



## **Maths Questions By Topic:**

### **Statistics Mark Scheme**

### **Edexcel GCSE (Higher)**

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## Old Spec A (Linear)

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Question	Answer	Mark	Mark scheme	Additional guidance
3 (a)	cf graph	M1	for 5 or 6 points plotted correctly	If histograms drawn, points must be identified
		A1	for a fully correct graph	Accept a smooth curve or line segments Ignore to the left of the first point and right of the last point
		SC B1	if 5 or 6 of their points plotted not at the end but consistent within each interval and joined by a curve or line segments providing no gradient is negative	
(b)	13 to 14	B1	for answer in the range 13 to 14 or ft their cf graph	ft only from a cf graph

Question	Answer	Mark	Mark scheme	Additional guidance
4	20 or 24 or 168	B1	for identification of the range of the girls (20) <b>or</b> the range (24) <b>or</b> the median (168) of the boys	
	Comparison	C2	for a correct comparison of medians <b>and</b> a correct comparison of ranges supported by correct figures  eg the median height for girls (165) is less than the median height for boys (168) and the range for girls (20) is less than the range for boys (24)  At least one comparison must be in context referring to height or quoting cm.	Simply quoting values for median, range is insufficient; they must be compared.
		(C1)	for a correct comparison of medians <b>or</b> a correct comparison of ranges that could fit their incorrect figure(s)	Context not necessary for C1



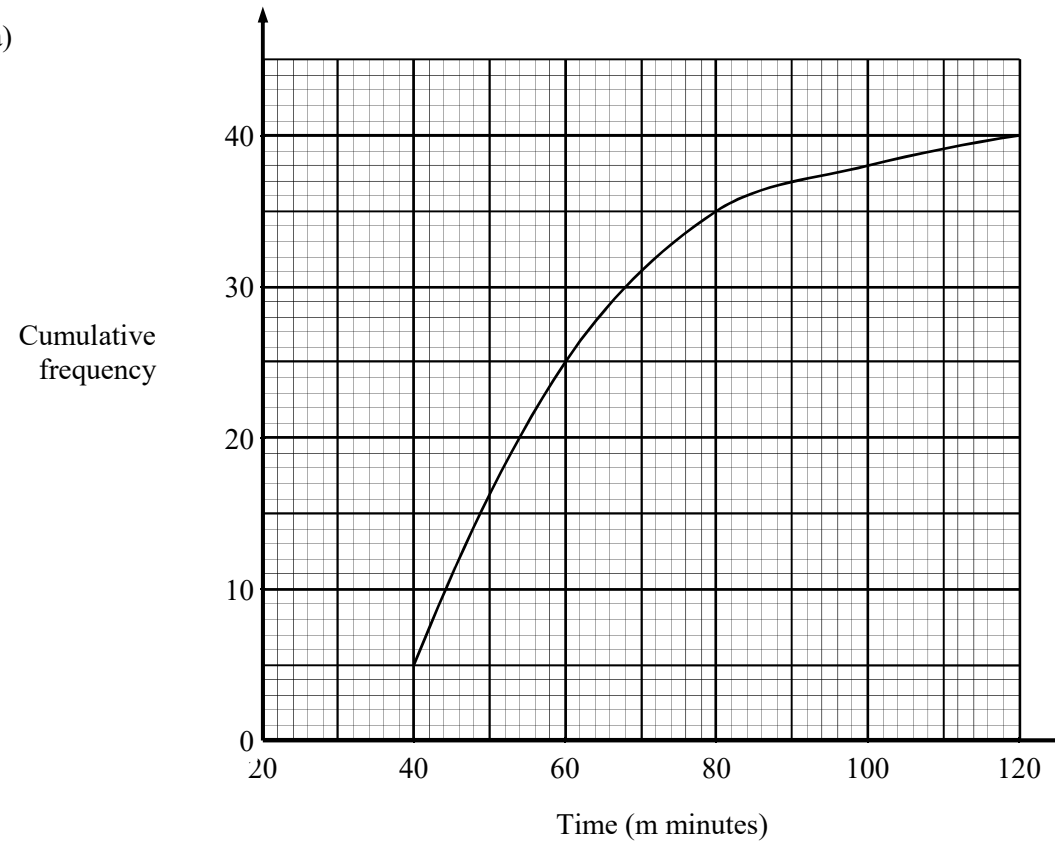
Question	Answer	Mark	Mark scheme	Additional guidance
5" (a)	5,15,35,55,70,80	B1	cao	
(b)	Graph drawn	M1	for 5 or 6 of their points plotted correctly from a cf table	Ignore to the left of the first point and right of the last point If histograms drawn, points must be identified Accept a smooth curve or line segments
		A1	for a fully correct graph SC B1 if 5 or 6 of their points plotted not at end but consistent within each interval and joined by a curve or line segments providing no gradient is negative	
(c)	Correct decision and correct figures	M1	for $60 \div 100 \times 80 (=48)$ oe	
		M1	reading value from graph at wage = 360 (=40) <b>or</b> for $35 + \frac{1}{5} \times 20 (=39)$	ft from a cum freq graph
		M1	reading value from graph at cf = 48 (=380)	
		C1	for "40" $\div 80 \times 100 (=50(\%))$ <b>or</b> for $60 \div 100 \times 80 (=48)$	
			ft for correct decision and correct figures, eg No with 48 and "380" <b>or</b> with "40" and "50"( $\%$ ) <b>or</b> with "40" and 48	

Question	Answer	Mark	Mark scheme	Additional guidance
6 (a)	540	P1	for $\frac{120}{20} (=6)$ or $\frac{20}{120} (=0.16..)$ or $\frac{90}{20} (=4.5)$ or $\frac{20}{90} (=0.22..)$	Decimal values truncated or rounded to 2 dp or more
		P1	for $\frac{20}{120} = \frac{90}{n}$ or $\frac{20}{90} = \frac{120}{n}$ or $\frac{90 \times 120}{20}$ oe	
		A1	cao	
(b)	Explanation	C1	for explanation  <b>Acceptable examples</b> If marks fall off Shirley will have over-estimated the number of bees There will be fewer bees Her amount will go down  <b>Not acceptable examples</b> My answer will be wrong It will increase the answer	

