7.16D Histograms: Fluency and Exam Drill

Total Marks

EDEXCEL Edexcel 1MA1 · Calculator allowed · about 50 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A histogram has a class 10-20 with frequency density 3. Work out the frequency for the class 10-20.

(Total for Question 1 is 1 mark)

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2 A histogram has classes 0-5, 5-15 and 15-25. The class widths are 5, 10 and 10. The frequency densities are 4, 2.5 and 3 respectively.
Work out the frequency of the class 5-15.

(Total for Question 2 is 2 marks)

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3 A histogram has three classes 0-4, 4-9 and 9-14. The frequency density for 0-4 is 2 and for 9-14 is 3. The total number of observations is 40.
Find the frequency density of the class 4-9.

(Total for Question 3 is 3 marks)

4 The histogram below has three bars:
0-6 width 6 with frequency density 2,
6-14 width 8 with frequency density 1.25,
14-20 width 6 with frequency density 1.5.
Estimate the frequency of the class 6-14.

Figure (to be drawn): Three histogram bars for intervals 0-6 (density 2), 6-14 (density 1.25), 14-20 (density 1.5). Not to scale.

(Total for Question 4 is 1 mark)

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5 A class 20-35 has frequency 45. Work out the frequency density for the class 20-35.

(Total for Question 5 is 2 marks)

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6 The histogram shows three classes:
0-10 width 10 with density 1 (frequency 10),
10-25 width 15 with density 2 (frequency 30),
25-40 width 15 with density 1.6 (frequency 24).
Estimate the median value.

Figure (to be drawn): Histogram with classes 0-10 (density 1), 10-25 (density 2), 25-40 (density 1.6). Not to scale.

(Total for Question 6 is 3 marks)

7 A histogram has classes:
0-10 density 1.2,
10-20 density 1.5,
20-40 density 0.8.
Use the histogram to estimate the mean. Give your answer correct to one decimal place.

Figure (to be drawn): Histogram with classes 0-10 (density 1.2), 10-20 (density 1.5), 20-40 (density 0.8). Not to scale.

(Total for Question 7 is 4 marks)

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8 The class 50-80 has width 30 and frequency 90. Show that the frequency density for 50-80 is 3.

(Total for Question 8 is 2 marks)

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9 A histogram has classes 0-5 (density 4) and 5-15 (density 2).
Estimate the number of observations with $3 \leq x < 8$.

Figure (to be drawn): Two histogram bars: 0-5 density 4, 5-15 density 2. Not to scale.

(Total for Question 9 is 3 marks)

10 A histogram has classes:
0-10 density 1 (frequency 10),
10-30 density 2 (frequency 40),
30-? density 3 (frequency unknown).
The total number of observations is 80.
Find the upper boundary of the last class.

(Total for Question 10 is 3 marks)

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11 A histogram has classes:
0-10 density 2,
10-25 density 4,
25-45 density d.
The midpoints are 5, 17.5 and 35 respectively.
The mean of the whole distribution is 20.
Find the frequency of the final class.

Figure (to be drawn): Histogram with classes 0-10 (density 2), 10-25 (density 4), 25-45 (density d). Not to scale.

(Total for Question 11 is 4 marks)

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12 A histogram has classes:
A: 0-10 density 3,
B: 10-20 density 2,
C: 20-50 density 1.2.
Which class has the largest frequency density and which class has the largest frequency? Give both answers.

(Total for Question 12 is 2 marks)

Mark scheme · 7.16D Histograms: Fluency and Exam Drill

Question 1

- **B1** 30 cao
- **Answer: 30 (because frequency = density × width = 3 × 10 = 30).**

Question 2

- **M1** multiply density by class width (2.5 × 10)
- **A1** 25 cao
- **Answer: 25 (because frequency = 2.5 × 10 = 25).**

Question 3

- **M1** calculate frequencies of known classes: 0-4: 2 × 4 = 8; 9-14: 3 × 5 = 15, then find missing frequency 40 - 8 - 15 = 17
- **M1** divide missing frequency by width: 17 ÷ 5
- **A1** 3.4 cao
- **Answer: 3.4 (because frequency for 4-9 is 17, so density = 17 ÷ 5 = 3.4).**

Question 4

- **B1** 10 cao
- **Answer: 10 (frequency = density × width = 1.25 × 8 = 10).**

Question 5

- **M1** divide frequency by width: 45 ÷ 15
- **A1** 3 cao
- **Answer: 3 (frequency density = 45 ÷ 15 = 3).**

Question 6

- **M1** find total frequency 10 + 30 + 24 = 64 and locate median at N/2 = 32 within class 10-25 (cumulative before = 10)
- **M1** use density 2 to find distance into class: (32 - 10) ÷ 2 = 11
- **A1** 21 cao
- **Answer: 21 (median at 10 + 11 = 21).**

Question 7

- **M1** calculate frequencies: 0-10: 1.2 × 10 = 12; 10-20: 1.5 × 10 = 15; 20-40: 0.8 × 20 = 16
- **M1** use midpoints 5, 15, 30 and calculate sum of x × frequency: 5×12 + 15×15 + 30×16 = 765
- **M1** divide by total frequency 12 + 15 + 16 = 43
- **A1** 17.8 awrt
- **Answer: 17.8 (mean approx 765 ÷ 43 approx 17.7907, so 17.8 to 1 d.p.).**

Question 8

- **M1** divide frequency by width: 90 ÷ 30
- **A1** 3 cao cso
- **Answer: 3 (90 ÷ 30 = 3).**

Question 9

- **M1** estimate contribution from 3-5: length 2 × density 4 = 8
- **M1** estimate contribution from 5-8: length 3 × density 2 = 6
- **A1** 14 cao
- **Answer: 14 (8 from 3-5 plus 6 from 5-8).**

Question 10

- **M1** set up equation: 10 + 40 + 3w = 80, where w is the width of the last class
- **M1** solve 3w = 30 so w = 10
- **A1** upper boundary = 30 + 10 = 40 cao
- **Answer: 40 (the last class is 30-40 because width w = 10).**

Question 11

- **M1** express frequencies: 0-10: 2×10 = 20; 10-25: 4×15 = 60; 25-45: 20d
- **M1** write mean equation: (5×20 + 17.5×60 + 35×20d) ÷ (20 + 60 + 20d) = 20
- **M1** solve equation to get d = 1.5
- **A1** frequency of final class = 20 × 1.5 = 30 cao
- **Answer: 30 (density d = 1.5 so frequency = 20 × 1.5 = 30).**

Question 12

- **B1** largest density: class A (density 3)
- **B1** largest frequency: class C (frequency = 1.2 × 30 = 36)
- **Answer:Largest density: class A (density 3).**
  Largest frequency: class C (frequency 1.2 × 30 = 36).