



4.18H Averages from Frequency Tables: Higher Tier Practice

EDEXCEL Edexcel 1MA1 · Calculator allowed · about 70 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** A teacher records the number of books read by 12 pupils in a term.

Number of books: 3, 5, 7

Frequency: 4, 3, 5

Work out the mean number of books read.

(Total for Question 1 is 2 marks)

- 2** The ages (in years) of 14 children in a club are recorded in this table.

Age: 10, 11, 12, 13

Frequency: 2, 5, 4, 3

Find the median age.

(Total for Question 2 is 4 marks)

- 3** From the table below, state the mode of the data and explain why it is the mode.

Value: 1, 2, 3, 4

Frequency: 2, 6, 4, 3

(Total for Question 3 is 3 marks)

- 4** The weights (in kg) of 14 parcels are recorded in grouped classes.

Class (kg): 0-10, 10-20, 20-30, 30-40

Frequency: 3, 5, 4, 2

Use class midpoints to estimate the mean weight of the parcels. Give your answer as an exact fraction and to 3 decimal places.

(Total for Question 4 is 6 marks)

- 5** Show that the mean of the following data is 12.

Value: 8, 12, 16

Frequency: 3, 4, 3

You must show your working.

(Total for Question 5 is 4 marks)

- 6** Find the missing frequency k in the table below if the mean of the data is 8.

Value: 4, 9, 14

Frequency: 5, k , 2

Show your working.

(Total for Question 6 is 5 marks)

- 7** Use the table to calculate the variance of the data (population variance), giving your answer correct to 3 decimal places.

Value: 1, 3, 5

Frequency: 4, 3, 3

Show all working.

(Total for Question 7 is 9 marks)

- 8** Two datasets A and B are given in frequency form.

Dataset A: Value 2, 4, 6 ; Frequency 3, 4, 3

Dataset B: Value 1, 5, 7 ; Frequency 2, 6, 2

(a) Work out which dataset has the larger mean. Show your working.

(b) For dataset B, a single extra value 20 is added. Explain the effect of this extra value on the mean and on the median of dataset B. You must justify your answers.

(a) (a) Work out which dataset has the larger mean. Show your working. **(4)**

(b) (b) If a single extra value 20 is added to dataset B, explain the effect on the mean **(3)**
and on the median. Justify your answers.

(Total for Question 8 is 7 marks)

Mark scheme · 4.18H Averages from Frequency Tables: Higher Tier Practice

Question 1

- **M1** multiply values by frequencies and sum, e.g. $3 \times 4 + 5 \times 3 + 7 \times 5$
- **A1** mean = $31/6$ (approximately 5.1667) cao
- **Answer: 31/6 (approximately 5.1667)**

Question 2

- **M1** calculate cumulative frequencies (2, 7, 11, 14) to locate median position
- **M1** identify 7th and 8th values lie in ages 11 and 12
- **A1** median = $(11 + 12) / 2$
- **A1** median = 11.5 cao
- **Answer: 11.5**

Question 3

- **B1** mode = 2 cao
- **B1** reason: 2 has the highest frequency (6) oe
- **B1** explicit statement that no other value has frequency greater than 6
- **Answer: Mode = 2 because it has the highest frequency (6).**

Question 4

- **M1** choose midpoints 5, 15, 25, 35
- **M1** calculate $f \times \text{midpoint}$ for each class: $3 \times 5, 5 \times 15, 4 \times 25, 2 \times 35$
- **M1** sum $f \times \text{midpoint} = 15 + 75 + 100 + 70 = 260$
- **M1** sum frequencies = 14
- **A1** mean = $260/14 = 130/7$ cao
- **A1** mean approximately 18.571 (3 dp) cao
- **Answer: 130/7 (approximately 18.571)**

Question 5

- **M1** calculate sum of values times frequencies: $8 \times 3 + 12 \times 4 + 16 \times 3 = 120$
- **M1** calculate total frequency $3 + 4 + 3 = 10$
- **A1** divide: $120/10$
- **A1** mean = 12 cso
- **Answer: 12**

Question 6

- **M1** set up equation $(4 \times 5 + 9 \times k + 14 \times 2) / (5 + k + 2) = 8$
- **M1** substitute: $(20 + 9k + 28) = 8(7 + k)$
- **M1** simplify to $48 + 9k = 56 + 8k$, so $k = 8$
- **A1** state $k = 8$
- **A1** check: mean = $(48 + 9 \times 8) / (7 + 8) = (48 + 72) / 15 = 120 / 15 = 8$ cao
- **Answer: k = 8**

Question 7

- **M1** calculate total frequency and mean: $f \text{ total} = 10$, $\text{mean } \bar{x} = (1 \cdot 4 + 3 \cdot 3 + 5 \cdot 3) / 10 = 28 / 10 = 2.8$
- **M1** calculate $x^2 \cdot f$ for each value: $1^2 \cdot 4 = 4$, $3^2 \cdot 3 = 27$, $5^2 \cdot 3 = 75$
- **M1** sum $x^2 f = 4 + 27 + 75 = 106$
- **M1** calculate $E(x^2) = 106 / 10 = 10.6$
- **M1** calculate $\text{mean}^2 = (2.8)^2 = 7.84$
- **M1** calculate variance $= E(x^2) - \text{mean}^2 = 10.6 - 7.84$
- **A1** variance $= 2.76$ (exact to 2 dp)
- **A1** variance $= 2.760$ (to 3 dp) cao
- **B1** clear method and correct final answer with workings shown
- **Answer: 2.760 (to 3 dp)**

Question 8

- (a) **M1** calculate sum for A: $2 \cdot 3 + 4 \cdot 4 + 6 \cdot 3 = 6 + 16 + 18 = 40$, total $f = 10$
- (a) **M1** mean $A = 40 / 10 = 4$
- (a) **M1** calculate sum for B: $1 \cdot 2 + 5 \cdot 6 + 7 \cdot 2 = 2 + 30 + 14 = 46$, total $f = 10$
- (a) **A1** mean $B = 46 / 10 = 4.6$, so B has larger mean cao
- (a) **Answer: mean A = 4; mean B = 4.6, so B has the larger mean**
- (b) **M1** calculate new mean: new sum $= 46 + 20 = 66$, new $f = 11$, new mean $= 66 / 11 = 6$
- (b) **M1** state that mean increases from 4.6 to 6 and give reason (outlier increases total divided by count)
- (b) **A1** median remains 5 because original ordered B values (10 values) had median between 5th and 6th both 5; with 11 values the median is the 6th value which is still 5 cao
- (b) **Answer: New mean $= 66 / 11 = 6$ (mean increases). Median remains 5 (no change).**