Histograms

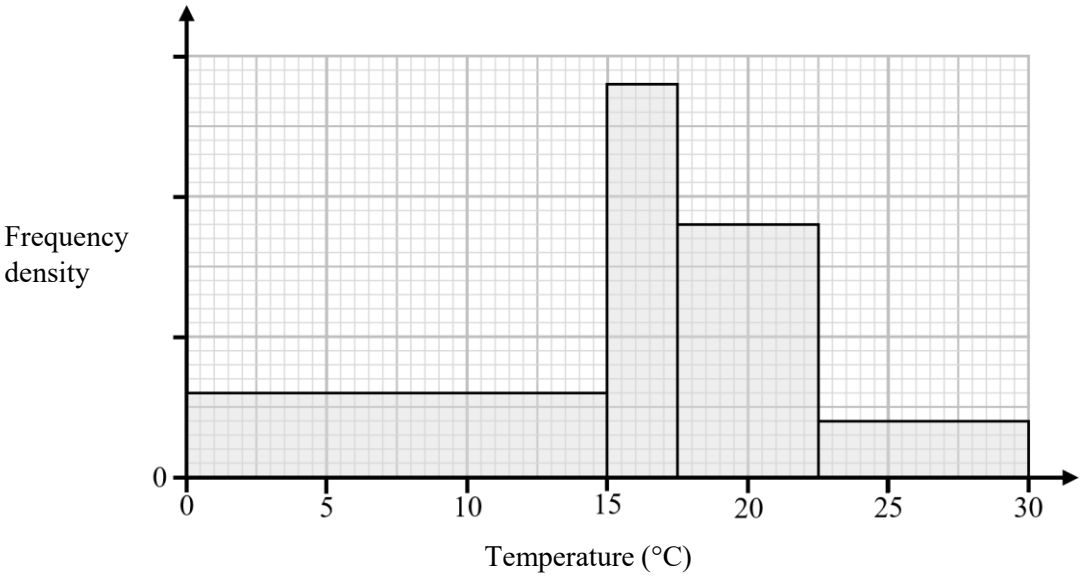
REVISE THIS TOPIC

CHECK YOUR ANSWERS

SCAN ME

SCAN ME

1 The histogram below gives information about the temperatures, in °C, of some cities on the same day.



18 cities had a temperature less than 15 °C.

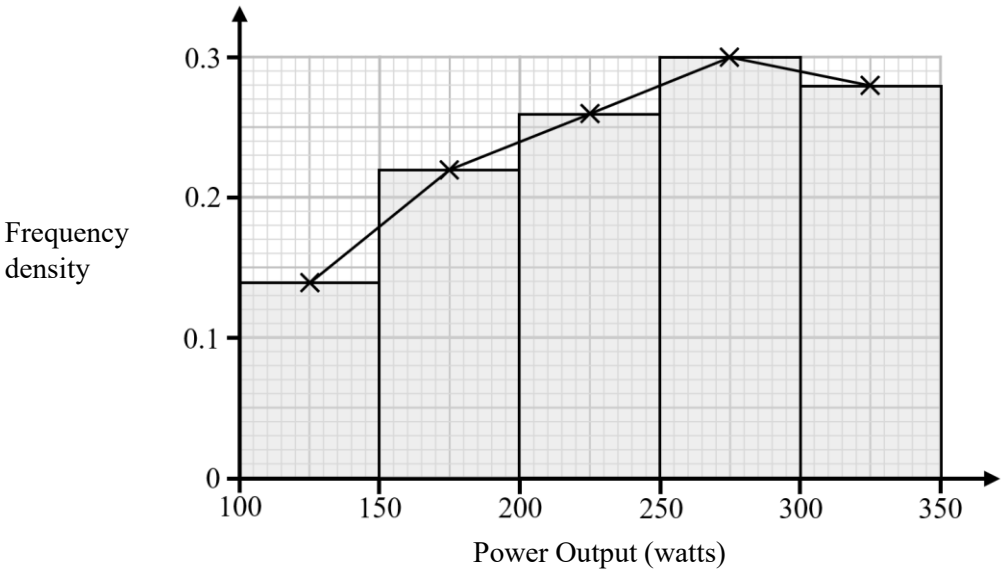
(a) Work out the total number of cities represented in the histogram. **(3)**

(b) Use linear interpolation to work out an estimate for the interquartile range of the temperatures. **(4)**

(Total for Question 1 is 7 marks)

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2 The histogram and its frequency polygon below give information about the power outputs, in watts, of 60 cyclists from a cycling club.



