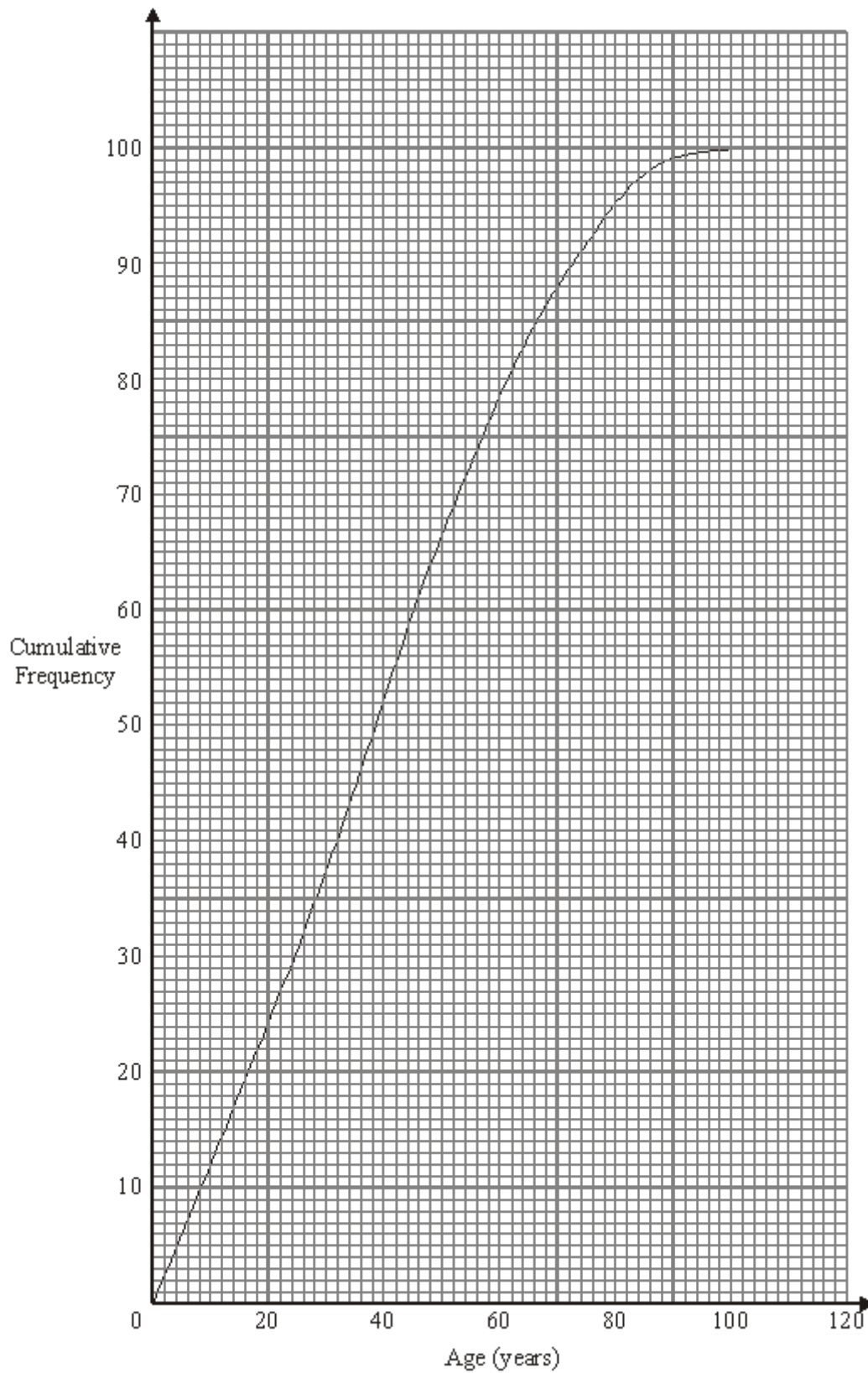


**Q1.** The cumulative frequency graph shows some information about the ages of 100 people.



- (a) Use the graph to find an estimate for the number of these people less than 70 years of age.

.....

(1)

- (b) Use the graph to find an estimate for the median age.

..... years

(1)

- (c) Use the graph to find an estimate for the interquartile range of the ages.

..... years

(2)

(Total 4 marks)

**Q2.** The table shows the number of televisions sold each month by a shop.

<b>Month</b>	April	May	June	July	Aug	Sept	Oct
<b>Number of televisions</b>	163	100	118	99	63	92	74

- (a) Work out the four-point moving averages for this information. The first three have been worked out for you.

.....120..... .....95..... .....93..... .....

(2)

(b) Use the moving averages to describe the trend.

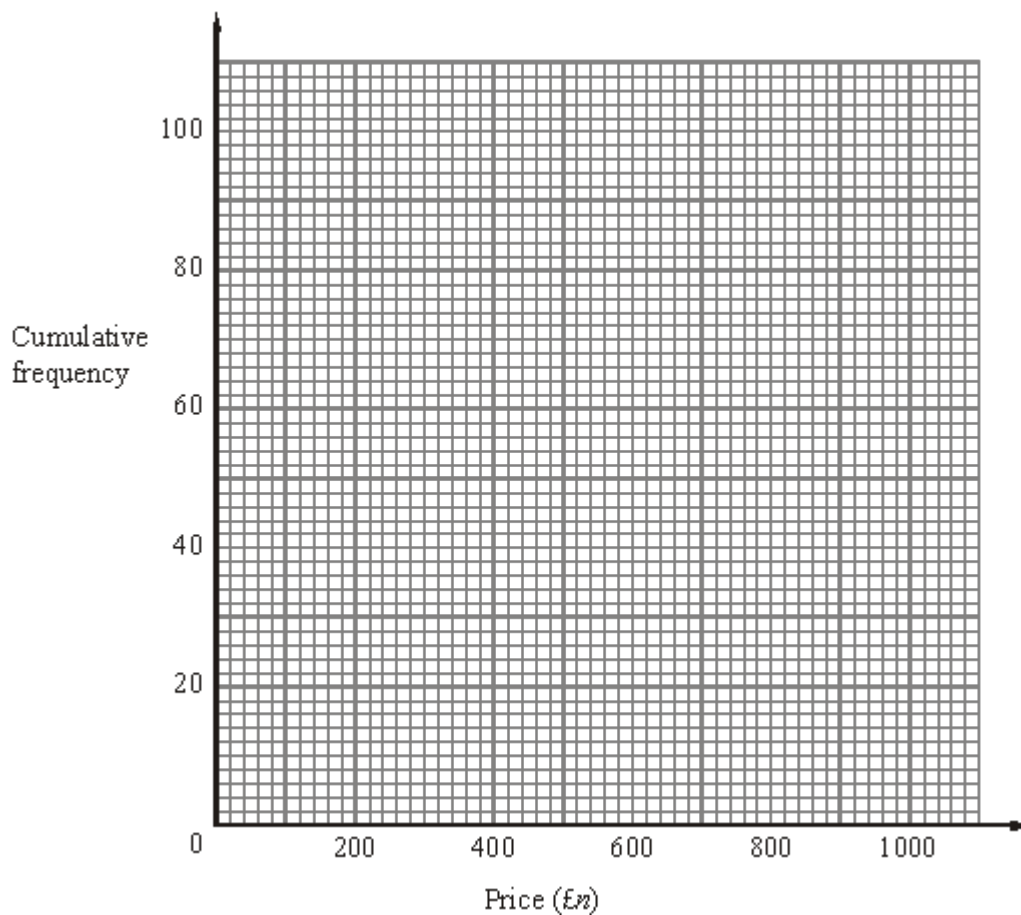
.....

