HIGHER

7.16 Histograms: Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

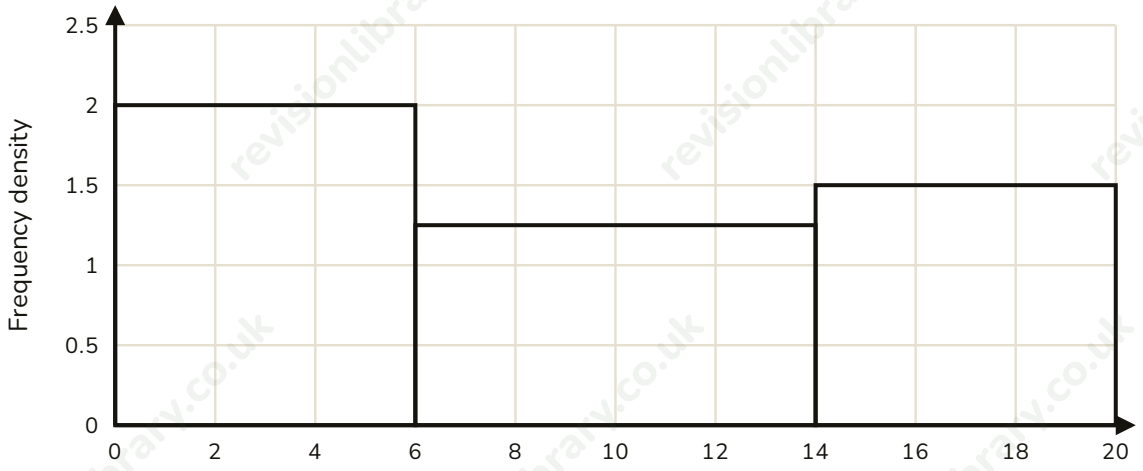
Answer ALL questions. Show all your working.

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)

---

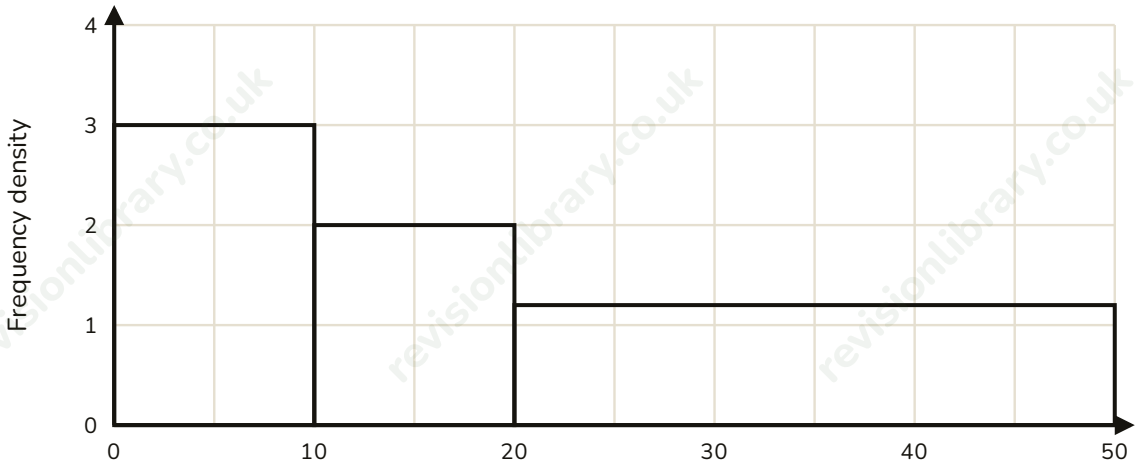
2 The histogram below has three bars:
0-6 width 6 with frequency density 2,
6-14 width 8 with frequency density 1.25,
14-20 width 6 with frequency density 1.5.
Estimate the frequency of the class 6-14.



