HIGHER

4.1 Histograms and Frequency Density: 1-hour Pack

Total Marks

EDEXCEL 4MA1 · Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 The table gives information about the masses, m kg, of parcels at a warehouse. There are 232 items altogether. Frequencies of the other classes: $50 < m \leq 70$: 56; $70 < m \leq 75$: 14; $75 < m \leq 105$: 78.

A histogram is drawn for all the classes. Work out the height of the bar for the class $20 < m \leq 50$.

(Total for Question 1 is 3 marks)

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2 The table gives information about the time, t minutes, spent on homework by pupils at a school. Class and frequency: $0 < t \leq 30$: 18; $30 < t \leq 35$: 8; $35 < t \leq 55$: 60; $55 < t \leq 65$: 18.

A histogram is drawn from this table. The bar for $30 < t \leq 35$ is 0.8 cm tall.

Work out the height of the bar for $0 < t \leq 30$.

(Total for Question 2 is 3 marks)

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3 A histogram shows information about the ages, a years, of people at a gym.
Bar heights (frequency density): $20 < a \leq 40$: height 0.2; $40 < a \leq 60$: height 0.6; $60 < a \leq 80$: height 2.8; $80 < a \leq 100$: height 2; $100 < a \leq 130$: height 1.
Calculate an estimate of the mean. Give your answer to 1 decimal place if it is not exact.

(Total for Question 3 is 4 marks)

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4 A histogram shows information about the time, t minutes, spent on homework by pupils at a high school.
Bar heights (frequency density): $20 < t \leq 50$: height 1.8; $50 < t \leq 70$: height 1; $70 < t \leq 80$: height 2.8; $80 < t \leq 90$: height 1.2; $90 < t \leq 100$: height 2.4.
Estimate the median. Give your answer to 1 decimal place if it is not exact.

(Total for Question 4 is 5 marks)

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5 The table gives information about the time, t minutes, spent on homework by pupils at an academy.
Class and frequency: $0 < t \leq 30$: 24; $30 < t \leq 50$: 44; $50 < t \leq 70$: 12; $70 < t \leq 90$: 12; $90 < t \leq 95$: 15.
A histogram is to be drawn. Work out the frequency density for each class.

(Total for Question 5 is 3 marks)

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6 A histogram shows information about the lengths, l cm, of fish caught in a lake.
Bar heights (frequency density): $0 < l \leq 20$: height 0.6; $20 < l \leq 30$: height 2.8; $30 < l \leq 40$: height 0.8.
Work out the frequency of the class $0 < l \leq 20$.

(Total for Question 6 is 2 marks)

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7 A histogram shows information about the ages, a years, of people at a swimming pool.
Bar heights (frequency density): $20 < a \leq 30$: height 2; $30 < a \leq 40$: height 0.2; $40 < a \leq 60$: height 1.8; $60 < a \leq 70$: height 2.2; $70 < a \leq 75$: height 0.6.
One item is chosen at random. Estimate the probability that $a > 63$.

(Total for Question 7 is 4 marks)

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8 The table gives information about the ages, a years, of people at a club. There are 36 items altogether. Frequencies of the other classes: $10 < a \leq 20$: 16; $20 < a \leq 25$: 4; $25 < a \leq 30$: 4.
A histogram is drawn for all the classes. Work out the height of the bar for the class $30 < a \leq 40$.

(Total for Question 8 is 3 marks)

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9 The table gives information about the time, t minutes, spent on homework by pupils at a school.
Class and frequency: $0 < t \leq 10$: 8; $10 < t \leq 15$: 14; $15 < t \leq 20$: 12; $20 < t \leq 40$: 28; $40 < t \leq 50$: 6.
A histogram is drawn from this table. The bar for $0 < t \leq 10$ is 1.2 cm tall.
Work out the height of the bar for $15 < t \leq 20$.

(Total for Question 9 is 3 marks)

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10 A histogram shows information about the distances, d km, travelled by workers to get to a hospital.

Bar heights (frequency density): $0 < d \leq 20$: height 1; $20 < d \leq 40$: height 2.2; $40 < d \leq 60$: height 1.6; $60 < d \leq 70$: height 1.8.

