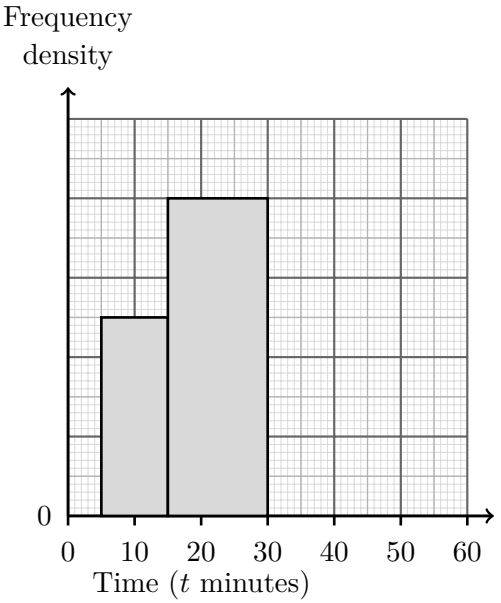
Statistics: Histograms & Frequency Density

Practice Worksheet (Edexcel GCSE 1MA1 June 2023 1H Style)

I Do

The incomplete table and incomplete histogram give information about the times, in minutes, that 140 people waited at a station for a train.

Time (t minutes)	**Frequency**
$0 < t \leq 5$	23
$5 < t \leq 15$	
$15 < t \leq 30$	
$30 < t \leq 40$	18
$40 < t \leq 60$	14

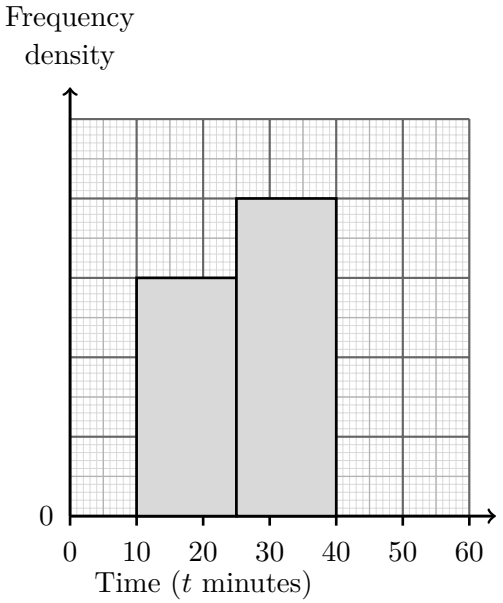


Complete the table and the histogram.

We Do

The incomplete table and incomplete histogram give information about the times, in minutes, that 150 passengers waited at an airport terminal.

Time (t minutes)	**Frequency**
$0 < t \leq 10$	20
$10 < t \leq 25$	
$25 < t \leq 40$	
$40 < t \leq 50$	15
$50 < t \leq 60$	10

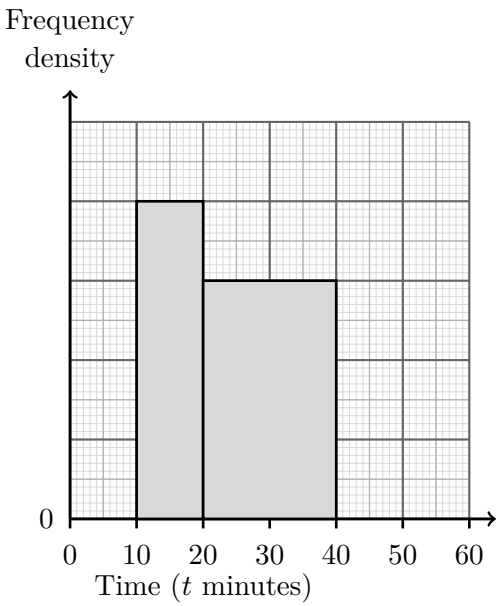


Complete the table and the histogram.

