

GCSE MATHS

Histograms

Worked Solutions

Q1

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$$w = 5 - 0 = 5$$

Find the class width.

$$d = 20/5 = 4$$

Divide frequency by width.

Q2

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$$w = 25 - 10 = 15$$

Find the class width.

$$d = 45/15 = 3$$

Divide frequency by width.

Q3

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$$w = 30 - 20 = 10$$

Find the class width.

$$d = 18/10 = 1.8$$

Divide frequency by width.

Q4

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$$f = 12(2.5) = 30$$

Multiply width by density.

Q5

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$$w = 42/3.5 = 12$$

Divide frequency by density.

$$\text{upper boundary} = 18 + 12 = 30$$

Add the width to the lower boundary.

Q6

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$$w = 5, 10, 5$$

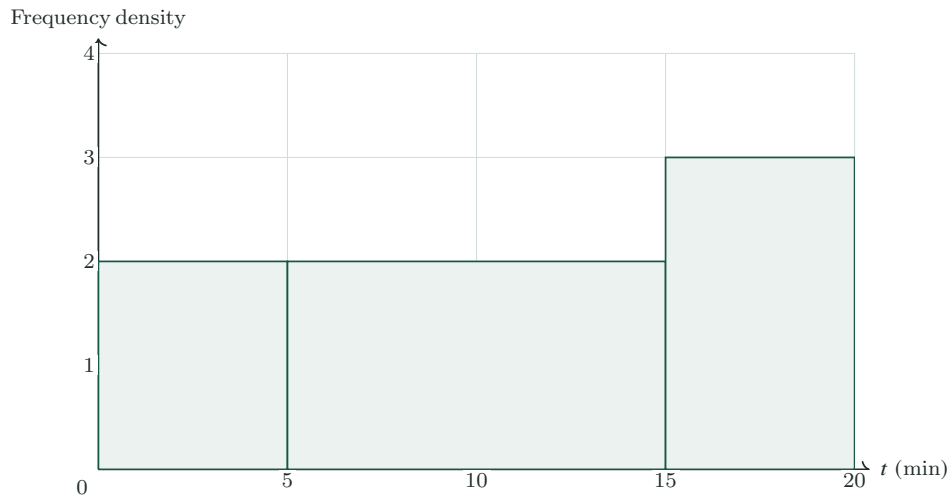
Find the three class widths.

$$d = 10/5, 20/10, 15/5$$

Divide each frequency by its width.

$$d = 2, 2, 3$$

Draw touching bars over the corresponding class intervals.



Q7

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$$(40 - 20) \times 1 = 20$$

Multiply the width of the last class by its frequency density.

Q8

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$$5(4) + 10(3) + 15(2) = 80$$

Add the frequencies represented by the three bar areas.

Q9

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$$8(3) = 24$$

Calculate all three bar areas.

$$12(2) = 24$$

$$20(1) = 20$$

$$0 < t \leq 8 \quad \text{and} \quad 8 < t \leq 20$$

The first two classes share the greatest frequency.

Q10

$$20 + 30 = 50$$

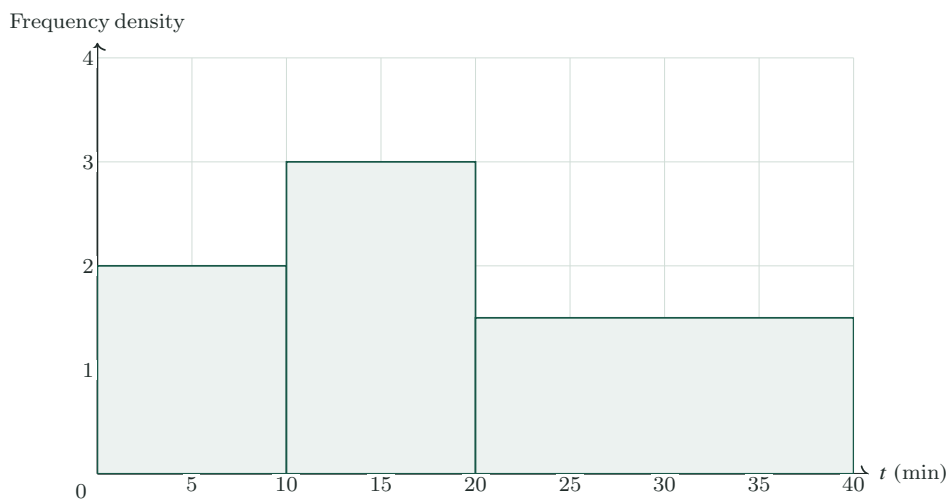
Find the frequency in the two drawn bars.

$$80 - 50 = 30$$

Find the missing frequency.

$$30/20 = 1.5$$

Draw the final bar with this frequency density.