(1)

The **cumulative frequency** table shows information about the prices, in £, of 100 televisions.

Price (£ $n$ )	Cumulative frequency
$0 < n \leq 200$	5
$0 < n \leq 400$	20
$0 < n \leq 600$	40
$0 < n \leq 800$	75
$0 < n \leq 1000$	100

(c) On the grid below, draw a cumulative frequency graph for the table.



(2)

(d) Use your graph to find an estimate for the median price of these televisions.

£ .....

(1)

(Total 6 marks)

**Q3.** The table gives some information about the area, in km<sup>2</sup>, of 30 countries.

Area ( $n$ million km <sup>2</sup> )	Frequency
$0.00 < n \leq 0.25$	4
$0.25 < n \leq 0.50$	9

$0.50 < n \leq 0.75$	4
$0.75 < n \leq 1.00$	5
$1.00 < n \leq 1.25$	6
$1.25 < n \leq 1.50$	1
$1.50 < n \leq 1.75$	1

(a) Write down the modal class interval.

.....

(1)

(b) Find the class interval that contains the median.

.....

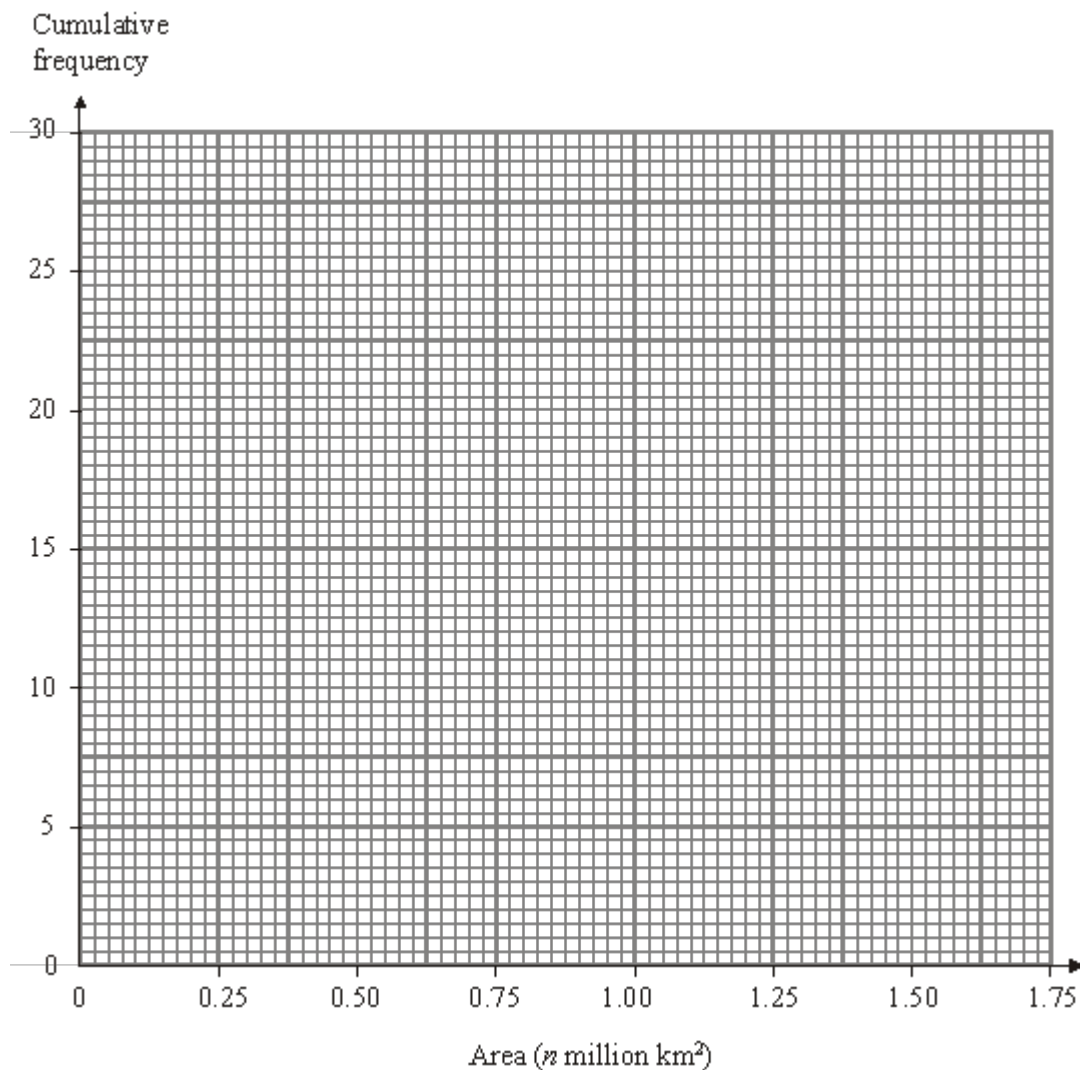
(1)

(c) Complete the cumulative frequency table.

