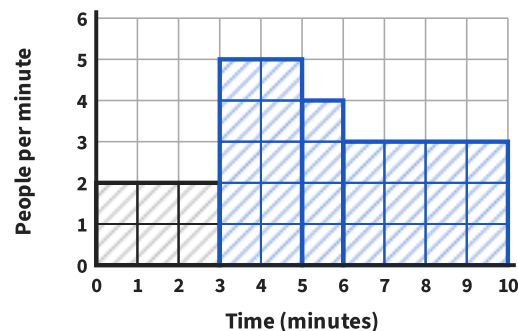


Histograms

1

Each square is one person. Draw each bar from squares, then write how tall it is.

Time (minutes)	Frequency	Height of bar
$0 < t \leq 3$	6	2
$3 < t \leq 5$	10	5
$5 < t \leq 6$	4	4
$6 < t \leq 10$	12	3

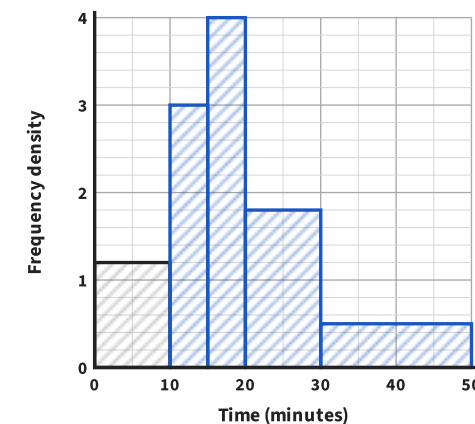


2 Notice the change!

frequency density = frequency $\div$ class width

Complete the table, then draw the histogram.

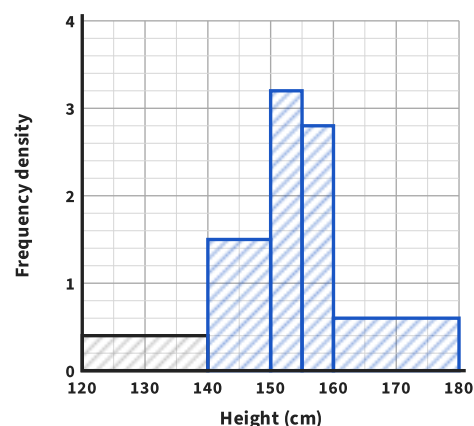
Time (minutes)	Frequency	Class width	Frequency density
$0 < t \leq 10$	12	10	1.2
$10 < t \leq 15$	15	5	3
$15 < t \leq 20$	20	5	4
$20 < t \leq 30$	18	10	1.8
$30 < t \leq 50$	10	20	0.5



3

Complete the table, then draw the histogram.

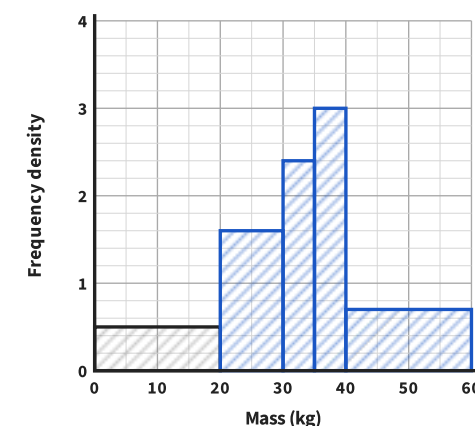
Height (cm)	Frequency	Class width	Frequency density
$120 < h \leq 140$	8	20	0.4
$140 < h \leq 150$	15	10	1.5
$150 < h \leq 155$	16	5	3.2
$155 < h \leq 160$	14	5	2.8
$160 < h \leq 180$	12	20	0.6



4

Complete the table, then draw the histogram.

Mass (kg)	Frequency	Class width	Frequency density
$0 < m \leq 20$	10	20	0.5
$20 < m \leq 30$	16	10	1.6
$30 < m \leq 35$	12	5	2.4
$35 < m \leq 40$	15	5	3
$40 < m \leq 60$	14	20	0.7

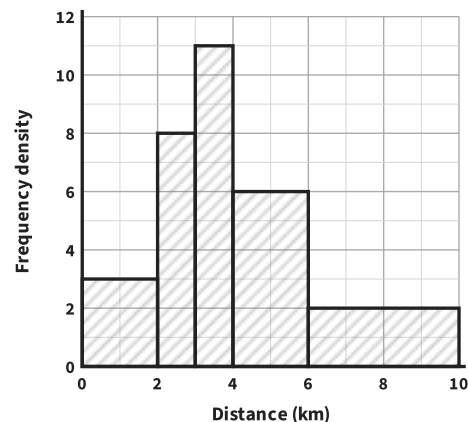


Histograms

5 Notice the change!

Use the histogram to complete the table. Frequency = frequency density $\times$ class width.

