



KS3.M-S5 Averages from Frequency Tables

AQA KS3.M-S5 · Calculators not allowed · about 60 minutes

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

1 Write down the mean, median and mode for each small frequency table.

(a) Data values: 2, 3, 3, 5 (1)

(b) Data values: 4, 4, 6 (1)

(c) Data values: 1, 2, 5, 6, 6 (1)

(d) Data values: 7, 7, 8, 9 (1)

2 A teacher records the number of books read by four pupils: Alice 3, Ben 5, Priya 2, Kwame 4. Calculate the mean number of books read.

(2)

3 Use the frequency table to write down the mode, then find the median.

Value: 10, 11, 12, 13

Frequency: 2, 3, 1, 4

(a) Write down the mode.

(1)

(b) Find the median value.

(2)

4 A small football club records goals scored in 5 matches: goals 0,1,2,3 with frequencies 1,2,1,1 respectively. Calculate the mean number of goals per match.

(2)

5 From the frequency table below, find the median.

Score: 2, 3, 4, 5, 6

Frequency: 1, 2, 4, 2, 1

(2)

6 Write down the modal class from this grouped frequency table.

Class intervals: 0-9, 10-19, 20-29

Frequency: 3, 7, 4

(1)

- 7** The table shows how many pets pupils in a class have.
Number of pets: 0, 1, 2, 3
Frequency: 5, 8, 4, 3
Find the mean number of pets per pupil.

(3)

- 8** A frequency table lists shoe sizes of 12 pupils. Sizes 3,4,5,6 have frequencies 2,3,4,3. Find the median shoe size.

(2)

- 9** From the table: Marks 0, 1, 2, 3 with frequencies 1, 4, 4, 1.
(a) State the mode. (b) Find the mean.

(a) State the mode.

(1)

(b) Find the mean.

(1)

- 10** A class of 15 pupils has scores with mean 12. One pupil with score 20 leaves and is replaced by a new pupil with score 8. Explain how the class mean changes and calculate the new mean.

(3)

- 11** Estimate the mean from this grouped frequency table where class widths are 10.
Class: 0-9, 10-19, 20-29, 30-39
Frequency: 4, 6, 3, 2

(3)

- 12** Using the grouped frequency table with classes 0-9, 10-19, 20-29 and frequencies 2, 5, 3, find the modal class and explain why we cannot give an exact mode.

(2)

- 13** A frequency table shows marks 5, 6, 7 with frequencies 3, f , 4. The mean mark is 6.1. Find f .

(3)

- 14** Two classes sat the same test. Class A median = 14, mean = 13.5. Class B median = 12, mean = 13. Decide which class is more likely to have a skewed distribution and explain your reasoning briefly.

(3)

15 A cumulative frequency table of test times (minutes) shows:

Time ≤ 10 : 2

Time ≤ 20 : 6

Time ≤ 30 : 11

Time ≤ 40 : 15

Find the lower quartile (25th percentile) time.

(2)

16 A school orders 60 identical exercise books. A survey of 30 pupils gave a frequency table for pages used last term: pages used 10, 20, 30, 40 with frequencies 6, 12, 9, 3. Using this table, estimate how many pages a randomly chosen pupil from the 60-pupil year might use on average.

(3)

17 Stretch: A grouped table gives class intervals 1-3, 4-6, 7-9 with frequencies 5, 12, 8. Use the modal class to estimate the mode using linear interpolation within the modal class. The modal class is 4-6. Show your working and give your answer to 1 decimal place.

(4)

18 Stretch: Which average, mean or median, would you quote for typical weekly pocket money if the distribution is strongly skewed by a few pupils with very large amounts? Give a short justification.

(3)

Mark scheme · KS3.M-S5 Averages from Frequency Tables

Question 1

- (a) **B1** mean = 3.25, median = 3, mode = 3 cao
- (a) Answer: **mean 3.25; median 3; mode 3**
- (b) **B1** mean = $14/3$, median = 4, mode = 4 cao
- (b) Answer: **mean 14/3; median 4; mode 4**
- (c) **B1** mean = $20/5$, median = 5, mode = 6 cao
- (c) Answer: **mean 4; median 5; mode 6**
- (d) **B1** mean = 7.75, median = 7.5, mode = 7 cao
- (d) Answer: **mean 7.75; median 7.5; mode 7**

Question 2

- **M1** sum of values $3 + 5 + 2 + 4 = 14$ or method to divide by 4 shown
- **A1** mean = 3.5 cao
- Answer: **3.5**

Question 3

- (a) **B1** mode = 13 cao
- (a) Answer: **13**
- (b) **M1** correct cumulative frequencies and locating middle position (total frequency 10 so median is 5th and 6th values)
- (b) **A1** median = 11.5 cao
- (b) Answer: **11.5**

