



eClassroom

GCSE MATHEMATICS • DATA & STATISTICS

Averages - Raw Data

Worksheet

Pearson Edexcel GCSE (1MA1) & International GCSE (4MA1) • No calculator

Free Averages from Raw Data worksheet for GCSE and iGCSE Maths, with full worked solutions



Tap a section to jump straight to it

By the end of this worksheet you can: find the mean, median, mode and range of a list of data • find a missing value from the mean • choose the most suitable average and spot outliers • *Higher:* quartiles and the interquartile range, combined means, and what happens to averages when data changes.

Which questions are for me?

FOUNDATION Everyone starts here. These skills appear on both tiers.

HIGHER Higher only: quartiles and the interquartile range, plus combined means and changes to data. Grades 6 to 9.

Every section has both, clearly labelled. Questions get harder as you go, and every skill in Sections A to D is needed in Section E.

Track your progress

Section	B	C	D	E
Foundation marks	23	10	13	15
Higher marks	16	14	17	15
My score				

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A**Worked examples & Your turn**

Read each example carefully. Cover it up, then answer the question beside it using the same method.

FOUNDATION*Everyone starts here***Worked example A1**

Find the mode, median, mean and range of
8, 3, 11, 3, 6, 12, 4, 9

Order first: 3, 3, 4, 6, 8, 9, 11, 12. Eight values, so the median is halfway between the 4th and 5th.

Mean = $56 \div 8$ Range = $12 - 3$

3; 7; 7; 9

Your turn A1

Find the mode, median, mean and range of
5, 14, 9, 7, 9, 2, 10

Worked example A2

The mean of five numbers is 7. Four of them are
3, 9, 6 and 8. Find the fifth.

The total of all five is $5 \times 7 = 35$

$35 - (3 + 9 + 6 + 8) = 35 - 26$

9

Your turn A2

The mean of four numbers is 12.5. Three of them
are 10, 15 and 11. Find the fourth.

Worked example A3

House prices: £180 000, £195 000, £210 000,
£205 000, £1 200 000. Which average best
describes a typical price?

£1 200 000 is an outlier that pulls the mean up. The median is not affected by it.

the median, £205 000

Your turn A3

Times to run 100 m, in seconds: 13.2, 13.8, 14.1,
13.5, 21.0 (a runner fell). Which average best
describes a typical time? Find it.



HIGHER*Higher only: quartiles, changes to data and combined means***Worked example A4: quartiles and the IQR**

3, 5, 6, 8, 9, 11, 12, 14, 15, 18, 20 Find the quartiles and the IQR.

11 values: the median is the 6th, the lower quartile the 3rd, the upper quartile the 9th.

LQ = 6, median = 11, UQ = 15

$$\text{IQR} = 15 - 6 = 9$$

Your turn A4

21, 23, 24, 26, 27, 29, 30, 31, 33, 34, 36, 38, 40, 41, 45 Find the quartiles and the IQR.

Worked example A5: changing every value

A set of data has mean 14 and range 6. Every value has 3 added. Find the new mean and range.

Adding 3 moves every value up 3: the mean moves up, the spread stays the same.

mean 17, range 6

Your turn A5

A set of data has mean 9 and range 5. Every value is multiplied by 4. Find the new mean and range.

Worked example A6: a combined mean

12 boys have a mean height gain of 5.5 cm. 18 girls have a mean gain of 6 cm. Find the mean for all 30.

Use totals: $12 \times 5.5 = 66$ and $18 \times 6 = 108$

$$(66 + 108) \div 30$$

5.8 cm

Your turn A6

20 people have a mean age of 40. Another 30 people have a mean age of 45. Find the mean age of all 50.

Worked example A7: a mean in algebra

The mean of x , $x+4$, $3x$, $2x+2$ is 12. Find x .

$$\text{Total} = 4 \times 12 = 48$$

$$7x + 6 = 48$$

$$x = 6$$

Your turn A7

The mean of $3x$, $x-2$, $x+7$, $3x+3$ is 11. Find x .



