



H16-test Histograms and Frequency Density: Test Pack

EDEXCEL 1ST0 · Calculator allowed · about 35 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** In a grouped frequency table with unequal class widths, the frequency density for a class is found using the formula:

frequency density = frequency $\div$ class width

- (a)** A class has frequency 24 and class width 6. Work out the frequency density for this class. (2)

- (b)** A different class has frequency 45 and class width 9. Work out the frequency density for this class. (2)

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(Total for Question 1 is 4 marks)

- 2** A cinema manager recorded how long, q minutes, each of 70 customers queued at the kiosk before a late-night screening. She grouped the times using unequal class widths, because most customers queued for a fairly short time, with far fewer queuing for a long time.

Time, q (minutes)	Frequency	Class width	Frequency density
$0 \leq q < 10$	12	10	1.2
$10 \leq q < 20$	18	10	1.8
$20 \leq q < 40$	20	20	?
$40 \leq q < 70$	15	30	?
$70 \leq q < 90$	5	20	?

- (a) Complete the table by calculating the three missing frequency densities. (3)

- (b) Write down the class with the highest frequency density. (1)

- (c) Suggest one reason why the manager used unequal class widths for the queue times, rather than five equal-width classes of 18 minutes each. (1)

(Total for Question 2 is 5 marks)

3 For each statement about histograms, write down whether it is True or False.

(i) In a histogram, the area of each bar represents the frequency for that class. **(1)**

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(ii) If every class in a histogram has the same width, the tallest bar always shows the class with the most data values. **(1)**

.....

(iii) In a histogram with unequal class widths, the tallest bar always shows the class with the most data values. **(1)**

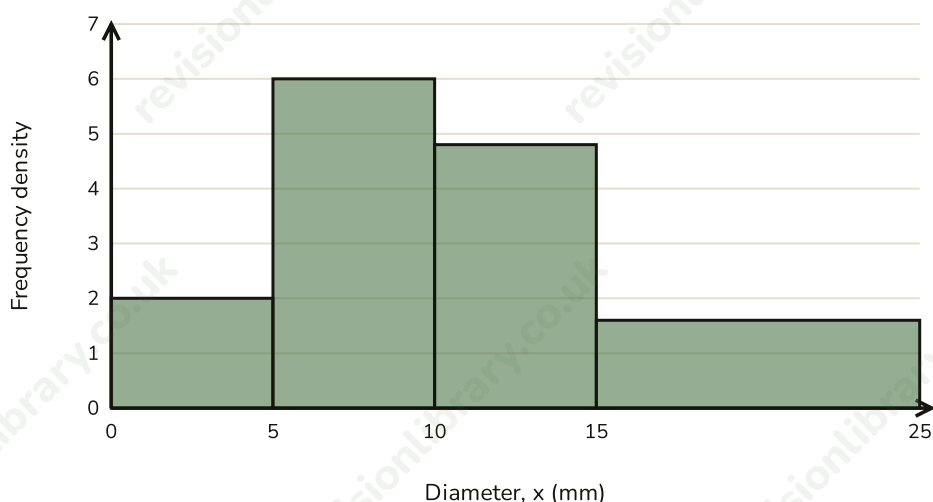
.....

(iv) The vertical axis of a histogram should always be labelled 'Frequency'. **(1)**

.....

(Total for Question 3 is 4 marks)

- 4 A quality inspector measured the diameter, x mm, of 80 ball bearings taken from a production line. The histogram shows the results.



- (a) Show that the number of ball bearings with diameter greater than 10mm is 40. (2)
- (b) Hence find the probability that a ball bearing chosen at random from the 80 tested has diameter greater than 10mm. Give your answer as a decimal. (2)
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- (c) State one assumption needed for your answer to part (b) to be valid. (1)

(Total for Question 4 is 5 marks)

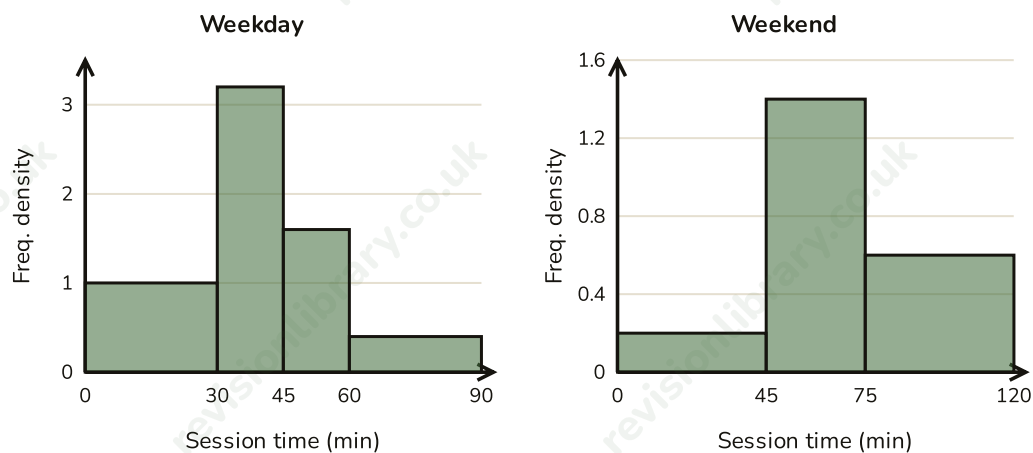
- 5 A gardener records the height, h cm, of 120 seedlings using unequal class widths, because most seedlings are a similar height but a few are much taller. The class $0 < h \leq 10$ has frequency 18. The class $10 < h \leq 40$ has frequency density 2.2. Work out how many of the 120 seedlings are NOT in these two classes.

