

Averages Problems

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 (2 marks)

Sienna writes down four whole numbers.

The mode of the four numbers is 6

The mean of the four numbers is 7

Two of the numbers are 6 and 9

Work out the other two numbers.

The mode is 6, so 6 must appear more than once.

Only one 6 is known, so one of the other numbers is 6.

The mean is 7, so the total is $4 \times 7 = 28$

Total of the three numbers we know: $6 + 9 + 6 = 21$

Last number = $28 - 21 = 7$

Check: 6, 6, 7, 9 has mode 6 and mean $28 \div 4 = 7$ ✓

Answer: 6 and 7

Marks: 1 mark for the total 28 or for saying one number is 6. 1 mark for 6 and 7.

2 (3 marks)

There are 10 players in the Red team.

Their mean score in a quiz is 18

The players in the Blue team have a mean score of 13

The mean score of all the players in both teams is 15

Work out the number of players in the Blue team.

Total for the Red team: $10 \times 18 = 180$

Each Red player is $18 - 15 = 3$ above the overall mean, so the Red team is $10 \times 3 = 30$ above in total.

Each Blue player is $15 - 13 = 2$ below the overall mean.

The amounts above and below must balance: $30 \div 2 = 15$

Check: $180 + 15 \times 13 = 180 + 195 = 375$ and $375 \div 25 = 15$ ✓

Answer: 15

Tip: You can also try values: with n Blue players the total is $180 + 13n$ and it must equal $15 \times (10 + n)$.

Marks: 1 mark for 180 or the differences 3 and 2. 1 mark for a correct method, e.g. $30 \div 2$ or trying a number of Blue players and checking the mean. 1 mark for 15.

3 (3 marks)

Priya has three cards. Each card has a number on it.

The mean of the three numbers is 7

The median is 5

The range is 8

Work out the three numbers.

Mean 7, so the total is $3 \times 7 = 21$

The median is the middle number, so in order the numbers are x , 5, (largest).

The range is 8, so the largest is $x + 8$.

Add them up: $x + 5 + x + 8 = 21$

$2x + 13 = 21$

$2x = 8$, so $x = 4$

The largest is $4 + 8 = 12$

Check: 4, 5, 12 has mean $21 \div 3 = 7$, median 5 and range $12 - 4 = 8$ ✓

Answer: 4, 5, 12

Marks: 1 mark for the total 21. 1 mark for writing the numbers as x , 5, $x + 8$ (or trying numbers that fit two of the conditions). 1 mark for 4, 5, 12.

4 (2 marks)

Jen runs a shoe shop.

She wants to know which shoe size to order most of.

- (a) Write down which average Jen should use.

Jen wants the size that sells the most.

The mode is the most common value.

Answer: Mode

- (b) Give a reason for your answer.

The shop needs to know which size is bought most often.

A mean shoe size could be a number like 6.3, which is not a real shoe size.

Answer: Most common size / mean may not be an actual size

5 (3 marks)

Bill's mean score for 4 games of darts is 45

After his fifth game, his mean score is 48

Work out Bill's score in his fifth game.

Total score after 4 games: $4 \times 45 = 180$

Total score after 5 games: $5 \times 48 = 240$

Score in the fifth game = $240 - 180 = 60$

Answer: 60

Marks: 1 mark for 180 or 240. 1 mark for $240 - 180$. 1 mark for 60.

6 (4 marks)

The mean time of 6 runners in a race is 52 seconds.
One of the times was recorded as 48 seconds by mistake.
It should have been 60 seconds.

- (a) Work out the correct mean time for the 6 runners.

Total of the recorded times: $6 \times 52 = 312$ seconds

The recorded time was 12 seconds too small ($60 - 48 = 12$).

Correct total: $312 + 12 = 324$ seconds

Correct mean: $324 \div 6 = 54$ seconds

Answer: 54 seconds

Tip: Change the total, not the mean: take off the wrong time and add on the right time, then divide by 6 again.

Marks: 1 mark for 6×52 or 312. 1 mark for 324 (or $312 - 48 + 60$). 1 mark for 54.

- (b) Another runner's time of 54 seconds is added to the results.
What effect does this have on the correct mean time?
Give a reason for your answer.

The new time, 54 seconds, is equal to the correct mean.

New total: $324 + 54 = 378$ seconds, and $378 \div 7 = 54$ seconds.

Answer: No effect: the mean stays 54 seconds, because the new time is equal to the mean

Tip: A new value equal to the mean keeps the mean the same. A value above the mean makes it go up; a value below makes it go down.

7 (3 marks)

Leo buys 4 bags of rice with a mean weight of 2.5 kg.

He also buys 6 bags of flour with a mean weight of 1.5 kg.

Leo says,

“The mean weight of all 10 bags is 2 kg, because 2 is halfway between 2.5 and 1.5”

Is Leo correct?

You must show how you get your answer.

Total weight of the rice: $4 \times 2.5 = 10$ kg

Total weight of the flour: $6 \times 1.5 = 9$ kg

Total weight of all 10 bags: $10 + 9 = 19$ kg

Mean weight: $19 \div 10 = 1.9$ kg

1.9 kg is not 2 kg, so Leo is not correct.

There are more bags of flour, so the mean is nearer to 1.5 kg.

Answer: No, the mean is 1.9 kg

Tip: You can only find the halfway value when the two groups are the same size. Always work out the totals first.

Marks: 1 mark for 10 or 9. 1 mark for $19 \div 10$. 1 mark for No with 1.9.

8 (3 marks)

The mean of a , b and c is 10

The mean of a , b , c , d and e is 12

Work out the mean of d and e .

The mean of a , b , c is 10, so $a + b + c = 3 \times 10 = 30$

The mean of all five is 12, so $a + b + c + d + e = 5 \times 12 = 60$

So $d + e = 60 - 30 = 30$

Mean of d and $e = 30 \div 2 = 15$

Answer: 15

Marks: 1 mark for 30. 1 mark for 60. 1 mark for 15.

9 (3 marks)

There are 12 apples in a bag.
The mean mass of the 12 apples is 150 g.
4 apples are taken out of the bag.
The mean mass of the 8 apples left in the bag is 145 g.
Work out the mean mass of the 4 apples that were taken out.

Total mass of 12 apples: $12 \times 150 = 1800$ g

Total mass of the 8 apples left: $8 \times 145 = 1160$ g

Total mass of the 4 apples taken out: $1800 - 1160 = 640$ g

Mean mass: $640 \div 4 = 160$ g

Answer: 160 g

Tip: Work with totals. Subtracting the means ($150 - 145$) does not give the answer.

Marks: 1 mark for 1800 or 1160. 1 mark for 640. 1 mark for 160.

10 (4 marks)

A chess club has 18 members.
The mean age of the 18 members is 24 years.
Two members, aged 19 and 24, leave the club.
Three new members join the club.
The mean age of the 19 members is now 26 years.
Work out the mean age of the three new members.

Total age of the 18 members: $18 \times 24 = 432$

After two members leave: $432 - 19 - 24 = 389$

Total age of the 19 members now: $19 \times 26 = 494$

Total age of the three new members: $494 - 389 = 105$

Mean age of the new members: $105 \div 3 = 35$ years

Answer: 35 years

Tip: Count the members carefully: $18 - 2 + 3 = 19$. Find each total by multiplying the mean by the number of members.

Marks: 1 mark for 432. 1 mark for 389 or 494. 1 mark for 105. 1 mark for 35.
