Test answers - Statistics: averages and grouped data

Year: Year 9 · Duration: 45 minutes · /20

Answer to Question 1 (4 marks)

a. Add the seven numbers: $6 + 9 + 4 + 9 + 7 + 5 + 9 = 49$. Divide by 7: $49 \div 7 =$**7**. (1 mark)
b. Put the numbers in order: 4, 5, 6, 7, 9, 9, 9. With seven values the median is the 4th value, which is **7**. (1 mark)
c. 9 appears three times, more than any other value, so the mode is **9**. (1 mark)
d. Range = largest − smallest $= 9 - 4 =$**5**. (1 mark)

Forgetting to order the data before finding the median is the most common error: the middle of the original list is 9, which is wrong. Here the mean and the median are both 7, while the mode is higher, because three pupils share the top value of 9.

Answer to Question 2 (4 marks)

a. The number of ratings is the total frequency: $2 + 3 + 5 + 6 + 4 = 20$ (1 mark). Multiply each rating by its frequency for the stars: $1 \times 2 + 2 \times 3 + 3 \times 5 + 4 \times 6 + 5 \times 4 = 2 + 6 + 15 + 24 + 20 = 67$ (1 mark).
b. Mean = total stars ÷ number of ratings $= 67 \div 20 =$**3.35** stars. (1 mark)
c. With 20 values the median is halfway between the 10th and 11th. Running totals: 2, 5, 10, 16, 20. The 10th value is 3 and the 11th is 4, so the median is $(3 + 4) \div 2 =$**3.5**. (1 mark)

Dividing 67 by 5 is wrong: there are 5 rating categories but 20 ratings.

Answer to Question 3 (4 marks)

a. The modal class is the group with the highest frequency, 8, so it is $10 < w \leq 20$. (1 mark)
b. We do not know the exact masses, so use the midpoint of each class to represent every parcel in it: 5, 15 and 25 kg. Multiply each midpoint by its frequency: $5 \times 5 = 25$, $8 \times 15 = 120$, $7 \times 25 = 175$ (1 mark). Total $= 25 + 120 + 175 = 320$ (1 mark). Estimated mean $= 320 \div 20 =$**16 kg** (1 mark).

The answer is only an estimate, since parcels in a class may not be spread evenly around its midpoint. It is sensible because 16 kg lies inside the modal class.

Answer to Question 4 (4 marks)

a. Total = mean × number of marks $= 5 \times 14 =$**70**. (1 mark)
b. After six tests the mean is 15, so the total of all six marks is $6 \times 15 = 90$ (1 mark). The sixth mark is the difference: $90 - 70 =$**20** (1 mark).
c. With a sixth mark of 8 the total would be $70 + 8 = 78$, and the new mean $78 \div 6 =$**13**. (1 mark)

A mark above the old mean pulls the mean up, and a mark below it pulls the mean down. In (b) the new mark is 6 above the old mean of 14, and sharing those 6 extra marks over 6 tests raises the mean by exactly 1. In (c) the mark is 6 below, so the mean falls by 1.

Answer to Question 5 (4 marks)

a. Compare the means: 3.2 goals is more than 3.0 goals, so **Team X** has the higher average. (1 mark)
b. The range measures spread. Team Y's range of 1 is much smaller than Team X's range of 4, so **Team Y** is more consistent. (1 mark)
c. Team X scores slightly more on average (1 mark), but its scores vary a lot from match to match, while Team Y almost always scores about 3. The difference in means is small, so the result is not certain; either team may be chosen if the reason uses both statistics (1 mark).

A good answer might say: "Team X, because its mean is higher, although its large range means it may sometimes score very few goals."