(Total for Question 2 is 1 mark)

© Revision Library | revisionlibrary.co.uk

3 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 3 is 2 marks)

---

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

(Total for Question 4 is 2 marks)

---

5 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 5 is 3 marks)

© Revision Library | revisionlibrary.co.uk

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

(Total for Question 6 is 2 marks)

---

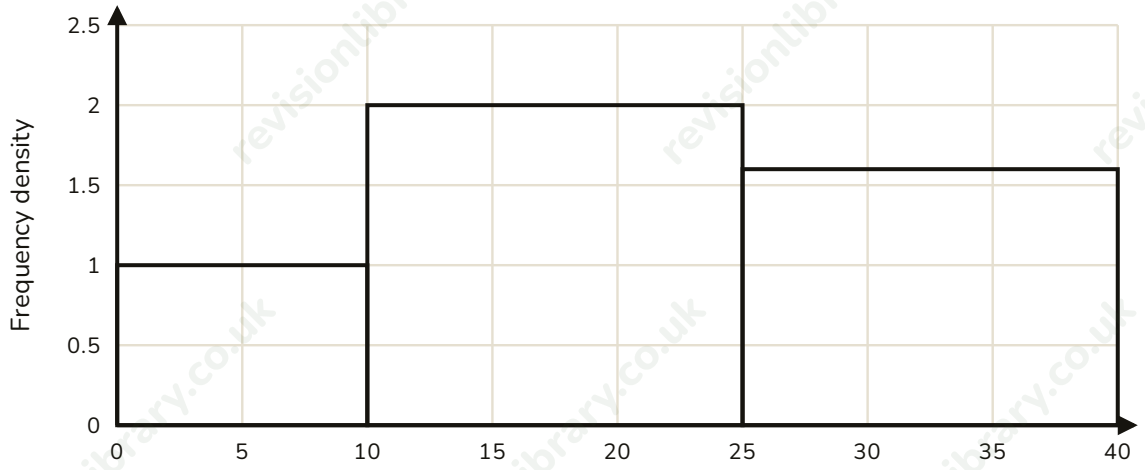
7 Which of the following is the correct formula for the frequency density of a class in a histogram?

- ☐ A) frequency density = frequency x class width
- ☐ B) frequency density = frequency / class width
- ☐ C) frequency density = class width / frequency
- ☐ D) frequency density = frequency + class width

(Total for Question 7 is 1 mark)

---

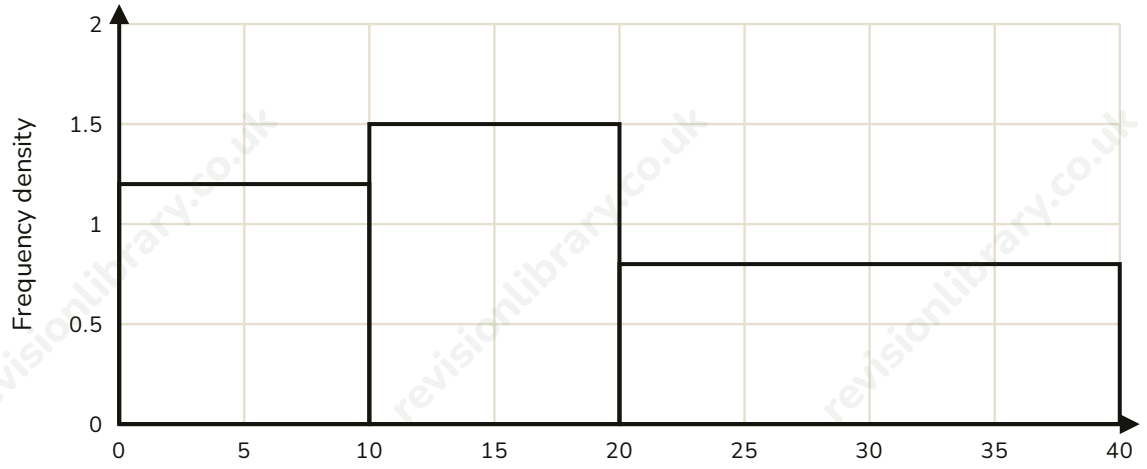
8 The histogram shows three classes:
0-10 width 10 with density 1 (frequency 10),
10-25 width 15 with density 2 (frequency 30),
25-40 width 15 with density 1.6 (frequency 24).
Estimate the median value.



