

The Mean

This is the average value for a set of single data values. It is calculated by adding up all the values and dividing by the number of values.

The Mean for grouped data

This is similar to some extent with the median for grouped data. No exact value can be found. It can only be estimated.

method:

find the mid-value for each group of data (call these values $m_1 \dots m_2 \dots m_3$ etc.)

in turn, multiply the mid-value for each group by its frequency ($f_1 m_1 \dots f_2 m_2 \dots$ etc.)

sum the (product of mid-value x frequency) $f_1 m_1 + f_2 m_2 + f_3 m_3 \dots$ etc.

divide the sum by the sum of all frequencies

$$\text{estimated mean} = \frac{\sum fm}{\sum f}$$

Example

The table represents the heights of pupils within a school.

Using the data calculate the mean value.

class	mid value	frequency	mid value x frequency
(height - h) cm	(m)	(f)	(fm)
$70 \leq h < 75$	72.5	2	145
$75 \leq h < 80$	77.5	7	542.5
$85 \leq h < 90$	87.5	21	1837.5
$95 \leq h < 100$	97.5	15	1462.5
$105 \leq h < 110$	107.5	12	1290
	total no. results	57	5277.5

$$\begin{aligned} \text{estimated mean} &= \frac{5277.5}{57} \\ &= 92.59 \\ &= 93 \text{ (rounded)} \end{aligned}$$

The Mode & Modal Class

For single values in a set of data, the mode is simply the value with the **highest frequency**.

For grouped values in a set of data, the modal class is simply that class/group with the highest frequency.

The Median

The median is the **middle value** of a set of data.

1__3__4__5__**9**__10__21__32__45

The median is therefore **9**

The Median for 'grouped values'

For grouped values finding the median is more difficult. It cannot be found exactly, but is estimated using '**interpolation**', which is essentially an educated guess.

The method is:

find which result is in the middle by dividing the total number of results in half. For example if there are 91 results, the median is result number 46(45.5 rounded up).

identify the modal class(the group of values/results) that contains the median

count how many numbers there are in this group

identify the frequency for the group

find the order of the median within the group

the median can be calculated as being the first number in the group **plus** a proportion of the number of results in the group

$$\text{median} = (\text{first no. in group}) + \left(\frac{\text{median position within group}}{\text{no. results in group (ie freq.)}} \right) \times (\text{no. numbers in group})$$

Example

The table represents the heights of pupils within a school.

Using the data calculate the median value.

class (height - h) cm	class width	frequency (f)
$70 \leq h < 75$	5	2
$75 \leq h < 80$	5	7
$85 \leq h < 90$	5	21
$95 \leq h < 100$	5	15
$105 \leq h < 110$	5	12
	total no. results	57

Since there are 57 values/results, the median occurs at position 28.5, ie. 29th to the nearest whole number.

This means that the median is the 29th value.

There are 2 values in the region $70 \leq h < 75$.

and a further 7 values in the region $75 \leq h < 80$.

So the median lies at the 20th value within the range $85 \leq h < 90$. This group has 21 values in it.

note: $(9 + 20 = 29)$

There are 5 numbers in the group.

The first number in the group is 85.

Using our equation:

$$\text{median} = (\text{first no. in group}) + \left(\frac{\text{median position within group}}{\text{no. results in group (ie freq.)}} \right) \times (\text{no. numbers in group})$$

$$\text{median} = (85) + \left(\frac{20}{21} \right) \times (5)$$

$$\text{median} = 85 + 4.76 = 89.76 \sim 90(\text{rounded})$$

Range of values

This is the spread of values, from the lowest to the highest.