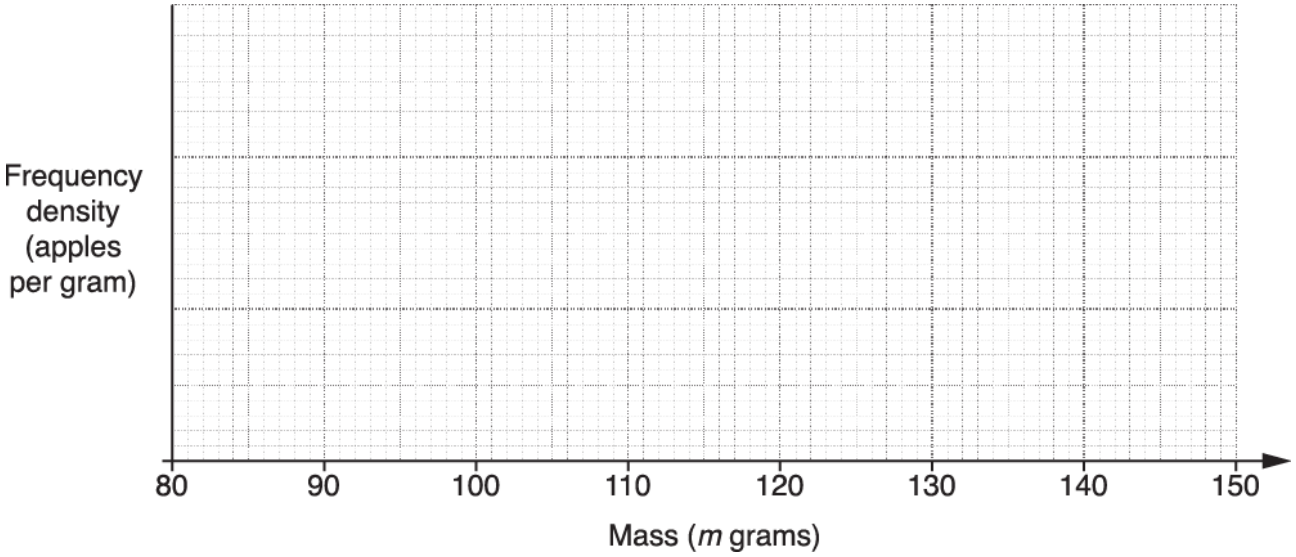
1. Lola collects 60 apples from the trees in her garden.

The masses of the apples are summarised in the table.

Mass (m grams)	Frequency
$80 < m \leqslant 100$	8
$100 < m \leqslant 110$	15
$110 < m \leqslant 120$	21
$120 < m \leqslant 130$	10
$130 < m \leqslant 150$	6

(i) Draw a histogram to represent this distribution.



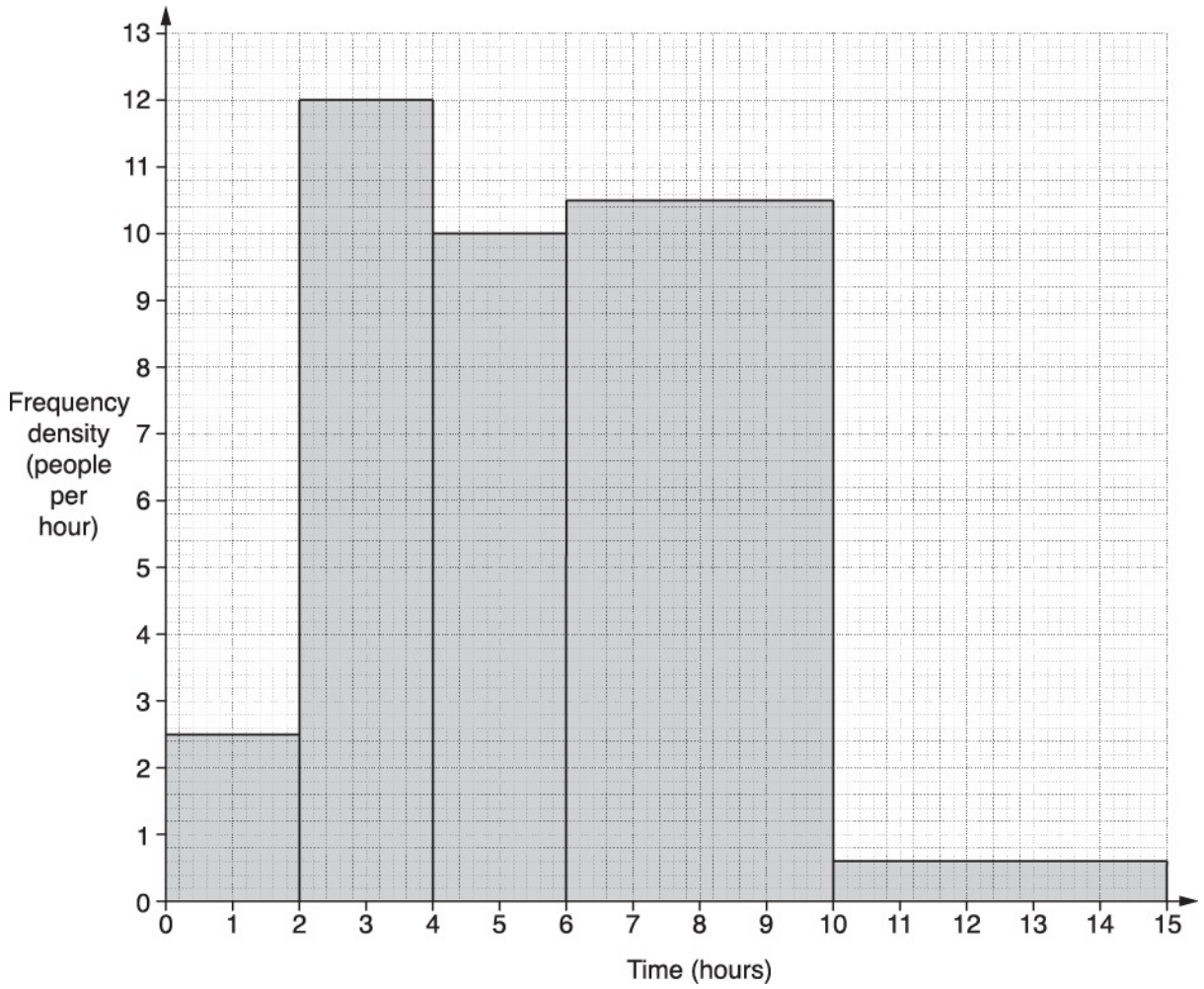
[3]

(ii) Estimate the number of these apples with a mass under 115 g.

---

[1]

2. This histogram represents the times spent cycling by members of a cycling group during one weekend.



(i) How many of the group cycled for 10 hours or more that weekend?

(i) _____ [1]

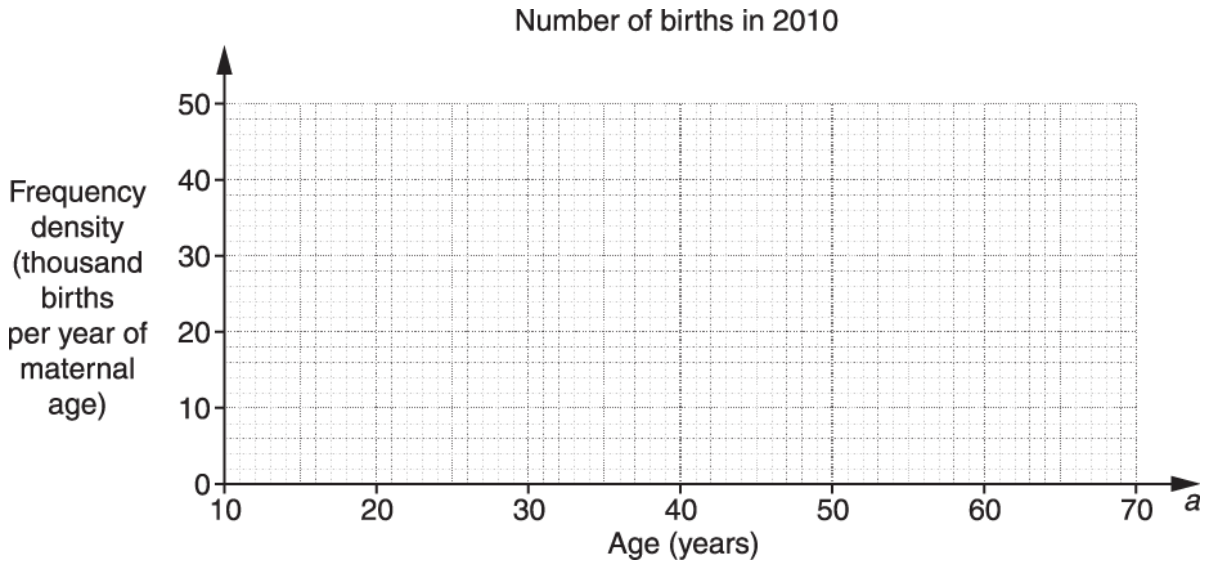
(ii) What can you tell from the histogram about the shortest time spent cycling?

_____ [1]

3. The table summarises the number of births to women of different ages in England and Wales in 2010.

Age (a years)	Number of births (thousands)
$10 \leqslant a < 20$	41
$20 \leqslant a < 25$	137
$25 \leqslant a < 30$	199
$30 \leqslant a < 35$	202
$35 \leqslant a < 40$	116
$40 \leqslant a < 45$	26
$45 \leqslant a < 65$	2

(i) Draw a histogram to represent this distribution.



[3]

(ii) The histogram below represents the distribution of the number of births to women of different ages in England and Wales in 1980.

Make two comparisons between the distributions for 2010 and 1980.

