# Histogram problems with missing values

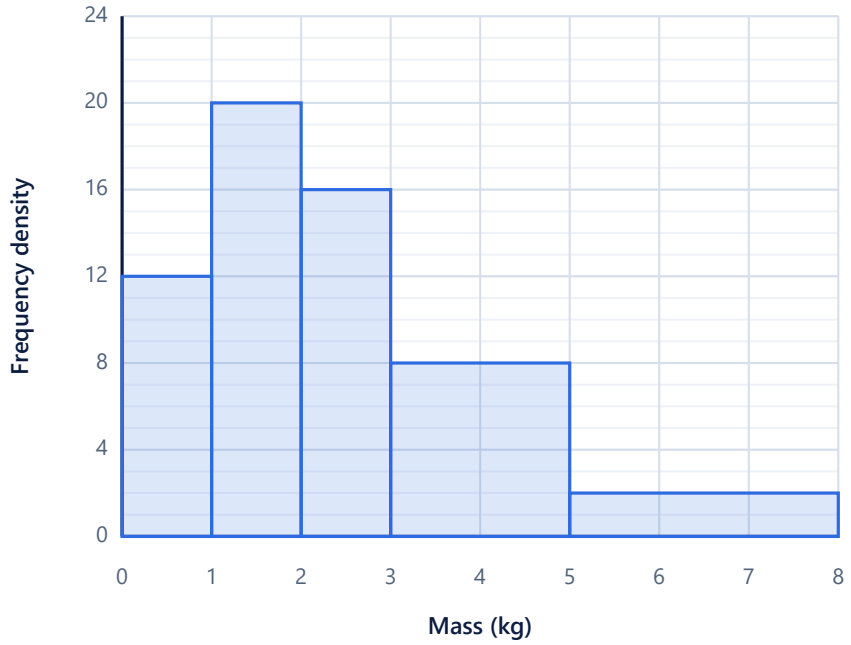
Grade 9 | Worked solutions

**GCSE Statistics topic practice**

**1** The histogram shows information about the masses of the parcels delivered by a courier in one day.

a. Work out the number of parcels with a mass between 3 kg and 5 kg. (1)

b. Work out an estimate for the number of parcels with a mass of more than 3.5 kg. (2)




(3 marks)

a) frequency = frequency density x class width

8 x 2 = 16

b) From 3.5 to 5 is 1.5 kg wide

8 x 1.5 = 12

From 5 to 8 is 3 kg wide

2 x 3 = 6

12 + 6 = 18

a) 16 b) 18


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**2** The table shows information about the times, $t$ seconds, some people took to solve a puzzle. Lena draws a histogram for this information.

| Time ($t$ seconds) | Frequency |
|---|---|
| $20 < t \leq 30$ | 15 |
| $30 < t \leq 50$ | 24 |
| $50 < t \leq 80$ | |

On Lena's histogram the bar for the class $20 < t \leq 30$ is 6 cm high.

a. Work out the height of the bar for the class $30 < t \leq 50$ (2)

b. The bar for the class $50 < t \leq 80$ is 2 cm high. Work out the frequency for this class. (2)

(4 marks)

