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# Median :- divides data in two parts - below the median above the median

To find median :-

→ Arrange in ascending or descending order

For Individual Series :-

→ for odd no :- median is middle item in the list

→ for even no :- median is mean of two middle numbers

$M$ = size of $\left(\frac{N+1}{2}\right)^{th}$ item

→ 1, 2, (5), 6, 9 $\quad M = \left(\frac{5+1}{2}\right)^{th}$ item $= 3^{rd}$ item

median

→ 1, 2, 3, 5, 6, 9 $\quad M = \left(\frac{6+1}{2}\right) = 3.5^{th}$ item $= \frac{3+5}{2} = 4$

Q] Find median

22, 16, 18, 13, 15, 19, 17, 20, 23

→ 13, 15, 16, 17, 18, 19, 20, 22, 23

↑ median

For Discrete Series :- 1) find cumulative frequency

$M$ = Size of $\left(\frac{N+1}{2}\right)^{th}$ item $= \left(\frac{59+1}{2}\right)^{th}$ item

$= 30^{th}$ item

Q]

| | x | f | cf |
|---|---|---|---|
| | 10 | 2 | 2 |
| | 12 | 5 | 2+5 = 7 |
| | 14 | 12 | 7+12 = 19 |
| ✓ | 16 | 20 | 19+20 = (39) |
| | 18 | 10 | 49 |
| | 20 | 7 | 56 |
| | 22 | 3 | 59 |

30 is included in 39 cf Hence median = 16

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Q

| x | f | cf |
|---|---|---|
| 1 | 1 | 1 |
| 2 | 3 | 4 |
| 3 | 5 | 9 |
| 4 | 6 | 15 |
| 5 | 10 | 25 |
| 6 | 13 | 38 |
| 7 | 9 | 47 |
| 8 | 5 | 52 |
| 9 | 3 | 55 |
| 10 | 2 | 57 |
| 11 | 2 | 59 |
| 12 | 1 | 60 |
| | $\Sigma f = 60$ | |

$M = \left(\frac{N+1}{2}\right)$ item

$= N = \Sigma f$

$= \frac{60+1}{2} = 30.5^{th}$ item

30.5 is included in 38

hence median = 6

For continuous series :-

$$\text{median} = l + \frac{\frac{N}{2} - cf}{f} \times i$$

If find median class $\rightarrow$ size $\left(\frac{N}{2}\right)^{th}$ item

$l$ = lower limit of median class

$i$ = size of class interval of median class

$N = \Sigma f$

$f$ = frequency of median class

$cf$ = cumulative frequency of the class preceding the median class.

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Q] 

| x | f | cf |
|---|---|---|
| 0-10 | 4 | 4 |
| 10-20 | 12 | 16 |
| 20-30 | 24 | 40 → cf |
| 30-40 | 36 | 76 |
| 40-50 | 20 | 96 |
| 50-60 | 16 | 112 |
| 60-70 | 8 | 120 |
| 70-80 | 5 | 125 |

median class = $\frac{\Sigma f}{2} = \frac{N}{2}$

$= \frac{125}{2} = 62.5$

median class = 30-40

$l = 30$ $N = 125$

$cf = 40$ $f = 36$

$i = 10$

$$\text{median} = l + \frac{\frac{N}{2} - cf}{f} \times i = 30 + \frac{\frac{125}{2} - 40}{36} \times 10$$

$= 36.25 =$ median

Q]

| x | f | cf |
|---|---|---|
| 6-5 | 4 | 4 |
| 5-10 | 6 | 10 |
| 10-15 | 10 | 20 |
| 15-20 | 16 | 36 |
| 20-25 | 12 | 48 |
| 25-30 | 8 | 56 |
| 30-25 | 4 | 60 |
| | 60 | |

median class = $\frac{60}{2} = 30^{th}$

$l = 15$ $N = 60$ $cf = 20$

$f = 16$ $i = 5$

$$m = 15 + \frac{30 - 20}{16} \times 5$$

$= 18.125$

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Q] Find missing frequency in following series if $N = 100$ and median $= 30$

| marks | f | cf | $\frac{N}{2} = 50^{th}$ item |
|---|---|---|---|
| 0-10 | 10 | 10 | |
| 10-20 | A | 10+A | median class $= 30-40$ |
| 20-30 | 25 | 35+A | $l = 30$ $\frac{N}{2} = 50$ |
| 30-40 | 30 | 65+A | |
| 40-50 | B | 65+A+B | $cf = 35+A$ $f = 65+A$ |
| 50-60 | 10 | 75+A+B | $i = 10$ |

$$\Sigma f = N = 10 + A + 25 + 30 + B + 10 = 100$$

$$A + B = 25$$

$$m = l + \frac{\frac{N}{2} - cf}{f} \times i$$

$$30 = 30 + \frac{50 - (35+A)}{65+A} \times 5$$

$$\frac{15 - A}{65+A} \times 5 = 0$$

$$A = 15$$

$$A + B = 25$$

$$B = 10$$