | 45

$N = 45$ $\frac{N}{2} = \frac{45}{2} = 22.5$

$(170-174) \rightarrow$ me class

$l_1 = 170$, $l_2 = 174$, $f = 15$

$cf = 22$

$$Me = l_1 + \frac{(l_2 - l_1)\left(\frac{N}{2} - cf\right)}{f}$$

$$= 170 + \frac{4(22.5 - 22)}{15}$$

$$= 170 + 0.13$$

$$Me = 170.13$$

Find the median

CI	5-9	10-14	15-19	20-24	25-29	30-34	35-39
f	8	18	27	21	10	8	7

CI	f	New CI	≤Cf
5-9	8	4.5-9.5	8
10-14	18	9.5-14.5	26
15-19	27	14.5-19.5	53
20-24	21	19.5-24.5	74
25-29	10	24.5-29.5	84
30-34	8	29.5-34.5	92
35-39	7	34.5-39.5	99

$l_1 = 14.5$

$l_2 = 19.5$

$f = 27$

$cf = 26$

$$N = 99 \Rightarrow \frac{N}{2} = \frac{99}{2} = 49.5$$

$$Me = l_1 + \frac{(l_2 - l_1)\left(\frac{N}{2} - cf\right)}{f}$$

$$Me = l_1 + \frac{(\frac{N}{2} - cf)}{f} \times c$$

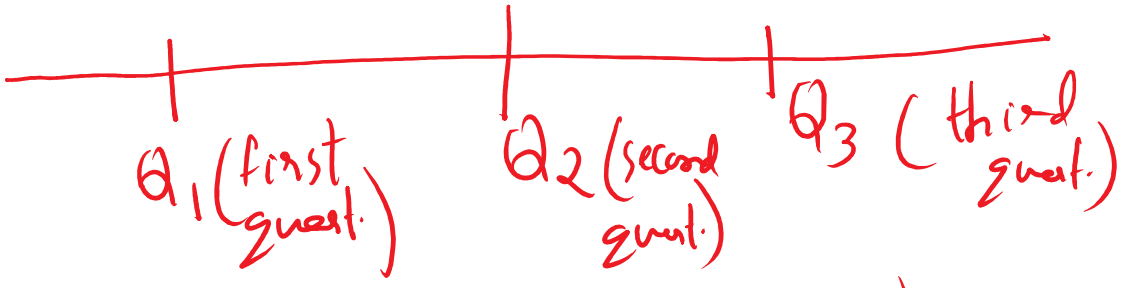
$$= 14.5 + \frac{(19.5-14.5)(49.5-26)}{27}$$

$$= 18.85$$

Quartiles

$Me = Q_2$

20



$$Q_1 = l_1 + \frac{(l_2 - l_1)(\frac{N}{4} - cf)}{f}$$

$$Q_3 = l_1 + \frac{(l_2 - l_1)(\frac{3N}{4} - cf)}{f}$$

Calculate the quartiles for the following data:

Wages in Rs.:	Less than 35	35 – 40	40 – 45	45 – 50	Over 50
No. of workers:	24	62	99	18	15

$\leq cf$	24	86	185	203	218

$N = 218, \quad \frac{N}{4} = \frac{218}{4} = 54.5$

$l_1 = 35, \quad l_2 = 40, \quad f = 62, \quad cf = 24$

$$Q_1 = l_1 + \frac{(l_2 - l_1)\left(\frac{N}{4} - cf\right)}{f}$$

$$= 35 + \frac{5(54.5 - 24)}{62}$$

$$= 37.46$$

(1) $Q_3 = ?$ $\quad \frac{3N}{4} = 3 \times 54.5 = 163.5$

$$Q_3 = l_1 + \frac{[l_2 - l_1)\left(\frac{3N}{4} - cf\right)}{f}$$

$$= 40 + \frac{5(163.5 - 86)}{62}$$

$$= 46.25$$

Practice sums

1.Find the median and the two quartiles for the following data.

Rainfall in cms:	20-25	25-30	30-35	35-40	40-45	45-50	50-55
No. of Years:	2	5	8	12	10	7	6

[Median = 39.17, $Q_1 = 33.44$ and $Q_3 = 45.36$]

2. For the following distribution of weights of 60 students, find the three quartiles.

Weights in Kgs:	30-34	35-39	40-44	45-49	50-54	55-59	60-64
No. of students:	3	5	12	18	14	6	2

[Median = 47.28, $Q_1 = 42.42$ and $Q_3 = 52$]

3. Find Median

53,31,35,-25,100,60,-16,13,-3,95

4. Find Median

X	12	14	16	18	20	22
F	5	10	15	12	8	3