Question 4

- **M1** use of sum value*frequency: $0*1 + 1*2 + 2*1 + 3*1 = 0 + 2 + 2 + 3 = 7$
- **A1** mean = $7/5 = 1.4$ cao
- Answer: **1.4**

Question 5

- **M1** correct cumulative frequency and middle position: total = 10 so median is average of 5th and 6th values
- **A1** median = 4 cao
- Answer: **4**

Question 6

- **B1** modal class 10-19 cao
- Answer: **10-19**

Question 7

- **M1** compute sum value*frequency: $0*5 + 1*8 + 2*4 + 3*3 = 0 + 8 + 8 + 9 = 25$
- **M1** correct total frequency $5+8+4+3 = 20$
- **A1** mean = $25/20 = 1.25$ cao
- Answer: **1.25**

Question 8

- **M1** cumulative frequencies give positions: total 12 so median is average of 6th and 7th values
- **A1** median = 5 cao
- Answer: **5**

Question 9

- (a) **B1** mode = 1 and 2 (bimodal) cao
- (a) **Answer: 1 and 2**
- (b) **B1** mean = $(0*1 + 1*4 + 2*4 + 3*1)/10 = 15/10 = 1.5$ cao
- (b) **Answer: 1.5**

Question 10

- **M1** state original total = $15 * 12 = 180$ or show change in total by -12 (20 replaced by 8)
- **M1** new total = $180 - 20 + 8 = 168$
- **A1** new mean = $168/15 = 11.2$ cao
- **Answer: 11.2**

Question 11

- **M1** use class midpoints 4.5, 14.5, 24.5, 34.5 and multiply by frequencies to get sums: $4*4.5 + 6*14.5 + 3*24.5 + 2*34.5$
- **M1** compute total frequency 15 and total of midpoint*freq = $18 + 87 + 73.5 + 69 = 247.5$ (allow small rounding steps)
- **A1** mean approx = $247.5/15 = 16.5$ cao
- **Answer: 16.5**

Question 12

- **B1** modal class 10-19 cao
- **B1** reason: data are grouped so individual values inside 10-19 unknown so exact mode not known
- **Answer: modal class 10-19; exact mode unknown because grouped data hide individual values**

Question 13

- **M1** use equation $(5*3 + 6*f + 7*4)/(3+f+4) = 6.1$ or equivalent
- **M1** form $15 + 6f + 28 = 6.1(7 + f) \Rightarrow 43 + 6f = 42.7 + 6.1f$ and solve
- **A1** $f = 3$ cao
- **Answer: 3**

Question 14

- **M1** state which class likely skewed (Class B because mean > median or vice versa) or show relationship
- **M1** explain idea: mean is affected by extreme values so differs from median when skewed
- **A1** conclude Class B is likely positively skewed because mean (13) is greater than median (12) or Class A near symmetric since mean 13.5 close to median 14
- **Answer: Class B more likely skewed; mean > median suggests positive skew**

Question 15

- **M1** identify total frequency 15 and 25% position = $0.25*15 = 3.75$ so look for 4th value in cumulative table
- **A1** lower quartile = 20 minutes cao
- **Answer: 20**

Question 16

- **M1** compute mean from sample: sum = $10*6 + 20*12 + 30*9 + 40*3 = 60 + 240 + 270 + 120 = 690$
- **M1** divide by sample size 30 to get mean = $690/30 = 23$
- **A1** estimate for 60 pupils = 23 pages on average per pupil cao
- **Answer: 23**

Question 17

- **M1** identify modal class 4-6 and write class width = 3, f_1 = frequency of modal class = 12, f_0 = previous class freq = 5, f_2 = next class freq = 8
- **M1** write interpolation formula estimate mode = $L + ((f_1 - f_0)/(2*f_1 - f_0 - f_2)) * w$ where L = lower class boundary and w = class width
- **M1** substitute values: $L = 3.5$, $w = 3$, numerator = $12 - 5 = 7$, denominator = $2*12 - 5 - 8 = 24 - 13 = 11$ giving fraction $7/11$
- **A1** mode approx = $3.5 + (7/11)*3 = 3.5 + 21/11 = 3.5 + 1.909... = 5.409... \Rightarrow 5.4$ (1 dp) cao
- **Answer: 5.4**

Question 18

- **M1** state median as the preferred average
- **M1** give reason that mean is pulled by extreme values while median resists extremes
- **A1** concise conclusion: quote median because it better represents a typical pupil in skewed data
- **Answer: Median; because it is not affected by extreme large amounts and better represents a typical pupil**