

Mean, Median, Mode and Range

Solutions

For AQA GCSE Mathematics (8300) • 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 seven numbers.

7 3 9 4 7 10 2

(a) Write down the mode.

The mode is the number that appears most often.

7 appears twice. Every other number appears once.

Answer: 7

(b) Work out the median.

Put the numbers in order first:

2, 3, 4, 7, 7, 9, 10

There are 7 numbers, so the median is the 4th one.

Answer: 7

Tip: Always put the numbers in order before finding the median. The middle of the unordered list is 4, which is wrong.

(c) Work out the mean.

Add all the numbers: $7 + 3 + 9 + 4 + 7 + 10 + 2 = 42$

There are 7 numbers.

$$\text{Mean} = 42 \div 7 = 6$$

Answer: 6

Marks: 1 mark for $42 \div 7$. 1 mark for 6.

(d) Work out the range.

$$\text{Range} = \text{largest} - \text{smallest}$$

$$10 - 2 = 8$$

Answer: 8

Tip: Use the largest and smallest numbers, not the last and first numbers in the list. Give the answer as one number, 8.

2 (1 mark)

Circle the median of these numbers.

5 8 12 15

Options: 8, 10, 12, 40

The numbers are already in order.

There are 4 numbers, so there are two middle numbers: 8 and 12.

The median is halfway between them:

$$(8 + 12) \div 2 = 10$$

Answer: 10

3 (3 marks)

Each number in a list is increased by 10
Tick **one** box for each statement.

	True	False	Cannot tell
The mode is increased by 10	✓		
The median is increased by 10	✓		
The range is increased by 10		✓	

Every number moves up by 10.

So the most common number (the mode) also moves up by 10: True.

The middle number (the median) also moves up by 10: True.

The largest and smallest both go up by 10.

So the difference between them (the range) stays the same: False.

Example: 1, 2, 6 has range 5. 11, 12, 16 also has range 5.

Answer: True, True, False

Tip: If you are not sure, try it with a short list of numbers, like 1, 2, 6.

Marks: 1 mark for each correct row.

4 (2 marks)

Here are five cards. One card is face down.

4	9	5	3	
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The mean of the five numbers is 6

Work out the number on the fifth card.

Mean = total ÷ number of cards

So total = mean × number of cards

Total = $6 \times 5 = 30$

The four cards we can see add up to $4 + 9 + 5 + 3 = 21$

Fifth card = $30 - 21 = 9$

Answer: 9

Marks: 1 mark for $5 \times 6 = 30$. 1 mark for 9.

5 (2 marks)

Write down four numbers that have

a mode of 5

a median of 6

a range of 4

Mode 5: start with two 5s. 5, 5, ?, ?

Range 4: if 5 is the smallest, the largest is $5 + 4 = 9$. 5, 5, ?, 9

Median 6: the middle two, 5 and the missing number, must average 6.

So the missing number is 7.

Check with 5, 5, 7, 9:

Mode = 5 ✓

Median = $(5 + 7) \div 2 = 6$ ✓

Range = $9 - 5 = 4$ ✓

Answer: e.g. 5, 5, 7, 9

Tip: Write your numbers in order and check all three conditions at the end. Changing one number can change the median.

Marks: 2 marks for four numbers that meet all three conditions. 1 mark for four numbers that meet two of them.

6 (2 marks)

Six numbers are written in order of size.

2 5 x 11 13 20

The median of the six numbers is 9

Work out the value of x .

With six numbers, the median is halfway between the 3rd and 4th numbers.

The 3rd and 4th numbers are x and 11.

Halfway between x and 11 is 9, so $x + 11 = 2 \times 9 = 18$

$$x = 18 - 11 = 7$$

Check: 2, 5, 7, 11, 13, 20 has median $(7 + 11) \div 2 = 9$ ✓

Answer: $x = 7$

Tip: The median is not simply the 3rd number. With an even number of values, it is halfway between the middle two.

Marks: 1 mark for $(x + 11) \div 2 = 9$ or 2×9 . 1 mark for 7.

7 (3 marks)

Here are the salaries, in £, of the 6 workers in a company.

18 200 20 400 21 800 21 800 21 800 94 000

(a) Work out the mean salary.

Add all six salaries:

$$18\,200 + 20\,400 + 21\,800 + 21\,800 + 21\,800 + 94\,000 = 198\,000$$

Divide by the number of workers:

$$198\,000 \div 6 = 33\,000$$

Answer: £33 000

Marks: 1 mark for the total divided by 6. 1 mark for £33 000.

(b) Why is the mean not the best average to represent the salaries?

The salary of £94 000 is much higher than the others. It is an outlier.

It pulls the mean up.

The mean (£33 000) is higher than five of the six salaries.

Answer: £94 000 is an outlier; mean is higher than most salaries

Tip: Your answer must talk about the mean and the £94 000 outlier. Talking only about the mode or range does not answer the question.

8 (3 marks)

Jess has taken five tests. Her mean score is 72

After her sixth test, her mean score is 74

What did she score in her sixth test?

Total = mean $\times$ number of tests

Total after 5 tests: $5 \times 72 = 360$

Total after 6 tests: $6 \times 74 = 444$

The sixth test adds the difference:

$444 - 360 = 84$

Answer: 84

Tip: Work with totals, not means. The answer is not $74 - 72 = 2$, and not $74 + 2$.

Marks: 1 mark for 360. 1 mark for 444. 1 mark for 84.

9 (4 marks)

Lowri sits four tests. Each test is out of 40 marks.
Her scores in the first three tests are

32 26 29

She wants her mean percentage for the four tests to be at least 75%
Work out the lowest score she needs in the fourth test.

The four tests are worth $4 \times 40 = 160$ marks in total.

75% of 160 = 120 marks, so she needs at least 120 marks altogether.

Her first three scores add up to $32 + 26 + 29 = 87$

Fourth test: $120 - 87 = 33$

Check: $87 + 33 = 120$ and $120 \div 160 = 0.75 = 75\%$ ✓

Answer: 33

Tip: A mean percentage of 75% over four equal tests means 75% of the total marks. You do not need to find each test's percentage.

Marks: 1 mark for 160. 1 mark for 75% of 160 = 120. 1 mark for 87. 1 mark for 33.