Area ( $n$ million km <sup>2</sup> )	Frequency
$0.00 < n \leq 0.25$	4
$0.00 < n \leq 0.50$	
$0.00 < n \leq 0.75$	
$0.00 < n \leq 1.00$	
$0.00 < n \leq 1.25$	
$0.00 < n \leq 1.50$	
$0.00 < n \leq 1.75$	

(1)

(d) On the grid, draw a cumulative frequency graph for your table.



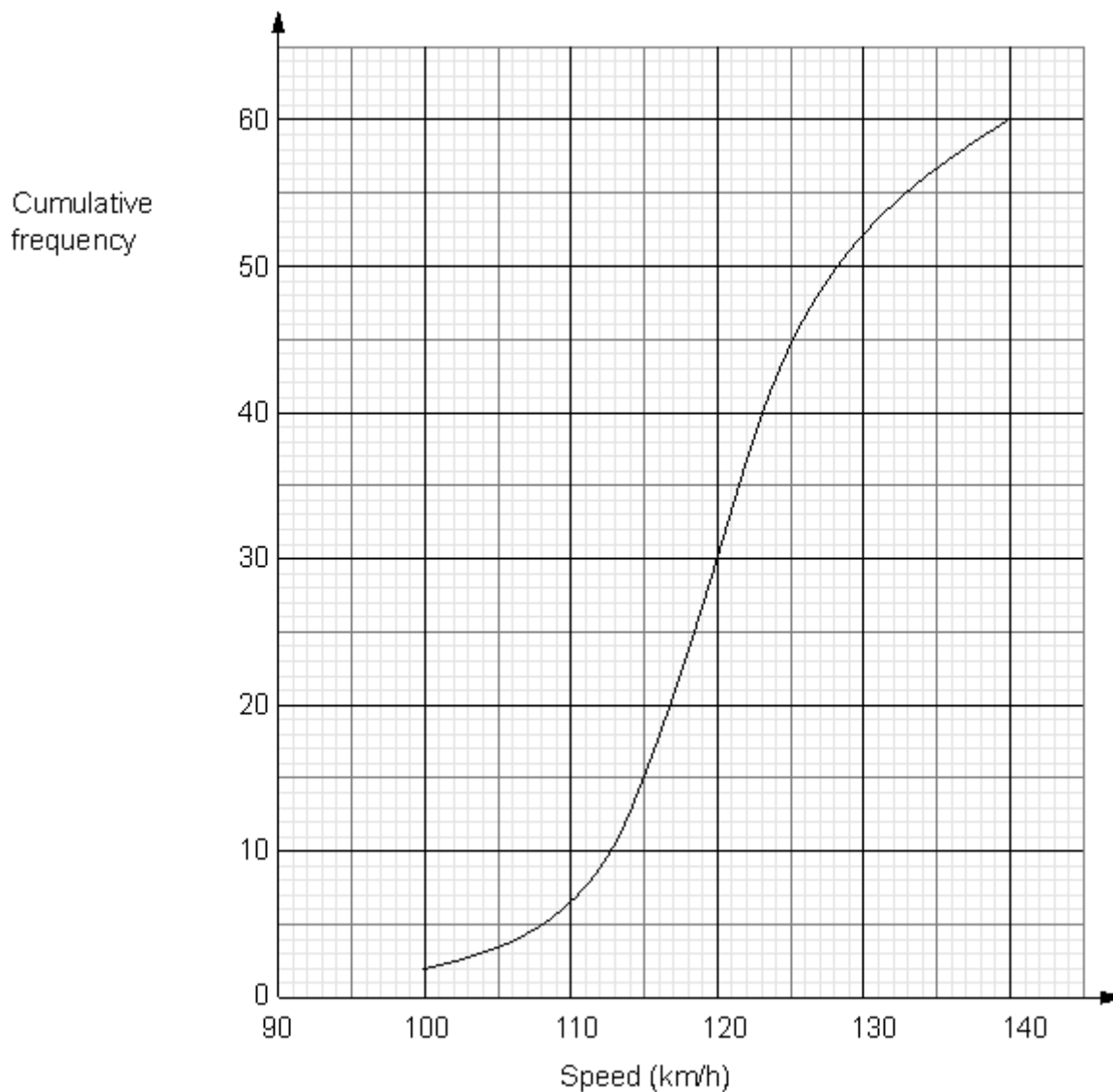
(2)

- (e) Use your graph to find an estimate for the number of these countries with an area greater than 0.90 million km<sup>2</sup>.

.....

(2)  
(Total 7 marks)

- Q4.** The cumulative frequency graph shows information about the speeds of 60 cars on a motorway one Sunday morning.



(a) Use the graph to find an estimate for the median speed.

..... km/h

(1)

The speed limit on this motorway is 130 km/h.  
 The traffic police say that more than 20% of cars travelling on the motorway break the speed limit.

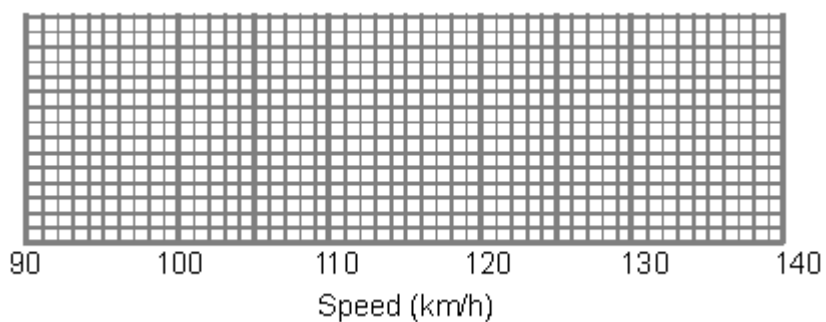
(b) Comment on what the traffic police say.

(3)

For these 60 cars

the minimum speed was 97 km/h  
and the maximum speed was 138 km/h.

- (c) Use the cumulative frequency graph and the information above to draw a box plot showing information about the speeds of the cars.



(3)  
(Total 7 marks)

- Q5.** The table shows some information about the weights, in grams, of 60 eggs.

Weight ( $w$ grams)	Frequency		
$0 < w \leq 30$	0		
$30 < w \leq 50$	14		
$50 < w \leq 60$	16		
$60 < w \leq 70$	21		
$70 < w \leq 100$	9		



- (a) Calculate an estimate for the mean weight of an egg.

