

Averages from Frequency Tables

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 (7 marks)

The table shows the number of goals a team scored in 20 matches.

Number of goals	0	1	2	3	4
Frequency	3	7	6	3	1

(a) Write down the mode.

The mode is the number of goals with the highest frequency.

The highest frequency is 7.

This is for 1 goal.

Answer: 1

Tip: The mode is the number of goals (1), not the frequency (7).

(b) Write down the range.

Range = largest number of goals – smallest number of goals

$$4 - 0 = 4$$

Answer: 4

(c) Work out the median.

There are 20 matches.

So the median is halfway between the 10th and 11th values.

Add up the frequencies as you go:

0 goals: matches 1 to 3

1 goal: matches 4 to 10

2 goals: matches 11 to 16

So the 10th value is 1 and the 11th value is 2.

Median = $(1 + 2) \div 2 = 1.5$

Answer: 1.5

Tip: Don't take the middle of the numbers 0 to 4 (that gives 2). Count through the frequencies.

Marks: 1 mark for finding the 10th and 11th values. 1 mark for 1.5.

- (d) Work out the mean number of goals.

Multiply each number of goals by its frequency:

$$0 \times 3 = 0$$

$$1 \times 7 = 7$$

$$2 \times 6 = 12$$

$$3 \times 3 = 9$$

$$4 \times 1 = 4$$

$$\text{Total goals} = 0 + 7 + 12 + 9 + 4 = 32$$

Divide by the number of matches, 20:

$$32 \div 20 = 1.6$$

Answer: 1.6

Tip: Divide by the total frequency (20 matches), not by 5 (the number of columns).

Marks: 1 mark for multiplying goals by frequency. 1 mark for dividing the total by 20. 1 mark for 1.6.

2 (1 mark)

The table shows the number of people in some cars.

Number of people	1	2	3	4
Frequency	8	10	12	5

Sam says, “The mode is 12”

Is Sam correct? Tick a box.

Give a reason for your answer.

No.

12 is the highest frequency: it is the number of cars with 3 people in them.

The mode is the **number of people** with the highest frequency.

So the mode is 3 people.

Answer: No, the mode is 3

3 (3 marks)

The table shows the number of brothers and sisters of 30 students.

Number of brothers and sisters	0	1	2	3	4
Frequency	8	11	6	3	2

(a) Kim says,

“The mean is $(8 + 11 + 6 + 3 + 2) \div 5 = 6$ ”

Explain what Kim has done wrong.

She has found the mean of the frequencies.

She should multiply each number of brothers and sisters by its frequency.

Then add these up and divide by the total frequency (30).

Answer: She found the mean of the frequencies

- (b) Work out the mean number of brothers and sisters.
Give your answer to 2 decimal places.

Multiply each number by its frequency:

$$0 \times 8 = 0$$

$$1 \times 11 = 11$$

$$2 \times 6 = 12$$

$$3 \times 3 = 9$$

$$4 \times 2 = 8$$

$$\text{Total} = 0 + 11 + 12 + 9 + 8 = 40$$

There are 30 students.

$$\text{Mean} = 40 \div 30 = 1.333 \dots$$

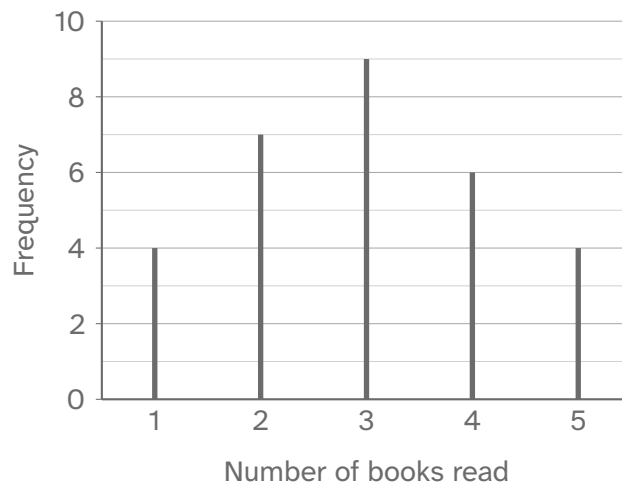
To 2 decimal places: 1.33

Answer: 1.33

Marks: 1 mark for $40 \div 30$. 1 mark for 1.33.

