

Averages and Range from Grouped Data

Starter

1. **(Review of previous material)** For the data values 2, 4, 7, 1, 9, 6, 5, 7, find:
- (a) the mean average
 - (b) the mode
 - (c) the median
 - (d) the range.

Working: (a) To calculate the mean average we add up the values and divide by the number of values.

$$\text{Mean} = \frac{2 + 4 + 7 + 1 + 9 + 6 + 5 + 7}{8} = \frac{41}{8} = 5.125$$

- (b) The mode is the most popular value.
As 7 is the only value that appears more than once, the mode = 7
- (c) The median is the middle value.
The values in ascending order are 1, 2, 4, 5, 6, 7, 7, 9
Since there are an even number of values, there are two values in the middle, 5 and 6. Therefore, we find the value half-way between.
So the median is 5.5.
- (d) Range = Highest value – Lowest value = 9 – 1 = 8

2. **(Review of previous material)** Pete got a mean of 12 for his six experiments. The values were 12, 13, 10, 12, 10, x . What is the value of the missing mark?

Working: The mean is 12: $\frac{12 + 13 + 10 + 12 + 10 + x}{6} = 12$

Add the numbers: $\frac{57 + x}{6} = 12$

Multiply by 6: $57 + x = 72$

Subtract 57 from both sides: $x = 15$

The missing mark is 15.

E.g. 1 The frequency table shows the mass of pears sold in a shop.

Mass	70 g	80 g	90 g	100 g	110 g	120 g
Frequency, f	2	7	9	11	8	3

Find the mean, mode, median and range.

Working:

$$\begin{aligned}\text{Mean} &= \frac{\text{Sum of (frequency} \times \text{value)}}{\text{Total frequency}} \\ &= \frac{(2 \times 70) + (7 \times 80) + (9 \times 90) + (11 \times 100) + (8 \times 110) + (3 \times 120)}{2 + 7 + 9 + 11 + 8 + 3} \\ &= \frac{3850}{40} = 96.25 \text{ g (3 s.f.)}\end{aligned}$$

Mode = 100 g *highest frequency*

Range = 120 – 70 = 50 g *highest – lowest*

Median – these are 40 values so the median is the $\frac{40 + 1}{2} = 20.5$ th value.

Mass	70 g	80 g	90 g	100 g	110 g	120 g
Frequency, f	2	7	9	11	8	3
Cumulative frequency	2	2 + 7 = 9	9 + 9 = 18	18 + 11 = 29		

The 18th value is 90 g.

The 29th value is 100 g.

So the 20.5 is 100 g so the median is 100 g.

Alternatively, you could also see that 29 is the first cumulative frequency value bigger than 20.5 so 100 g is the median.

E.g. 2 The frequency table shows the price of a Mars bar in different shops.

Price	49p	50p	51p	52p	53p	54p
Frequency, f	3	4	7	10	6	5

Find the mean, mode, median and range.

Working:

$$\begin{aligned}\text{Mean} &= \frac{\text{Sum of (frequency} \times \text{value)}}{\text{Total frequency}} \\ &= \frac{(3 \times 49) + (4 \times 50) + (7 \times 51) + (10 \times 52) + (6 \times 53) + (5 \times 54)}{3 + 4 + 7 + 10 + 6 + 5} \\ &= \frac{1812}{35} = 51.8 \text{ p (3 s.f.)}\end{aligned}$$

$$\text{Mode} = 52 \text{ p} \quad \textit{highest frequency}$$

$$\text{Range} = 54 - 49 = 5 \text{ p} \quad \textit{highest} - \textit{lowest}$$

Median — these are 35 values so the median is the $\frac{35 + 1}{2} = 18$ th value.

Price, p	49p	50p	51p	52p	53p	54p
Frequency, f	2	3	5	10	6	4
Cumulative frequency	2	2 + 3 = 5	5 + 5 = 10	10 + 10 = 20		

20 is the first cumulative frequency value bigger than 18 so 52 p is the median.

Video: [Mean from a frequency table](#)
Video: [Median from a frequency table](#)
Video: [Mode](#)
Video: [Range](#)

[Solutions to Starter and E.g.s](#)

Exercise

CIMT 8A p90 Ex 5.2 Qu 1-10