(a) Calculate an estimate for the mean power output of the 60 cyclists. **(2)**

(b) Calculate an estimate for the standard deviation of the power outputs of the 60 cyclists. **(2)**

An outlier is any value that falls either

more than 2 × (standard deviation) above the mean or
more than 2 × (standard deviation) below the mean.

The lowest power output of the 60 cyclists was 115 watts.
The highest power output of the 60 cyclists was 339 watts.

(c) Use your answers to parts (a) and (b) to show that, based on the estimates, none of the power outputs are outliers. **(2)**

(d) Use linear interpolation to estimate the median power output.
Give your answer to 1 decimal place. **(4)**

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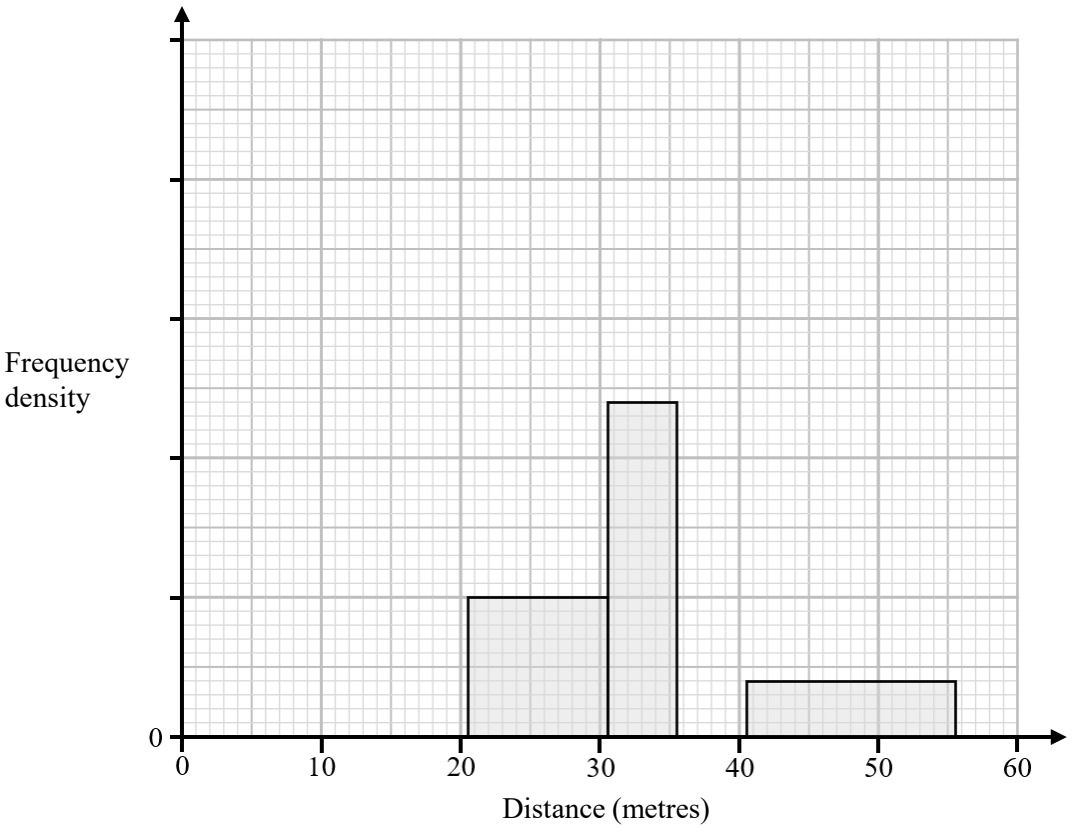
(Total for Question 2 is 10 marks)

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3 The partially completed table and partially completed histogram below show the distances, to the nearest metre, of javelin throws by athletes in a competition.

