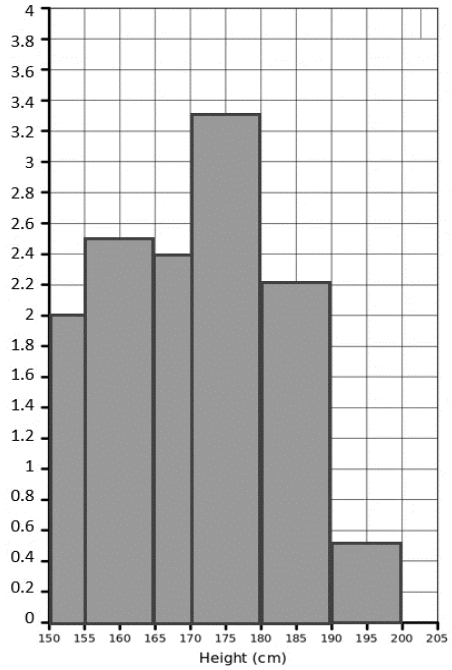
Histograms Mark Scheme

1

Height (cm)	Frequency	Frequency Density
$150 < cm \leq 155$	10	$10 \div 5 = 2$
$155 < cm \leq 165$	25	$25 \div 10 = 2.5$
$165 < cm \leq 170$	12	$12 \div 5 = 2.4$
$170 < cm \leq 180$	33	$33 \div 10 = 3.3$
$180 < cm \leq 190$	22	$22 \div 10 = 2.2$
$190 < cm \leq 200$	5	$5 \div 10 = 0.5$

2



[1] Correctly calculated frequency density

[1] Histogram with correct bar widths

[1] Correct bar heights

Time (mins)	Frequency
$0 < t \leq 5$	$5 \times 1 = 5$
$5 < t \leq 10$	$5 \times 1.8 = 9$
$10 < t \leq 15$	$5 \times 2 = 10$
$15 < t \leq 20$	$5 \times 3 = 15$
$20 < t \leq 30$	$10 \times 0.8 = 8$
$30 < t \leq 45$	$15 \times 0.6 = 9$

[1] for correct time groups

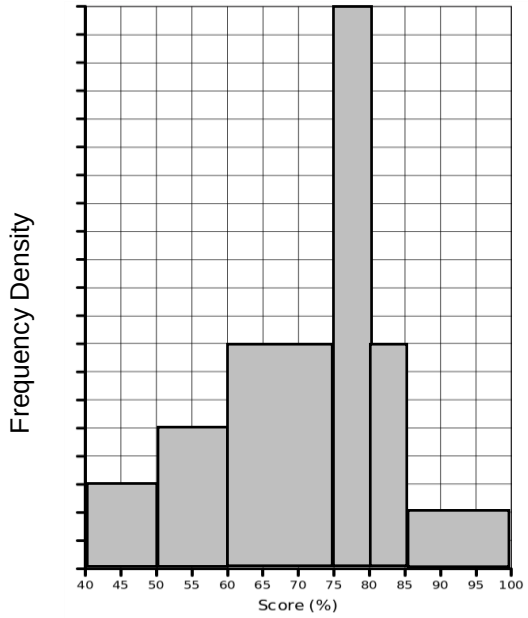
[1] for correct frequencies (allow 1 error)

[1] All correct

3

Score (%)	Frequency	Frequency Density	Cumulative Frequency
$40 < m \leq 50$	3	$3 \div 10 = 0.3$	3
$50 < m \leq 60$	5	$5 \div 10 = 0.5$	8
$60 < m \leq 75$	12	$12 \div 15 = 0.8$	20
$75 < m \leq 80$	10	$10 \div 5 = 2$	30
$80 < m \leq 85$	4	$4 \div 5 = 0.8$	34
$85 < m \leq 100$	3	$3 \div 15 = 0.2$	37

3(a)



1] Correctly calculated frequency density

[1] Histogram with correct bar widths

[1] Correct bar heights

3(b)

$$Median\ is\ the\ \frac{37+1}{2} = 19^{th}\ number$$

$$19^{th}\ number\ is\ in\ the\ 60 < m \leq 75\ interval$$

$$19^{th}\ number\ is\ the\ 19 - 3 - 5 = 11\ places\ out\ of\ 12\ into\ this\ interval$$