Calculate an estimate of the mean. Give your answer to 1 decimal place if it is not exact.

(Total for Question 10 is 4 marks)

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11 A histogram shows information about the heights, h cm, of plants in a greenhouse.

Bar heights (frequency density): $20 < h \leq 40$: height 2; $40 < h \leq 60$: height 2.8; $60 < h \leq 65$: height 1.2; $65 < h \leq 70$: height 1.4.

Estimate the median. Give your answer to 1 decimal place if it is not exact.

(Total for Question 11 is 5 marks)

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12 A histogram shows information about the distances, d km, travelled by workers to get to a hospital.

Bar heights (frequency density): $20 < d \leq 50$: height 0.4; $50 < d \leq 70$: height 2; $70 < d \leq 90$: height 2.6; $90 < d \leq 110$: height 2.6; $110 < d \leq 130$: height 1.4.

Estimate the number of workers with d less than or equal to 52.

(Total for Question 12 is 3 marks)

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Mark scheme · 4.1 Histograms and Frequency Density: 1-hour Pack

Question 1

missing frequency = 232 - 148 = 84	**M1**
frequency density = frequency / width = 84/30	**M1**
height = 2.8	**A1**

Answer: 2.8

Question 2

bar height is proportional to frequency density	**M1**
densities 1.6 and 0.6, giving a height scale of 0.8 / 1.6 = 0.5 cm per unit	**M1**
height = 0.3 cm	**A1**

Answer: 0.3 cm

Question 3

frequencies = frequency density x width: 4, 12, 56, 40, 30	**M1**
midpoints: 30, 50, 70, 90, 115	**M1**
sum of midpoint x frequency = 11690, divided by the total frequency 142	**M1**
mean = 82.3	**A1**

Answer: 82.3

Question 4

frequencies = frequency density x width: 54, 20, 28, 12, 24	**M1**
total frequency 138, so the median is the 69th value	**M1**
median lies in the class $50 < t \leq 70$, with 54 values before it	**M1**
interpolates: 50 + (69 - 54) / 1	**M1**
median = 65	**A1**

Answer: 65

Question 5

uses frequency density = frequency / class width	**M1**
at least two frequency densities correct, e.g. 0.8 and 2.2	**A1**
frequency densities: 0.8, 2.2, 0.6, 0.6, 3	**A1**

Answer: 0.8, 2.2, 0.6, 0.6, 3

Question 6

uses frequency = frequency density x class width	**M1**
0.6 x 20 = 12	**A1**

Answer: 12

Question 7

frequencies = frequency density x width: 20, 2, 36, 22, 3	**M1**
total frequency = 83	**M1**
estimates the number with $a > 63$ as 18.4 using the proportion of the class $60 < a \leq 70$	**M1**
probability = 18.4/83 = 92/415	**A1**

Answer: 92/415

Question 8

missing frequency = 36 - 24 = 12	**M1**
frequency density = frequency / width = 12/10	**M1**
height = 1.2	**A1**

Answer: 1.2

Question 9

bar height is proportional to frequency density	**M1**
densities 0.8 and 2.4, giving a height scale of 1.2 / 0.8 = 1.5 cm per unit	**M1**
height = 3.6 cm	**A1**

Answer: 3.6 cm

Question 10

frequencies = frequency density x width: 20, 44, 32, 18	**M1**
midpoints: 10, 30, 50, 65	**M1**
sum of midpoint x frequency = 4290, divided by the total frequency 114	**M1**
mean = 37.6	**A1**

Answer: 37.6

Question 11

frequencies = frequency density x width: 40, 56, 6, 7	**M1**
total frequency 109, so the median is the 54.5th value	**M1**
median lies in the class $40 < h \leq 60$, with 40 values before it	**M1**
interpolates: 40 + (109/2 - 40) / 2.8	**M1**
median = 45.2	**A1**

Answer: 45.2

Question 12

the part of the class $50 < d \leq 70$ up to 52 has width 2	**M1**
frequency in that part = 2 x 2 = 4, then adds the frequencies of the earlier classes	**M1**
16	**A1**

Answer: 16

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