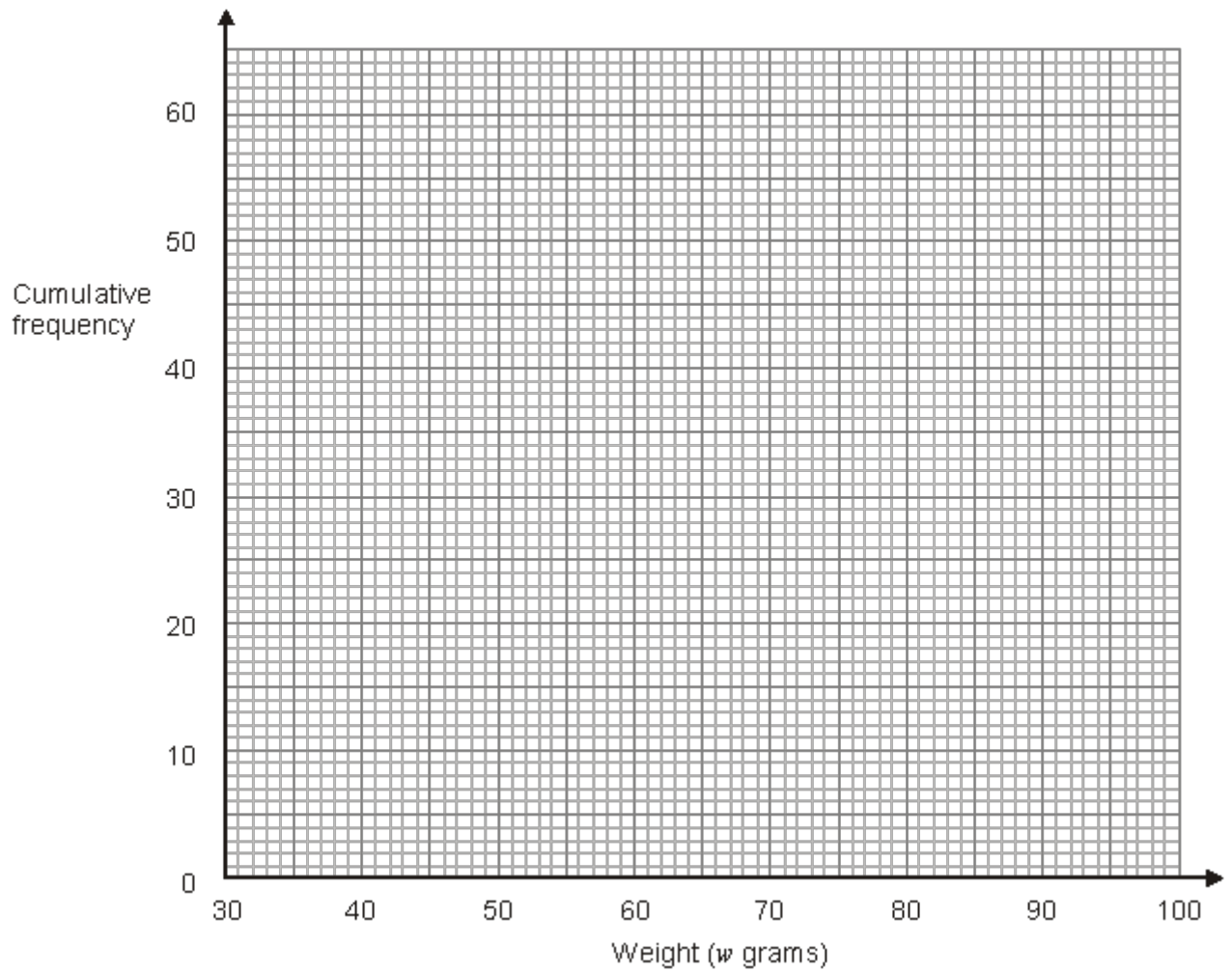
..... g

(4)

- (b) Complete the cumulative frequency table.

Weight ( $w$ grams)	Cumulative frequency
$0 < w \leq 30$	0
$0 < w \leq 50$	
$0 < w \leq 60$	
$0 < w \leq 70$	
$0 < w \leq 100$	

(1)



(c) On the grid, draw a cumulative frequency graph for your table.

(2)

(d) Use your graph to find an estimate for the number of eggs with a weight greater than 63 grams.

.....

(2)

(Total 9 marks)

**Q6.** The table shows information about the amount spent by 100 customers in a supermarket.

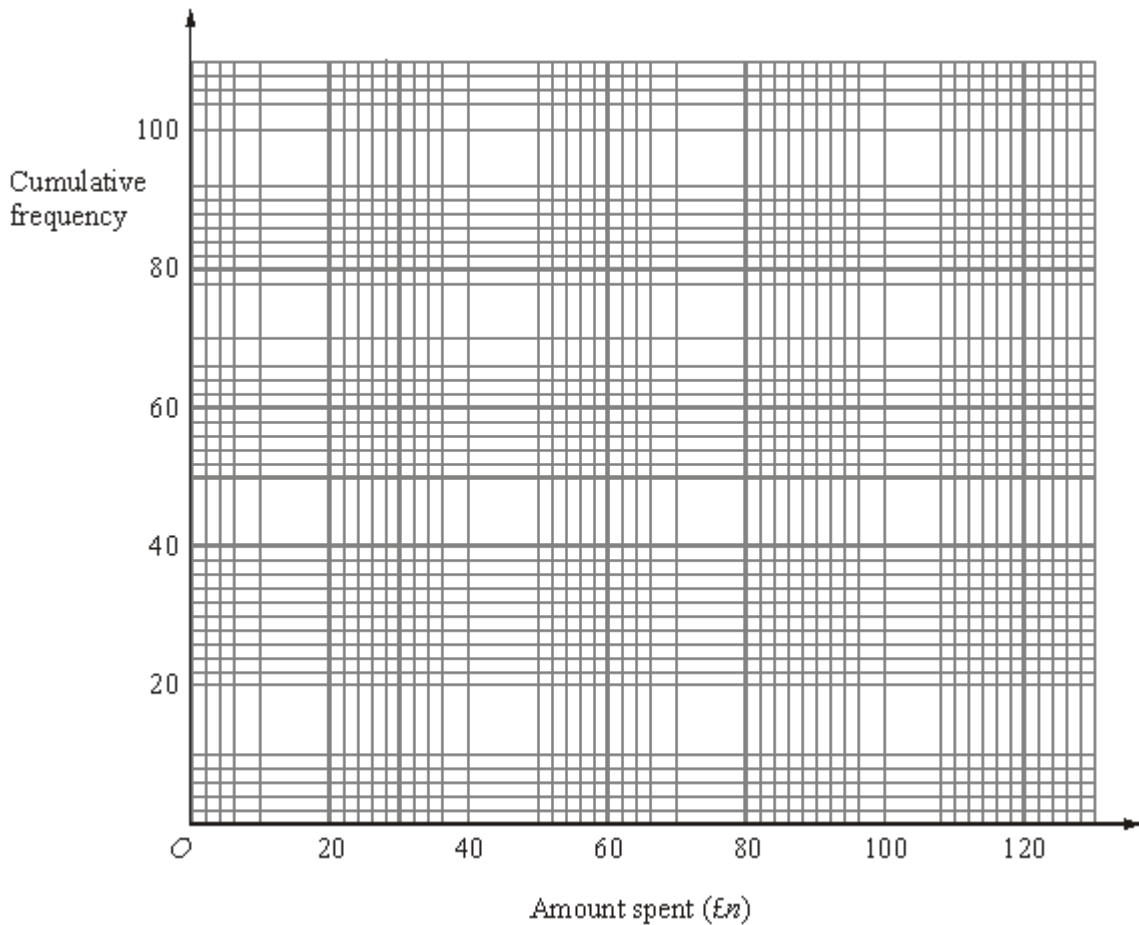
Amount spent (£ $n$ )	Frequency
$0 < n \leq 20$	18
$20 < n \leq 40$	22
$40 < n \leq 60$	35
$60 < n \leq 80$	15
$80 < n \leq 100$	8
$100 < n \leq 120$	2