Question	Answer	Mark	Mark scheme	Additional guidance
5	No (supported)	P1  P1  C1	<p>for process to find total weight of the 4 red bricks, eg. <math>5 \times 4 (= 20)</math>  <b>or</b>  for process to find total weight of the 5 blue bricks eg. <math>9 \times 5 (= 45)</math></p> <p>for process to find total weight of all 10 bricks,  eg. “20” + “45” + 6 (= 71)</p> <p>No with correct supporting evidence  <b>Acceptable examples</b>  No, it is 7.1  She is wrong, it is 0.1 more  No, (the total weight is) 71 not 70  <b>Not acceptable examples</b>  Yes ....  No, it is 71</p>	<p>May be seen next to statements  20 must be clearly referenced to the red bricks.  <math>5 + 9 + 6 = 20</math> gets no marks</p> <p>Candidates working in grams will need to give  7100 and 7000 for example as comparable  figures</p>

Question	Answer	Mark	Mark scheme	Additional guidance	
6	(a) cf graph through (40, 5), (60, 25), (80, 35), (100, 38) and (120, 40)	C2	for a complete and accurate cf graph	May be a cumulative frequency curve or a cumulative frequency polygon Ignore any graph drawn to the left of the first point If histograms drawn, plots must be identified	
		(C1	for at least 4 or 5 cf values plotted correctly)		
			SC: B1 for 4 or 5 points plotted not at end but consistently within each interval and joined provided no gradient is negative		
	(b)	answer in range 21 to 28	M1		for UQ in the range 66 to 70 or LQ in the range 42 to 46 or ft their cf graph
			A1		for answer in range 21 to 28 or ft their cf graph
	(c)	answer in the range $\frac{19}{40}$ to $\frac{24}{40}$	M1		for finding the difference between readings taken from the cf axis at points from a mark of 50 and a mark of 90 or ft their graph (if possible)
A1			for an answer in the range $\frac{19}{40}$ to $\frac{24}{40}$ or ft their cf graph	Accept any equivalent fraction, decimal from 0.475 to 0.6 or percentage from 47.5% – 60%	

Q6(a)



Question	Answer	Mark	Mark scheme	Additional guidance
7	72	M1          A1	for $\frac{5}{30} = \frac{12}{p}$ oe, eg $\frac{12}{p} \times 30 = 5$ or $12 \div \frac{5}{30}$ <b>or</b> $5 : 30 = 12 : p$ <b>or</b> 1 in 6 ( $30 \div 5$ ) counters are yellow, so $12 \times "6"$ <b>or</b> using equivalent ratios to $5 : 30$ , eg. $2 : 12$ and $10 : 60$ and adding to give $2 + 10 : 12 + 60$  cao	

Question	Answer	Mark	Mark scheme	Additional guidance
:	(a)	59, 53, 66	B2 for Median = 59, LQ = 53, UQ = 66, may be seen in working  (B1 for one correct)	
	(b)	Yes, with reason	C1 for Yes and comment comparing median ages, ft from (a) <b>Acceptable examples</b> “59” < 70 All statistics/values are lower for coach A (so they are younger) Median is lower The middle age is lower on coach A  <b>Not acceptable examples</b> Median is higher Median for coach A is “59” and coach B is 70 The oldest on coach A is 79 and the oldest on coach B is 85 There are people on coach B that are older than on coach A	
	(c)	No, with reason	C1 for No and comment comparing spreads of ages from ranges or IQRs, ft from (a) <b>Acceptable examples</b> 38 < 43 <b>or</b> “13” < 19 Greater difference between greatest and least age for coach B Range for coach B is larger than coach A The range of ages is wider on coach B than on coach A The range is 5 greater on coach B There is a smaller difference between the lower and upper quantiles on coach A than on coach B The IQR is shorter for coach A  <b>Not acceptable examples</b> Quartiles are less for coach A 53 < 54 <b>or</b> 79 < 85 (oe) Range for coach A is 38 and range for coach B is 43 Coach A ranges from 41-79 but coach B ranges from 42-85	Working A: Range = 38, IQR = “13” B: Range = 43, IQR = 19

Question	Answer	Mark	Mark scheme	Additional guidance	
9	(a)	box plot drawn	B1	ends of whiskers at 0 and 42 with a box	The box can be of any height. Accept ends that are marked (eg line, cross, dot) or defined by the end of the whiskers if clear.
			B1	median at 10 inside a box	Has to be inside a box; whiskers not required
			B1	for ends of box at 4 and 20	An independent mark that can be awarded for just a box; do not need whiskers for this mark.
(b)	Comparison	C1	for a correct comparison of medians, eg. the median delay time on Mon was greater than the median delay time on Tues. or ft (a)	Simply quoting values for median, range and IQR is insufficient, they must be compared	
		C1	for a correct comparison of a measure of spread, eg. the interquartile range (range) of delay times on Mon was greater than the interquartile range (range) of delay times on Tues. or ft (a) For the award of both marks at least one of the comparisons must be in context	Comparisons can relate to the median, and then either the range or the IQR.	
(c)	statement	C1	‘No’ with statement explaining that there might not be any delays between 25 minutes and 30 minutes as in the upper 25% (12 trains) the delays may all be between 17 and 25 or 30 and 33	The ‘No’ may be implied from their wording, and could be written next to the “?” The statement must mention (or imply) values above the UQ of 17	