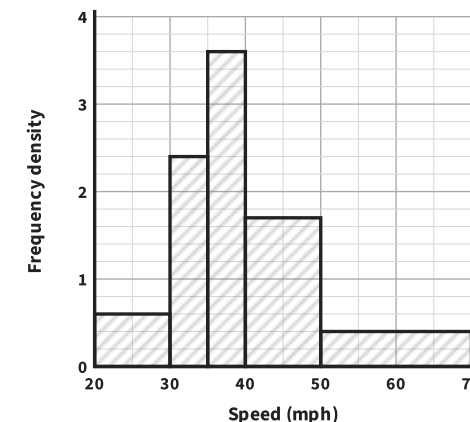
Distance (km)	Frequency	Class width	Frequency density
$0 < d \leq 2$	6	2	3
$2 < d \leq 3$	8	1	8
$3 < d \leq 4$	11	1	11
$4 < d \leq 6$	12	2	6
$6 < d \leq 10$	8	4	2



6

Use the histogram to complete the table. Frequency = frequency density $\times$ class width.

Speed (mph)	Frequency	Class width	Frequency density
$20 < s \leq 30$	6	10	0.6
$30 < s \leq 35$	12	5	2.4
$35 < s \leq 40$	18	5	3.6
$40 < s \leq 50$	17	10	1.7
$50 < s \leq 70$	8	20	0.4



7 Notice the change!

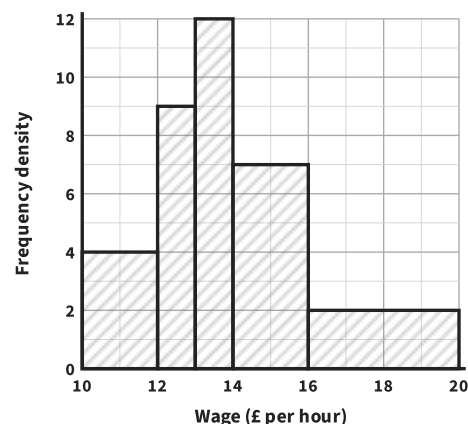
Estimate how many values are between 12 and 16.

Frequency = area of the bar
Frequency = frequency density $\times$ class width

$$9 \times 1 + 12 \times 1 + 7 \times 2$$

$$9 + 12 + 14 = 35$$

Estimate 35



8

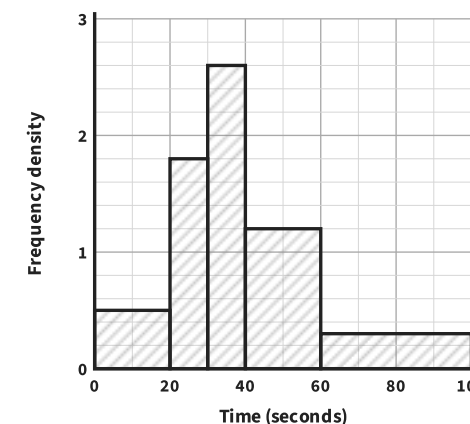
Estimate how many values are between 30 and 50.

Frequency = area of the bar
Frequency = frequency density $\times$ class width

$$2.6 \times 10 + 1.2 \times 10$$

$$26 + 12 = 38$$

Estimate 38

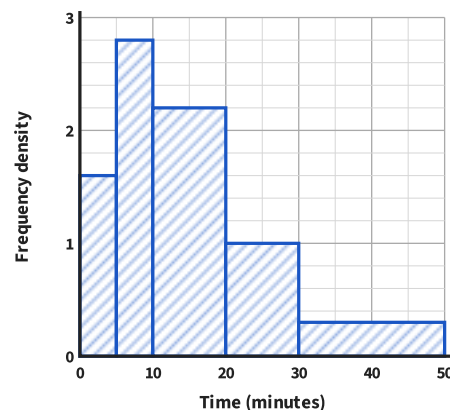


Histograms *further practice*

9

The waiting times of 60 customers at a bank. Complete the table, then draw the histogram.

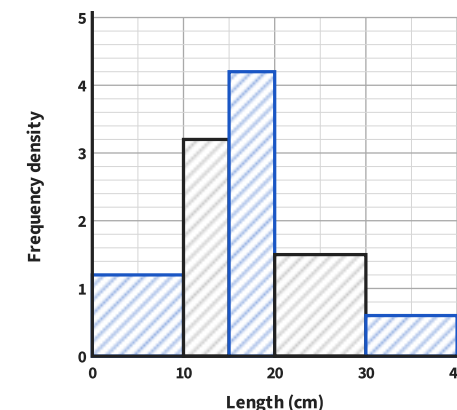
Time (minutes)	Frequency	Class width	Frequency density
$0 < t \leq 5$	8	5	1.6
$5 < t \leq 10$	14	5	2.8
$10 < t \leq 20$	22	10	2.2
$20 < t \leq 30$	10	10	1
$30 < t \leq 50$	6	20	0.3



10

Use the table and the histogram to complete each other.

