

Mean, Median, Mode and Range

Solutions

For Pearson Edexcel GCSE Mathematics (1MA1) • Foundation tier

Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

1 (5 marks)

Here are the ages, in years, of nine people.

14 20 9 16 21 14 11 18 15

(a) Write down the mode.

The mode is the value that appears most often.

14 appears twice. Every other age appears once.

Answer: 14

(b) Work out the range.

Largest age: 21

Smallest age: 9

Range = $21 - 9 = 12$

Answer: 12

(c) Find the median.

Put the ages in order:

9, 11, 14, 14, **15**, 16, 18, 20, 21

There are 9 ages, so the median is the 5th one.

Answer: 15

Tip: Order the list first, and keep both 14s. Leaving out a repeated value moves the middle.

(d) Work out the mean.

Give your answer correct to 1 decimal place.

Add all the ages: $14 + 20 + 9 + 16 + 21 + 14 + 11 + 18 + 15 = 138$

There are 9 people.

Mean = $138 \div 9 = 15.333 \dots$

To 1 decimal place: 15.3

Answer: 15.3

Tip: Mean, median, mode and range are easy to mix up. The mean is the one where you add them all and divide.

Marks: 1 mark for $138 \div 9$. 1 mark for 15.3.

2 (1 mark)

Here are four numbers.

3 8 10 15

Sam says, 'The median is 10 because 10 is in the middle.'

Sam is wrong.

Explain why.

There are 4 numbers, which is an even number.

So there are two middle numbers: 8 and 10.

The median is halfway between them: $(8 + 10) \div 2 = 9$

Answer: Median is between 8 and 10, i.e. 9

Tip: With an even number of values, the median is halfway between the two middle values.

3 (1 mark)

Here are the lowest temperatures in a town on five days.

5 °C -2 °C 8 °C 3 °C -4 °C

Ines says,

‘The range is $8 - 4 = 4$ °C’

Ines is wrong.

Explain why.

The range is the highest temperature minus the lowest temperature.

The lowest temperature is -4 °C, not 4 °C.

Range = $8 - (-4) = 8 + 4 = 12$ °C

Answer: The lowest value is -4, so the range is $8 - (-4) = 12$ °C

Tip: Subtracting a negative number is the same as adding. From -4 up to 8 is 12 degrees.

4 (2 marks)

The mean of four numbers is 12

Three of the numbers are 8, 15 and 10

Work out the fourth number.

Total of the four numbers = mean $\times$ 4

$12 \times 4 = 48$

The three numbers we know add up to $8 + 15 + 10 = 33$

Fourth number = $48 - 33 = 15$

Answer: 15

Marks: 1 mark for $4 \times 12 = 48$. 1 mark for 15.

5 (2 marks)

Write down three whole numbers that have a mean of 7 and a range of 6

Mean 7 means the three numbers add up to $3 \times 7 = 21$.

Range 6 means largest – smallest = 6.

Try 4 and 10 (difference 6).

The third number is $21 - 4 - 10 = 7$.

Check 4, 7, 10:

Mean = $21 \div 3 = 7$ ✓

Range = $10 - 4 = 6$ ✓

Answer: e.g. 4, 7, 10

Marks: 2 marks for three numbers that work. 1 mark for numbers with a mean of 7 or a range of 6.

6 (3 marks)

There are 3 people in a lift.

Their mean weight is 70 kg.

Two more people get into the lift. Their weights are 82 kg and 91 kg.

Work out the mean weight of the 5 people.

Total weight of the first 3 people: $3 \times 70 = 210$ kg

Add the two new people: $210 + 82 + 91 = 383$ kg

There are now 5 people.

$$\text{Mean} = 383 \div 5 = 76.6 \text{ kg}$$

Answer: 76.6 kg

Tip: You can't just find the mean of 70, 82 and 91. The 70 is the mean of 3 people, so use the total, 210.

Marks: 1 mark for 210. 1 mark for dividing the new total by 5. 1 mark for 76.6.

7 (4 marks)

Bryn records the time of his journey to school on 5 days.

The mean time for the 5 days is 18 minutes.

The times, in minutes, for days 1 to 4 are

15 22 16 17

(a) Work out the time of the journey on day 5

Total time for the 5 days: $5 \times 18 = 90$ minutes

Days 1 to 4: $15 + 22 + 16 + 17 = 70$ minutes

Day 5: $90 - 70 = 20$ minutes

Answer: 20 minutes

Marks: 1 mark for $5 \times 18 = 90$. 1 mark for 20.

(b) On day 6 the journey takes 36 minutes.

Work out the mean journey time for the 6 days.

Total for the 6 days: $90 + 36 = 126$ minutes

Mean = $126 \div 6 = 21$ minutes

Answer: 21 minutes

Tip: Use the total for all 6 days. Finding the mean of 18 and 36 gives 27, which is wrong.

Marks: 1 mark for $90 + 36 (= 126)$. 1 mark for 21.

8 (3 marks)

12 students in team A took a quiz. Their mean score was 7.5

8 students in team B took the same quiz. Their mean score was 9

Anika says,

“The mean score of all 20 students is 8.25, because $(7.5 + 9) \div 2 = 8.25$ ”

Is Anika correct?

You must show how you get your answer.

Team A total: $12 \times 7.5 = 90$

Team B total: $8 \times 9 = 72$

Total for all 20 students: $90 + 72 = 162$

Mean = $162 \div 20 = 8.1$

8.1 is not 8.25, so Anika is not correct.

Answer: No, the mean is 8.1

Tip: You can only average the two means if the teams are the same size. Team A has more students, so its mean counts for more.

Marks: 1 mark for 90 or 72. 1 mark for $(90 + 72) \div 20$. 1 mark for 8.1 and “No”.

9 (3 marks)

A box contains 20 apples.

The mean mass of the 20 apples is 150 g.

Jo takes one apple out of the box. This apple has a mass of 172 g.

She puts a different apple into the box.

The mean mass of the 20 apples in the box is now 148 g.

Work out the mass of the apple Jo put into the box.

Total mass at the start: $20 \times 150 = 3000$ g

Take out the 172 g apple: $3000 - 172 = 2828$ g

Total mass at the end: $20 \times 148 = 2960$ g

Mass of the apple Jo put in: $2960 - 2828 = 132$ g

Check: $(2828 + 132) \div 20 = 2960 \div 20 = 148$ ✓

Answer: 132 g

Tip: The mean only went down by 2 g, but the new apple is not just 2 g lighter than 172 g (170 is wrong). There are 20 apples, so the total went down by $20 \times 2 = 40$ g.

Marks: 1 mark for $20 \times 150 = 3000$ or $20 \times 148 = 2960$. 1 mark for $3000 - 172 (= 2828)$ or a total difference of 40. 1 mark for 132.