You Do

The incomplete table and incomplete histogram give information about the times, in minutes, that 160 customers waited at a service center.

Time (t minutes)	**Frequency**
$0 < t \leq 10$	25
$10 < t \leq 20$	
$20 < t \leq 40$	
$40 < t \leq 50$	20
$50 < t \leq 60$	15



Complete the table and the histogram.

Challenge

Use the completed histogram and data from the **I Do** question (train station waiting times for 140 people).

(a) Work out an estimate for the number of people who waited **more than 25 minutes** at the station.

(b) Calculate an estimate for the **median** waiting time. Show clear working.

Answers & Worked Solutions

- **I Do:**
  1. From the given histogram bars:
     - $5 < t \leq 15$: Width $= 10$, Height (FD) $= 2.5 \implies$ Frequency $= 10 \times 2.5 = \mathbf{25}$.
     - $15 < t \leq 30$: Width $= 15$, Height (FD) $= 4.0 \implies$ Frequency $= 15 \times 4.0 = \mathbf{60}$.
  2. Missing histogram bars to draw:
     - $0 < t \leq 5$: Width $= 5$, Frequency $= 23 \implies$ FD $= \frac{23}{5} = \mathbf{4.6}$ (height 4.6).
     - $30 < t \leq 40$: Width $= 10$, Frequency $= 18 \implies$ FD $= \frac{18}{10} = \mathbf{1.8}$ (height 1.8).
     - $40 < t \leq 60$: Width $= 20$, Frequency $= 14 \implies$ FD $= \frac{14}{20} = \mathbf{0.7}$ (height 0.7).

- **We Do:**
  1. Table values from histogram:
     - $10 < t \leq 25$: Width $= 15$, FD $= 3.0 \implies$ Frequency $= 15 \times 3.0 = \mathbf{45}$.
     - $25 < t \leq 40$: Width $= 15$, FD $= 4.0 \implies$ Frequency $= 15 \times 4.0 = \mathbf{60}$.
  2. Missing histogram bars to draw:
     - $0 < t \leq 10$: FD $= \frac{20}{10} = \mathbf{2.0}$ (height 2.0).
     - $40 < t \leq 50$: FD $= \frac{15}{10} = \mathbf{1.5}$ (height 1.5).
     - $50 < t \leq 60$: FD $= \frac{10}{10} = \mathbf{1.0}$ (height 1.0).

- **You Do:**
  1. Table values from histogram:
     - $10 < t \leq 20$: Width $= 10$, FD $= 4.0 \implies$ Frequency $= 10 \times 4.0 = \mathbf{40}$.
     - $20 < t \leq 40$: Width $= 20$, FD $= 3.0 \implies$ Frequency $= 20 \times 3.0 = \mathbf{60}$.
  2. Missing histogram bars to draw:
     - $0 < t \leq 10$: FD $= \frac{25}{10} = \mathbf{2.5}$ (height 2.5).
     - $40 < t \leq 50$: FD $= \frac{20}{10} = \mathbf{2.0}$ (height 2.0).
     - $50 < t \leq 60$: FD $= \frac{15}{10} = \mathbf{1.5}$ (height 1.5).

- **Challenge:**
  1. (a) For $t > 25$:
     - Part of $15 < t \leq 30$ class ($25 < t \leq 30$, width 5): $\frac{5}{15} \times 60 = 20$ people.
     - $30 < t \leq 40$ class: 18 people.
     - $40 < t \leq 60$ class: 14 people.
     - Total estimate $= 20 + 18 + 14 = \mathbf{52}$ people.
  2. (b) Median position $= \frac{140}{2} = 70$th person.
     - Cumulative frequency up to $t = 15$: $23 + 25 = 48$ people.
     - Need $70 - 48 = 22$ more people in the class $15 < t \leq 30$ (frequency 60, width 15).
     - Estimated Median $= 15 + \left(\frac{22}{60} \times 15\right) = 15 + 5.5 = \mathbf{20.5}$ minutes.