Length (cm)	Frequency	Class width	Frequency density
$0 < l \leq 10$	12	10	1.2
$10 < l \leq 15$	16	5	3.2
$15 < l \leq 20$	21	5	4.2
$20 < l \leq 30$	15	10	1.5
$30 < l \leq 40$	6	10	0.6



11

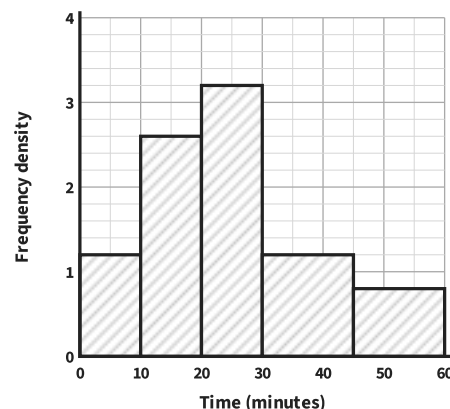
The histogram shows how long 100 people take to get to work. Estimate the percentage of the people who take more than 40 minutes.

Working

$$1.2 \times 5 + 0.8 \times 15 = 18$$

Percentage

about 18%



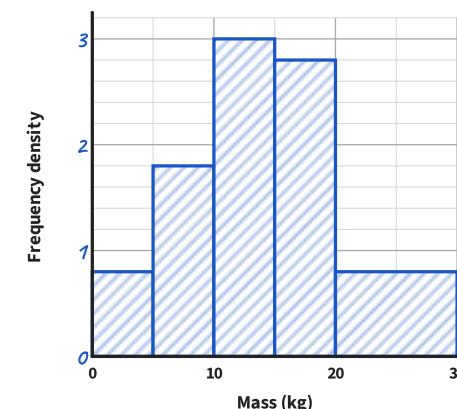
12

The masses of 50 suitcases. Complete the table, choose a scale and draw the histogram. Estimate how many weigh between 12 kg and 25 kg.

Mass (kg)	Frequency	Class width	Frequency density
$0 < m \leq 5$	4	5	0.8
$5 < m \leq 10$	9	5	1.8
$10 < m \leq 15$	15	5	3
$15 < m \leq 20$	14	5	2.8
$20 < m \leq 30$	8	10	0.8

Estimate

$$3 \times 3 + 14 + 0.8 \times 5 = 27$$



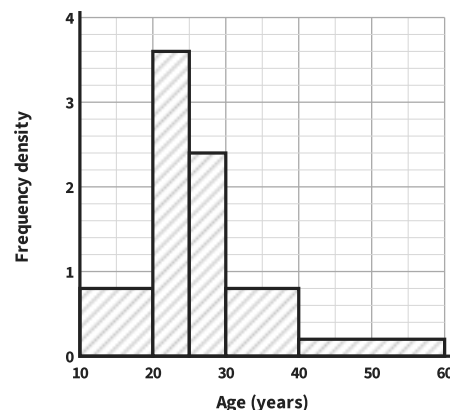
13

The histogram shows the ages of 50 people at a concert. Estimate the mean age.

Age (years)	Frequency	Midpoint
$10 < a \leq 20$	8	15
$20 < a \leq 25$	18	22.5
$25 < a \leq 30$	12	27.5
$30 < a \leq 40$	8	35
$40 < a \leq 60$	4	50

Estimated mean

$$1335 \div 50 = 26.7 \text{ years}$$



14

The histogram shows the times some people spent in a museum. There are 18 people in the class $10 < t \leq 20$. How many people are there altogether?

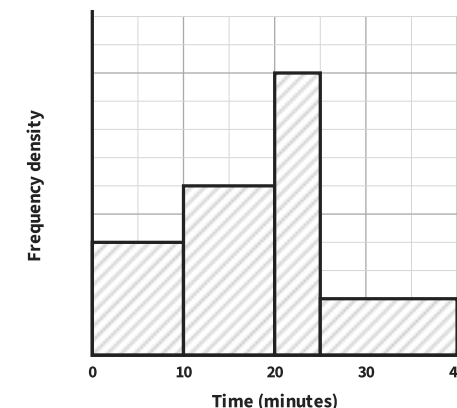
The frequency density axis has no scale.

Working

18 people in 12 squares: 1.5 for each square

Altogether

$$36 \text{ squares} \times 1.5 = 54 \text{ people}$$



15

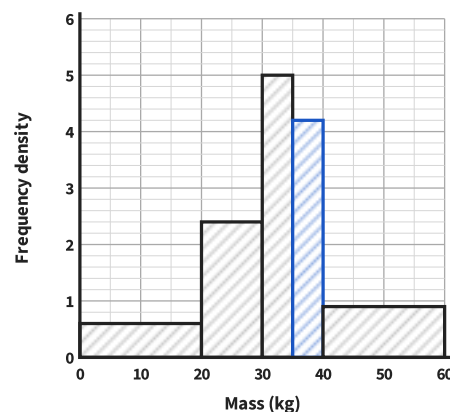
The histogram shows the masses of 100 parcels. The bar for $35 < m \leq 40$ is missing. Draw it.

Working

$$100 - (12 + 24 + 25 + 18) = 21$$

Frequency density

$$21 \div 5 = 4.2$$



16

Ben says the class $30 < m \leq 35$ has the most people in it, because its bar is the tallest. Is Ben right? Explain.

Working

$$3 \times 5 = 15, \text{ but } 1.2 \times 20 = 24$$

Answer

No: 0 to 20 has more; frequency is the area of the bar