a) frequency density = frequency ÷ class width

15 ÷ 10 = 1.5

A frequency density of 1.5 is drawn 6 cm high

6 ÷ 1.5 = 4

Each 1 unit of frequency density is 4 cm high

30 to 50

24 ÷ 20 = 1.2

1.2 x 4 = 4.8 cm

b) Find the frequency density of the 2 cm bar

2 ÷ 4 = 0.5

frequency = frequency density x class width

0.5 x 30 = 15

a) 4.8 cm b) 15


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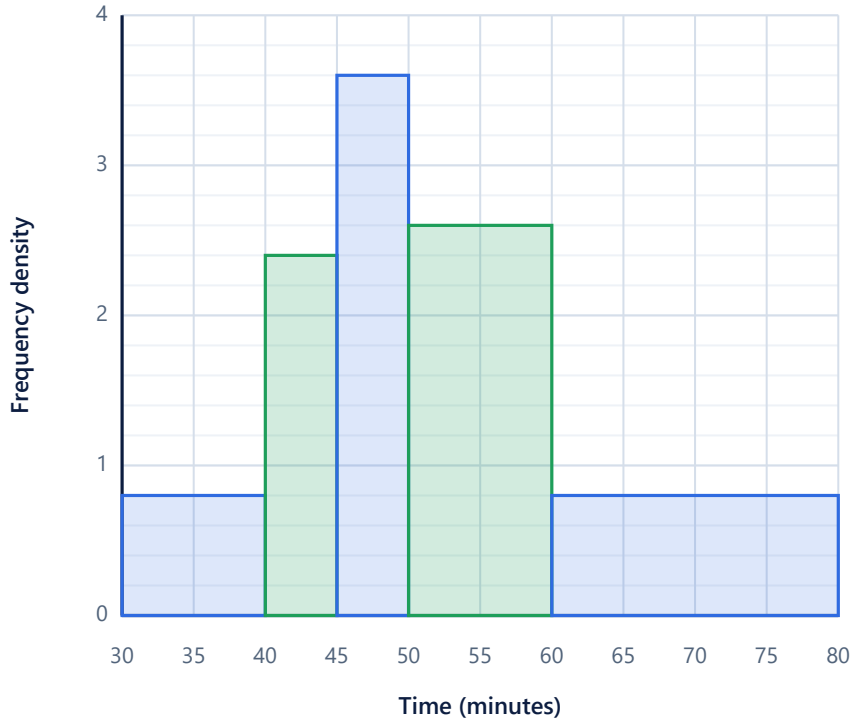
**3** The incomplete table and the incomplete histogram show the times, $t$ minutes, that some runners took to finish a 10 km race.

| Time ($t$ minutes) | Frequency |
|---|---|
| $30 < t \leq 40$ | 8 |
| $40 < t \leq 45$ | 12 |
| $45 < t \leq 50$ | |
| $50 < t \leq 60$ | 26 |
| $60 < t \leq 80$ | |

a. Use the histogram to complete the table. (2)

b. Use the table to complete the histogram. (1)

c. Work out an estimate for the median time. Give your answer correct to 1 decimal place. (2)




(5 marks)

a) frequency = frequency density × class width

Check with the first bar

$0.8 \times 10 = 8$

45 to 50

$3.6 \times 5 = 18$

60 to 80

$0.8 \times 20 = 16$

b) frequency density = frequency ÷ class width

40 to 45

$12 \div 5 = 2.4$


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50 to 60

$26 \div 10 = 2.6$

Draw bars of height 2.4 and 2.6

c) Find the total frequency

$8 + 12 + 18 + 26 + 16 = 80$

$80 \div 2 = 40$

The median is the 40th value

Cumulative frequencies

8, 20, 38, 64, 80

The 40th value is in the class $50 < t \leq 60$

It is 40 - 38 = 2 values into a class of 26

$$\text{median} = 50 + \frac{2}{26} \times 10$$

$$\text{median} = 50 + 0.769...$$

$$\text{median} = 50.8 \text{ minutes}$$

a) 18 and 16 b) heights 2.4 and 2.6 c) 50.8 minutes


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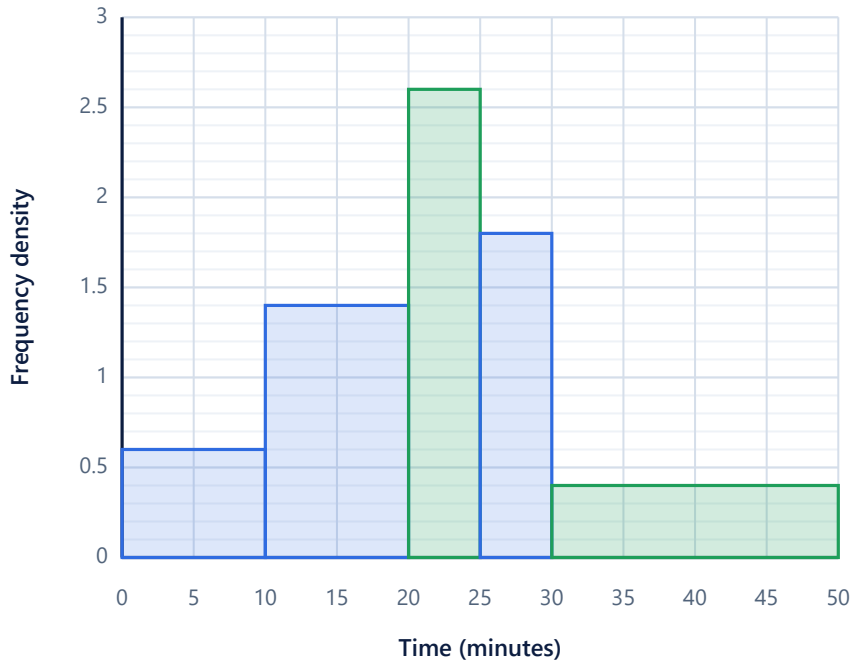
**4** 50 students were asked how long, $t$ minutes, they spent on their homework one evening. The table and the incomplete histogram show the results.