(a) Complete the cumulative frequency table for this information.

Amount spent (£ $n$ )	Cumulative frequency
$0 < n \leq 20$	18
$0 < n \leq 40$	
$0 < n \leq 60$	
$0 < n \leq 80$	
$0 < n \leq 100$	
$0 < n \leq 120$	

(1)

(b) On the grid, draw a cumulative frequency graph for your table.



(2)

(c) Use your graph to find an estimate for the median amount spent.

£ .....

(1)

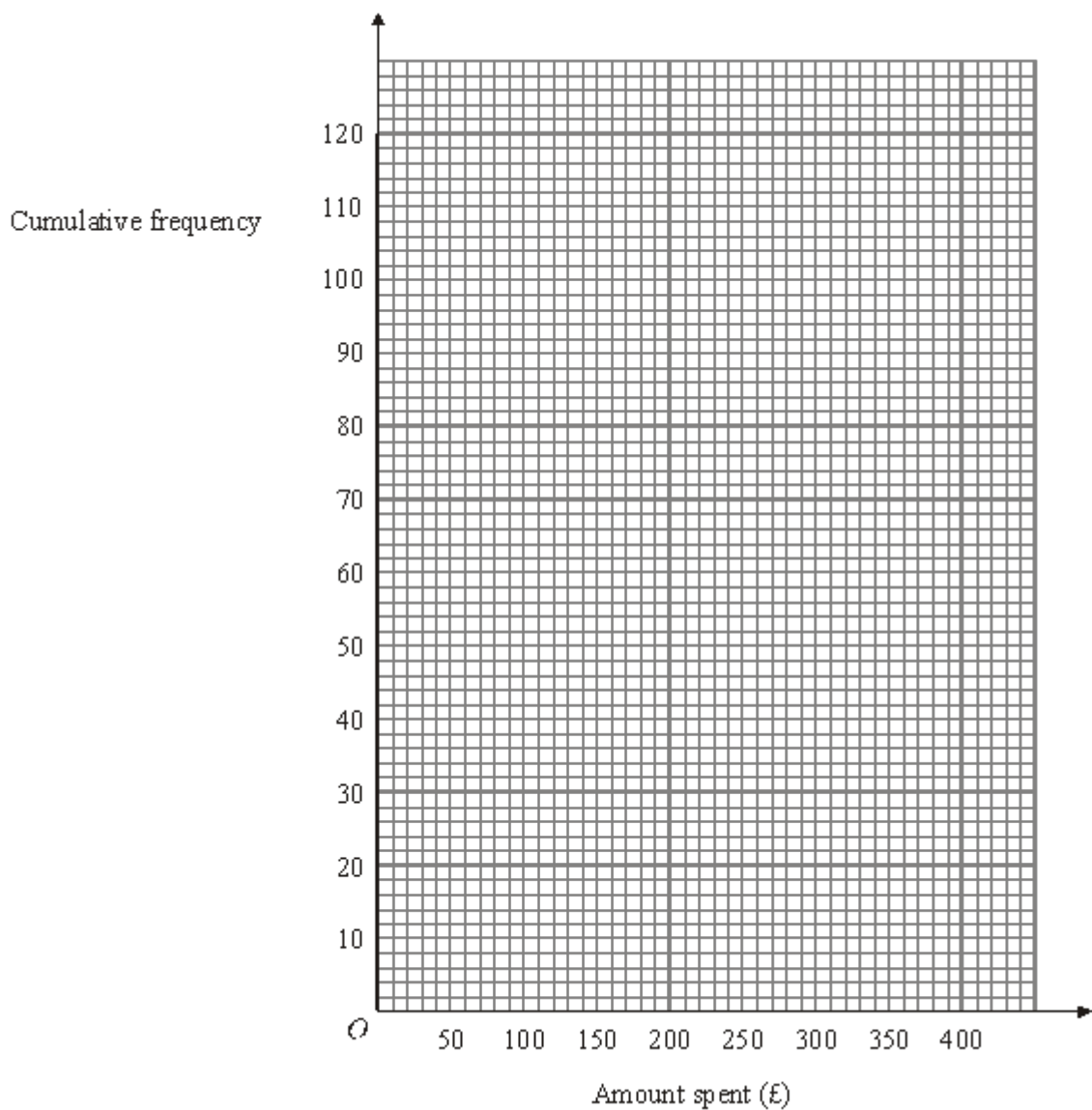
(Total 4 marks)

**Q7.** Lucy did a survey about the amounts of money spent by 120 men during their summer holidays.

The cumulative frequency table gives some information about the amounts of money spent by the 120 men.