Q11

$$f = 10(2) = 20$$

Find the middle bar area.

$$N = 5(4) + 10(2) + 20(1) = 60$$

Find the total.

$$P = 20/60 = \frac{1}{3}$$

Divide the relevant frequency by the total.

Q12

$$f_1 = 4(6) = 24$$

Calculate the frequencies from the bar areas.

$$f_3 = 12(1) = 12$$

$$24 : 12 = 2 : 1$$

Simplify the ratio.

Q13

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$$10(3) + 5(4) = 50$$

Add the first bar area and the relevant part of the second bar.

Q14

$$N = 5(2) + 10(4) + 15(2) = 80$$

$$\text{Median} \approx 5 + \frac{40 - 10}{4} = 12.5 \text{ min}$$

Find the total frequency.

The 40th observation lies in the second class.

Q15

$$\sum f = 20 + 60 + 10 = 90$$

$$\bar{t} \approx \frac{5(20) + 20(60) + 35(10)}{90} = 18.3 \text{ min} \quad (1 \text{ d.p.})$$

Find the class frequencies.

Weight each class midpoint by its frequency.

Q16

$$N = 10(1) + 10(2) + 20(2) = 70$$

$$\frac{15(2)}{70} \times 100 \approx 42.9\%$$

Find the total frequency.

Use the part of the last class above 25 minutes.

Q17

$$N = 10(4) + 10(2) + 10(2) = 80$$

$$Q_1 \approx 20/4 = 5 \text{ min}$$

Find the total frequency.

The 20th observation lies in the first class.

Q18

$$N = 20 + 40 + 20 = 80$$

$$Q_1 = 10$$

$$Q_3 = 20$$

$$\text{IQR} = 20 - 10 = 10 \text{ min}$$

Find the total frequency.

The 20th and 60th observations are at class boundaries.

Subtract the quartiles.

Q19

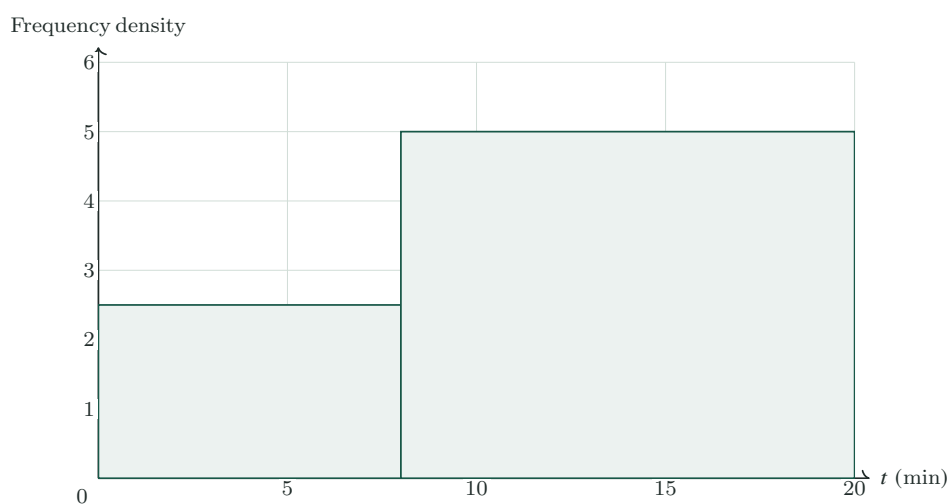
$$20/8 = 2.5$$

Divide each frequency by its class width.

$$60/12 = 5$$

$$\text{Frequency} = 60$$

Read the second class in the table.