Distance (metres)	5 – 20	21 – 30	31 – 35	36 – 40	41 – 55
Frequency	4	5		12	



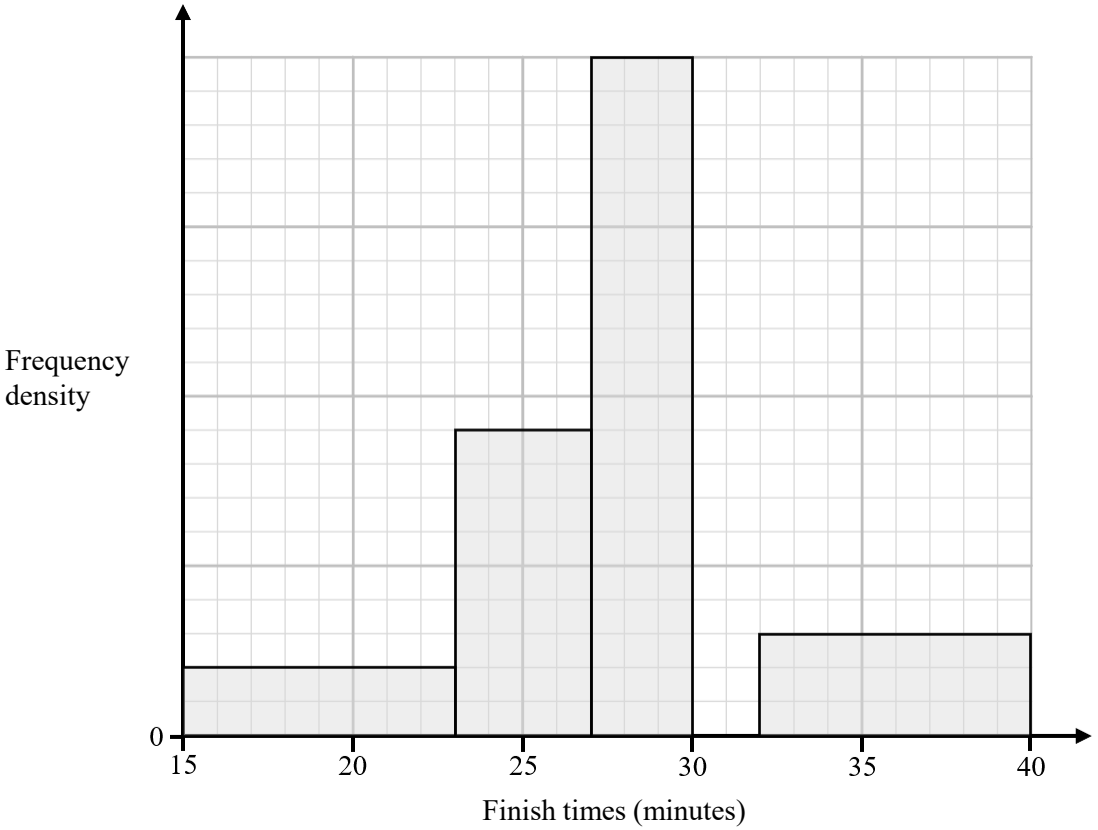
(a) Complete the table. **(2)**

(b) Complete the histogram. **(2)**

(Total for Question 3 is 4 marks)

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4 The partially completed histogram below gives information about the finish times, in minutes, of runners at a fun run.



All the runners finished with times between 15 and 40 minutes.

10% of the runners finished with a time less than 23 minutes.

(a) Complete the histogram **(3)**

One of the runners is selected at random.

(b) Estimate the probability that this runner had a finish time less than 18 minutes 30 seconds. **(2)**

(c) Use linear interpolation to estimate the interquartile range of the finish times. **(5)**

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(Total for Question 4 is 10 marks)

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5 The partially completed histogram below gives information about the ages of employees at a large company.