1

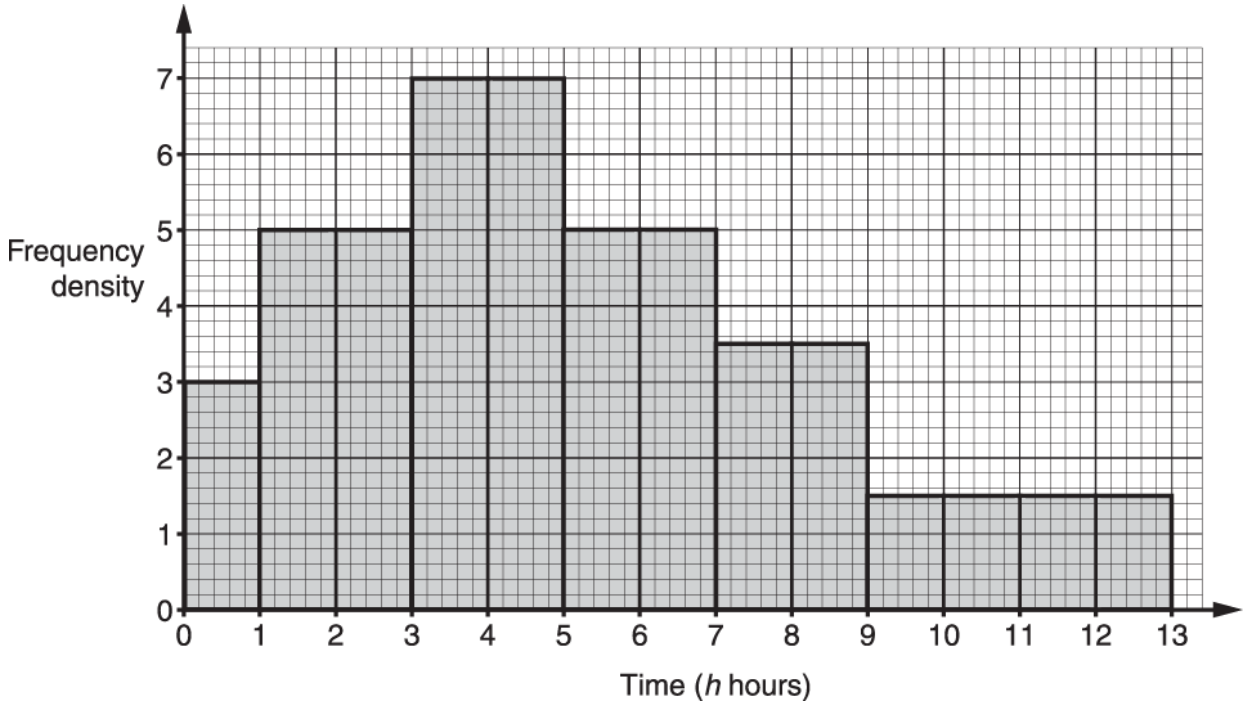
2

---

[2]

4. Jo asked 50 people how many hours they used their mobile phone.

She drew this histogram to represent her results.



How many people in Jo's survey used their mobile phone for more than 7 hours?

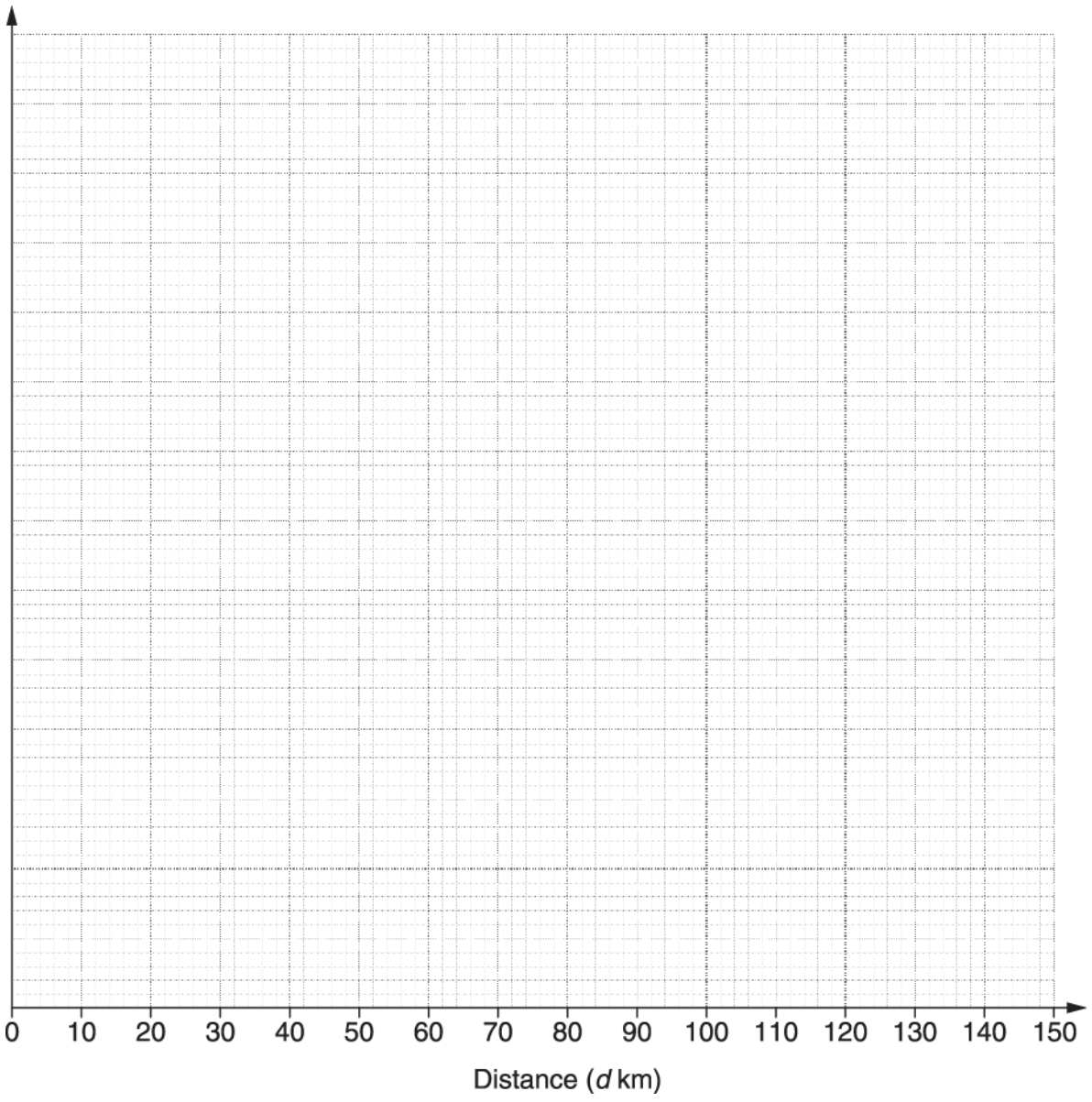
_____

[2]

5. This table summarises the distances cycled by members of a cycling group during one weekend.

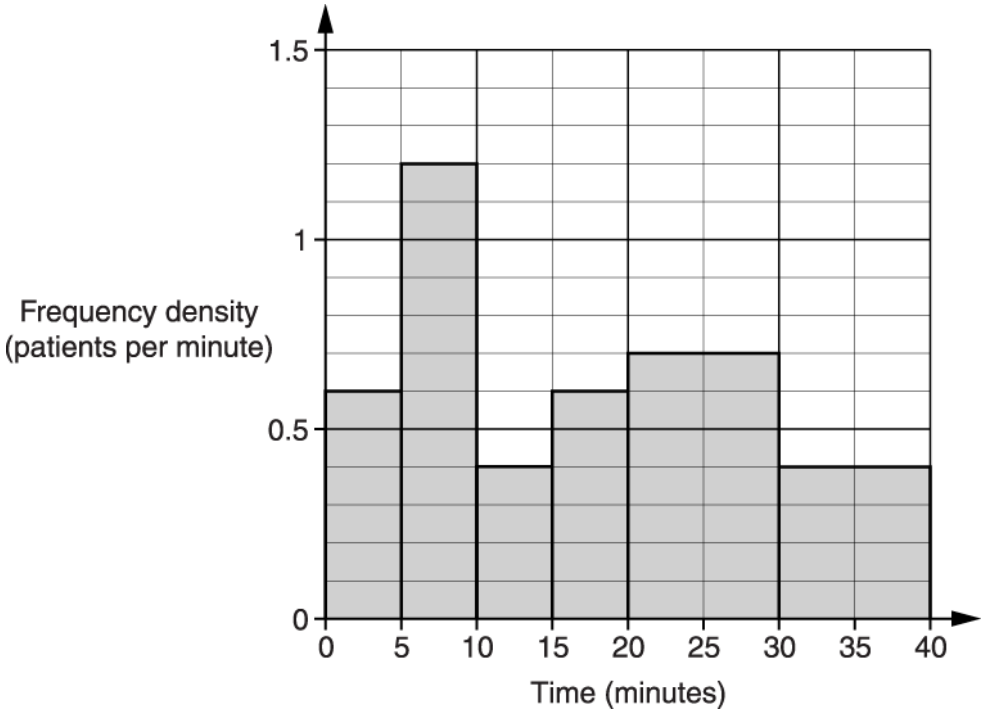
Distance (d km)	Frequency
$10 \leqslant d < 20$	4
$20 \leqslant d < 30$	7
$30 \leqslant d < 50$	25
$50 \leqslant d < 100$	40
$100 \leqslant d < 150$	18

Draw a histogram to represent this information.



[4]

6. This histogram summarises the times that 25 patients waited before their appointment at a dental surgery one day.



How many patients waited between 20 and 30 minutes?