(Total for Question 8 is 3 marks)

© Revision Library | revisionlibrary.co.uk

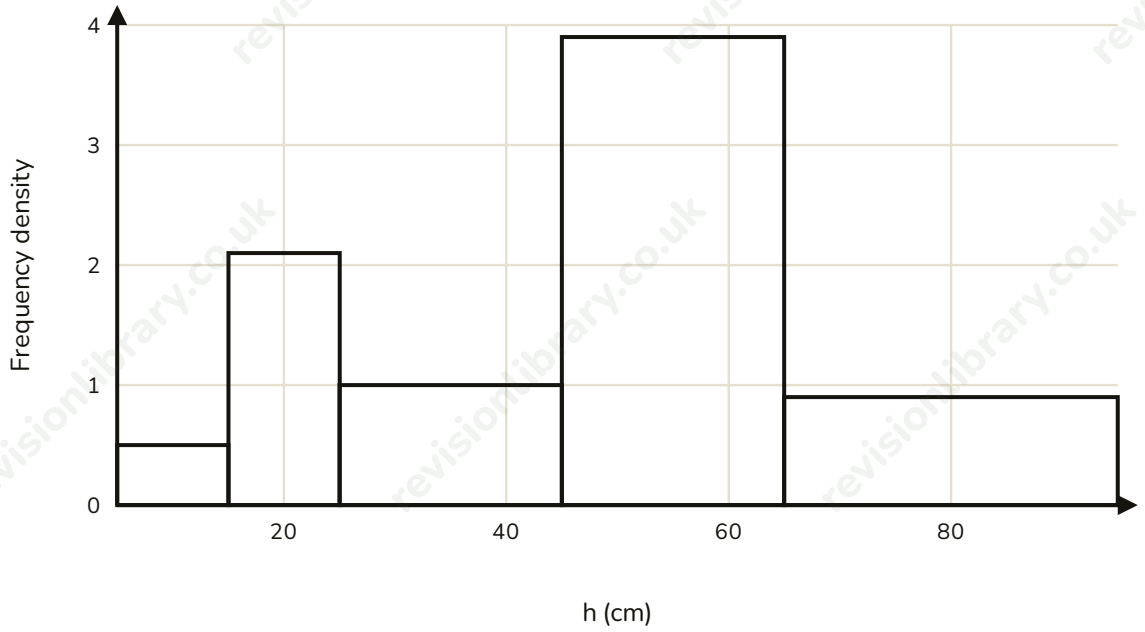
9 A histogram has classes:
0-10 density 1.2,
10-20 density 1.5,
20-40 density 0.8.
Use the histogram to estimate the mean. Give your answer correct to one decimal place.



(Total for Question 9 is 4 marks)

© Revision Library | revisionlibrary.co.uk

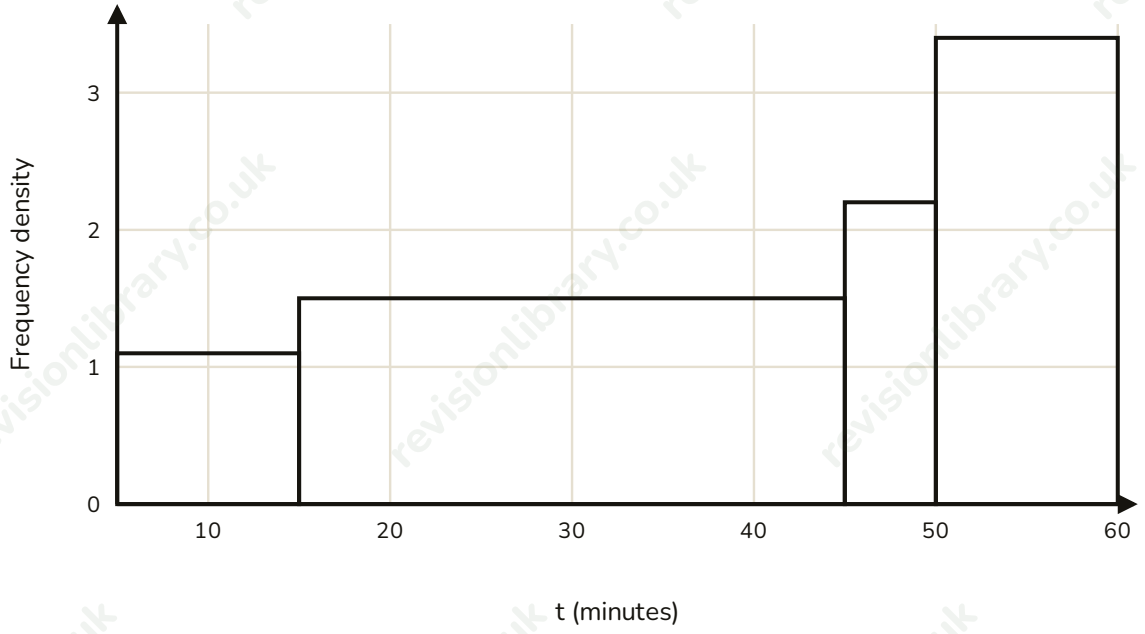
10 A histogram shows the height (h cm) of some items. The heights of the bars (frequency densities) are: $5 < h \leq 15$: bar height 0.5; $15 < h \leq 25$: bar height 2.1; $25 < h \leq 45$: bar height 1; $45 < h \leq 65$: bar height 3.9; $65 < h \leq 95$: bar height 0.9. Work out the total frequency.