Amount (£ $A$ ) spent	Cumulative frequency
$0 \leq A < 100$	13
$0 \leq A < 150$	25
$0 \leq A < 200$	42
$0 \leq A < 250$	64
$0 \leq A < 300$	93
$0 \leq A < 350$	110
$0 \leq A < 400$	120

(a) On the grid, draw a cumulative frequency diagram.



(2)

(b) Use your cumulative frequency diagram to estimate the median.

£ .....

(2)

A survey of the amounts of money spent by 200 women during their summer holidays gave a median of £205

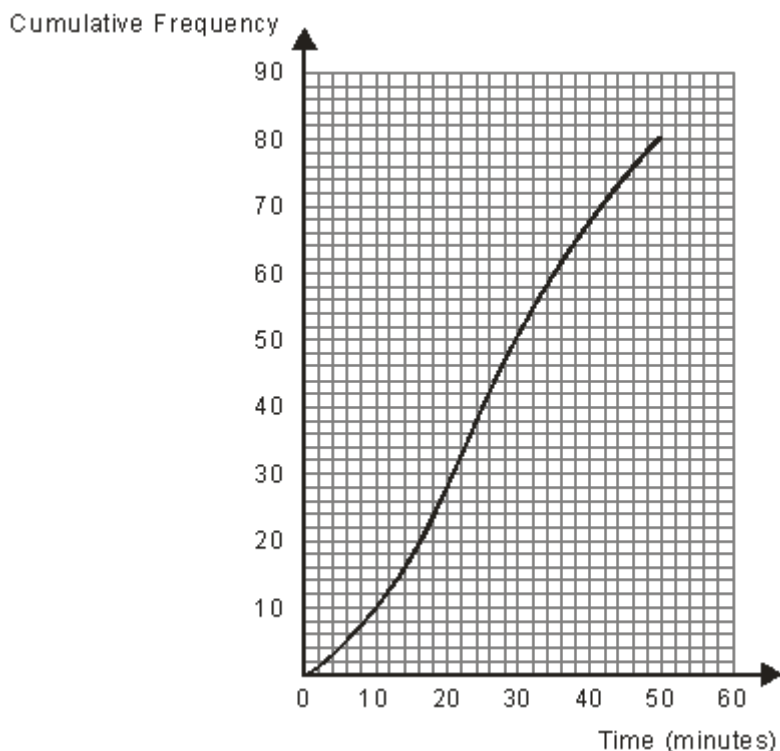
(c) Compare the amounts of money spent by the women with the amounts of money spent by the men.

.....  
.....

(1)

(Total 5 marks)

**Q8.** The cumulative frequency diagram gives information about the time, in minutes, 80 people were kept waiting at a hospital casualty department.



- (a) Write down the number of people who waited for 20 minutes or less.

.....

(1)

- (b) Work out an estimate of the number of people who waited for between 26 minutes and 40 minutes.

.....

(2)

The hospital has a target that no more than 15% of people are kept waiting for 40 minutes or more in the casualty department each day.

- (c) Has the hospital achieved its target for the day?  
You must explain your answer.

.....  
.....

(2)  
(Total 5 marks)



M1.

	Working	Answer	Mark	Additional Guidance
(a)		88	1	<b>B1</b> for value in range 87 – 89
(b)		38	1	<b>B1</b> for value in range 38 –39
(c)	57 – 20	37	2	<b>B2</b> for 32 – 40 ( <b>B1</b> for using graph at 25 and 75; may be indicated by marks at 25 and 75)
<b>Total for Question: 4 marks</b>				

M2.

	Working	Answer	Mark	Additional Guidance
(a)		82	2	<b>M1</b> for $(99 + 63 + 92 + 74) \div 4$ or $328 \div 4$ <b>A1</b> cao
(b)		Decreasing	1	<b>B1</b> for decreasing oe
(c)	Heights = 5, 20, 40, 75, 100	Correct cumulative frequency graph	2	<b>B2</b> for fully correct cumulative frequency graph (Ignore any part of graph outside range of points)  ( <b>B1</b> for 4 or 5 points plotted correctly $\pm 1$ full (2mm) square at the end of interval or for 4 or 5 points plotted not at end but consistent within each interval and joined)
(d)		640 – 680	1	<b>B1</b> for 640 – 680 or ft (dep on graph being cf) for reading from graph at 50+ 1 full (2mm) square
<b>Total for Question: 6 marks</b>				

**M3.**

	Answer	Mark	Additional Guidance
(a)	$0.25 < p \leq 0.50$	1	<b>B1</b> for $0.25 < p \leq 0.50$ (accept 0.25 to 0.5(0) or clearly identified on the diagram as the mode)
(b)	$0.5 < n \leq 0.75$	1	<b>B1</b> for $0.5 < n \leq 0.75$ (accept 0.5(0) to 0.75 or clearly identified on the diagram as the median)
(c)	4, 13, 17, 22, 28, 29, 30	1	<b>B1</b> cao
(d)	cf graph	2	<b>B2</b> for a fully correct cf graph (accept ogive) [ <b>B1</b> for 5 or 6 consistent, correctly plotted points from a sensible cf table (increasing values) <b>OR</b> for a cf graph drawn through points other than the end points of each interval]
(e)	9 or 10 or 11	2	<b>M1</b> for clear method to read off from a cf graph at area = 0.90, on the cf scale, can be awarded from their reading $\pm 1$ sq <b>A1</b> ft for an answer of 9 or 10 or 11 <b>[B1</b> for an answer in the range 9 to 11 if <b>M0</b> scored]
<b>Total for Question: 7 marks</b>			

**M4.**

	Working	Answer	Mark	Additional Guidance
(a)		120	1	<b>B1</b> for 119.5 – 120.5
(b)	60 – 52 = 8 20% of 60 = 12	Claim not true since 8 < 20% of 60	3	<b>M1</b> for using graph at 130, may be implied by a value in the range 52 to 53 seen <b>A1</b> for 8 (cars breaking speed limit) or 13.(3..) % (accept 7 or 11.(6..) %) <b>A1</b> for correct conclusion with fully correct

				working OR <b>M1</b> for using cf = 48 <b>A1</b> for (20% of cars exceed) value in the range 126.5 to 127.5 km/h <b>A1</b> for correct conclusion with fully correct working
(c)		3		<b>B3</b> for complete box plot with all three aspects  Aspect 1: ends of whiskers at 97 and 138 Aspect 2: ends of box at 115 and 125 Aspect 3: median marked at 120 or ft (a)  ( B2 for two aspects, B1 for one aspect )  (Allow tolerance of $\frac{1}{2}$ square)
<b>Total for Question: 7 marks</b>				