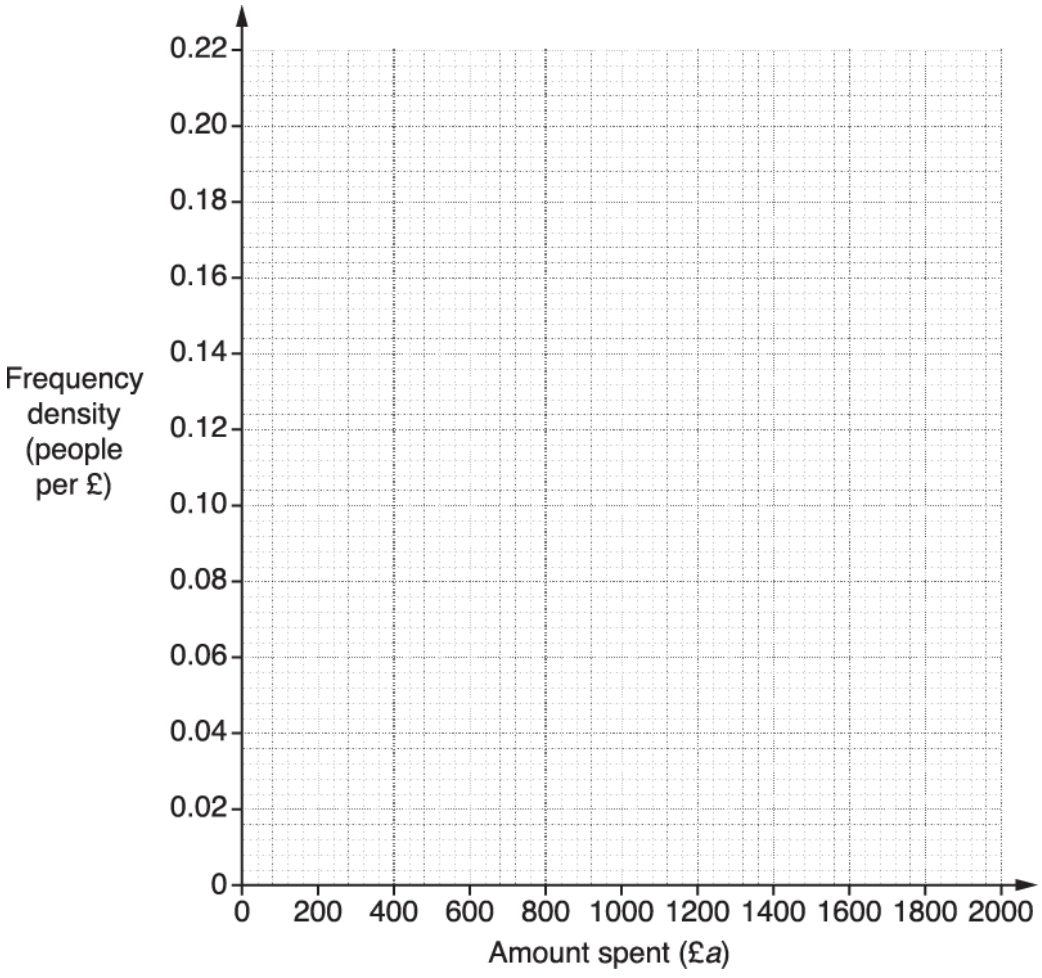
_____ [1]

7(a). A travel agent did a survey about the amount spent per person on a week's holiday.

This table summarises the amount spent on travel and accommodation.

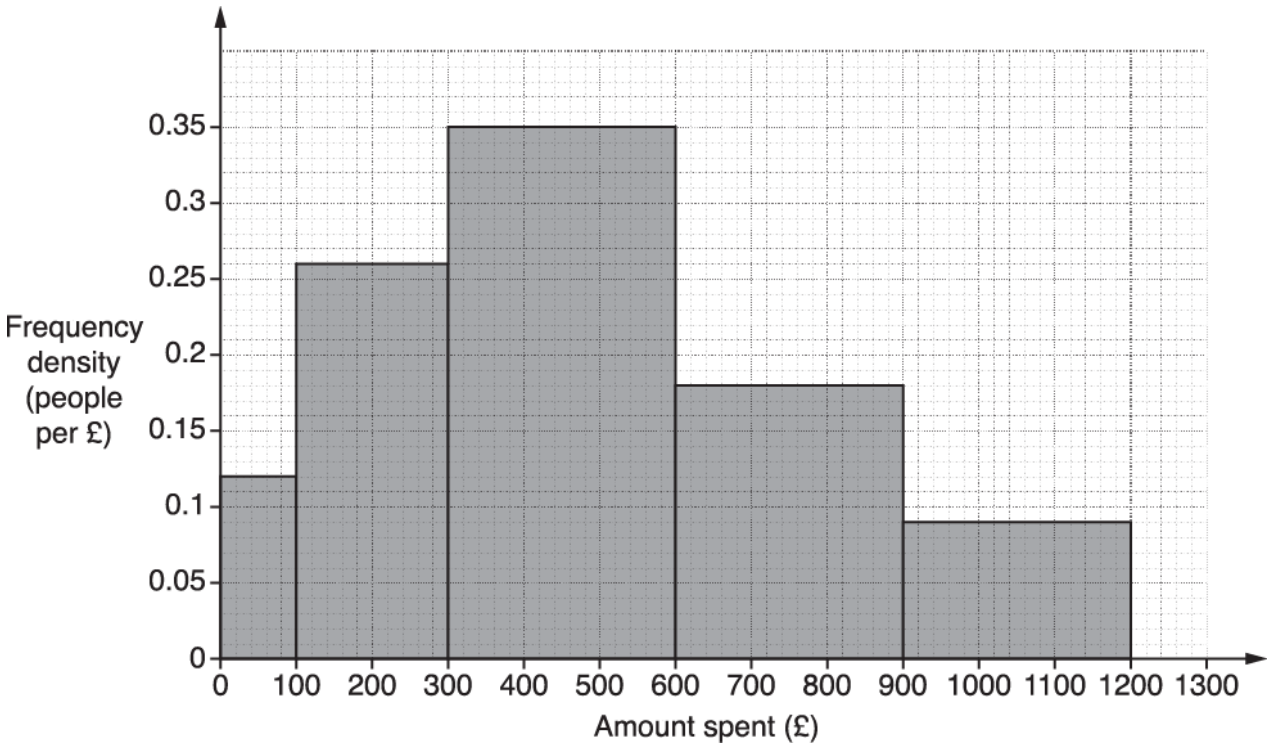
Amount spent (£a)	Frequency
$0 \leqslant a \leqslant 100$	12
$100 < a \leqslant 300$	40
$300 < a \leqslant 500$	36
$500 < a \leqslant 1000$	86
$1000 < a \leqslant 1500$	66
$1500 < a \leqslant 2000$	10

Draw a histogram to represent this information.



[3]

(b). This histogram represents the amount spent on food, drink and entertainment.



How many people spent from £600 to £900 on food, drink and entertainment?

_____ [1]

(c). The travel agent totalled the amounts spent by each person on travel and accommodation and on food, drink and entertainment to work out their total spending on a holiday. The travel agent said

The person who spent most on their holiday spent £3100 altogether.

Explain how this is possible, given the data in parts (a) and (b).

_____

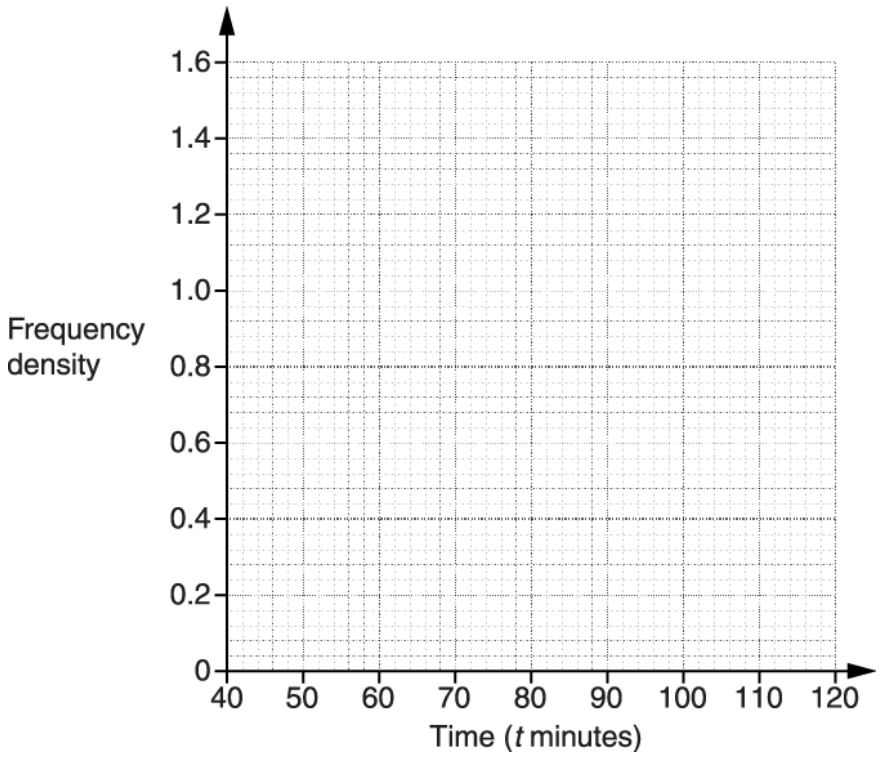
_____

_____ [1]

8. A teacher records the times taken for pupils to complete a cross-country course.
The results are summarised in the table below.

