Averages & quartiles

Question Paper 1

Level	A Level
Exam Board	Edexcel
Subject	Mathematics
Module	Mechanics and Statistics
Topic	Location and spread
Sub-Topic	Averages & quartiles
Booklet	Question paper 1

Time Allowed: **45 minutes**

Score: **/41**

Percentage: **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	77.5%	70%	62.5%	57.5%	45%	<45%

1. *Kaff coffee* is sold in packets. A seller measures the masses of the contents of a random sample of 90 packets of *Kaff coffee* from her stock. The results are shown in the table below.

Mass w (g)	Midpoint y (g)	Frequency (f)
$240 \leq w < 245$	242.5	8
$245 \leq w < 248$	246.5	15
$248 \leq w < 252$	250	35
$252 \leq w < 255$	253.5	23
$255 \leq w < 260$	257.5	9

(You may use $\sum fy^2 = 5\,644\,171.75$)

Use linear interpolation to estimate the median mass of the contents of a packet of *Kaff coffee* to 1 decimal place. **(2)**

(Total 2 marks)

2. The birth weights, in kg, of 1500 babies are summarised in the table below.

Weight (kg)	Midpoint, $x$kg	Frequency, f
0.0 – 1.0	0.50	1
1.0 – 2.0	1.50	6
2.0 – 2.5	2.25	60
2.5 – 3.0		280
3.0 – 3.5	3.25	820
3.5 – 4.0	3.75	320
4.0 – 5.0	4.50	10
5.0 – 6.0		3

[You may use $\sum fx = 4841$ and $\sum fx^2 = 15\,889.5$]

(a) Write down the missing midpoints in the table above. **(2)**

(b) Calculate an estimate of the mean birth weight. **(2)**

(c) Use interpolation to estimate the median birth weight. **(2)**

(Total 6 marks)

3. Keith records the amount of rainfall, in mm, at his school, each day for a week. The results are given below.

$$2.8 \qquad 5.6 \qquad 2.3 \qquad 9.4 \qquad 0.0 \qquad 0.5 \qquad 1.8$$

Jenny then records the amount of rainfall, x mm, at the school each day for the following 21 days. The results for the 21 days are summarised below.

$$\sum x = 84.6$$

(a) Calculate the mean amount of rainfall during the whole 28 days.

(2)

Keith realises that he has transposed two of his figures. The number 9.4 should have been 4.9 and the number 0.5 should have been 5.0
Keith corrects these figures.

(b) State, giving your reason, the effect this will have on the mean.

(2)

(Total 4 marks)

4. The marks, x, of 45 students randomly selected from those students who sat a mathematics examination are shown in the stem and leaf diagram below.

Mark		Totals		Key	(3|6 means 36)
3	6 9 9	(3)			
4	0 1 2 2 3 4	(6)			
4	5 6 6 6 8	(5)			
5	0 2 3 3 4 4	(6)			
5	5 5 6 7 7 9	(6)			
6	0 0 0 0 1 3 4 4 4	(9)			
6	5 5 6 7 8 9	(6)			
7	1 2 3 3	(4)			

(a) Write down the modal mark of these students. **(1)**

(b) Find the values of the lower quartile, the median and the upper quartile. **(3)**

(Total 4 marks)

5. A survey of 100 households gave the following results for weekly income £*y*.

Income *y* (£)	Mid-point	Frequency *f*
$0 \leqslant y < 200$	100	12
$200 \leqslant y < 240$	220	28
$240 \leqslant y < 320$	280	22
$320 \leqslant y < 400$	360	18
$400 \leqslant y < 600$	500	12
$600 \leqslant y < 800$	700	8

(You may use $\sum fy^2 = 12\,452\,800$)

Use linear interpolation to estimate the median weekly income to the nearest pound.   **(2)**

(Total 2 marks)

6. The labelling on bags of garden compost indicates that the bags weigh 20 kg. The weights of a random sample of 50 bags are summarised in the table below.

Weight in kg	Frequency
14.6 – 14.8	1
14.8 – 18.0	0
18.0 – 18.5	5
18.5 – 20.0	6
20.0 – 20.2	22
20.2 – 20.4	15
20.4 – 21.0	1

[Use $\sum fy^2 = 171\,503.75$]

Using linear interpolation, estimate the median.   **(2)**

(Total 2 marks)

7. Sunita and Shelley talk to one another once a week on the telephone. Over many weeks they recorded, to the nearest minute, the number of minutes spent in conversation on each occasion. The following table summarises their results.