[1] Correct logic used

Splitting the interval into even pieces by dividing the width by the frequency

$$\frac{15}{12} = 1.25$$

Find how far the number is into the interval by multiplying it by our previous answer.

$$11 \times 1.25 = 13.75$$

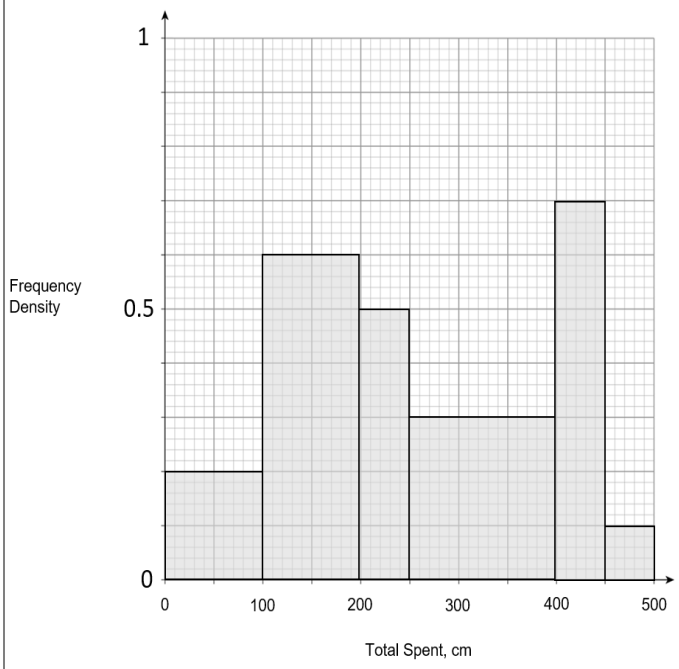
$$And\ add\ it\ to\ the\ lower\ end\ of\ the\ interval$$

$$60 + 13.75 = 73.75$$

[1] Correct answer

4

Total spent (£)	Frequency	Frequency Density
$0 < £ \leq 100$	20	$20 \div 100 = 0.2$
$100 < £ \leq 200$	60	$60 \div 100 = 0.6$
$200 < £ \leq 250$	25	$25 \div 50 = 0.5$
$250 < £ \leq 400$	$150 \times 0.3 = 45$	0.3
$400 < £ \leq 450$	35	$35 \div 50 = 0.7$
$450 < £ \leq 500$	5	$5 \div 50 = 0.1$



