4.18 Averages from Frequency Tables: Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 65 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A survey asks 7 pupils how many books they read last month. The frequency table is:
Number of books: 0, 1, 2, 3
Frequency: 2, 3, 1, 1
Write down the mode number of books.

(Total for Question 1 is 1 mark)

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2 The mean and range for Class A and Class B are summarised below. Use these to compare the two classes' test results.

	Mean	Range
Class A	5.85	4
Class B	6.85	3

(Total for Question 2 is 2 marks)

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3 A different hockey team's manager recorded the number of goals scored in each match of a season. The mean number of goals scored per match was 1.5. One frequency value, t, is unknown. Find the value of t.

Goals scored per match

Goals, x	0	1	2	3
Frequency, f	5	6	t	3

(Total for Question 3 is 4 marks)

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4 The grouped frequency table shows the results of a survey (Time in minutes).

$0 < x \leq 20$: 19

$20 < x \leq 40$: 20

$40 < x \leq 60$: 18

$60 < x \leq 80$: 18

$80 < x \leq 100$: 11

Work out an estimate for the mean. Give your answer correct to 1 decimal place.

(Total for Question 4 is 4 marks)

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5 Grace kept a record of the number of books read last month by 20 pupils in her form. The table shows the results.

Books read (x): 0, 1, 2, 3, 4
Frequency (f): 3, 7, 6, 3, 1
Total number of pupils = 20

Find the median number of books read.

(Total for Question 5 is 2 marks)

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6 The table shows the number of texts sent by 20 pupils in a day.
Texts: 0, 1, 2, 3
Frequency: 6, 8, 4, 2
Calculate the median number of texts sent.

(Total for Question 6 is 4 marks)

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7 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 7 is 3 marks)

8 A cafe is choosing between two vending machines. Each machine was tested with 30 customers, and the waiting time for a drink, w seconds, was recorded for each customer. Calculate an estimate of the mean waiting time for each machine, and use your answers to advise the cafe which machine has the shorter typical waiting time. You must show your working.

Machine A

w (seconds)	Frequency
$0 \leq w < 10$	10
$10 \leq w < 20$	14
$20 \leq w < 30$	6
Total	**30**

Machine B

w (seconds)	Frequency
$0 \leq w < 10$	8
$10 \leq w < 20$	10
$20 \leq w < 30$	12
Total	**30**

(Total for Question 8 is 4 marks)

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9 The times, in seconds, taken by 20 runners to finish a sprint were recorded.

Sprint times, t seconds (20 runners)

11.2	13.5	9.8	14.1	10.5
12.9	14.0	9.5	13.2	11.8
14.6	10.1	12.4	13.8	9.9
11.5	14.9	10.8	12.1	13.0

(a) Use the data to complete a grouped frequency table with the class intervals $9 \leq t < 11$, $11 \leq t < 13$ and $13 \leq t < 15$. **(2)**

(b) Calculate an estimate of the mean sprint time. Give your answer correct to 2 decimal places. **(4)**

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(Total for Question 9 is 6 marks)

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10 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 10 is 4 marks)

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11 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 11 is 4 marks)

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12 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 12 is 6 marks)

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13 A cafe recorded the time, m minutes, that 26 + b customers spent queuing at the counter. One frequency, b, is unknown.

Time, m (minutes): $0 < m \leq 5$, $5 < m \leq 10$, $10 < m \leq 15$, $15 < m \leq 20$

Frequency (f): 8, 12, b, 6

Given that the estimated mean queuing time is 10 minutes, find the value of b. You must show your working.

(Total for Question 13 is 4 marks)

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Mark scheme · 4.18 Averages from Frequency Tables: Test Pack

Question 1

1 cao	**B1**

Answer: 1 (one book is the mode because frequency 3 is highest).

Question 2

correct comparison of the means with correct direction, e.g. Class B has a higher mean (6.85 > 5.85), so Class B scored higher on average, oe	**B1**
correct comparison of the ranges with correct direction, e.g. Class B has a smaller range (3 < 4), so Class B's scores were more consistent, oe	**B1**

Answer: Class B did better on average, since its mean (6.85) is higher than Class A's mean (5.85). Class B's scores were also more consistent, since its range (3) is smaller than Class A's range (4).

Question 3

sum(fx) = 15 + 2t oe	**M1**
sum(f) = 14 + t oe	**M1**
correct equation formed and rearranged, e.g. (15 + 2t) = 1.5(14 + t) oe	**M1**
t = 12 cao	**A1**

Answer: t = 12

Question 4

midpoints of the classes	**M1**
midpoint x frequency	**M1**
sum 3940 divided by 86	**M1**
45.8	**A1**

Answer: 45.8

Question 5

correct use of cumulative frequencies to identify the 10th and 11th values (3, 10, 16, 19, 20) oe	**M1**
1.5 cao	**A1**

Answer: 1.5

Question 6

identify middle positions 10th and 11th in 20 items	**M1**
locate 10th and 11th values in cumulative: six 0s then eight 1s gives positions 7-14 as 1	**M1**
state both middle values are 1	**M1**
1 cao	**A1**

Answer: 1 (the 10th and 11th values are both 1 so median = 1).

Question 7

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

Answer: Mode = 2 because it has the highest frequency (6).

Question 8

estimate for Machine A: sum(f x midpoint) = 410, mean = 410 / 30 = 13.67 awrt oe	**M1**
estimate for Machine B: sum(f x midpoint) = 490, mean = 490 / 30 = 16.33 awrt oe	**M1**
both means correct, awrt 13.67 and awrt 16.33	**A1**
correct conclusion, Machine A, with valid reason based on the two calculated means (ft their means)	**B1**

Answer: Machine A: 13.67 seconds; Machine B: 16.33 seconds; recommend Machine A, as it has the shorter mean waiting time.

Question 9

(a) at least two of the three frequencies correct	**B1**
(a) all three frequencies correct: 6, 6, 8	**B1**

(a) Answer: $9 \le t < 11$: 6; $11 \le t < 13$: 6; $13 \le t < 15$: 8

(b) midpoints 10, 12, 14 identified (ft their frequencies from (a))	**M1**
(b) sum(f x midpoint) = 244 oe (ft their frequencies)	**M1**
(b) 244 / 20 (dependent on both previous M marks)	**M1**
(b) 12.2 cao	**A1**

(b) Answer: 12.2 seconds

Question 10

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

Answer: 11.5

Question 11

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

Answer: 12

Question 12

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

Answer: 130/7 (approximately 18.571)

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Question 13

correct midpoints identified: 2.5, 7.5, 12.5, 17.5	**M1**
sum(fx) = 20 + 90 + 12.5b + 105 (= 215 + 12.5b) oe, and sum(f) = 26 + b oe	**M1**
(215 + 12.5b) / (26 + b) = 10 leading to 215 + 12.5b = 260 + 10b, dependent on both previous M marks	**dM1**
18 cao	**A1**

Answer: b = 18

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