Question	Answer	Mark	Mark scheme	Additional guidance
10 (a)	Box plot drawn	B3	for a fully correct box plot	Condone the lack of a vertical marker at the end of the tails
		(B2)	for at least 3 correctly plotted values including box and whiskers/tails )	Note that a box must be present, as must "tails"
		(B1)	for at least 2 correctly plotted values including box or whiskers/tails or 5 correct values plotted or clearly identified and no box or whiskers/tails )	
(b)	60	M1	for a method to find $\frac{3}{4}$ of 80 eg $20 + 20 + 20$ or $\frac{3}{4} \times 80$	
		A1	cao	

Question	Working	Answer	Mark	Notes
33 (a)		365	M1	$fx$ with $x$ consistent within intervals eg $200 \times 1$ , $300 \times 11$ , $400 \times 5$ , $500 \times 0$ , $600 \times 3$ , if 200, 3300, 2000, 0, 1800 are seen without working then condone 1 error (dep) $\Sigma fx \div \Sigma f$ eg “7300” $\div 20$ cao for comment about outliers affecting mean
(b)		Comment	M1 A1 C1	
12 (a)	161 + 7 154 + 20	Box plot	M1	for method to find UQ (168) <b>or</b> highest value (174), may be implied by correct values plotted for showing a box and at least 3 correctly plotted values from 154, 161, 165, 168, 174 for fully correct box plot  (ft) for comparison of the median  (ft) for comparison of the spread NB: for award of both marks, at least one comparison must be in context. NB: figures need not be stated, but if they are they must be correct (ft)
(b)	Med IQR Range Y11 16 7 20 Y7 157.5 10.5 24.5	Comparison	M1 A1 C1  C1	

Question	Working	Answer	Mark	Notes
35 (a)		10,19	B1	cao
(b)		positive	C1	positive (correlation)
(c)		12 to 13	M1	for an appropriate line of best fit drawn, or a point marked at $(x, 16.4)$ or a horizontal line drawn from 16.4 across to $(x, 16.4)$ where $x$ is in the range 12 to 13
(d)		explanation	A1	hours given in the range 12 to 13
			C1	(yes) e.g. as the majority of points for high temperature appear when there are more hours of sunshine (positive correlation)
36		72	P1	for showing the process of $30 \times 60 (=1800)$ or $20 \times 54 (=1080)$
			P1	(dep P1) for showing the complete process e.g. $(“1800” - “1080”) \div 10$
			A1	concluding the answer is 72 (and not 66)

Question	Working	Answer	Notes
37		400	<p>P1 Start to process eg. <math>1200 \div 60</math></p> <p>A1 400 oe (accept number of whole pizzas eg. <math>400 \div 4 = 100</math> with 4 people per pizza)</p> <p>C1 Eg. Assumption that sample is representative of population – it may not be all 1200 people are going to the party – need less pizza if they don't, assume 4 people per pizza – if different may need more/fewer pizzas</p>
38 (a)	Median = 22; lq = 18; uq = 26	Box plot	<p>C1 Start to interpret information eg. one of median, lq, uq correct</p> <p>C1 Starts to communicate information eg. box plot with box, whiskers and at least 3 of median, lq, uq, min and max correct</p> <p>C1 Correct box plot</p>
(b)		Ben with reason	<p>M1 interpret information eg ft from box plot to find iqr (8) or range (11)</p> <p>C1 ft eg. Ben with lower iqr (8) and range (11)</p>
39			<p>C1 C1 for frequencies used for heights or areas not proportional to frequencies</p> <p>C1 C1 for 2<sup>nd</sup> mistake - final bar of wrong width</p>

Question	Working	Answer	Notes
3:		'Yes' with correct working	P1 begins process of working with mean eg $35 \times 10 (=350)$ or $33 \times 11 (=363)$ or $10 \times (35 - 33) (=20)$ or $11 \times (35 - 33) (=22)$ P1 (dep) finding the difference eg "363" – "350", or $33 - "20"$ or $35 - "22"$ C1 'Yes' with 13 from correct working

Question	Working	Answer	Notes
3;		more than	<p>C1 Makes reference to different numbers of girls and boys</p> <p>C1 Completes reasoning eg there are more (boys) with 80% than (girls) with 70% or correct mean <math>(700+1200)\div 25 = 76</math></p>
42" i		18	<p>M1 Uses frequency density for under 80 bar eg <math>7\div 10</math></p> <p>M1 Completes method to find over 105 minutes frequency eg <math>1.2 \times 15</math> or <math>\frac{3}{4} \times (1.2 \times 20)</math></p> <p>A1 18 cao</p>
ii		Reasoning	<p>C1 Correct explanation about grouped data so actual values between 100 and 120 unknown</p>

Question	Answer	Mark	Mark scheme	Additional guidance
43	Error in inequalities	C1	<p>for identifying incorrect inequalities</p> <p><b>Acceptable examples</b>  gives at least one correct inequality eg <math>(10 &lt; t \leq 20)</math> should be <math>0 &lt; t \leq 20</math>  it should be <math>t \leq 20</math>  (all) inequalities should start with 0  should start with 0</p> <p><b>Not acceptable examples</b>  <math>10 &lt; t \leq 20</math> is wrong  the numbers have been added wrong</p>	