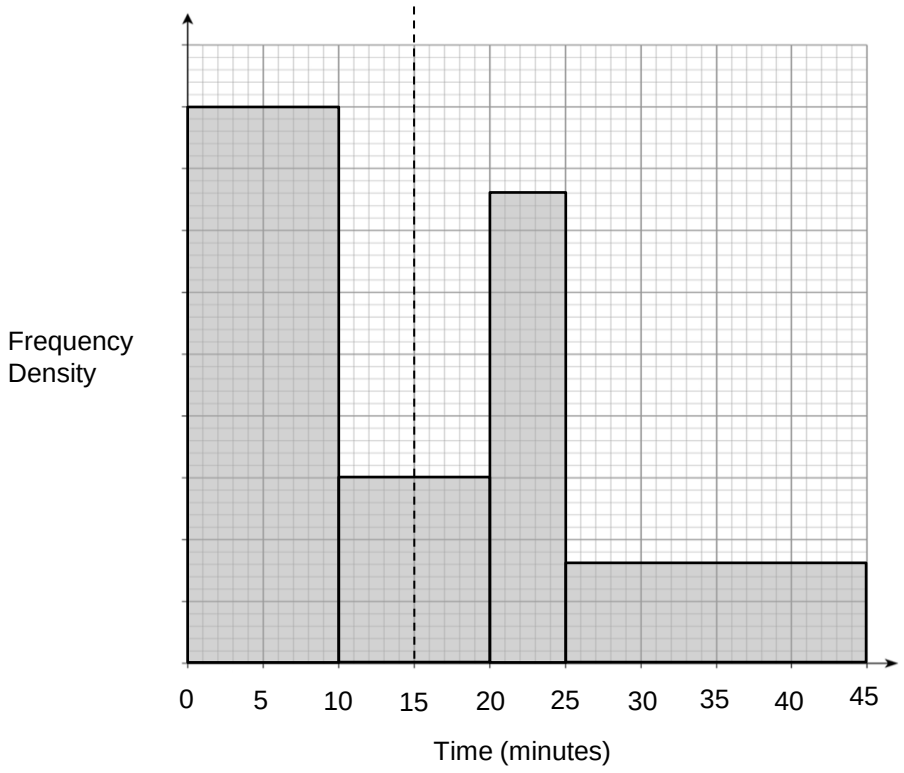
[1] Correct table

[1] Correctly calculated frequency density

[1] Histogram with correct bar widths and heights

5(a)	$20 + 12 + 8 = 40$	[2] (from calculation of frequency of each class)
5(b)	$25 < x \leq 45$	[1]
5(c)	6 students in $70 < x \leq 80$	[1] Need to split the $70 < x \leq 80$ interval in half
	6+8=14 students got 75% or more, so got either an A or a B.	[1] Final answer
5(d)	This is an estimate because it is not clear how many students got between 75% and 80%, they could have all got less than 75.	[1] Comment about grouped data

<table>
<tr><td></td><td></td><td></td></tr>
<tr><td>6</td><td>
<table>
<tr><th>Time</th><th>Frequency</th><th>Frequency Density</th></tr>
<tr><td>$30 < t \leq 35$</td><td>x</td><td>z</td></tr>
</table>
We get frequency density (z) by dividing the frequency (x) by the width of the class interval
$(35 - 30 = 5)$.
$$z = \frac{x}{5}$$
</td><td>[1] Setting up the table</td></tr>
<tr><td></td><td>
<table>
<tr><th>Time</th><th>Frequency</th><th>Frequency Density</th></tr>
<tr><td>$30 < t \leq 35$</td><td>$x + y$</td><td>$1.15z$</td></tr>
</table>
$$1.15z = \frac{x + y}{5}$$
</td><td>[1] Adding y students gives a new frequency of $x + y$, and increases the frequency density by 15%
(multiplies by 1.15)</td></tr>
<tr><td></td><td>$$1.15 \times \frac{x}{5} = \frac{x + y}{5}$$
$$\frac{1.15x}{5} = \frac{x + y}{5}$$
$$1.15x = x + y$$
$$\frac{3}{20}\, x = y$$</td><td>[1] Two simultaneous equations established</td></tr>
<tr><td></td><td>We get two possible solutions for x
and y.
$$x = 20\ y = 3$$
$$x = 40\ \ y = 6$$</td><td>[1] Making the following assumptions:
• The number of students must be a whole number.
• x has be divisible by 20, because of the fraction, so is a multiple of 20
• x has to be less than 50, because of what Tom said.</td></tr>
<tr><td>6(b)</td><td>$$\frac{32 - 30}{35 - 30} = \frac{2}{5} = 0.4 = 40\%$$</td><td>[1] Assumption that students are spread evenly across the group.</td></tr>
<tr><td></td><td>Hence either $(20 + 3) \times 0.4 \approx 9\ students$
Or $(40 + 6) \times 0.4 \approx 18\ \ students$</td><td>[1]</td></tr>
</table>

7		
	$Sum\ of\ area\ =\ 18\ +\ 6\ +\ 7.6\ +\ 6.4\ =\ 38$ (large squares)	[1] Finding total area of the histogram
	$People\ per\ square = \frac{266}{38} = 7$	[1] Finding number of people corelating to each large square of the histogram
	$38 - 17\ = 21$ $21\ \times\ 7 = 147\ people$ $\frac{147}{266} = 55.263.. = 55.3\%\ (1dp)$	[1] Total number of people that are eligible for the cycle-to-work scheme

END