The number of employees aged between 25 and 35 is 80 more than the number of employees aged between 35 and 45.

(a) Work out the number of employees aged between 18 and 25. **(3)**

There are a total of 416 employees at the company.
The age of the oldest employee is 75

(b) Complete the histogram by adding a bar for ages between 45 and 75. **(3)**

An outlier is any value that falls either

more than 1.5 × (interquartile range) above the upper quartile or
more than 1.5 × (interquartile range) below the lower quartile.

Given that $Q_1 = 23$ and $Q_3 = 36$

(c) Show that at least one employee's age is considered an outlier. **(2)**

The mean age of the employees is 31.7 years, and the standard deviation is 11.8 years.

The CEO of the company assumes that in 1 year's time, the same 416 employees will be working at the company and that there will be no new employees.

(d) Using the CEO's assumption, write down
(i) the mean age of employees at the company in 1 year's time.
(ii) the standard deviation of the ages of the employees in 1 year's time. **(2)**

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(Total for Question 5 is 10 marks)

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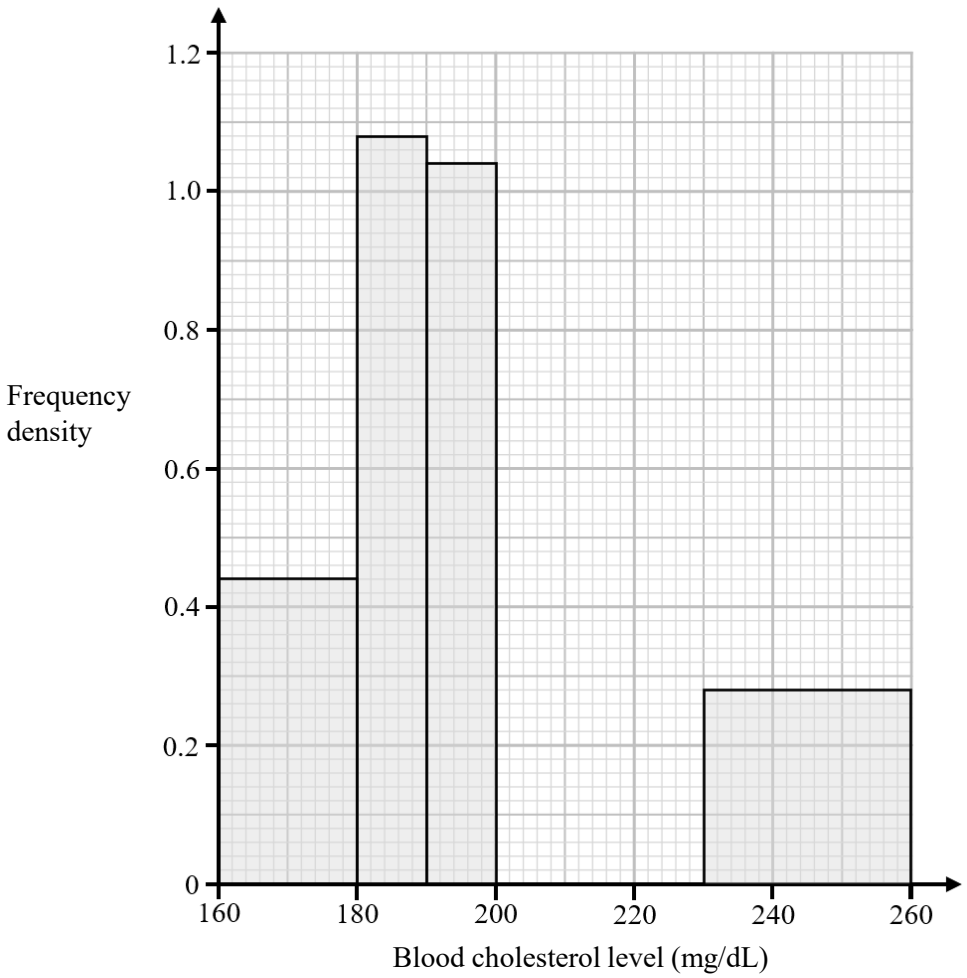
6 A doctor wanted to investigate the blood cholesterol levels of patients at their surgery.
They decide to take a sample of 200 patients.