Question	Answer	Mark	Mark scheme	Additional guidance																								
44 (a)	138	M1	for upper quartile = 188 <b>or</b> lower quartile = 50 <b>or</b> an indication that they are trying UQ – LQ	Could be written on the grid																								
		A1	cao																									
(b)	Yes, with reason	C1	Yes, with reason <b>Acceptable examples</b> Yes, because the median is at 2 hour (120 min) Yes, since 50% is at the 2 hour mark Yes, because the middle is at 2 hours  <b>Not acceptable examples</b> No ..... The median is at the 2 hour mark Yes, because 50% is exactly half way between “188” and “50”																									
(c)	statement	C1	<b>Acceptable examples</b> The median is lower on Tuesday (higher on Monday) The upper quartile is lower on Tuesday (higher on Monday) There may just have been one person waiting for 210 mins We don't know how many people were waiting for each time  <b>Not acceptable examples</b> The range is bigger for Tuesday (smaller for Monday) The IQR is smaller for Tuesday (bigger for Monday)	<table> <thead> <tr> <th></th> <th>M</th> <th>T</th> </tr> </thead> <tbody> <tr> <td>Shortest time</td> <td>20</td> <td>20</td> </tr> <tr> <td>Lower quartile</td> <td>50</td> <td>50</td> </tr> <tr> <td>Median</td> <td>120</td> <td>100</td> </tr> <tr> <td>Upper quartile</td> <td>188</td> <td>140</td> </tr> <tr> <td>Longest time</td> <td>200</td> <td>210</td> </tr> <tr> <td>Range</td> <td>180</td> <td>190</td> </tr> <tr> <td>IQR</td> <td>138</td> <td>90</td> </tr> </tbody> </table>		M	T	Shortest time	20	20	Lower quartile	50	50	Median	120	100	Upper quartile	188	140	Longest time	200	210	Range	180	190	IQR	138	90
	M	T																										
Shortest time	20	20																										
Lower quartile	50	50																										
Median	120	100																										
Upper quartile	188	140																										
Longest time	200	210																										
Range	180	190																										
IQR	138	90																										



Question	Answer	Mark	Mark scheme	Additional guidance
45	30	P1	for process to find one correct frequency, eg. $0.8 \times 5 (= 4)$ or $1.6 \times 10 (= 16)$ or $2.2 \times 10 (= 22)$ or $1.2 \times 15 (= 18)$  <b>or</b> to find one correct area eg $5 \times 8 (=40)$ or $10 \times 16 (=160)$ or $10 \times 22 (=220)$ or $15 \times 12 (=180)$	Accept equivalent methods proportional to those shown.
		P1	for process to find total number of people, eg. “4” + “16” + “22” + “18” (= 60)  <b>or</b> for process to find total area eg “40” + “160” + “220” + “180” (= 600)	Condone 1 error in reading from the graph for 2 <sup>nd</sup> and 3 <sup>rd</sup> P marks
		P1	for process to find 20% of the total number of people, eg. “60” $\times$ 0.2 oe (= 12) <b>or</b> for process to find 20% of the total area “600” $\times$ 0.2 oe (=120)	
		A1	cao	NB: correct answer without supportive working gets 0 marks

Question	Answer	Mark	Mark scheme	Additional guidance
46	Two changes	C1  C1	<p>plot the median at 162, not 161 oe</p> <p>plot the upper quartile at 171, not 172 oe</p> <p><b>Acceptable examples</b>  the median has been plotted at 161 / upper quartile at 172  the upper quartile should be 171 (not 172)  UQ is wrong as IQR is 17 not 18</p> <p><b>Not acceptable examples</b>  the median / upper quartile have been plotted / drawn wrong  the upper quartile has been worked out incorrectly  She needs to work out the UQ</p>	

Question	Answer	Mark	Mark scheme	Additional guidance
47	Two statements	C2	<p>Two different statements</p> <p><b>Acceptable</b></p> <p>There is no 'frequency' label / <math>y</math>-axis is not labelled / no title for the <math>y</math>-axis</p> <p>The polygon should not be closed / have a line at the bottom / have first and last points connected</p> <p>(15, 6) has been plotted incorrectly / at (15, 8) / (The first point is at) 8 rather than 6 / First point is on an incorrect frequency</p> <p><b>Not acceptable</b></p> <p>There is no title / Points should be joined with a curve / <math>x</math>-axis doesn't start at 0</p> <p>There is no label / The axes have not been labelled (<math>x</math> and <math>y</math>)</p> <p>The points haven't (all) been plotted correctly</p> <p><math>10 &lt; w \leq 20</math> and <math>30 &lt; w \leq 40</math> have been plotted wrong</p> <p>The first point is plotted incorrectly, its at (15, 7) not (15, 6)</p> <p>The points have been joined up wrong / Points should not be joined in the shape of a triangle / They've connected all the points</p> <p>Done the midpoints rather than the numbers on the right side / The points are in the middle</p> <p>(C1 for one statement eg from those above)</p>	Ignore additional statements provided no contradiction

Question	Answer	Mark	Mark scheme	Additional guidance
48 (i)	238	P1 A1	for working with proportion eg $\frac{17}{50} \times 700$ oe cao	
(ii)	statement	C1	for statement <b>Acceptable</b> Sample is representative (otherwise answer wrong) Random sample (otherwise answer will be different) The 50 people are from the 700 (otherwise not accurate) 17 out of <b>every</b> 50 want a sports bag (otherwise answer will be different / wrong) There is no bias That the other 650 will want the same gifts as the 50 <b>Not acceptable</b> There would be more than 17 people who want the sports bag I rounded my answer 17 out of 50 want a sports bag A repeat of the calculation done in (i) Most of the people would want a sports bag References as what might change in the future (eg a change in membership) That all 700 people wanted a type of gift rather than no gift (otherwise would have changed my answer)	

Question	Answer	Mark	Mark scheme	Additional guidance
49" (a)	Explanation	C1	eg 'No' the median is 57	
(b)	Comparison	C1	(ft) a correct comparison of medians eg the median weight for Megan was greater than the median weight for Amy	Simply quoting values for median, range and IQR is insufficient, they must be compared
		C1	a correct comparison of a measure of spread eg the interquartile range of weights for Megan was greater than the interquartile range of weights for Amy For the award of both marks at least one of the comparisons must be in the context of the question	Median Range IQR Megan 57 49 26 Amy 42 47 16 Figures given must be correct. Comparisons can relate to the range or the IQR
4:	Bar of height 3.2	M1	method to find any frequency eg $1.2 \times 2.5 (= 3)$ or $2 \times 2.5 (= 5)$ or $2.8 \times 5 (= 14)$ or $0.8 \times 12.5 (= 10)$	Accept equivalent methods proportional to those shown
			<b>or</b> method to use areas eg $12 \times 5 (=60)$ or $20 \times 5 (=100)$ or $28 \times 10 (=280)$ or $8 \times 25 (=200)$	
		M1	complete method to find total frequency for the four intervals eg "3" + "5" + "14" + "10" (=32) <b>or</b> "60" + "100" + "280" + "200" (=640)	
		C1	cao	

