



H16-30min Histograms and Frequency Density: 30-minute Pack

EDEXCEL 1ST0 · Calculator allowed · about 30 minutes

Total Marks

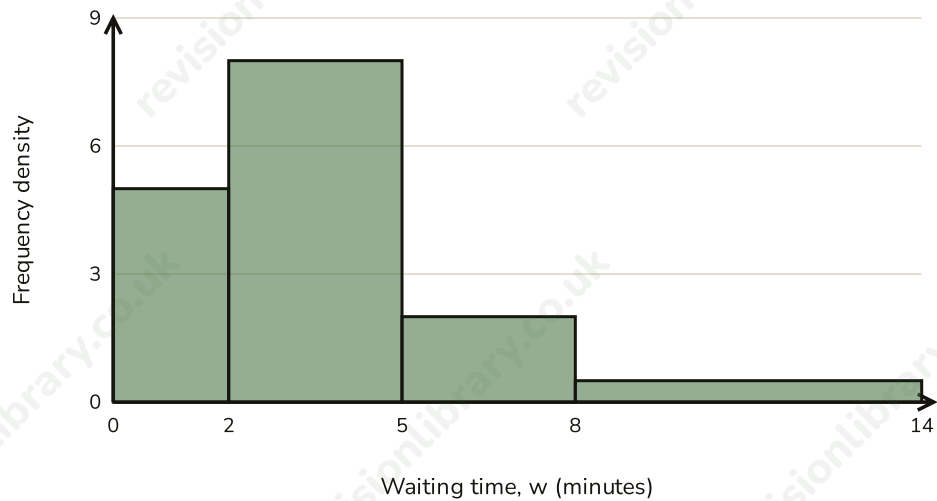
Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** A class has frequency 40 and class width 8. Work out the frequency density for this class.

(Total for Question 1 is 1 mark)

- 2 A cafe manager recorded how long, w minutes, each of a sample of customers waited to be served one lunchtime. The histogram shows the results.



- (a) Work out the number of customers who waited between 2 and 5 minutes. (2)

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(b) Work out the number of customers who waited between 8 and 14 minutes. (2)

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(c) Hence work out how many times as many customers waited between 2 and 5 minutes as waited between 8 and 14 minutes. (2)

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(Total for Question 2 is 6 marks)

- 3** The times, t seconds, taken by 60 runners to complete a sprint drill were recorded, using unequal class widths because sprint times cluster closely together while a few slower runners take much longer. Some entries in the table are missing.

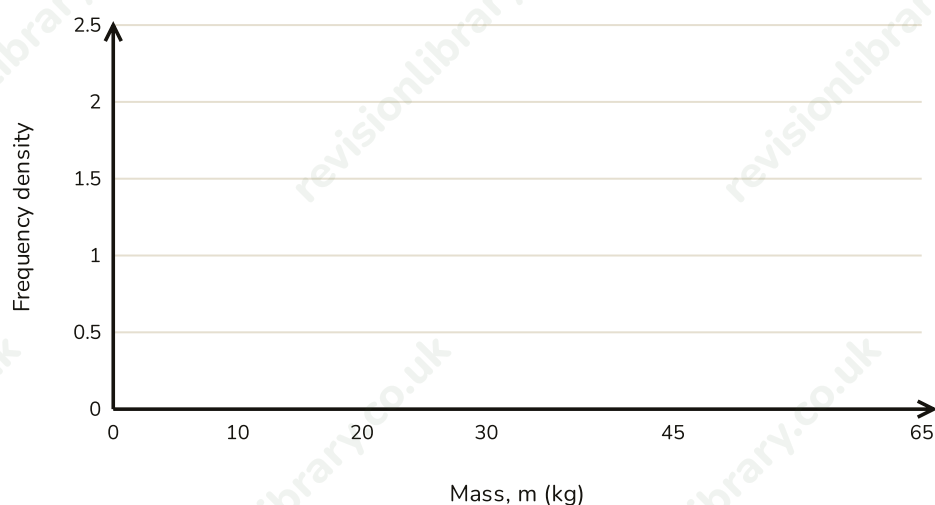
Time, t (seconds)	Frequency	Class width	Frequency density
$10 \leq t < 12$	9	2	4.5
$12 \leq t < 14$	?	2	6
$14 \leq t < 17$	21	3	?
$17 \leq t < 22$	?	5	1.2
$22 \leq t < 30$	?	8	?

- (a) Complete the table by finding the frequency for the class $12 \leq t < 14$, and the frequency density for the class $14 \leq t < 17$. (2)
- (b) Complete the table by finding the frequency for the class $17 \leq t < 22$. (1)
- (c) Given that the total frequency is 60, work out the frequency for the class $22 \leq t < 30$, and hence its frequency density. (3)
- (d) Explain why it would not be appropriate to compare the classes in this table using their frequencies alone. (1)

(Total for Question 3 is 7 marks)

- 4 A vet recorded the mass, m kg, of 80 dogs brought in for a routine check-up, using the grouped frequency table below.