Time (to the nearest minute)	Number of Conversations
5–9	2
10–14	9
15–19	20
20–24	13
25–29	8
30–34	3

The mid-point of each class was represented by x and its corresponding frequency by f, giving $\Sigma fx = 1060$.

Calculate an estimate of the mean time spent on their conversations.

(2)

(Total 2 marks)

8. The age in years of the residents of two hotels are shown in the back to back stem and leaf diagram below.

Abbey Hotel   8|5|0 means 58 years in Abbey hotel and 50 years in Balmoral hotel   Balmoral Hotel

Abbey		Stem	Balmoral	
(1)	2	0		
(4)	9751	1		
(4)	9831	2	6	(1)
(11)	99997665332	3	447	(3)
(6)	987750	4	005569	(6)
(1)	8	5	000013667	(9)
		6	233457	(6)
		7	015	(3)

For the Balmoral Hotel,

(a) write down the mode of the age of the residents, **(1)**

(b) find the values of the lower quartile, the median and the upper quartile. **(3)**

(Total 4 marks)

9. A researcher measured the foot lengths of a random sample of 120 ten-year-old children. The lengths are summarised in the table below.

Foot length, l, (cm)	Number of children
$10 \leqslant l < 12$	5
$12 \leqslant l < 17$	53
$17 \leqslant l < 19$	29
$19 \leqslant l < 21$	15
$21 \leqslant l < 23$	11
$23 \leqslant l < 25$	7

Use interpolation to estimate the median of this distribution. **(2)**

(Total 2 marks)

10. A teacher selects a random sample of 56 students and records, to the nearest hour, the time spent watching television in a particular week.

Hours	$1-10$	$11-20$	$21-25$	$26-30$	$31-40$	$41-59$
Frequency	6	15	11	13	8	3
Mid-point	5.5	15.5		28		50

Use linear interpolation to estimate the median length of time spent watching television by these students.

(2)

(Total 2 marks)

11. A class of students had a sudoku competition. The time taken for each student to complete the sudoku was recorded to the nearest minute and the results are summarised in the table below.

Time	Mid-point, x	Frequency, f
2 - 8	5	2
9 - 12		7
13 - 15	14	5
16 - 18	17	8
19 - 22	20.5	4
23 - 30	26.5	4

(You may use $\sum fx^2 = 8603.75$)

Use linear interpolation to estimate the median time taken by the students.

(2)

(Total 2 marks)

12. The times, in seconds, spent in a queue at a supermarket by 85 randomly selected customers, are summarised in the table below.

Time (seconds)	Number of customers, f
$0 - 30$	2
$30 - 60$	10
$60 - 70$	17
$70 - 80$	25
$80 - 100$	25
$100 - 150$	6

Use linear interpolation to estimate the median of this distribution.

(2)

(Total 2 marks)

13. A midwife records the weights, in kg, of a sample of 50 babies born at a hospital. Her results are given in the table below.

Weight (w kg)	Frequency (f)	Weight midpoint (x)
$0 \leqslant w < 2$	1	1
$2 \leqslant w < 3$	8	2.5
$3 \leqslant w < 3.5$	17	3.25
$3.5 \leqslant w < 4$	17	3.75
$4 \leqslant w < 5$	7	4.5

[You may use $\sum fx^2 = 611.375$]

Use linear interpolation to estimate the median weight of these babies.

(2)

(Total 2 marks)

14. An estate agent is studying the cost of office space in London. He takes a random sample of 90 offices and calculates the cost, £x per square foot. His results are given in the table below.

Cost (£x)	Frequency (f)	Midpoint (£y)
$20 \leqslant x < 40$	12	30
$40 \leqslant x < 45$	13	42.5
$45 \leqslant x < 50$	25	47.5
$50 \leqslant x < 60$	32	55
$60 \leqslant x < 80$	8	70

(You may use $\sum f y^2 = 226\,687.5$)

A histogram is drawn for these data and the bar representing $50 \leqslant x < 60$ is 2 cm wide and 8 cm high.

(a) Use linear interpolation to estimate the median cost. **(2)**

(b) Estimate the mean cost of office space for these data. **(2)**

(Total 4 marks)

15. Helen is studying the daily mean wind speed for Camborne using the large data set from 1987. The data for one month are summarised in Table 1 below.

Windspeed	n/a	6	7	8	9	11	12	13	14	16
Frequency	13	2	3	2	2	3	1	2	1	2

Table 1

Calculate the mean for these data. **(1)**

(Total 1 marks)