Question	Answer	Mark	Mark scheme	Additional guidance
4; (i)	65	M1	for working with proportion eg $10 \div 30 \times 195 (=65)$	Condone use of 200 for 195
(ii)	statement	A1 C1	cao for statement  <b>Acceptable examples</b> sample is representative (otherwise answer wrong) random sample (otherwise answer will be different) the 30 students are from the 195 (otherwise not accurate) 10 out of every 30 want to go to the Theme Park (otherwise answer will be different/wrong) there is no bias  <b>Not acceptable examples</b> There would be more than 10 people who want to go to the Theme Park I rounded my answer	

Question	Answer	Mark	Mark scheme	Additional guidance
52 (a)	5, 35, 55, 70, 78, 80	B1	cao	
(b)	cf graph	M1	for 5 or 6 of their points plotted correctly from a cf table	Ignore to the left of the first point and right of the last point
		A1	for a fully correct graph	Accept a smooth curve or line segments
			SCB1 if 5 or 6 of their points plotted not at end but consistent within each interval and joined by a curve or line segments providing no gradient is negative	
(c)	7.5	M1	for a clear method to read off the cf graph at 90	Sight of 74 or 6 implies M1
		M1	for a full method to find the percentage eg $(80 - "74") \div 80 \times 100 (=7.5)$	The following readings give the following percentages
		A1	for 7.5 or ft cf graph	72 = 10% 73 = 8.75% 74 = 7.5% 75 = 6.25% 76 = 5%

Question	Answer	Mark	Mark scheme	Additional guidance
53	statements	C1	<p>for lobf incorrect</p> <p><b>Acceptable examples</b>  lobf  lobf does not suit all points/not a lobf  lobf wrong since hits <math>x</math> axis/is inaccurate/should be amongst the crosses  lobf goes through the origin/through one point</p> <p><b>Not acceptable examples</b>  no correlation/there is no title</p>	
		C1	<p>for height scale not linear</p> <p><b>Acceptable examples</b>  150 missing  Height not linear / Height numbers going up wrong</p> <p><b>Not acceptable examples</b>  150  graph does not start at 140/graph does not start at 0  height should start at 170</p>	



Question	Answer	Mark	Mark scheme	Additional guidance
54 (a)	4, 6, 5, 4	M1	for a correct method to find at least 2 frequencies from bars of different widths, eg $10 \times 0.4 (=4)$ , $10 \times 0.6 (=6)$ , $5 \times 1 (=5)$ , $20 \times 0.2 (=4)$	
		A1	cao	
(b)	10	M1	for $\frac{23+1}{4} (=6)$ <b>or</b> $\frac{23}{4} (=5.75)$ could fit from their table in (a)	
		A1	for 10 or 9.375	Be aware of 10 coming from incorrect working ft does not apply to the A1

Question	Working	Answer	Mark	Notes
35" (a)		31.4	P1	for working with circumference formula, eg $\pi \times 80$ (=251. ...) oe
(b)		No (supported)	A1 C1	for answer in the range 31.4 to 31.5 accept $10\pi$ Mean distance stays the same with reason, eg total distance remains unchanged or same number of points
56		0.119	P1 P1 A1	for starting the process, eg finds area $25\pi$ or $16\pi$ oe, or finds angle for town A, $0 - 19$ ( $70^\circ$ ), may be on diagram for a complete process, eg $\frac{70}{360} \times \frac{25\pi}{41\pi}$ $0.118 - 0.119$ or $11.8\% - 11.9\%$
57 (a)	1.5, 6, 10.2, 7.2, 1.2	Histogram drawn	C1 C1 C1	for 2 correct bars of different widths or at least 3 correct frequency densities. for all bars in correct proportions or 4 correct bars with axes scaled and labelled. for fully correct histogram with axes scaled and labelled.
(b)		$\frac{123}{150}$	M1 A1	for a method to find number of students in interval, eg $30 + 51 + 36 + \frac{1}{3} \times 18$ (= 123) or $150 - 15 - \frac{2}{3} \times 18$ (= 123) for $\frac{123}{150}$ oe or 0.82 or 82%

Question	Working	Answer	Mark	Notes
58		12	M1 A1	for evidence of taking a reading from the graph from $h = 160$ for answer in the range 11.8 to 12.2
59		7	P1  P1  A1	for correct process to find any frequency, eg. "1.1" $\times$ 10 (= 11) or "2.8" $\times$ 10 (= 28) or "2.3" $\times$ 20 (= 46) or "1.4" $\times$ 20 (= 28) or "1.4" $\times$ 10 (= 14) or "0.7" $\times$ 30 (= 21)  or for a correct process to find the total area and an area of any block, eg. using $1 \text{ cm}^2 = 1$ unit of area to get 53.6 and one of 4.4, 11.2, 18.4, 11.2, 5.6, 8.4  (dep P1) for complete process to find 20% of ("1.4" $\times$ 10 + "0.7" $\times$ 30), eg. $\frac{20}{100} \times "35"$ or $\frac{"5.6"+"8.4"}{"53.6"} \times 134 \times \frac{20}{100}$ cao

Question	Working	Answer	Notes
5: (a)		$22 \leq f < 24$	B1
(b)		21.9	M1 $x \times f$ using midpoints
			M1 (dep on previous mark) " $x \times f$ " $\div 40$
			A1 accept 22 if working seen