B**Fluency**

Each question is a designed sequence. From one part to the next, ask yourself: what changed, and what did it do to the answer?

FOUNDATION*Everyone starts here*

B1 For the data 3, 5, 5, 8, 9 find

- (a) the mode (b) the median (c) the mean (d) the range

[4 marks]

B2 The 9 in the data above is changed to 19. The data is now 3, 5, 5, 8, 19 Find

- (a) the mean (b) the median (c) the range (d) the mode

[4 marks]

B3 Find the median of each set of data.

- (a) 2, 4, 7, 9 (b) 9, 2, 7, 4, 10, 1
(c) 1.2, 3.4, 2.6, 5.0 (d) -3, 2, -1, 4, 0, -5

[4 marks]

B4 Find the missing number in each case.

- (a) The mean of four numbers is 6. Three of them are 2, 5 and 9
(b) The mean of five numbers is 10. Four of them are 8, 12, 7 and 9
(c) The range of 3, 8 and x is 10, and x is the largest.
(d) The numbers 2, 5, x , 11 are in order and their median is 6

[4 marks]



FOUNDATION*continued: choosing an average and totals*

- B5** Which average would be best for each set of data? Give a reason.
- (a) The shoe sizes sold in a shop in one day.
 - (b) The salaries of eight workers and their manager, who earns much more than the others.
 - (c) Test marks of 20 students, with no unusual marks. [3 marks]
- B6**
- (a) 12 students have a mean of 7 points. Find the total number of points.
 - (b) A 13th student scores 20 points. Find the new mean.
 - (c) Eight values have a mean of 4.5. Find their total.
 - (d) A ninth value makes the mean 5. Find the ninth value. [4 marks]

HIGHER*Higher tier only*

- B7** For the data 2, 4, 5, 7, 8, 10, 11, 13, 14, 16, 20 find
- (a) the median
 - (b) the lower quartile
 - (c) the upper quartile
 - (d) the interquartile range
- [4 marks]
- B8** A set of data has mean 12 and range 8. Find the new mean or range when
- (a) 5 is added to every value: the mean
 - (b) 5 is added to every value: the range
 - (c) every value is multiplied by 3: the mean
 - (d) every value is multiplied by 3: the range
- [4 marks]



HIGHER*continued: combined means and algebra*

- B9** (a) 10 values have mean 6 and 15 values have mean 8. Find the mean of all 25
(b) 4 values have mean 20 and 6 values have mean 15. Find the mean of all 10
(c) 12 values have mean 9. How many values of 14 must be added to make the mean 11?
(d) Five numbers have mean 7. One more number makes the mean 8. Find that number. [4 marks]
- B10** Find x .
(a) The mean of x , $x+2$ and $x+4$ is 10
(b) 3, x , 9 are in order and their median is 5
(c) The mean of $2x$, $3x$, $5x$ and 10 is 15
(d) The range of x , $2x$ and $3x$ is 12, where $x > 0$
[4 marks]



C**Reasoning**

Show your working and explain your thinking. A correct answer without a reason does not score full marks.

FOUNDATION

Everyone starts here

- C1** Tom finds the median of 8, 3, 9, 1, 5 and says it is 9, because 9 is in the middle.
Explain Tom's mistake, and find the correct median. [2 marks]
- C2** Sam writes the range of 4, 12, 7, 15 as "4 to 15"
Explain what is wrong, and write the correct range. [2 marks]
- C3** Is it possible for five whole numbers to have a mean of 10 and a median of 12? Give an example or explain why not. [3 marks]
- C4** For the data 4, 5, 5, 6, 30 work out the mean and the median. Which gives a better idea of a typical value? Explain. [3 marks]



HIGHER*Higher tier only*

- C5** Class P has a mean mark of 60 and class Q has a mean mark of 70. Jo says, "The mean mark for both classes together is 65"
Explain why Jo may be wrong. When would she be right? [3 marks]
- C6** The data is 12, 14, 15, 15, 16, 17, 18, 19, 60
Find the range and the interquartile range, and explain which is the better measure of spread for this data. [3 marks]
- C7** A set of data has mean 8 and interquartile range 5. Every value is doubled and then 1 is subtracted.
Find the new mean and the new interquartile range. [3 marks]
- C8** n numbers have mean m . One more number, v , is added.
- (a) Show that the new mean is $m + \frac{v - m}{n + 1}$
- (b) Hence explain what happens to the mean when v is equal to, greater than, or less than m [5 marks]



D**Problem solving**

You decide the method. Read the whole question first, and show every step.