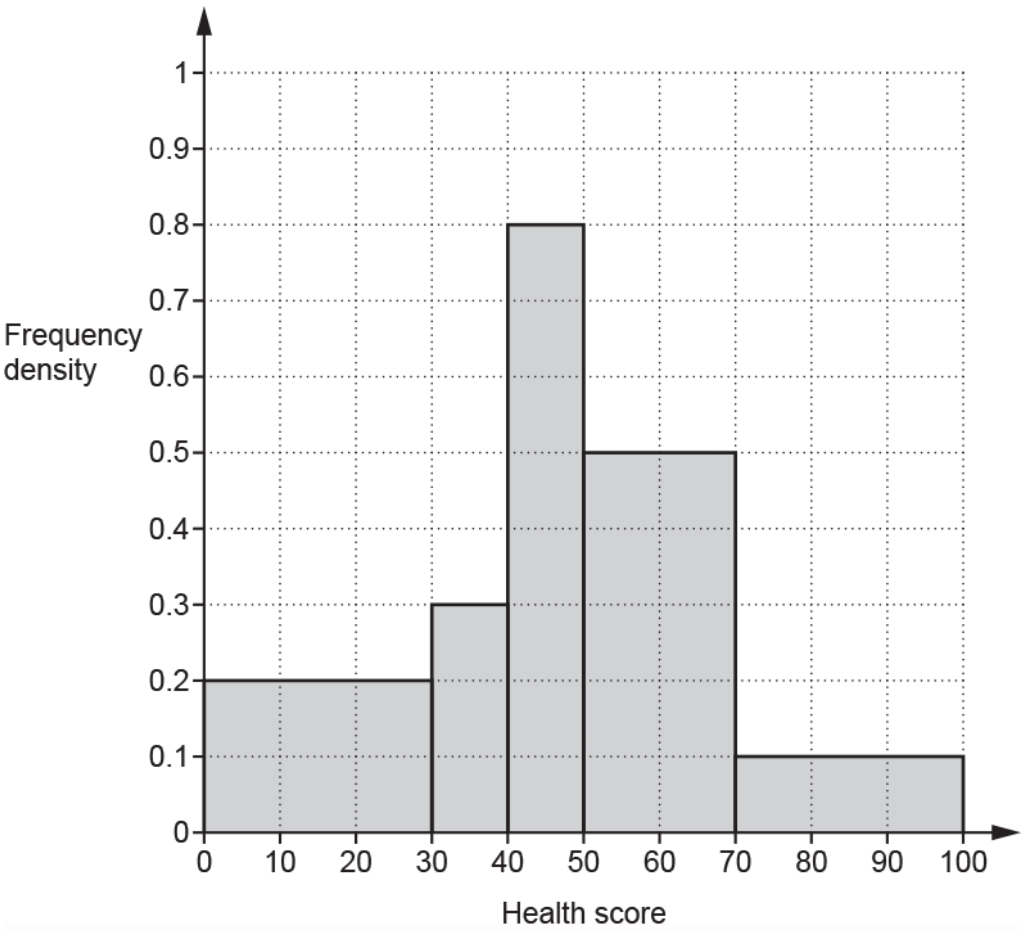
Time (t minutes)	Number of pupils
$40 < t \leqslant 50$	8
$50 < t \leqslant 60$	15
$60 < t \leqslant 80$	6
$80 < t \leqslant 120$	4

Draw a histogram on the grid below to show this data.



[3]

9(a). The histogram summarises a health score for a group of people.



Estimate the fraction of the group who had a score of 45 or more.

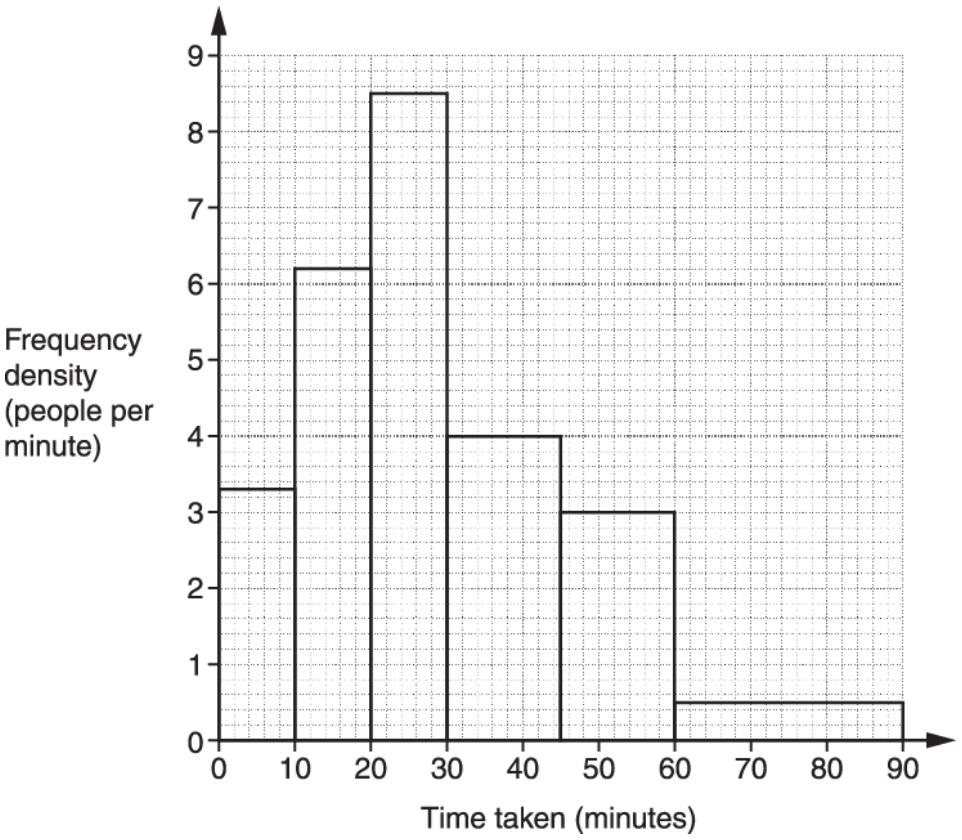
---------- [4]

(b). What assumption did you make in answering part (a)?

---------- [1]

10. Sonia surveyed a group of people in her town to find out how long it took each of them to travel from home to work.

Her results are summarised in the histogram.



(i) How many of these people took more than one hour to travel to work?

(i) _____ [1]

(ii) A national survey showed that 75% of workers took 30 minutes or less to travel from home to work.

How do the results of Sonia's survey compare with the national survey?

---

[4]

11. Eli and Jo each asked 50 people in their year group how many hours they used their mobile phone last Saturday.

Here are Eli's results.

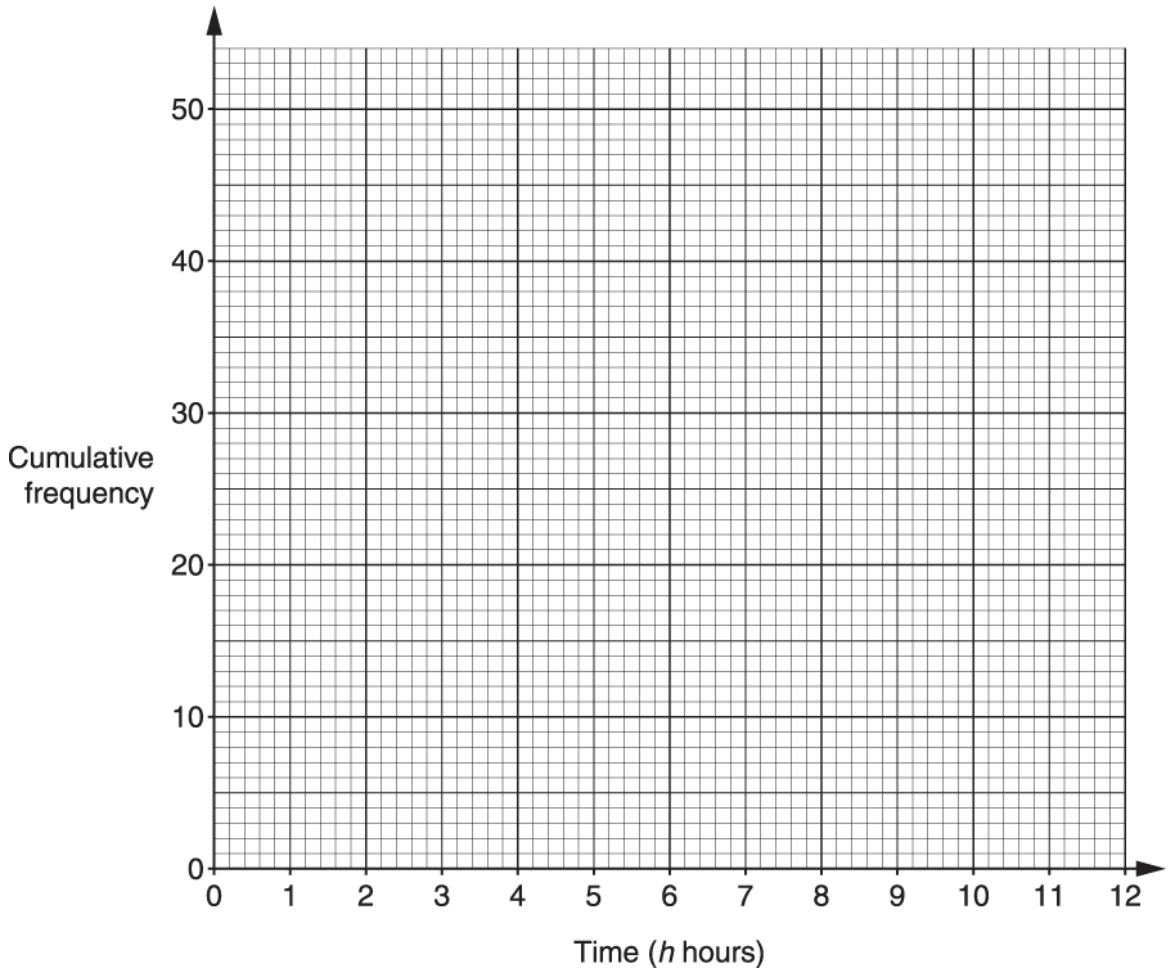
Time (h hours)	Tallies
$h = 0$	II
$0 < h \leqslant 2$	IIII
$2 < h \leqslant 4$	𝍸 III
$4 < h \leqslant 6$	𝍸 𝍸 III
$6 < h \leqslant 8$	𝍸 𝍸 𝍸 II
$8 < h \leqslant 10$	𝍸
$10 < h \leqslant 12$	I

(i) Complete this cumulative frequency table for Eli's results.