Q20

$$1 \text{ cm}^2 \leftrightarrow 5(2) = 10$$

Multiply the horizontal and vertical scale factors.

$$f = 6(10) = 60$$

Scale the paper area.

Q21

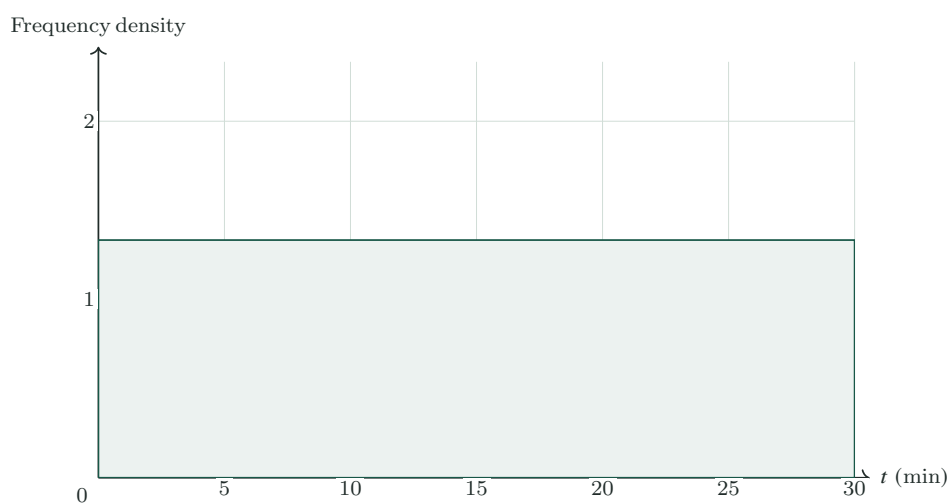
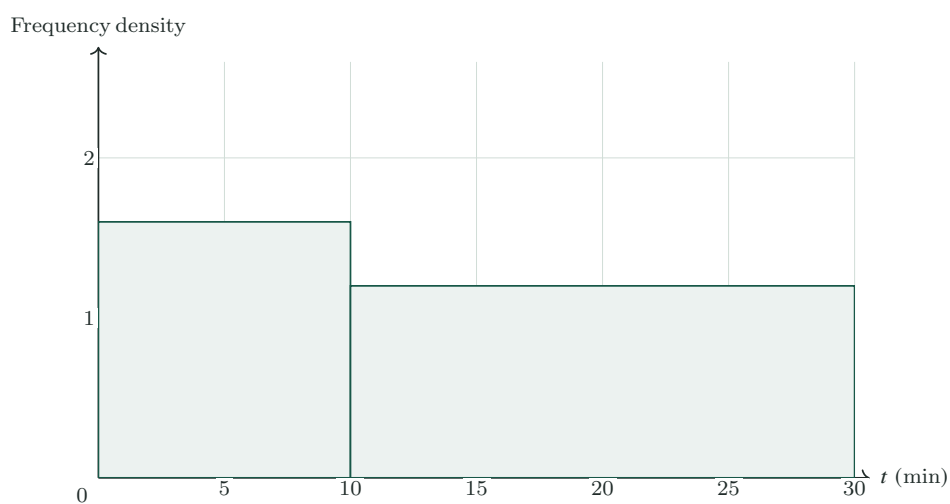
$$f = 16 + 24 = 40$$

$$w = 30$$

$$d = 40/30 = \frac{4}{3}$$

Combine frequencies and widths.

Do not average the two original heights without weighting.



Q22

$$f_1 = 40$$

$$f_2 = 60$$

$$a = 40/10 = 4$$

$$b = 60/20 = 3$$

$$a : b = 4 : 3$$

Use the percentage and total.

Divide by different class widths.

State the ratio of heights.

Q23

$$\frac{20 + 10k}{40 + 10k} = 0.6$$

$$20 + 10k = 24 + 6k$$

$$4k = 4 \Rightarrow k = 1$$

First two bar areas over total area.

Multiply by the denominator.

Solve.

Q24

$$\frac{20(5) + 10k(15) + 20(30)}{40 + 10k} = 17.5$$

$$700 + 150k = 700 + 175k$$

$$k = 0$$

Form the grouped mean.

Multiply through.

Only an empty middle class gives this mean.