(a) Identify the population. **(1)**

The doctor asks the next 200 patients who book appointments at the surgery if they will take a blood cholesterol level test.

(b) State the type of sampling technique used by the doctor. **(1)**

The partially completed histogram below shows the blood cholesterol levels of the patients who agreed to do the test.



22 of the patients had a blood cholesterol level between 160 mg/dL and 180 mg/dL.

(c) Work out the number of patients with a blood cholesterol level between 230 mg/dL and 260 mg/dL. **(3)**

60% of the 200 patients who were asked, agreed to take the test.
Of these patients, all recorded a blood cholesterol level between 160 mg/dL and 260 mg/dL.

(d) Complete the histogram by adding the bar for blood cholesterol levels between 200 mg/dL and 230 mg/dL **(3)**

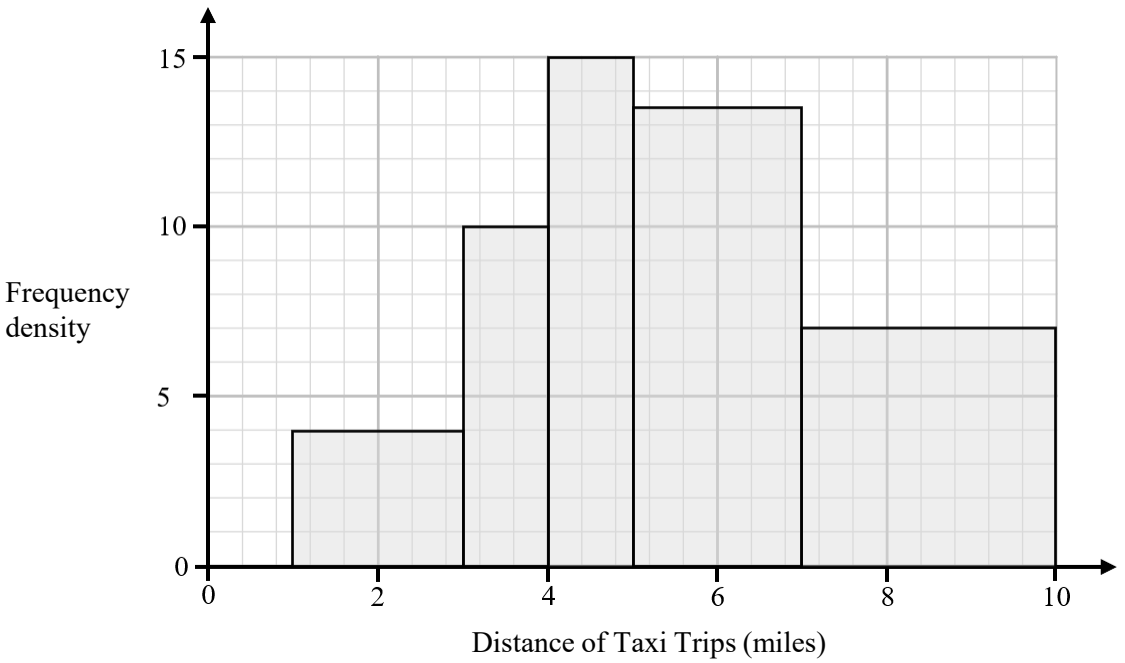
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(Total for Question 6 is 8 marks)

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Solutions

7 The histogram below shows the distances, in miles, of 81 taxi trips provided by a taxi driver.



The taxi driver only provides trips if the journey distance is between 1 mile and 10 miles.

(a) Calculate the percentage of the taxi trips that were between 3 and 5 miles. **(2)**

The mean distance of the taxi trips is 5.6 miles.
The standard deviation of the distances of the taxi trips is 2.35 miles.