Question	Working	Answer	Notes
5; "		Mean of 96 or net deviation of 0 so target met	M1 for correct interpretation of the graph, with at least one correct reading or a line drawn through 96 with at least one correct deviation M1 complete method to find mean of six months sales, eg. $(110+84+78+94+90+120) \div 6 (= 96)$ or the sum of six deviations, eg. $(14-12-18-2-6+24) \div 6 (= 0)$ C1 for a correct answer of 96 or 0 with correct conclusion
62" (a)  (b)		$160 < h \leq 170$  1. Points should be plotted at mid-interval values 2. The polygon should not be closed	B1 for identifying the correct class interval  C1 for a correct error identified C1 for a correct error identified
63"		84	M1 for correct interpretation of given information leading to a method to find fd, eg. $20 \div 100$ (thousand) or for an acceptable key P1 for a process to find at least two required frequencies, eg. $0.8 \times 50 (= 40)$ , $0.6 \times 50 (= 30)$ , $0.14 \times 100 (= 14)$ A1 for 84 cao

Question	Working	Answer	Notes
62" (a)		Trend described	C1 for "percentage of people who use the shop decreases" oe
(bi)		13 - 17	P1 for process to draw trend line on graph A1 for 13 - 17
(bii)		No + reason	C1 for comment, eg "no, because 2020 is beyond the time period covered by the given data"
65" (a)		0.43	M1 for use of graph at 240 minutes A1 for 0.42 – 0.44 oe
(b)		comparison	B1 for at least one median (249 – 252 or 273 – 276) B1 for least one interquartile range (69 – 73 or 67 - 71) C1 for comment comparing average times eg females take longer than males oe C1 for comment comparing spreads of times from IQRs, eg the spread of times is about the same  (NB – at least one of the comments must be in context)

Question	Answer	Mark	Mark scheme	Additional guidance
66 (a)	(100,18)	B1	cao	
(b)	12.8 to 14.8	M1	for a method to read off eg line of best fit <b>or</b> line up from 370 <b>or</b> for a point on the grid at (370, $y$ ) where $y$ lies between 12.8 and 14.8	
		A1	for an answer in the range 12.8 to 14.8	
(c)	Decision and statement	C1	for decision and statement  <b>Acceptable examples</b> No, as this point can be disregarded from the general trend No, ignore this point No, the correlation is positive No, because even with an outlier you can still have a negative or positive correlation. No, there is still a correlation. No, as you can use the rest of the data to determine a correlation. No, as outlier does not affect the majority No as a line of best fit can still be drawn No, it is an anomaly  <b>Not acceptable examples</b> Yes, .... Outliers can be ignored [no decision] No, the outlier can be ignored so the correlation is negative No there are other things that can affect the test	

Question	Answer	Mark	Mark scheme	Additional guidance
67	16.5	M1  M1  A1	for method to find total of ages of boys, eg $18 \times 16.2 (= 291.6)$ or total of ages of girls, eg $27 \times 16.7 (= 450.9)$ or total of ages of boys and girls, eg 742.5  for complete method, eg $\frac{"291.6"+"450.9"}{45} (= \frac{742.5}{45})$  cao	May use an equivalent method with number of boys and girls used in the ratio 2 : 3  $\frac{16.2+16.7}{2}$ scores 0 marks
68	7.645	P1  P1  P1  A1	for process to use area to find at least one frequency, eg for first frequency $(7.2 - 6.4) \times 10 (= 8)$ or $(7.2 - 6.4) \times 5 (= 4)$ or $4 \times 5 \times 5 (= 100)$  for process to find all frequencies, eg 8, 20, 40, 12 or multiples eg 4, 10, 20, 6 or 100, 250, 500, 150  (dep P2) for process to estimate mean, eg $((6.8 \times [8]) + (7.4 \times [20]) + (7.8 \times [40]) + (8.1 \times [12]))$ $\div ([8] + [20] + [40] + [12])$  for 7.645 (accept 7.65)	Frequencies could be written on the graph  Marks are for correct processes, one or more frequencies may be incorrect  Award full marks if a correct answer is seen in working and is then incorrectly rounded.



Question	Answer	Mark	Mark scheme	Additional guidance										
69	35 to 42	M1  A1	for drawing a suitable line of best fit <b>or</b> for a line from $x = 34$ <b>or</b> for a point marked on the grid at $(34, y)$ , $y$ in the range 33 to 44  answer in the range 35 to 42	Line at $x = 34$ does not have to be full length of grid but should be in or reach the data set. Acceptable values for the data set are $y = 33$ to $y = 44$										
6:	18.6	M1  M1  A1	for finding 4 products within intervals (including end points)  for $\Sigma fx \div (1 + 2 + 7 + 8)$ <b>or</b> $(7.5 \times 1 + 12.5 \times 2 + 17.5 \times 7 + 22.5 \times 8) \div (1 + 2 + 7 + 8)$ <b>or</b> $(“7.5” + “25” + “122.5” + “180”) \div “18”$ <b>or</b> $“335” \div “18”$  for 18.6(111...)	<table border="1"> <thead> <tr> <th>Min <math>fx</math></th> <th>Max <math>fx</math></th> </tr> </thead> <tbody> <tr> <td>5</td> <td>10</td> </tr> <tr> <td>20</td> <td>30</td> </tr> <tr> <td>105</td> <td>140</td> </tr> <tr> <td>160</td> <td>200</td> </tr> </tbody> </table> $\Sigma fx$ <b>must</b> come from 4 products $fx$ within intervals (including end points)	Min $fx$	Max $fx$	5	10	20	30	105	140	160	200
Min $fx$	Max $fx$													
5	10													
20	30													
105	140													
160	200													
6;	Box plot	M1  M1  A1	for correctly identifying one of the LQ (188), median (197) or UQ (209) from the stem leaf  for showing a box and at least 3 correctly plotted values from 173, 188, 197, 209, 219  for a fully correct box plot	May be implied by one of these values being correctly plotted.										