(Total for Question 10 is 3 marks)

© Revision Library | revisionlibrary.co.uk

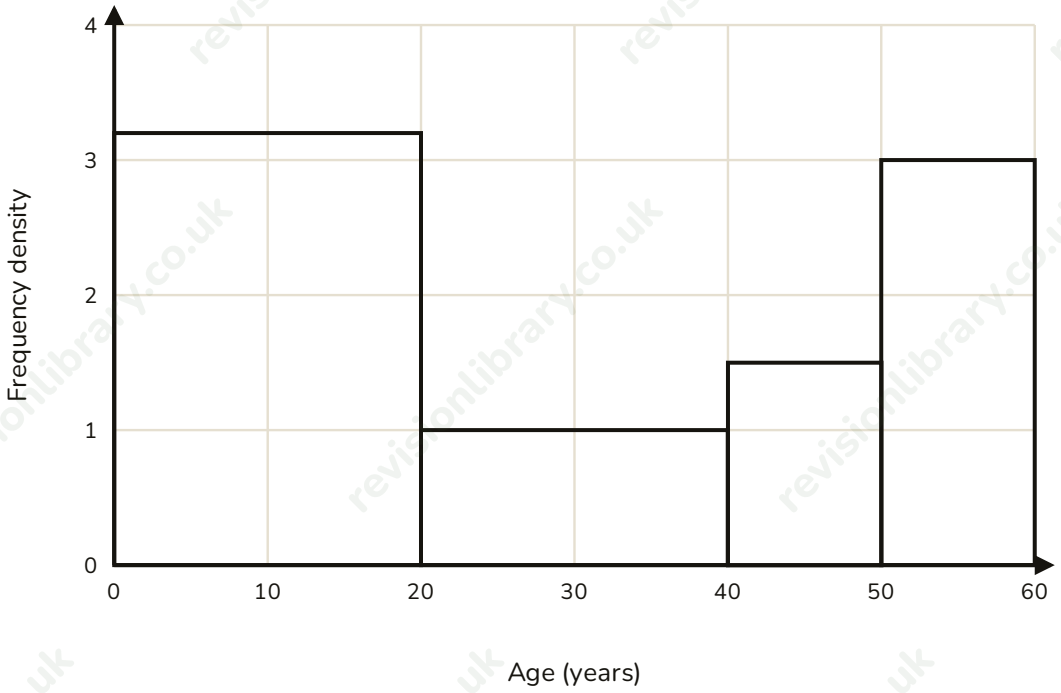
11 A histogram shows the time (t minutes) of some items. The heights of the bars (frequency densities) are: $5 < t \leq 15$: bar height 1.1; $15 < t \leq 45$: bar height 1.5; $45 < t \leq 50$: bar height 2.2; $50 < t \leq 60$: bar height 3.4. Work out an estimate for the mean time. Give your answer correct to 1 decimal place.