Time (h hours)	$h = 0$	$h \leq 2$	$h \leq 4$	$h \leq 6$	$h \leq 8$	$h \leq 10$	$h \leq 12$
Cumulative frequency	2	6					

[1]

(ii) Draw a cumulative frequency diagram to represent Eli's results.



[3]

(iii) Use your cumulative frequency diagram to find an estimate of the interquartile range of Eli's results. Show how you obtain your answer.

(iii)_____ hours

[2]

12(a) The table shows the marks gained by 150 students taking an examination.

.

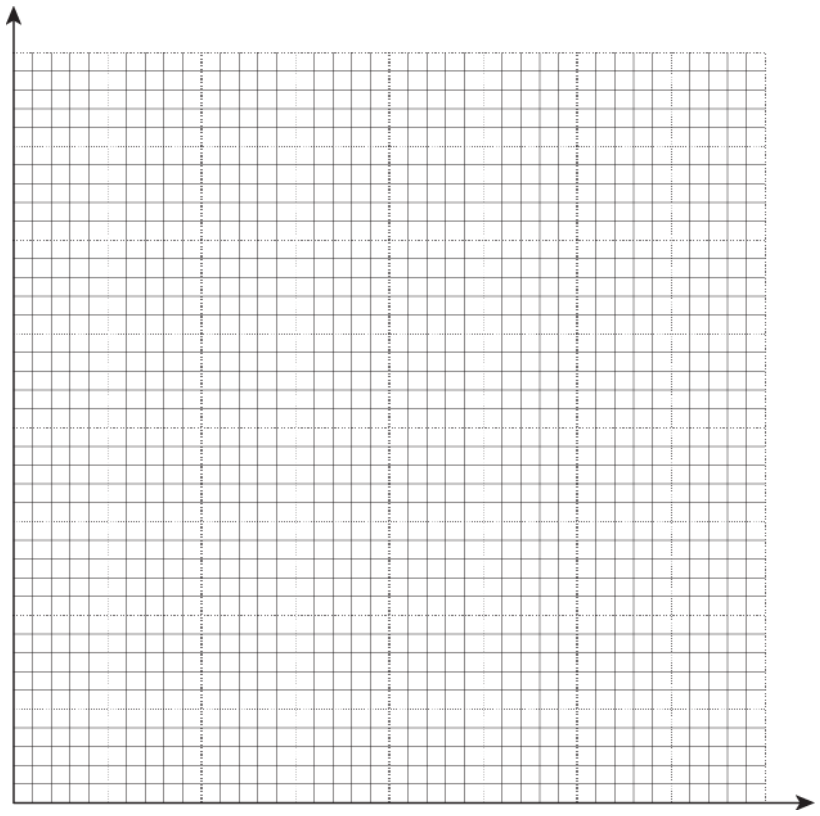
Mark (m)	$0 < m \leqslant 10$	$10 < m \leqslant 20$	$20 < m \leqslant 30$	$30 < m \leqslant 40$	$40 < m \leqslant 50$	$50 < m \leqslant 60$	$60 < m \leqslant 70$	$70 < m \leqslant 80$
Frequency	9	14	26	27	25	22	17	10

(i) Construct a cumulative frequency table.

Mark (m)	$m \leqslant 10$	$m \leqslant 20$	$m \leqslant 30$	$m \leqslant 40$	$m \leqslant 50$	$m \leqslant 60$	$m \leqslant 70$	$m \leqslant 80$
Cumulative Frequency	9							150

[2]

(ii) Draw the cumulative frequency graph on the grid below.



[4]

(b). Students are to be awarded Gold, Silver, Bronze or Fail.

The students' teacher wishes to award the top 10% of students Gold, the next 60% Silver and the next 20% Bronze.

Use your graph to estimate the lowest mark that Silver will be awarded for.

(b) _____ **[3]**

(c). Explain why the teacher's method will not necessarily award Gold to exactly 10% of the students.

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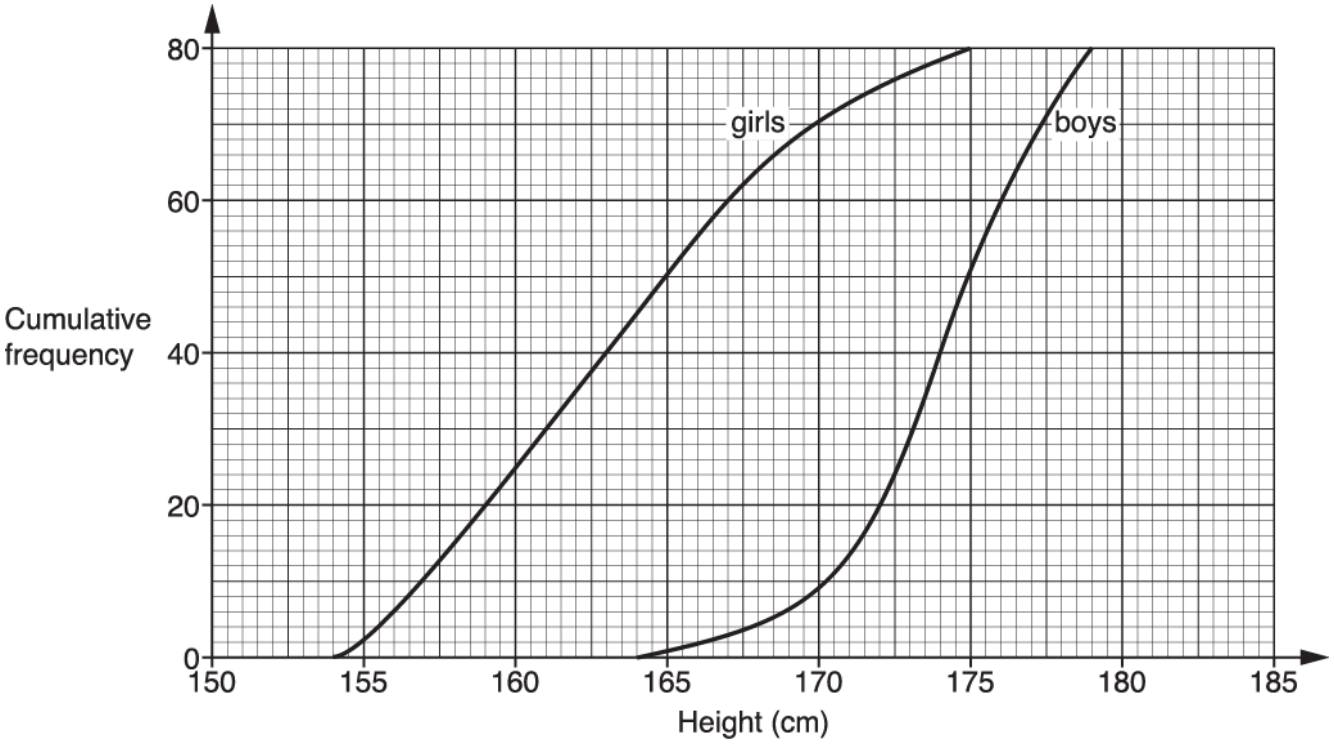
[1]

13(a). The cumulative frequency diagram shows the distribution of heights of a group of 80 Year 11 girls and 80 Year 11 boys.



Decide whether each statement below is true or false.

Use the cumulative frequency diagram to explain how you can tell.

Statement	True/False	Reason
More than one third of the boys are taller than the tallest girl.		
On average, the boys are taller than the girls.		
The boys' heights are more varied than the girls' heights.		

[3]

(b). Use the diagram to find

(i) the median height of the girls,

_____ cm

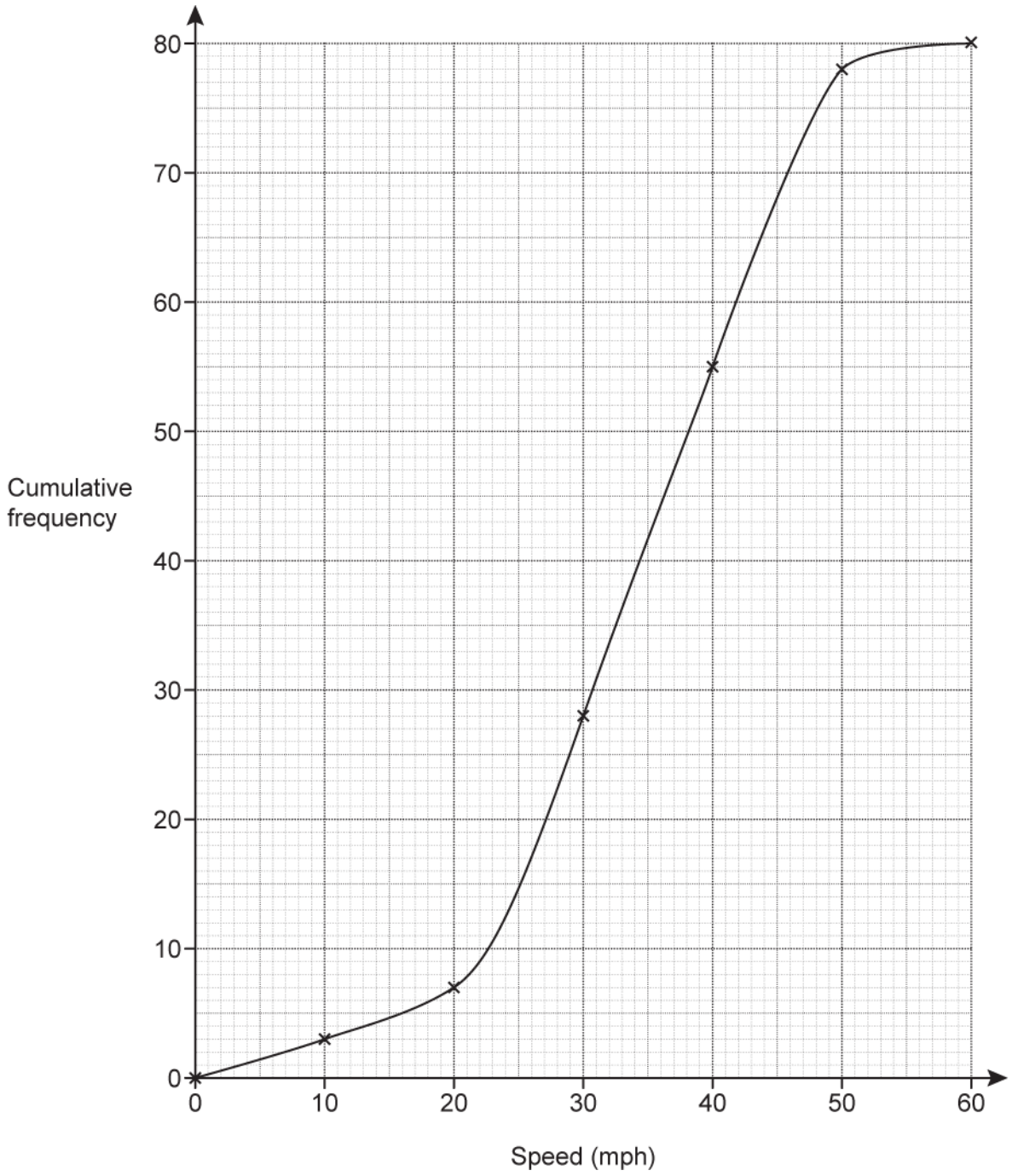
[1]