Question	Answer	Mark	Mark scheme	Additional guidance
72 (a)	$40 < h \leq 50$	B1	accept 40 – 50 oe	
(b)	<p>polygon drawn</p> <p>(15,7), (25,13) (35,14), (45,12) (55,16), (65,18)</p>	<p>B2</p> <p>(B1)</p>	<p>for fully correct polygon with points plotted at the midpoints</p> <p>for points plotted correctly but not joined by straight lines</p> <p><b>or</b> joining points at correct heights consistently within intervals including plotting at end values</p> <p><b>or</b> correct frequency polygon with one point incorrect</p> <p><b>or</b> correct frequency polygon with first and last points joined directly)</p>	<p>Joining must be with line segments</p> <p>for example, at 10, 20, 30,... or at 20, 30, 40,...</p> <p>Ignore any histogram drawn and any part of frequency polygon outside range of first and last points plotted</p>

Question	Answer	Mark	Mark scheme	Additional guidance
73	statement	B2	<p>Two different statements</p> <p><b>Acceptable</b></p> <p>eg should be joined with straight lines (not curve)/should use a ruler</p> <p>1<sup>st</sup> (quarter) not shown/plotted/labelled/not all quarters labelled</p> <p>does not show all 4 seasons</p> <p>9.5 missing from vertical axes/not linear</p> <p>vertical (number) axis does not start at 0/the y axis starts at 6</p> <p>the graph does not begin at 0, it starts at 6</p> <p>it is not clear what 2, 3, 4 on the x-axis mean</p> <p>the scale of years doesn't make sense</p> <p>there is lack of clarity about what the numbers on the x axis represent</p> <p>graph is curved line</p> <p><b>Not acceptable</b></p> <p>eg no value plotted for 2 in 2016</p> <p>it does not start at 0 (no reference to vertical axis)/missing 0</p> <p>they should not have connected the dots like that</p> <p>the numbers on the x axis are repeated</p> <p>the numbers along the x axis 2, 3, 4</p> <p>the years on the x axis have not been written properly</p> <p>does not follow a sequence</p> <p>it needs a discontinuity wiggle on the axis</p> <p>no title</p>	Ignore additional statements provided no contradiction
	statement	(B1	One statement eg from those above.)	

Question	Answer	Mark	Mark scheme	Additional guidance
74	210	M1	for method to find total frequency, $60 \times 2 (= 120) + 30 \times 5 (= 150) + 30 \times 9 (= 270) + 15 \times 6 (= 90)$ $+ 45 \times 2 (= 90)$ or 720  <b>OR</b>  for method to find the total area, $4 + 5 + 9 + 3 + 3 (= 24 \text{ cm}^2)$	Accept one error in total for the award of the method marks  24 must be from adding areas of bars not heights of bars
		M1	for finding the number of onions less than 60g or greater than 120 g = $120 + 90 + 90 (= 300)$ ,  <b>OR</b>  for finding the number of onions between 60g and 120g $= 150 + 270 (= 420)$  <b>OR</b>  for finding the area under the graph less than 60 or greater than 120 $= 4 + 3 + 3 (= 10 \text{ cm}^2)$  <b>OR</b>  for finding the area under the graph between 60 and 120 $= 5 + 9 (= 14 \text{ cm}^2)$	14 must be from adding areas of bars not heights of bars
		M1	(dep M2) for $1 - \frac{300}{720} (= \frac{7}{12})$ oe OR for $\frac{420}{720} (= \frac{7}{12})$ oe OR for $\frac{14}{24} (= \frac{7}{12})$ oe	Accept 58.3...%
		A1	cao	

Question	Answer	Mark	Mark scheme	Additional guidance
75 (a)	5	M1	“2” $\div$ 40 $\times$ 100	“2” comes from their reading of the height of the 20 to 24 column
		A1	cao	
(b)	9.5 shown	M1	for frequencies of 11, 8, 13, 6 and 2 (allow one error) <b>or</b> for midpoints 2, 7, 12, 17 and 22	May be seen on chart
		M1	for finding at least 4 products $fx$ consistently within interval (including end points)	
		M1	for $\Sigma“fx” \div (“11” + “8” + “13” + “6” + “2”)$ <b>or</b> $(11 \times 2 + 8 \times 7 + 13 \times 12 + 6 \times 17 + 2 \times 22) \div 40$ <b>or</b> $\Sigma“fx” (=380)$ <b>and</b> $9.5 \times (“11” + “8” + “13” + “6” + “2”)$ ( $=380$ )	Evidence of two different calculations that should lead to 380 are required for this mark
		C1	for correct figures showing the answer or accurate figures to compare from correct working eg 380 from two calculations	
76	Diagram drawn	B2	for correct frequency polygon	Plotting at (5,14), (15,18), (25,26), (35,12) Must use line segments for B2
		(B1	for points plotted at correct midpoints of intervals  <b>or</b> joining points at correct heights consistently within intervals including plotting at end values  <b>or</b> correct frequency polygon with one point incorrect  <b>or</b> correct frequency polygon with first and last points joined directly)	Joining must be with line segments  NB ignore any histogram drawn and any part of frequency polygon outside range of first and last points plotted

Question	Answer	Mark	Mark scheme	Additional guidance
77 (a)	Histogram drawn	B3	for fully correct histogram eg relative heights 6, 3, 4, 2, 2	
		(B2	for 4 correct blocks <b>or</b> all 5 frequency $\div$ class interval <b>and</b> 1 correct block)	
		(B1	for at least 2 correct blocks of different widths <b>or</b> for frequency $\div$ class interval for at least 3 frequencies)	
(b)	66 to 71	M1	indication of the median in the third interval <b>or</b> proportional method shown	Just stating the interval is sufficient for this mark May be implied by the number on the answer line
		A1	ft answer between 66 and 71	Median is at (approx.) 68.75 by a proportional method