(Total for Question 11 is 4 marks)

© Revision Library | revisionlibrary.co.uk

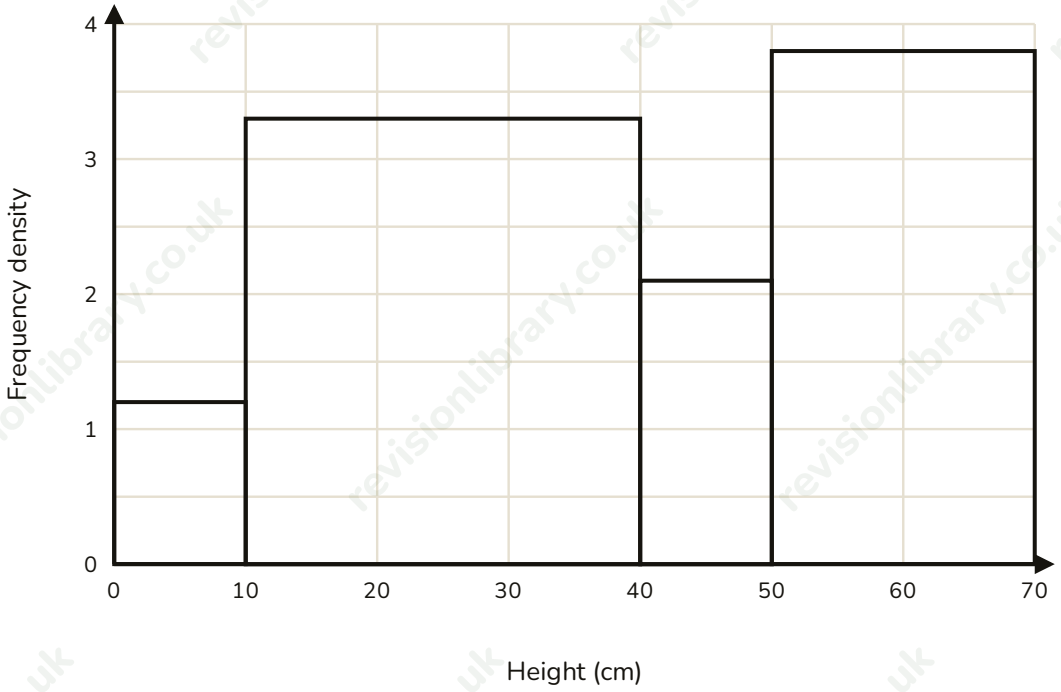
12 A histogram shows the age (a years) of some items. The heights of the bars (frequency densities) are: $0 < a \leq 20$: bar height 3.2; $20 < a \leq 40$: bar height 1; $40 < a \leq 50$: bar height 1.5; $50 < a \leq 60$: bar height 3. Work out an estimate for the number of items with a greater than 16.



(Total for Question 12 is 4 marks)

© Revision Library | revisionlibrary.co.uk

13 A histogram shows the height (h cm) of some items. The heights of the bars (frequency densities) are: $0 < h \leq 10$: bar height 1.2; $10 < h \leq 40$: bar height 3.3; $40 < h \leq 50$: bar height 2.1; $50 < h \leq 70$: bar height 3.8. Work out the total frequency.



(Total for Question 13 is 3 marks)

---

14 A histogram shows the time (t minutes) of some items. The bar for the class width 10 has a frequency of 33. Another bar has class width 30 and is 2 times as tall as that bar. Work out the frequency for the class of width 30.