(ii) the number of boys who are at least 175 cm tall.

_____

[2]

14. The cumulative frequency graph shows the speeds, in miles per hour (mph), of vehicles passing a 40 mph speed limit sign on a road.



A speed camera will be installed if more than 30% of vehicles go over the speed limit of 40 mph.
Use information from the graph to decide if a speed camera should be installed. **[4]**

END OF QUESTION PAPER

Question			Answer/Indicative content	Marks	Part marks and guidance	
1		i	Correct histogram drawn with linear scale from 0	3	**B2** for at least four bars correct height OR **B1** for at least three correct frequency densities seen or at least three bars correct height FT *their* frequency densities and *their* linear scale AND **B1** for bars correct width and position with linear scale marked on frequency density axis **Max 2 marks if histogram not completely correct**	Use overlay for 2cm to 1 unit scale, other scales are acceptable, for B2 scale may be implied by bars in proportion Tolerance ±1mm for heights and widths Correct f.d. 0.4, 1.5, 2.1, 1, 0.3 *Their* frequency densities must follow attempt at frequency ÷ interval width Need not be frequency densities, scale must start from 0, 0 need not be shown, scale must include minimum two numbers Condone unruled and missing final vertical line <u>Examiner's Comments</u> Those candidates who knew that frequency density was required for a histogram often calculated the values, drew the bars correctly and remembered to include the scale. Some candidates attempted to calculate frequency densities but made errors in the division of 8 by 20 and 6 by 20. Some attempts at calculating frequency density involved multiplying frequency by the class width or dividing class width by frequency. A large number of candidates just plotted the frequencies, but they were given partial credit if they had included a linear scale starting from 0 and their bars were of the correct width.

Question			Answer/Indicative content	Marks	Part marks and guidance	
		ii	33 or 34	1		Integer answer only <u>Examiner's Comments</u> Many candidates gave a reasonable estimate of the number of apples, but some gave a non-integer answer such as 33.5 which was inappropriate. Common incorrect answers were 23, the number of apples under 110 g, and 44, the number under 120 g.
			Total	4		

Question			Answer/Indicative content	Marks	Part marks and guidance	
2		i	3	1		
		ii	It was between 0 and 2 hours	1	Accept 'it was less than 2 hours' or 'it was 2 hours or less' or 'from 0 to 1.99 h' or better **Examiner's Comments** Quite a good number of histograms were drawn. Frequency graphs were also in evidence but perhaps not as many as on past occasions, and many candidates seemed to realise they needed to calculate something first. Errors were inverting the division, multiplying frequency by width or, occasionally, performing a calculation involving the mid-points or cumulative frequency. Most scales were appropriate and consistent for their values, although the 'frequency density' label was often missing. The width of the first bar extending to zero, rather than starting at 10, was another common error. In part (b), those who had been able to work out frequency densities to draw their graph, and a few others, usually correctly interpreted the histogram to work out the number of people cycling for 10 hours or more. However, in the last part, although most responses used the first bar, few candidates could correctly interpret its meaning in relation to the time taken, with many referring to the number of	**Exemplar responses** 0 for comment only about number of people cycling shortest time; must refer to the time only a few people cycled between 0 and 2 hours (1) Relatively very few did short distance, so less arrived between 0–2 hours (1) The shortest distance was up to 2 hours (1) 2.5 people did up to 2 hrs [ignore number of people] (1) Five people did 2 hours (0) only 5 people cycled the shortest time (0)

Question			Answer/Indicative content	Marks	Part marks and guidance	
					cyclists or comparing its 'frequency' with that of the other bars. Those that did mention time often thought the shortest time was 2 hours.	
			Total	2		

Question			Answer/Indicative content	Marks	Part marks and guidance	
3		i	Correct histogram drawn	3	**B2** for all 7 bars correct heights OR **B1** for at least 5 bars correct heights or 5 correct frequency densities **soi** 4.1, 27.4, 39.8, 40.4, 23.2, 5.2, 0.1 and **B1** for at least 5 bars correct width **Examiner's Comments** In part (b)(i) many candidates dealt very well with the difficulty of the real data and produced an accurate histogram within the acceptable tolerances. Common errors were in the width of the bar for 45 to 65 years, which often stopped at 55, 60 or 70. Where heights of bars were incorrect it was usually 40.4 plotted at 44 or 4.1 plotted at 41. Most candidates however gained at least one mark in this question.	Tolerance is ± one small square Tolerance is ± one small square Accept to nearest integer Maximum 2 marks if frequency polygon seen
		ii	Two valid, worthwhile comparisons e.g. More mothers > 40 in 2010 More mothers < 20 in 1980 More positive skew in 1980 than 2010	2	**B1** for each Comments may compare mode, spread or different bars for example **Examiner's Comments** In part (b)(ii) a comparison was required, so candidates needed to make two comments that clearly described similarities or differences between the two distributions and they did not perform as well as was expected on this question where any valid comparison would have been given	Mark best part of each comment Comments must include some comparison If graph drawn must ft from their graphs otherwise must be correct Do not accept comments about frequency density If ranges other than those given are used, comparison must be clearly correct **Exemplar Response** 30–40 year olds births per year has now increased Women over 45 now have children

Question			Answer/Indicative content	Marks	Part marks and guidance	
					credit. Many correct statements were seen, such as 'there were no births in 1980 by women over the age of 45' but although this was correct it could not be given credit because it did not involve any comparison. Comments needed to refer to specific age groups and referring to younger/older people was considered too open to interpretation.	More people aged between 10–20 gave birth in 1980 On both the age between 25–30 is large Births were more spread out in 2010 More births in 1980 In 2010 the most common age is between 30 and 35 whereas in 1980 it is between 25 and 30 In 2010 older people are having babies with 100 babies per year when the woman is aged between 45 and 60 whereas in 1980 no one above 45 had a baby There are more older women giving birth in 2010 between 45 and 65 There are less births in women aged 10–20 in 2010 The range of ages is larger in 2010 from 10 years old to 65 years old The most popular ages in 1980 are 20–30 in 2010 25–35 A lot more had babies at age 20–25 in 1980 25–30 is not much different from 1980 – 2010 A lot more births between the age of 10 and 20 in 2010 compared to 1980 More births in 2010 for over 45 year olds than in 1980

Question			Answer/Indicative content	Marks	Part marks and guidance	
						The frequency density for 10 < a < 20 year olds is about the same in both years There were a higher number of births for 25 < a < 30 year olds in 1980 than 2010 There are a higher amount of 30 year olds giving birth in 2010 There are also a higher number of 40–45 year olds giving birth More women in 1980 were given birth at younger age than in 2010 The interquartile range of about women in 2010 is higher than the interquartile range of 1980 The number of births were more between 20s to 30s in 1980 There is no number of births to women in age groups 45–50 in 1980 comparing to 2010 The frequency of births have risen since 1980 all the way through to 2010 People of older ages have started having children in 2010 The 1980s median has a bigger value than 2010 of 20 1980s range has bigger value which makes 2010 more consistent

Question			Answer/Indicative content	Marks	Part marks and guidance	
						A majority of women gave birth when they were 20–35 years old Not many gave birth from the ages of 10–20 and 35–45 years old There are a higher number of babies born in 2010 than in 1980 The age bracket of over 45 in 1980 shows no births after but 2010 has consistent births until age 65 The age of women giving birth has risen More women are having babies Most women give birth between the ages of 20 and 30 Small distribution of births over the age of 40 The modal ages in 2010 are between 25–35 and in 1980 it is 20–30 The overall number of births per year has decreased since 1980 Less people are having kids before the age of 40 in 2010 In 2010 women kept having children through their 40s unlike in 1980 More people in 1980 had children between the ages of 10 and 40 than in 2010