(Total for Question 5 is 3 marks)

- 6** A market trader sells umbrellas and records his sales on a histogram with unequal class widths. He says: 'The tallest bar on my histogram is for umbrellas priced £15 to £20, so I sold more umbrellas in that price range than in any other.' The class $15 < p \leq 20$ has frequency density 9. The class $20 < p \leq 45$ has frequency density 3. Work out the number of umbrellas sold in each of these two price ranges, and use your answers to evaluate the trader's claim.

(Total for Question 6 is 4 marks)

- 7** A gym recorded the length of members' gym sessions, in minutes, separately for 114 weekday visits and 78 weekend visits. The histograms show the results.



- (a) Work out the number of weekday sessions lasting between 45 and 60 minutes. (2)
- (b) Work out the number of weekend sessions lasting between 45 and 75 minutes. (2)
- (c) Make two comparisons between the weekday and weekend histograms, referring to frequency density values from each chart. (2)

(Total for Question 7 is 6 marks)

Mark scheme · H16-test Histograms and Frequency Density: Test Pack

Question 1

- (a) **M1** $24 \div 6$, oe
- (a) **A1** 4 cao
- (a) **Answer: 4**
- (b) **M1** $45 \div 9$, oe
- (b) **A1** 5 cao
- (b) **Answer: 5**

Question 2

- (a) **B1** 1.0 cao ($20 \div 20$)
- (a) **B1** 0.5 cao ($15 \div 30$)
- (a) **B1** 0.25 cao ($5 \div 20$)
- (a) **Answer: 1.0, 0.5, 0.25**
- (b) **B1** $10 \leq q < 20$ cao, ft from (a)
- (b) **Answer: $10 \leq q < 20$**
- (c) **B1** sensible reason, e.g. most queue times are short and cluster together, so narrower classes there give more detail, while the few long queue times can be grouped into wider classes without losing useful information
- (c) **Answer: Narrower classes give more detail where most of the data lies; the few long queue times can share a wider class.**

Question 3

- (i) **B1** True cao
- (i) **Answer: True**
- (ii) **B1** True cao
- (ii) **Answer: True**
- (iii) **B1** False cao
- (iii) **Answer: False**
- (iv) **B1** False cao
- (iv) **Answer: False**

Question 4

- (a) **M1** $4.8 \times 5 + 1.6 \times 10$, oe
- (a) **A1** $24 + 16 = 40$, fully shown
- (a) **Answer: 40**
- (b) **M1** $40 \div 80$, ft from (a)
- (b) **A1** 0.5 cao
- (b) **Answer: 0.5**
- (c) **B1** each ball bearing is equally likely to be chosen (selection is at random), oe
- (c) **Answer: Each ball bearing is equally likely to be selected.**

Question 5

- **M1** 2.2×30 , oe (=66, the frequency of the second class)
- **M1** $18 + 66$, oe (=84)
- **A1** 36 cao
- **Answer: 36**

Question 6

- **M1** 9×5 , oe (=45)
- **M1** 3×25 , oe (=75)
- **A1** 45 and 75 both correct
- **B1** the claim is false: 75 umbrellas were sold priced 20 to £45, more than the 45 sold priced 15 to £20, even though 15-20 has the taller bar
- **Answer: The claim is false: 75 umbrellas were sold priced 20-£45, more than the 45 sold priced 15-£20, even though 15-£20 has the taller bar.**

Question 7

- (a) **M1** 1.6×15 , oe
- (a) **A1** 24 cao
- **(a) Answer: 24**
- (b) **M1** 1.4×30 , oe
- (b) **A1** 42 cao
- **(b) Answer: 42**
- (c) **B1** the weekday histogram's highest frequency density (3.2) is in the 30-45 minute class, showing most weekday sessions are relatively short
- (c) **B1** the weekend histogram's highest frequency density (1.4) is in the 45-75 minute class, showing weekend sessions typically last longer than weekday sessions
- **(c) Answer: Weekday sessions are concentrated in the shorter 30-45 minute class (FD 3.2); weekend sessions are concentrated in the longer 45-75 minute class (FD 1.4), so weekend sessions tend to last longer.**