**M5.**

	Working	Answer	Mark	Additional Guidance
(a)	$15 \times 0 = 0$ $40 \times 14 = 560$ $55 \times 16 = 880$ $65 \times 21 = 1365$ $85 \times 9 = 765$ $3570 \div 60$	59.5	4	<b>M1</b> for finding at least 4 products $fx$ consistently within interval (including end points) <b>M1</b> (dep) for use of at least 4 correct midpoints <b>M1</b> (dep on first M) for " $\Sigma fx$ " $\div$ 60 <b>A1</b> for 59.5
(b)		14, 30, 51, 60	1	<b>B1</b> all 4 correct
(c)			2	<b>M1</b> for at least 4 of "5 points" plotted consistently within each interval, $\pm 0.5$ full square, and joined by curve or line segments providing no gradient is negative. <b>A1</b> for a fully correct cf graph.
(d)			2	<b>B2</b> for answer in the range 21 – 25 <b>(B1</b> for answer in the range 35 – 39) <b>OR</b>

				<b>M1</b> (dep on graph being cf) for using $w = 63$ <b>A1</b> ft ( $\pm 0.5$ square)
<b>Total for Question: 9 marks</b>				

**M6.**

	Answer	Mark	Additional Guidance
(a)	(18), 40, 75, 90, 98, 100	1	<b>B1</b> for all correct
(b)		2	<b>B1</b> ft for 5 or 6 points plotted correctly $\pm 1$ full (2mm) square at the end of interval dep on sensible table (condone 1 addition error) <b>B1</b> (dep) for points joined by curve or line segments provided no gradient is negative – ignore any part of graph outside range of their points (SC: <b>B1</b> if 5 or 6 points plotted not at end but consistent within each interval and joined)
(c)	approx 46	1	<b>B1</b> (ft dep on graph being cf) for reading from graph at $50 \pm 1$ full (2mm) square
<b>Total for Question: 4 marks</b>			

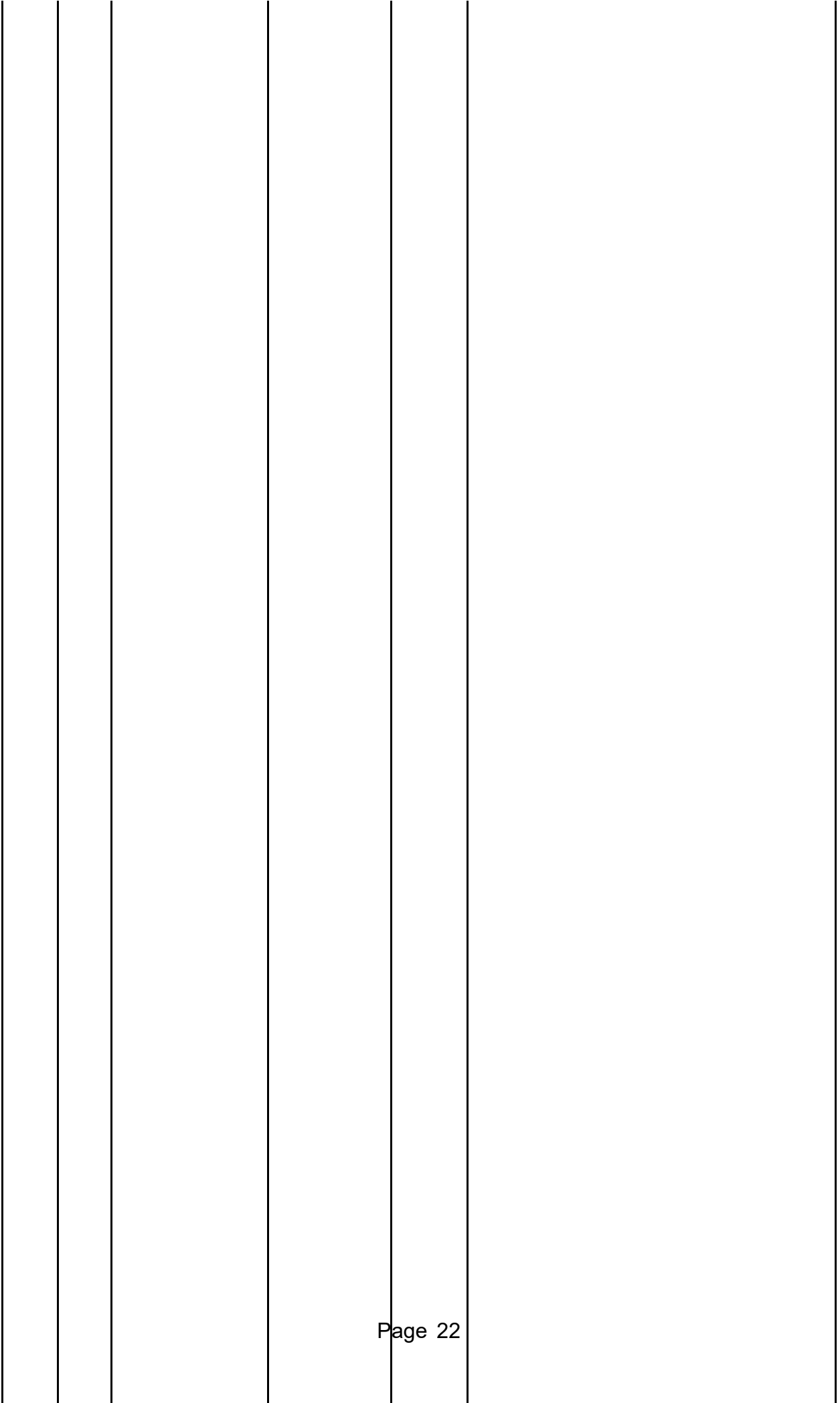
**M7.**

	Answer	Mark	Additional Guidance
(a)	Ogive	2	<b>B1</b> 6 or 7 points plotted correctly $\pm 1$ full (2mm) square <b>B1</b> (dep) for points joined by curve or line segments provided no gradient is negative – ignore any part of

			graph outside range of their points (SC: <b>B1</b> if 6 or 7 points plotted not at end but consistent within each interval and joined)
(b)	240	2	<b>B2</b> if answer is in the range 235 – 245  <b>OR</b> <b>M1</b> (dep on graph being cf) for using cf = 60 or 60.5 <b>A1</b> ft ( $\pm 1$ square)
(c)		1	<b>B1</b> ft correct comment comparing money spent by men with money spent by women
<b>Total for Question: 5 marks</b>			