| Time ($t$ minutes) | Frequency |
|---|---|
| $0 < t \leq 10$ | 6 |
| $10 < t \leq 20$ | 14 |
| $20 < t \leq 25$ | $x$ |
| $25 < t \leq 30$ | 9 |
| $30 < t \leq 50$ | 8 |

a. Work out the value of $x$. (1)

b. Complete the histogram. (2)

c. Work out an estimate for the percentage of the students who spent more than 28 minutes on their homework. (2)




(5 marks)

a) The frequencies add up to 50

$6 + 14 + 9 + 8 = 37$

$x = 50 - 37$

$x = 13$

b) frequency density = frequency ÷ class width

20 to 25

$13 \div 5 = 2.6$

30 to 50

$8 \div 20 = 0.4$

Draw bars of height 2.6 and 0.4


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c) 28 to 30 is 2 minutes of a 5 minute class

$\frac{2}{5} \times 9 = 3.6$

Add the 8 students in the last class

$3.6 + 8 = 11.6$

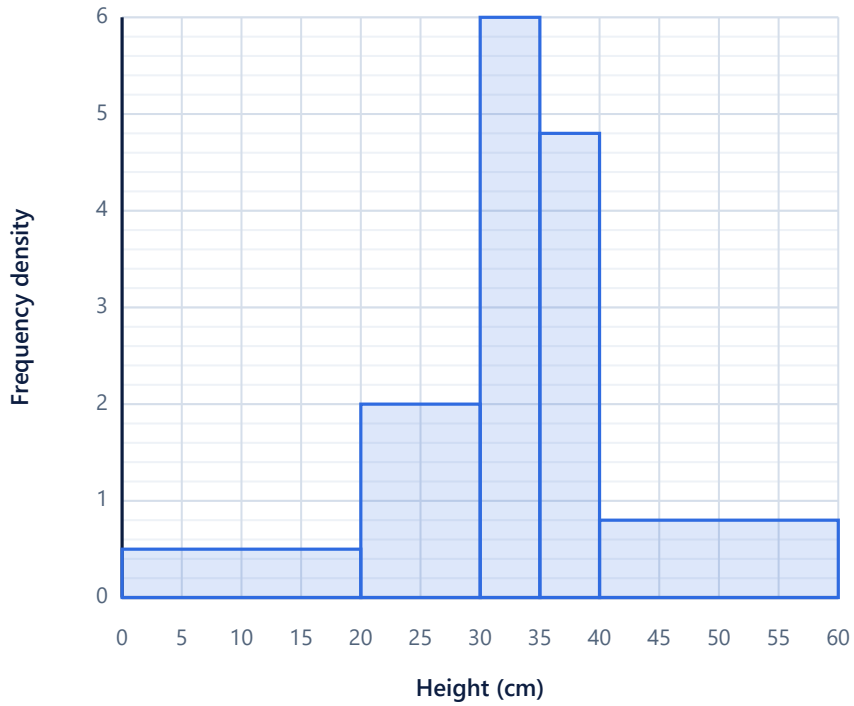
$\frac{11.6}{50} \times 100 = 23.2\%$

**a) 13 b) heights 2.6 and 0.4 c) 23.2%**

**5** The histogram shows information about the heights, $h$ cm, of the tomato plants in a greenhouse.

a. Show that there are 100 tomato plants in the greenhouse. (2)

b. 25% of the tomato plants are taller than $k$ cm. Work out an estimate for the value of $k$. Give your answer correct to 1 decimal place. (3)




(5 marks)

a) frequency = frequency density × class width

$0.5 \times 20 = 10$

$2 \times 10 = 20$

$6 \times 5 = 30$

$4.8 \times 5 = 24$

$0.8 \times 20 = 16$

$10 + 20 + 30 + 24 + 16 = 100$

b) 25 plants are taller than k, so 75 are shorter

$100 - 25 = 75$


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Cumulative frequencies

10, 30, 60, 84, 100

The 75th plant is in the class 35 to 40

It is 75 - 60 = 15 plants into a class of 24

$$k = 35 + \frac{15}{24} \times 5$$

$$k = 35 + 3.125$$

$$k = 38.1$$

a) total = 100 b) $k = 38.1$


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