Mass, m (kg)	Frequency	Class width	Frequency density
$0 < m \leq 10$	8	10	0.8
$10 < m \leq 20$	20	10	?
$20 < m \leq 30$	24	10	?
$30 < m \leq 45$	18	15	?
$45 < m \leq 65$	10	20	?



- (a) Complete the table by calculating the four missing frequency densities. (4)

- (b) On the grid, draw a histogram to show this information. (3)

(Total for Question 4 is 7 marks)

- 5** A school's PE department wants to investigate how long, t minutes, Year 10 students spend on physical activity after school on a typical day. They plan to survey a sample of 60 students and record the times using a grouped frequency table with unequal class widths. The data they collected is shown below.

Time, t (minutes)	Frequency	Class width	Frequency density
$0 \leq t < 15$	9	15	?
$15 \leq t < 30$	36	15	?
$30 \leq t < 60$	12	30	?
$60 \leq t < 90$	3	30	?

- (a)** (Plan) Give one reason why the department might choose unequal class widths for this survey, rather than dividing the times into equal-width classes. **(1)**
- (b)** (Process) Complete the table above by calculating the frequency density for each class. **(4)**
- (c)** (Interpret) State the modal class in terms of frequency density, and use it to describe when Year 10 students are typically most active. **(2)**
- (d)** (Interpret) A teacher claims: 'More than half of the students surveyed are active for under 30 minutes.' Use the table to comment on whether this claim is supported. **(2)**

(Total for Question 5 is 9 marks)

Mark scheme • H16-30min Histograms and Frequency Density: 30-minute Pack

Question 1

- **B1** 5 cao
- **Answer: 5**

Question 2

- (a) **M1** 8×3 , oe
- (a) **A1** 24 cao
- **(a) Answer: 24**
- (b) **M1** 0.5×6 , oe
- (b) **A1** 3 cao
- **(b) Answer: 3**
- (c) **M1** $24 \div 3$, ft from (a) and (b)
- (c) **A1** 8 cao
- **(c) Answer: 8**

Question 3

- (a) **B1** 12 cao (6×2)
- (a) **B1** 7 cao ($21 \div 3$)
- **(a) Answer: 12, 7**
- (b) **B1** 6 cao (1.2×5)
- **(b) Answer: 6**
- (c) **M1** $60 - (9 + 12 + 21 + 6)$, oe
- (c) **A1** 12 cao
- (c) **B1** 1.5 cao, ft ($12 \div 8$)
- **(c) Answer: 12, 1.5**
- (d) **B1** the class widths are unequal, so a class can have a higher frequency simply because it covers a wider range of times, not because times are more concentrated there; frequency density accounts for this
- **(d) Answer: The class widths are unequal, so frequency alone does not show how concentrated the data is.**

Question 4

- (a) **B1** 2.0 cao
- (a) **B1** 2.4 cao
- (a) **B1** 1.2 cao
- (a) **B1** 0.5 cao
- **(a) Answer: 2.0, 2.4, 1.2, 0.5**
- (b) **B1** a suitable linear scale used on the frequency density axis, starting at 0
- (b) **B1** all five bars drawn to the correct height (0.8, 2.0, 2.4, 1.2, 0.5), ft from (a), tolerance $\pm$ half a small square
- (b) **B1** bars drawn with no gaps between them, chart fully labelled
- **(b) Answer: Histogram with bars of frequency density 0.8, 2.0, 2.4, 1.2, 0.5 across the five classes, drawn touching with no gaps.**

Question 5

- (a) **B1** sensible reason, e.g. most students' activity times are expected to cluster in a fairly narrow range, so narrower classes there give more detail, while few students are active for a very long time so those can share a wider class
- **(a) Answer: Unequal widths let the narrow, closely-clustered range of typical times be shown in more detail.**
- (b) **B1** 0.6 cao
- (b) **B1** 2.4 cao
- (b) **B1** 0.4 cao
- (b) **B1** 0.1 cao
- **(b) Answer: 0.6, 2.4, 0.4, 0.1**
- (c) **B1** $15 \leq t < 30$, ft from (b)
- (c) **B1** sensible interpretation, e.g. activity times are most concentrated between 15 and 30 minutes, more so than any other length of time relative to its class width
- **(c) Answer: $15 \leq t < 30$; this class has the greatest concentration of activity times.**
- (d) **M1** $9 + 36 = 45$, and $45 \div 60 (= 0.75 \text{ or } 75\%)$, oe
- (d) **A1** supported, since 75% is more than half, with correct figures quoted
- **(d) Answer: Supported: 45 out of 60 students (75%) are active for under 30 minutes.**