**M8.**

		Working	Answer	Mark	Additional Guidance
	(a)		28	1	<b>B1</b> 27 — 29
	(b)	68 – 42	26	2	<b>M1</b> 68 — 42



<b>FE</b>	(c)	15% of 80 = 12	Yes, with correct conclusion	2	<b>M1</b> looks up 68 or 40 min on cumulative frequency <b>A1</b> correct conclusion
<b>Total for Question: 5 marks</b>					

**E1.** In part (a), the vast majority of candidates were able to find an estimate for the number of people less than 70 years old. Common incorrect answers here were 86, 78 and 12.

Part (b) was generally done well. Common incorrect answers here were 78 and 66.

In part (c), was done less well. Many candidates knew that they had to work with values at 25 and 75 (as evidenced by lines in the cumulative frequency diagram), but a significant number of these did not know what to do next. Common incorrect answers here were 50 (from  $75 - 25$ ), 20 and answers derived from misinterpreting the horizontal scale 56.

**E2.** Many candidates were not aware of how to find the last moving average in (a). By far the most common error was to find a three-point moving average, with some candidates even finding the average of the moving averages given.

In part (b) many candidates did not understand what was required and commented on the number of televisions sold each month. All that was required was to say that the trend was decreasing yet many went into great detail about every number in the table. In parts (a) and (b) 29% of the candidates scored all 3 marks with a further 44% scoring 2 marks. 20% of the candidates scored no marks at all.

Many candidates were successful in parts (c) and (d) with 38% scoring all 3 marks and a further 20% scoring two marks. Quite a few candidates plotted the cumulative frequency values at 100, 200, 300, 400 and 500 thinking that the points needed to be plotted at the midpoints of the price intervals, clearly not understanding the question.

Some of these candidates did, however, go on and earn the mark in (d) for correctly reading from their graph. Some plotted the points in the correct position but then failed to join the points whilst others plotted the points correctly but then proceeded to draw a line of best fit. Nearly 20% of the candidates scored no marks at all on the final two parts of the question.



**E3.** This cumulative frequency question was very well understood by the majority of candidates with success rates of over 75% in parts (a), (b) and (c). The most common incorrect response in part (a) was stating the frequency of 9 rather than the class interval and in (b) the incorrect responses centred on finding the median of the frequency numbers, and  $0.75 - 100$  as it was in the middle of the table).

Candidates were slightly less successful in part (d) where they had to draw the cumulative frequency curve. Line segments were accepted but many candidates lost a mark for poor plotting or plotting the points in the middle or at the beginning of the class interval. In part (e) the success rate dropped even more to 10%. Candidates could score 1 mark for an integer answer of 9, 10 or 11 without showing their working or for showing their working but then forgetting to take their cumulative frequency reading from 30. Candidates also struggled to interpret the horizontal scale, and it was often difficult to ascertain evidence of their line at 0.9. A small minority of candidates chose 4 for their answer, the number of groups with a value equal or higher than 0.9

##

It is encouraging to report that well over 80% of candidates were able to find an estimate for the median speed. Part (b) was more challenging and a substantial proportion of candidates did not appreciate the need to use the graph to estimate how many cars broke the speed limit. These candidates often restricted themselves to working out 20% of 60 or even 20% of 130 km/h. Other candidates provided a correct, concise and clear argument to support their conclusion that the police were wrong. Good attempts were made to draw an accurate box and whisker diagram, with few candidates not knowing what was expected. Many weaker candidates were able to gain some marks here. The drawing of the whiskers and the median was generally well done. However candidates' attempts at finding and drawing the lower and upper quartiles were less successful.

##

In part (a) many candidates scored the 2 marks for obtaining the products of the midpoints and the frequencies, showing correct calculations for at least 4 of the 5 products  $fx$  and using the correct midpoints. The most common error seemed to be  $15 \times 0 = 15$ . After gaining the first two marks many went on to add and then divide by 60 but division by 260 or 5 were common errors. In some cases it was clear that candidates did not know how to approach this question and instead used the columns to calculate cumulative frequency or frequency density.

Part (b) was answered correctly by a majority of candidates although a few did not seem to know what was required and listed midpoints or worked out frequency density. Even though candidates had a calculator, again arithmetic errors were seen.

In part (c) students generally managed to plot the points that they had identified in (b) correctly but many lost the marks as they failed to join the points. Points were sometimes badly joined particularly the last two often resulting in a curve which contained a negative gradient. Encouragingly the plotting at midpoints was rarely seen.

Many candidates who had a cumulative frequency graph understood what to do in part (d), although a few had difficulty reading the vertical axis with 36 or 37 being read as 46 or 47. Some failed to read the question carefully and so did not subtract their value from 60 so giving an answer for a weight less than 63 grams rather than more than.

- E6.** The majority of candidates were able to pick up some marks on this question. In part (a), the cumulative frequency table was usually accurate, although careless arithmetic errors were often seen. Accurate plotting was a little less well done, and a significant number of candidates failed to either plot points at the end of the intervals or in many cases drew histograms. In part (c), many candidates read their median from the cf axis from either 50 (to give an answer of 60) or 60 (to give an answer of 75) on the horizontal axis.
- E7.** In part (a) most candidates were able to plot the points correctly and produce an accurate cumulative frequency graph. Some candidates plotted the points correctly but drew a line of best fit and some plotted at the midpoints of the amounts spent. Part (b) was also answered well with most candidates able to find the median. Few, though, drew a horizontal line from  $cf = 60$  so were unable to be awarded a method mark if their answer was incorrect. Some candidates believed the median to be 64 (the frequency in the middle of the table) and some wrote 0-250. Good comparisons were made in part (c) between the spending of men and women although there were some confused statements made by candidates who did not appreciate that the different numbers of men and women was not relevant when comparing the medians.