FOUNDATION

Everyone starts here

- D1** Ali's mean score in four tests is 62. After his fifth test, his mean score is 65
What did he score in the fifth test? [3 marks]
- D2** Three whole numbers have a mode of 7 and a mean of 8
Find the three numbers, and write down their median and their range. [4 marks]
- D3** Kim's mean score in 10 quizzes is 7.5. Her lowest score, 3, is removed.
Find her new mean score. [3 marks]
- D4** Four consecutive even numbers have a mean of 15. Find the four numbers. [3 marks]



HIGHER*Higher tier only*

- D5** 20 values have mean 30 and another 30 values have mean 40
One value in the first group was recorded as 30 but should have been 80. Find the correct mean of all 50 values. [4 marks]
- D6** The data is 21, 24, 25, 27, 28, 30, 31, 33, 34, 36, 52
An outlier is a value more than $1.5 \times \text{IQR}$ above the upper quartile, or below the lower quartile.
Show that 52 is an outlier and that there are no low outliers. [4 marks]
- D7** The six numbers 3, 5, x , x , 12, 15 are in order. Their median is 8
Find x and the mean of the six numbers. [4 marks]
- D8** Five positive whole numbers have a mean of 9, a median of 8, a mode of 4 and a range of 11
Find the five numbers. Explain why there is only one possible set. [5 marks]





Exam practice

Exam-style questions. Write your answers in the spaces. Aim for about one minute per mark.

FOUNDATION

Foundation and Higher crossover

E1 Here are nine numbers. 8 2 9 4 11 12 3 4 10

(a) Write down the mode.

.....
(1)

(b) Find the median.

.....
(1)

(c) Work out the mean.

.....
(1)

(d) Work out the range.

.....
(1)

(Total for Question E1 is 4 marks)

E2 The mean of six numbers is 8. Five of the numbers are 5, 9, 7, 10 and 6

Work out the sixth number.

.....
(Total for Question E2 is 2 marks)



- E3** The salaries of seven workers are
£22 000 £24 000 £25 000 £26 000 £28 000 £30 000 £95 000

(a) Find the median salary.

.....
(1)

(b) The manager says the mean salary is a fair way to describe a typical salary. Explain why she is wrong.

(2)

(Total for Question E3 is 3 marks)

- E4** Eight students' marks were 14 16 17 18 19 21 22 25
When the marks were typed in, the 18 was typed as 81

(a) Work out the correct mean.

.....
(2)

(b) Explain why the mistake changes the mean by much more than it changes the median.

(1)

(Total for Question E4 is 3 marks)

- E5** The mean of five numbers is 12. One number is removed and the mean of the other four is 13
Work out the number that was removed.

.....
(Total for Question E5 is 3 marks)

HIGHER

Higher tier only

- E6** Here are 11 values in order. 15 18 20 22 23 25 27 28 30 33 35
Find the interquartile range.

.....
(Total for Question E6 is 3 marks)



- E7** A set of data has mean 25 and range 12. Every value has 5 added to it and is then doubled.
Find the new mean and the new range.

mean range

(Total for Question E7 is 3 marks)

- E8** Class *A* has 20 students with a mean score of 64. Class *B* has a mean score of 70
The mean score of all the students in both classes is 66. How many students are in class *B*?

(Total for Question E8 is 4 marks)

- E9** Sam's mean score over his first n games is 15. In his next game he scores 30, and his mean rises to 16
(a) Find n .

(2)

- (b) How many more games scoring 30 would Sam need to raise his mean to 20?

(3)

(Total for Question E9 is 5 marks)

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