4 (6 marks)

The members of a book club recorded how many books they each read in March. The chart shows information about the results for 30 members.



- (a) Work out the range of the number of books read.

The smallest number of books read is 1 and the largest is 5.

$$\text{Range} = 5 - 1 = 4$$

Answer: 4

Tip: The range uses the numbers of books along the bottom (1 to 5), not the heights of the lines.

- (b) Work out the median number of books read.

Read the frequencies from the chart: 4, 7, 9, 6, 4

There are 30 members, so the median is halfway between the 15th and 16th values.

Add up the frequencies as you go:

1 book: members 1 to 4

2 books: members 5 to 11

3 books: members 12 to 20

So the 15th and 16th values are both 3.

Median = 3

Answer: 3

Tip: Don't pick the middle of 1, 2, 3, 4, 5 without counting. Here it happens to be 3, but you must count through the frequencies to show it.

Marks: 1 mark for finding the 15th and 16th values (or counting through the frequencies).
1 mark for 3.

- (c) Work out the mean number of books read.
Give your answer to 2 decimal places.

Multiply each number of books by its frequency:

$$1 \times 4 = 4$$

$$2 \times 7 = 14$$

$$3 \times 9 = 27$$

$$4 \times 6 = 24$$

$$5 \times 4 = 20$$

$$\text{Total books} = 4 + 14 + 27 + 24 + 20 = 89$$

$$\text{Mean} = 89 \div 30 = 2.966 \dots$$

To 2 decimal places: 2.97

Answer: 2.97

Marks: 1 mark for at least three correct products. 1 mark for dividing your total by 30. 1 mark for 2.97.

5 (3 marks)

The table shows the number of pets owned by some students.

Number of pets	0	1	2	3
Frequency	4	6	x	2

The mean number of pets is 1.5

Work out the value of x .

Total number of pets: $0 \times 4 + 1 \times 6 + 2 \times x + 3 \times 2 = 12 + 2x$

Number of students: $4 + 6 + x + 2 = 12 + x$

Mean = total pets $\div$ number of students = 1.5

So $12 + 2x = 1.5(12 + x)$

$12 + 2x = 18 + 1.5x$

Subtract $1.5x$ and 12: $0.5x = 6$

$x = 12$

Check: $\frac{12 + 24}{24} = \frac{36}{24} = 1.5 \quad \checkmark$

Answer: 12

Tip: The number of students is the total frequency, $12 + x$. Don't forget to include the x .

Marks: 1 mark for $12 + 2x$ or $12 + x$. 1 mark for a correct equation. 1 mark for 12.

6 (3 marks)

The table shows the number of cars owned by each of 24 households.

Number of cars	Number of households
0	4
1	x
2	y
3	5

The median number of cars is 1.5

Work out the value of x and the value of y .

There are 24 households, so $4 + x + y + 5 = 24$

So $x + y = 15$

The median is halfway between the 12th and 13th values.

A median of 1.5 means the 12th value is 1 and the 13th value is 2.

So exactly 12 households have 0 or 1 car.

$4 + x = 12$, so $x = 8$

$y = 15 - 8 = 7$

Check: the 12th household has 1 car and the 13th has 2 cars. Median = $(1 + 2) \div 2 = 1.5$

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Answer: $x = 8, y = 7$

Tip: A median of 1.5 is halfway between 1 and 2. So the two middle households must have 1 car and 2 cars.

Marks: 1 mark for $x + y = 15$ (or $4 + x + y + 5 = 24$). 1 mark for $4 + x = 12$. 1 mark for $x = 8$ and $y = 7$.