Question			Answer/Indicative content	Marks	Part marks and guidance	
						More people in 2010 had children between the ages of 40 and 50 than in 1980 More teens have got pregnant in 2010 There are more births 30 < a < 35 in 2010 Older people are giving birth in 2010 till they are 65 whereas in 1980 they stopped at 45 There are more births in 2010 than in 1980 and it has a higher mean In 1980 nobody over the age of 45 had a baby but in 2010 nobody over the age of 65 had a baby 1 [bod] The range of distributions is greater in 2010 than 1980 with class width to 65 years instead of 45 years In 1980 the highest distribution, modal class, was 25 < a < 30 whereas in 2010 it's 30 < a < 35 There are more 30–35 in 2010. There are fewer 30–35 in 1980. In 2010 there were 4000 births between 10 and 20 but in 1980 there were 6000 In 2010 there were 137000 births between 20 and 25 but in 1980 there were 200 000 births

Question			Answer/Indicative content	Marks	Part marks and guidance	
			Total	5		
4			13 nfww	2	**M1** for 7 and 6 (may be seen on diagram; may be split into 3.5s and 1.5s); condone one error but both bars must be attempted	NB not from 7h or 6h eg 13 – 7 = 6 Examiner's Comments Interpreting the histogram in part (b) was done well by most candidates, although, by this stage of the paper, some candidates had no idea how to proceed.
			Total	2		
5			Fds 0.4, 0.7, 1.25, 0.8, 0.36	1	At least 3 correct; may be implied by heights of bars	
			Bars of correct height	1	Tolerance 1 mm unless on gridlines	FT their scale;
			Bars of correct width	1	Must have no bar 0–10	Ignore additional polygons
			Vertical axis with consistent linear scale and labelled 'Frequency density' oe	1	**B0** for scale of 0–40 etc for frequency graph even if labelled frequency density	Accept abbreviations;
			Total	4		
6			7	1	Examiner's Comments Some weaker candidates omitted this question. However those who knew this topic often correctly found the frequency.	
			Total	1		

Question			Answer/Indicative content	Marks	Part marks and guidance	
7	a		Frequency densities 0.12, 0.2, 0.18, 0.17[2], 0.13[2], 0.02 soi	1	Seen or plotted Condone one error	
			Heights correct	1	No FT from wrong frequency density	accept plotting within square for 0.17 to 0.172, and similarly for 0.13 to 0.132
			Widths correct	1	0 for widths mark if polygon drawn as well **Examiner's Comments** Constructing the histogram was done well.	for 100, 300, 500, 1500 condone vertical up to half a square out
	b		54	1	**Examiner's Comments** Most candidates calculated the frequency densities correctly, with some let down by an incorrect plot (0.2 being plotted as 0.02, for example). Weaker candidates usually scored the mark for widths.	

Question			Answer/Indicative content	Marks	Part marks and guidance	
	c		the groups go up to 2000+1200 = 3200 max, but the person who spent most can spend less than this	1	or 'they may not have been the top person in each category but spent most overall' bod 'they' as being the person who spent most Examiner's Comments Most probably did not appreciate what was actually being asked, so most of the better candidates merely argued that £3200 was the maximum sum so £3100 must be possible.	Condone omission of being the person who spent most if valid spending itemised e.g. 2000 + 1100 [= 3100]; must reference 3200 (or 2000 and 1200) or reference both 1500 – 2000 and 900 – 1200 Response It is possible that one person who spent between 1500 and 2000 in (a) is the same person who spent between 900 and 1200 in b) e.g. £2000 from (a) and £1100 from (b) (1 bod error the 'same person') It is possible because the highest amounts are £2000 and £1200 spent on accommodation etc. These are not necessarily the actual amounts spent – they are merely the average. So while £3200 would be the highest amount, £3100 is likely as people did not necessarily spend the highest amounts in each category (1 in spite of error 'the average' and 'people') They might have spent £2000 on travel etc but only £1100 on food etc because although the group is from 900 to 1200 it doesn't mean the biggest value is £1200, all the values could be £1100 or less but it still goes into that category (1) They could have spent up to £2000 on tr and acc and up to £1200 on food etc which is £3200 so it is

Question			Answer/Indicative content	Marks	Part marks and guidance	
						possible they spent £3100 (1 bod; the 'up to's help to give the mark) The max was 3200 but nobody spent as much as that (0 not sufft) The person was in the top band for both (0 not sufft) The most is 3200. You would have to spend £100 less than that (0 not sufft) They could have spent £2000 on travel and accommodation and spent £1100 on food, drink and entertainment. (0 not sufft) The groups show a range of spending. They might have spent £2000 on travel and acc. And £1100 on food etc with no one actually spending £1200 on that (1 bod)
			Total	5		

Question			Answer/Indicative content	Marks	Part marks and guidance	
8			fully correct histogram	3	**M1** for correct bar widths e.g. 40–50, 50–60, 60–80, 80–120 **M1** for two correct heights or three correct figures seen from 0.8, 1.5, 0.3, 0.1 <u>Examiner's Comments</u> Most candidates drew the correct bar widths and most drew the first two bars correctly. They calculated the frequency density by usually dividing the frequency by 10; many did not check that the class widths varied in the last two classes. Plotting of the histogram was usually very accurate, the scale providing few problems.	tolerance on graph is $\pm \frac{1}{2}$ small square condone freehand 'bars'
			Total	3		

Question			Answer/Indicative content	Marks	Part marks and guidance	
9	a		$\frac{17}{30}$	4	B2 for $\frac{17}{3}$ OR M2 for 30×0.1+20×0.5+10×0.8+10×0.3+30×0.2 soi by 30 or M1 for three correct frequencies from 3, 10, 8, 3 and 6. and M1 for 3 + 10 + 4 or 17 It can be done with probabilities Examiner's Comments In part (a) unfortunately very few knew how to extract the frequencies from this histogram. It was still possible to answer this question but errors were made in calculating the required figures as the width of each group had to be considered.	
	b		They were evenly spread out in the 40 – 50 class	1	accept any correct statement e.g. half the people in the 40 – 50 got over 45 Examiner's Comments In part (b) it is always the method to treat frequencies in grouped tables as being uniformly distributed within each group.	

Question			Answer/Indicative content	Marks	Part marks and guidance
			Total	5	

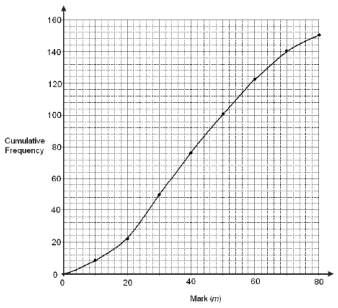
Question			Answer/Indicative content	Marks	Part marks and guidance	
10		i	15	1	Examiner's Comments Candidates who understood how to interpret a histogram gave the correct answer of 15 in part (i). It was common to see answers of 0.5 which was simply a reading of the frequency density.	

Question			Answer/Indicative content	Marks	Part marks and guidance	
		ii	60% in Sonia's survey is less than 75% Or 225 people in national survey is more than 180 people in Sonia's survey	4	**M1** for at least 3 of 33, 62, 85, 60, 45, 15 **M1 dep** for sum of *their* 6 frequencies **M1** for 0.75 × *their* '300' Or *their* (33 + 62 + 85) ÷ *their* '300' **M1** for correct comparison of *their* percentage with 75% or *their* number of people with *their* 225 **Max 3 marks if errors in working** **Examiner's Comments** Some candidates gave correct answers with clear comparisons of the two surveys in part (ii). Having reached the correct percentage of 60% in Sonia's survey some candidates failed to compare this with the 75% in the national survey, either just stating Sonia's result or saying that it was different to the national survey. Some candidates misread the scales on the axes leading to incorrect frequencies or incorrect bar widths. Candidates who showed their method clearly often gained some credit in this question, as even if the frequencies had been found incorrectly or frequency densities used, method marks were available for	Frequencies may be seen on graph 300 seen implies **M1M1** or 180 seen implies **M1** Dependent on previous method mark, may be implied by correct total of their 6 seen frequencies accept eg $\frac{180}{300}$ See exemplars for acceptable comments Allow equivalent method marks if areas of bars used eg 82.5, 155, 212.5, 150, 112.5, 37.5 leading to $\frac{450}{750}$ **Response** **Assume values used in these comments follow from the candidate's working. These are given as examples to clarify when the final M1 mark may be awarded. This M1 can only be awarded if percentage / no of people (ft their working) is used in the reason.** Sonia's results are close to national survey as 75% of Sonia's is 19.125 and only 18 people got to work with 30 minutes or less (M1) Sonia's survey says that less than 75% take 30 minutes or less [*scores M1 if their % less than 75% has been clearly identified*] (M1)

Question			Answer/Indicative content	Marks	Part marks and guidance	
					calculating the percentage and for making a clear comparison between the two surveys using their results.	Sonia's survey shows that 10% less take less than 30 mins to get to work in comparison with the national survey [*following their calculation giving 65%*] (M1) Around 70% of workers took 30 minutes or less to travel to work, 5% less than national survey (M1) Hers are different to the national survey as only 58% of people she surveyed take 30 mins or less which is different (M1) Sonia's results are wrong because only 59% of people took 30 minutes or less [***wrong** is incorrect*] (M0) There are 179/349 which is 51.3% meaning Sonia's survey is different to the national survey [*not quite enough to imply less*] (M0) Sonia's is 60% under 30 mins but isn't far off national survey (M0) Sonia's survey wasn't the same results as the national survey as 60% took 30 mins or less to travel home from work [*'only 60%' would just imply this M1*] (M0) Only 60% of workers are home within 30 minutes [*doesn't mention what it's comparing with*] (M0)
			Total	5		

Question			Answer/Indicative content	Marks	Part marks and guidance	
11		i	14, 27, 44, 49, 50	1		
		ii	plots at rh end of intervals	1	0 for plots of frequencies etc.	attempts at frequency graphs score 0 in this part
		ii	plots of correct heights	1	tol 1 mm; ft one error in table eg cfs 2, 6, 12, 25, 42, 47, 48	0 for bars at correct heights since must miss off one end; if cf graph as well as bars, ignore bars
		ii	join with smooth curve or straight line segments	1	ft their ascending plots only; tol 2mm	

