

Median for Grouped Data

The median for grouped data can be found either by interpolation or by using a formula.

The formula is

$$\text{Median} = LB + w \left(\frac{\frac{1}{2}n - \sum f_b}{f_m} \right)$$

where

LB is the lower boundary or limit of the class containing the median

w is the width of the median class interval

n is the total frequency, or the number of values

$\sum f_b$ is the number of values below LB

f_m is the number of values containing the median

Example 1

In the table below, the median is the 75th value, so it lies in the 5 to 9 class interval.

Time (min)	Frequency	Cumulative frequency
0 - 4	32	32
5 - 9	71	103
10 - 14	20	123
15 - 19	14	137
20 - 24	10	147
25 - 29	3	150

The median lies in this interval, 4.5 to 9.5

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$\sum f_b = 32$

$f_m = 71$

$n = 150$

LB = the lower boundary of the class interval 5 to 9, which is 4.5

$$w = 9.5 - 4.5 = 5$$

So, using the formula :

$$\text{Median} = 4.5 + 5 \left(\frac{\left(\frac{1}{2} \times 150 \right) - 32}{71} \right) = 7.53 \text{ minutes}$$

Finding the median and quartiles for grouped data

Example 2

	Heights (cm)	Frequency	Cumulative frequency	
The median lies in this interval, 350.5 to 400.5	175 - 225	4	4	$\sum f_b = 4 + 8 + 18$
	226 - 300	8	12	
	301 - 350	18	30	$f_m = 28$
	351 - 400	28	58	
	401 - 500	7	65	$n = 65$

Using the formula :

$$\text{Median} = 350.5 + 50 \left(\frac{\left(\frac{1}{2} \times 65\right) - (4 + 8 + 18)}{28} \right) = 354.964 \dots \approx 355 \text{ cm}$$

Lower and Upper Quartiles for Grouped Data

Take the same formula as above, but change the $\frac{1}{2}$ into $\frac{1}{4}$ for the lower quartile, and into $\frac{3}{4}$ for the upper quartile :

$$\text{Lower quartile} = LB + w \left(\frac{\left(\frac{1}{4}n - \sum f_b\right)}{f_m} \right)$$

and

$$\text{Upper quartile} = LB + w \left(\frac{\left(\frac{3}{4}n - \sum f_b\right)}{f_m} \right)$$

where the variables refer to the class interval containing the quartile.

For Example 1 above:

$$\begin{aligned} \text{Lower quartile} &= 4.5 + 5 \left(\frac{\left(\frac{1}{4} \times 150\right) - 32}{71} \right) \\ &= 4.89 \end{aligned}$$

and

$$\begin{aligned} \text{Upper quartile} &= 9.5 + 5 \left(\frac{\left(\frac{3}{4} \times 150\right) - 103}{20} \right) \\ &= 11.875 \end{aligned}$$

For Example 2 above:

Try the calculations yourself, and check that you get

Lower Quartile = 312.3 and Upper Quartile = 383.982... \approx 384