(Total for Question 14 is 3 marks)

© Revision Library | revisionlibrary.co.uk

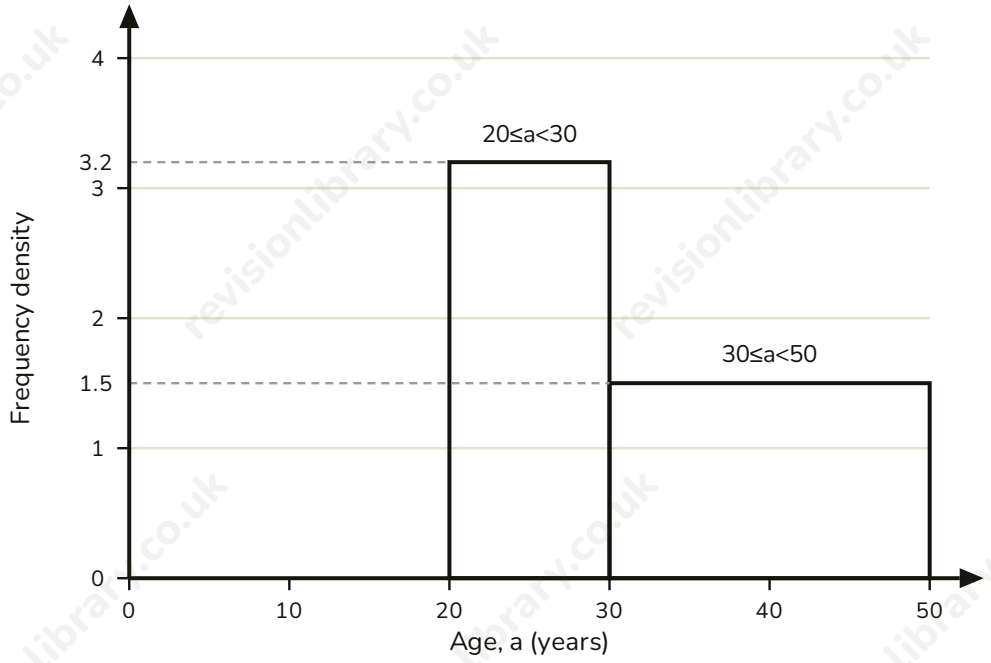
15 A histogram shows the height (h cm) of some items. The heights of the bars (frequency densities) are: $5 < h \leq 15$: bar height 3.8; $15 < h \leq 35$: bar height 0.6; $35 < h \leq 55$: bar height 3; $55 < h \leq 65$: bar height 2.4. Work out an estimate for the mean height. Give your answer correct to 1 decimal place.

(Total for Question 15 is 4 marks)

---

16 A histogram shows the ages of visitors to a museum. The class $20 \leq a < 30$ has frequency density 3.2, and the class $30 \leq a < 50$ has frequency density 1.5.

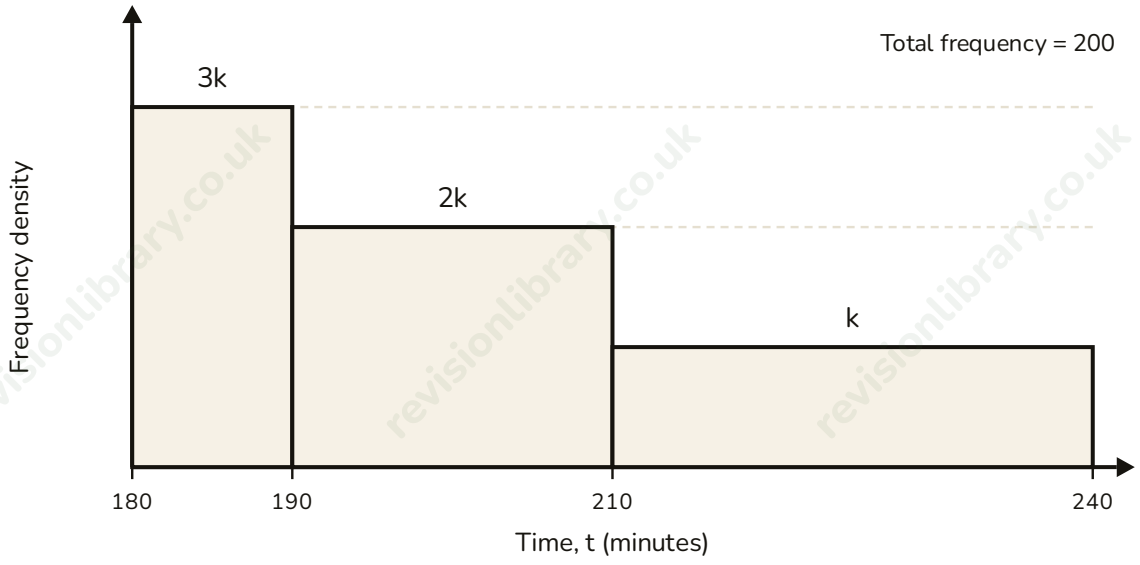
James says: 'More visitors were aged 30-50 than 20-30, because that class covers a bigger range of ages.'