Question			Answer/Indicative content	Marks	Part marks and guidance	
		iii	FT their cf graph with correct evidence	2	oe in hours and minutes throughout (condone poor notation); allow FT from plots at midpoints correct down lines for LQ and UQ on graph without values then correct answer is enough for full marks **M1** for LQ or UQ FT their ascending diagram tol 1mm of our reading to 1 d.p. at the correct horizontal positions	eg condone 7.12 for 7h 12min = 7.2 h non-cumulative frequency graphs and lines of best fit score 0 in this part (no FT if they have horizontal reading-off lines not within correct grid squares) <u>Examiner's Comments</u> A few candidates failed to appreciate the cumulative aspect of the question in part (a) and scored poorly. However, apart from a few arithmetic slips, most completed the table and plotted points at the correct height. Most also plotted at the right-hand end and joined their plots appropriately. There were only a few instances of bars. Most candidates who had drawn a cumulative frequency graph showed evidence of how to find the interquartile range and found this accurately, although there were a few instances of using the median.
			Total	6		

Question			Answer/Indicative content	Marks	Part marks and guidance	
12	a	i	Table: 9 23 49 76 101 123 140 150	2	**M1** for attempt to accumulate the values	
		ii		4	**B1** for labelling axes **B1** for correct curve through points **B1** for at least six points correctly plotted	
	b		28 – 32	3	**M1** for 45 or 105 seen **A1** for corresponding answer **FT** *their* graph	
	c		The boundaries are set from approximations based on grouped data, not the actual scores obtained by the students	1		
			Total	**10**		

Question			Answer/Indicative content	Marks	Part marks and guidance	
13	a		True, 28 taller than 175, greater than one third of 80	1		**More than one third of the boys are taller than the tallest girl:** T, 30/80 is larger than 1/3 [*30 and 80 seen*] (1) / T, 1/3 of boys taller than 175.5, and the tallest girl is 175 (1) / T, because 30 boys are taller than tallest girls and 30 is bigger than 1/3 of 80 [*30 and 80 seen*] (1) / T, 30 out of the 80 boys were taller than the tallest girl [*30 and 80 seen*] (1) / T, 3/8 of the boys were taller than the tallest girl [*condone 30/80 simplified to 3/8*] (1) / **Do not accept** T, the tallest girl is 175cm and there are a cumulative frequency of 30 boys who are taller than this [*80 not seen*] / T, 30 boys out of 50 are over 175cm, the same as the tallest girl [*50 in place of 80*] / T, because 20 boys are taller than the tallest girl [*no ft from their aii*] / T, because only just under one third are taller than the tallest girl / T, more than a third of the boys on the graph are past 175 / T, boys heights are bigger / T, the last third are longer than the tallest girl / T, half of the boys are taller than the tallest girl / F 1/3 of 80 is around 26, 30 boys were taller [*states False, so 0*] Exemplar responses – **On**

Question	Answer/Indicative content	Marks	Part marks and guidance
			average, the boys are taller than the girls: T, boys have a higher median (1) / T, the girls average is 163cm and is smaller than the boys of 172cm [*comparison, ignore values*] (1) / T, the boys mean is bigger [*condone mean*] (1) / T, the boys' line is further to the right [*implies higher median*] (1) / T, they have greater upper and lower values and the boys median is higher [*first comment is not incorrect, so do not penalise*] (1) / T, half the girls are taller than 163cm whereas all the boys are taller than 164cm [*correct statement and implies higher median*] (1) / T the boys heights are further along the diagram showing that they are all averagely taller (1)bod / **Do not accept**: T, the median is higher [*needs to specify boys' median*] / T, the median for the girls' heights is 165.5cm while for boys it is 175.5 cm [*no comparison of values*] / T, the boys average is bigger [*no interpretation, repeating question*] / T, the first boy was 164 where the first girl was 154 [*must compare average, not tallest/shortest*] / T, the line is further along [*needs to specify boys' line*] / T, the boys height starts a

Question	Answer/Indicative content	Marks	Part marks and guidance
			lot higher than girls. Girls line stops at 175cm, boys at 179cm [*compares tallest/shortest*] / T, they have a taller start, finish and steeper gradient [*too vague*] / T, because most of the boys heights are taller than girls [*too vague*] / T, the boys' heights range from 164–178 whereas the girls' range from 154 to 175. So there are more taller boys / T, the boys heights reach 179cm, the girls reached 175cm [*must compare average, not tallest/shortest*] / T, the boys always have a larger height on the diagram [*not quite enough*] / T, UQ for boys is bigger than UQ for girls [*not comparing medians*] / Exemplar responses – **The boys' heights are more varied than the girls' heights:** F, girls' heights are more spread out [*implies bigger range*] (1) / F, the girls have a bigger range (1) / F, the IQR for girls is 8cm whereas the IQR for boys is only 4cm [*if IQR correct no explicit comparison required*] (1) / F, the girls have a range from 154–175 while the boys have a smaller range of 164–179 [*explicit comparison*] (1) / F, the boys range is 15cm and the girls range is 21cm [*if ranges correct no explicit*

Question	Answer/Indicative content	Marks	Part marks and guidance
			comparison required] (1) / F, the boys heights vary from 164 to 178 where girls vary from 154 to 175, more spread out [*explicit comparison*] (1) / F, the boys line is much steeper than the girls meaning is shorter so less varied (1) / F, the girls heights is more varied because the girls line spreads out more than the boys [*implies less steep*] (1) / F, the boys have a straighter line on the graph meaning close together whereas girls have a bendier line which means that they are more spread out (1)bod / Do not accept: F, their line has a steeper gradient [*needs to specify boys' line*] / F, they are closer together [*too vague and doesn't specify boys*] / F, the girls are continuously changing whereas the boys just rapidly increase at 170 [*unclear*] / F, the graph shows the girls heights always differ, the boys line shows 170–172 was most common [*not enough*] / F, the boys line starts at 164cm and ends at 179 where girls starts at 154cm and ends at 175cm [*no comparison*] / F, because the boys height range from 164–179 and girls range from 154–175 [*must give explicit comparison if range not*

Question			Answer/Indicative content	Marks	Part marks and guidance	
						evaluated] / F, this is not shown on the graph / F, the girls height is more varied than the boys [*repeats question*] / F, girls range 21 but boys range is only 13 [*must give explicit / comparison if ranges not both correct, 'only' is not enough as a comparison*] / F, boys IQR = 5, girls IQR = 9 [*must give explicit comparison if IQRs not both correct*] Must have True/False correct **and** reason Accept 28 to 30 Reason must include 28 to 30 and 80 (or 3/8) or 1/3 are taller than *k* where $175 < k \leq 176$ and tallest girl is 175
			True, median for boys greater than girls	1		Values of median not required in comparison. Do not penalise for incorrect values. Condone mean for median

Question			Answer/Indicative content	Marks	Part marks and guidance	
			False, range or IQR for boys less than girls	1		Correct values of range/IQR are not required if used in comparison. If both ranges/IQRs evaluated correctly no comparison required. Range G = 21, B = 15. IQR G = 8, B = 4 <u>Examiner's Comments</u> Many candidates correctly identified whether each statement was true or false, however many gave vague or long-winded explanations rather than a succinct explanation with clear reference to the appropriate aspect of the data. In the first reason, candidates were expected to relate their previous answer of 30 to the sample size of 80 and compare this with one third. Many identified that the median would be an appropriate measure of average from a cumulative frequency diagram and quoted the correct values in their second reason but omitted a comparison. Quoting 'Boys have a higher median' was enough to score but 'They have a higher median' was not sufficiently clear. Most were able to score the mark for the third reason since the idea of range was well known, although some simply quoted the tallest and shortest heights for each.

Question			Answer/Indicative content	Marks	Part marks and guidance	
	b	i	163	1		Examiner's Comments Most candidates read the value of the median correctly from the cumulative frequency diagram in (i).
		ii	28 to 30	2	**B1** for 50 to 52 seen	Examiner's Comments Many candidates correctly read the cumulative frequency for a height of 175 cm from the diagram, but a significant number gave this as their answer rather than subtracting from 80 to give the number of boys who were at least 175 cm tall.
			Total	6		

Question			Answer/Indicative content	Marks	Part marks and guidance		
14			55 soi by 25 80 – *their* 55 soi 25 [0].3[0] × 80 soi 24 25 and 24 so yes oe	B1 M1 M1 A1	condone if written on graph or *their* 25 ÷ 80 or 31[%] or 31.2 to 31.3[%] 31[%] or 31.2 to 31.3[%][and 30] so yes **A1dep** on both **M1**s and **A1FT** follow through from *their* 55	accept any correct method e.g **B1** for 55 **M2** for [0].7 × 80 soi 56 or **M1** for [0].3 × 80 soi 24 **A1** for 55 and 56 so yes	

Examiner's Comments

There were many correct methods to answer this question. Most candidates were able to interpret a cumulative frequency graph correctly. The common error was to take the reading as being 'more than' rather than 'less than'. The expected solution was to read off that 55 vehicles were being driven at 40 mph or less. As there were 80 vehicles, 25 of them were going over 40 mph. This 25 was then expressed as a percentage of 80, giving 31.25%, which is more than the allowable amount, so a speed camera needed to be installed. Another common correct method was to find 30% of the 80 vehicles, giving a

Question			Answer/Indicative content	Marks	Part marks and guidance	
					total of 24 that would be allowed to go over 40 mph, however the graph gave 25, so again the camera needed to be installed. Another less common although equally acceptable method was to find 70% of 80 (which is 56), which is the number that need to be at 40 mph or below; the graph gave only 55, so again the camera was needed. An error made by some candidates was to misinterpret the 55 as a percentage of 80 and think that this 68.75% was a lot more than 30%, whereas it is the 100 – 68.75 that needs to be compared. A further error was made by those candidates who misunderstood the graph, and thought that the numbers read off it at each 10 mph value were the number of vehicles actually travelling at that speed.	
			Total	4		