An outlier is any value that falls either

more than 2 × (standard deviation) above the mean or
more than 2 × (standard deviation) below the mean.

(b) Show that none of the distances of the taxi trips were considered outliers. **(2)**

The taxi driver decides to model the **frequency density** for the 81 taxi trips by a curve with equation

$$y = k(1 - x)(x - 10) \qquad 1 \leq x \leq 10$$

where k is a constant.

(c) Find the value of k. **(4)**

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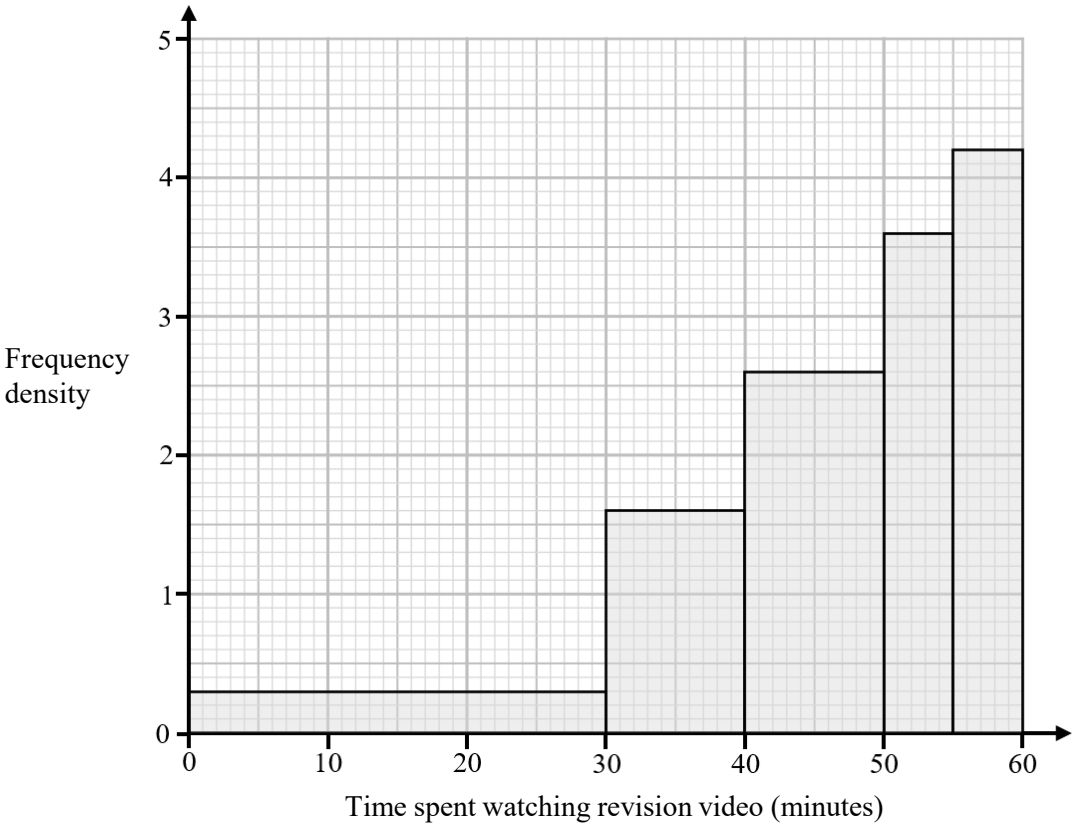
(Total for Question 7 is 8 marks)

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8 90 students were asked to watch a 60-minute revision video to prepare for their exams.

The histogram below shows the amount of time each student spent watching the video, up to a maximum of 60 minutes.



(a) Use linear interpolation to work out an estimate for the median time spent watching the video. Give your answer in minutes and seconds, to the nearest second. **(4)**

The class teacher decides to model the **frequency density** for the 90 times by a curve with equation

$$y = \frac{1}{k}x^2 \qquad 0 \leq x \leq 60$$

where k is a constant.

(b) Find the value of k. **(4)**

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(Total for Question 8 is 8 marks)

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