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3.4 Histograms

1.

Time, t (min)	$3 \leq t < 4$	$4 \leq t < 4.5$	$4.5 \leq t < 5$	$5 \leq t < 6.5$	$6.5 \leq t < 8$
frequency	7	13	19	15	6

a) Class width of $4 \leq t < 4.5$ interval = 0.5

b) frequency density = $\frac{\text{frequency}}{\text{class width}}$

$$3 \leq t < 4 \rightarrow \frac{7}{1} = 7$$

$$4 \leq t < 4.5 \rightarrow \frac{13}{0.5} = 26$$

$$4.5 \leq t < 5 \rightarrow \frac{19}{0.5} = 38$$

$$5 \leq t < 6.5 \rightarrow \frac{15}{1.5} = 10$$

$$6.5 \leq t < 8 \rightarrow \frac{6}{1.5} = 4$$

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2.

Time, t (min)	$0 \leq t < 3$	$3 \leq t < 4$	$4 \leq t < 4.5$	$4.5 \leq t < 5$	$5 \leq t < 6$	$6 \leq t < 10$
frequency	3	6	8	7	5	12

a) A histogram is suitable diagram for displaying this data because the classes are of unequal width

b) Calculate frequency densities

$$0 \leq t < 3 \rightarrow \frac{3}{3} = 1$$

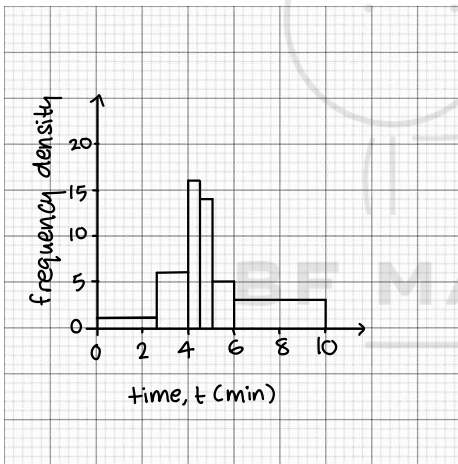
$$3 \leq t < 4 \rightarrow \frac{6}{1} = 6$$

$$4 \leq t < 4.5 \rightarrow \frac{8}{0.5} = 16$$

$$4.5 \leq t < 5 \rightarrow \frac{7}{0.5} = 14$$

$$5 \leq t < 6 \rightarrow \frac{5}{1} = 5$$

$$6 \leq t < 10 \rightarrow \frac{12}{4} = 3$$



3.

Time, t (ms)	$0 \leq t < 4$	$4 \leq t < 6$	$6 \leq t < 7$	$7 \leq t < 7.5$	$7.5 \leq t < 8.5$	$8.5 \leq t < 10$
frequency	2	10	15	12	8	3

- a) A histogram is appropriate for displaying this data because:
- The data is continuous
 - The classes are of different widths

b) $4 \leq t < 6$
width = 1cm
height = 2.5cm

frequency = 10
class width = 2
frequency density = $\frac{10}{2} = 5$

height = 2.5 so divide 5 by 2 = 2.5cm
width = 1 so divide 1 by 2 = 0.5cm

$7.5 \leq t < 8.5$

frequency = 8
class width = 1
frequency density = $\frac{8}{1} = 8$

height = 8 so divide by 2 = 4cm
width = 1 so divide by 2 = 0.5cm

4.

- a) frequency density = 0.8
class width = 10

$$\begin{aligned}\text{frequency} &= \text{frequency density} \times \text{class width} \\ &= 0.8 \times 10 \\ &= 8\end{aligned}$$

- b) Count the number of gnomes taller than 45cm
↳ 25 gnomes

Calculate percentage:

$$\frac{25}{66} \times 100 = 37.9\% \text{ (3 sf)}$$

5.

Time, t (min)	$35 \leq t < 45$	$45 \leq t < 50$	$50 \leq t < 55$	$55 \leq t < 65$	$65 \leq t < 100$
Frequency	18	p	42	q	14

- a) Looking at histogram:

$$\begin{aligned}p \rightarrow \text{frequency density} &= 6 \\ \text{class width} &= 5\end{aligned}$$

$$\begin{aligned}\text{frequency} &= \text{frequency density} \times \text{Class width} \\ &= 6 \times 5 \\ &= 30\end{aligned}$$

$$\begin{aligned}q \rightarrow \text{frequency density} &= 7 \\ \text{class width} &= 10\end{aligned}$$

$$\begin{aligned}\text{frequency} &= 7 \times 10 \\ &= 70\end{aligned}$$

b) $50 \leq t < 55$
class width = 5
frequency = 42

$$\text{frequency density (height)} = \frac{\text{frequency}}{\text{class width}} = \frac{42}{5} = 8.4$$

6. Create table with mass intervals, frequencies, and frequency densities

Calculate the number of civets that are heavier than 10kg by summing the frequencies of the classes that are above 10kg

The civets heavier than 10kg include:

- $10.5 \leq x < 11.5$, frequency = $18 \times 1 = 18$
- $11.5 \leq x < 12$, frequency = $32 \times 0.5 = 16$
- $12 \leq x < 12.5$, frequency = $38 \times 0.5 = 19$
- $12.5 \leq x < 13$, frequency = $34 \times 0.5 = 17$
- $13 \leq x < 14$, frequency = $9 \times 1 = 9$
- $14 \leq x < 15.5$, frequency = $6 \times 1.5 = 9$

Sum the frequencies of these classes to get the total number of civets heavier than 10kg:

$$(10.5 - 10) \times 6 + 18 + 16 + 19 + 17 + 9 + 9 = 91$$

Thus, the number of civets that are heavier than 10kg is 91