(Total for Question 16 is 3 marks)

© Revision Library | revisionlibrary.co.uk

17 A histogram represents the finishing times, in minutes, of 200 athletes in a marathon, grouped into three classes: $180 \leq t < 190$ (width 10), $190 \leq t < 210$ (width 20), and $210 \leq t < 240$ (width 30). The heights of the three bars are in the ratio 3 : 2 : 1 respectively. Find the number of athletes with finishing times in the class $190 \leq t < 210$.



Bar heights in ratio 3 : 2 : 1 (scale unknown)

(Total for Question 17 is 3 marks)

© Revision Library | revisionlibrary.co.uk

Mark scheme · 7.16 Histograms: Test Pack

Question 1

30 cao **B1**

Answer: 30 (because frequency = density × width = 3 × 10 = 30).

Question 2

10 cao **B1**

Answer: 10 (frequency = density × width = 1.25 × 8 = 10).

Question 3

largest density: class A (density 3) **B1**

largest frequency: class C (frequency = 1.2 × 30 = 36) **B1**

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

Question 4

divide frequency by width: 45 ÷ 15 **M1**

3 cao **A1**

Answer: 3 (frequency density = 45 ÷ 15 = 3).

Question 5

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 **M1**

3.4 cao **A1**

Answer: 3.4 (because frequency for 4-9 is 17, so density = 17 ÷ 5 = 3.4).

Question 6

divide frequency by width: 90 ÷ 30 **M1**

3 cao cso **A1**

Answer: 3 (90 ÷ 30 = 3).

Question 7

B cao **B1**

Answer: B

Question 8

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 **M1**

21 cao **A1**

Answer: 21 (median at 10 + 11 = 21).

Question 9

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 **M1**

17.8 awrt **A1**

Answer: 17.8 (mean approx 765 ÷ 43 approx 17.7907, so 17.8 to 1 d.p.).

Question 10

frequency = frequency density x class width for at least two classes **M1**

all frequencies found **M1**

151 cao **A1**

Answer: 151

Question 11

frequencies found using frequency density x width **M1**

midpoints used **M1**

sum of frequency x midpoint divided by total frequency **M1**

38.1 minutes cao **A1**

Answer: 38.1 minutes

Question 12

fd x (20 - 16) for the class containing 16 **M1**

frequencies of the later classes found **M1**

adds all the parts **M1**

77.8 cao **A1**

Answer: 77.8

Question 13

frequency = frequency density x class width for at least two classes **M1**

all frequencies found **M1**

208 cao **A1**

Answer: 208

Question 14

frequency density of first bar = 33/10 **M1**

frequency density of second bar = 2 x 33/10 **M1**

198 cao **A1**

Answer: 198

Question 15

frequencies found using frequency density x width **M1**

midpoints used **M1**

sum of frequency x midpoint divided by total frequency **M1**

36.0 cm cao **A1**

Answer: 36.0 cm

Question 16

frequency for $20 \leq a < 30 = 3.2 \times 10 = 32$ **M1**

frequency for $30 \leq a < 50 = 1.5 \times 20 = 30$ **M1**

correct conclusion with comparison shown: since 32 > 30, James is wrong oe **B1**

Answer: James is wrong: there were 32 visitors aged 20-30 but only 30 aged 30-50, even though that class covers a bigger age range.

© Revision Library | revisionlibrary.co.uk

Question 17

expressing frequencies in terms of k: 10 x 3k = 30k, 20 x 2k = 40k, 30 x k = 30k	**M1**
30k + 40k + 30k = 200, so 100k = 200, k = 2	**M1**
frequency for 190 ≤ t < 210 = 40k = 80 cao	**A1**

Answer: 80 athletes

© Revision Library | revisionlibrary.co.uk