Question	Answer	Mark	Mark scheme	Additional guidance
78 (a)	negative	B1	cao	Ignore any description of a relationship and any reference to strength of correlation
(b)	Explanation	C1	for a correct explanation, eg “not in line with the trend of the other points” “does not fit in with the correlation” “is far away from the other points or line of best fit”	
(c)	Comment	C1	for an explanation eg “point would be outside of the range of the scatter diagram”	

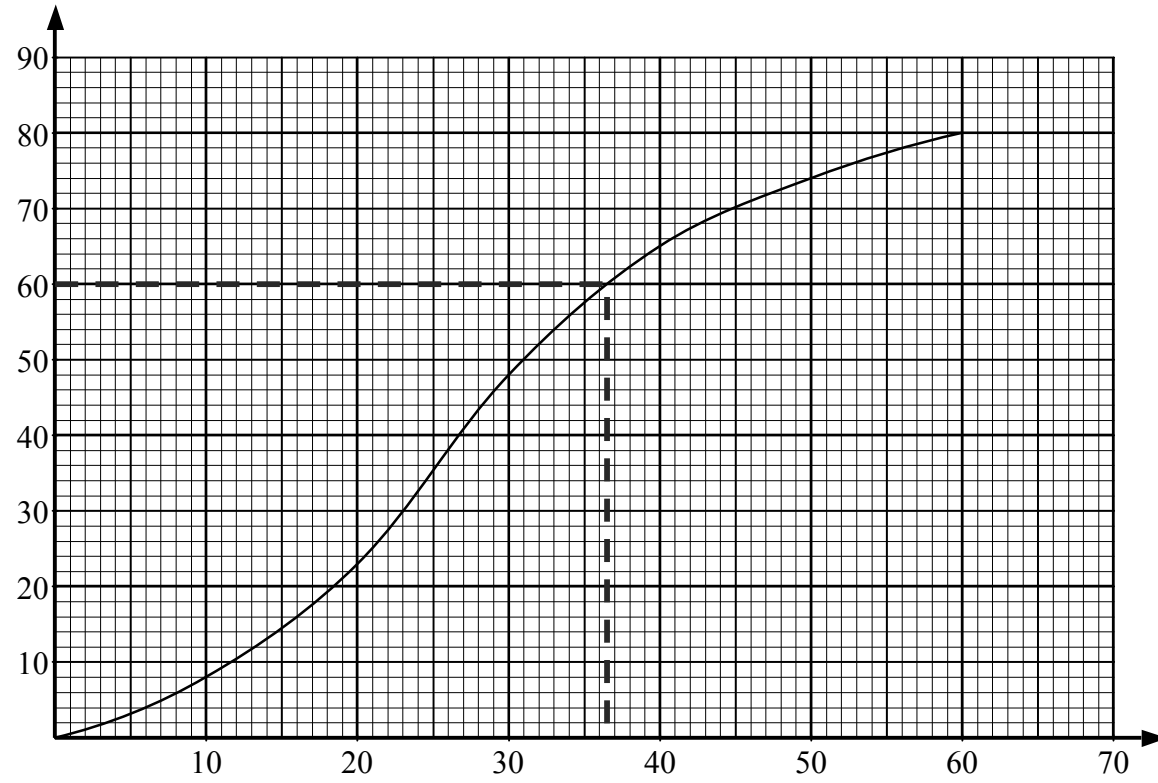
Question	Working	Answer	Mark	Notes
79 (a)		$160 < h \leq 170$	B1	correct class interval
(b)		Line segments joining the points (135, 4), (145, 11), (155, 24), (165, 22) and (175, 19)	C2 [C1]	for fully correct frequency polygon for points plotted correctly at midpoints of intervals OR joining points with line segments at the correct heights and consistent within the intervals (including end values) OR correct frequency polygon with one point incorrect OR correct frequency polygon with first and last point joined]  NB: ignore any histogram drawn and any part of frequency polygon outside range of first and last points plotted
7: (a)		57	B1	cao
(b)		Decision and reason	C1	Jamil might not be correct and reason, eg the maximum weight could be less than 80 or the minimum weight could be less than 40
(c)		Shown	C1  C1	for evidence of reading from the graph at weight 65 (= 48 to 49) or at cf 45 (= 63)  eg 25% of 60 is 15 but only 11 potatoes have a weight greater than 65g or 25% of potatoes have a weight greater than 63g



Question	Working	Answer	Mark	Notes
7; (a)		12	B1	cao
82 (a)		180	M1 A1	for evidence of using the LQ (150) and UQ (330) eg 330 – 150 cao
(b)	60,180,300,350,650		B2 (B1)	for fully correct box plot for showing a box and at least 3 correctly plotted values
(c)	Medians 250 and 300	Statement	C1	for a correct comparative statement relevant to the question e.g. Yes because the female students have a greater median than the male students

Question	Working	Answer	Notes
83 (a)	Draws LOBF Finds $ht \div base = \frac{85 - 20}{0 - 25} = -2.6$	No + reason	M1 Interpret question eg. draw line of best fit M1 Start to test eg. gradient e.g. $\frac{85 - 20}{0 - 25} = -2.6$ C1 Gradient within range $\pm(2 - 3)$ and 'no'
(b)		The LOBF would have to be used outside the data	C1 Convincing explanation
84 (a)		11A	M1 For a cumulative frequency diagram with at least 5 points plotted correctly at the ends of the intervals C1 For correct graph with points joined by curve or straight line segments  [SC B1 if the shape of the graph is correct and 5 points of their points are <b>not</b> at the ends but consistently within each interval <b>and</b> joined.]
(b)		26.5	B1 25 - 28
(c)	$80 \div 4 \times 3 = 60$ Draw line parallel to mark axis from CF = 50	36.5	P1 For process to find number who failed eg $80 \div 4 \times 3 = 60$ P1 Draw line parallel to mark axis from CF = "60" and read off A1 For 35 - 38

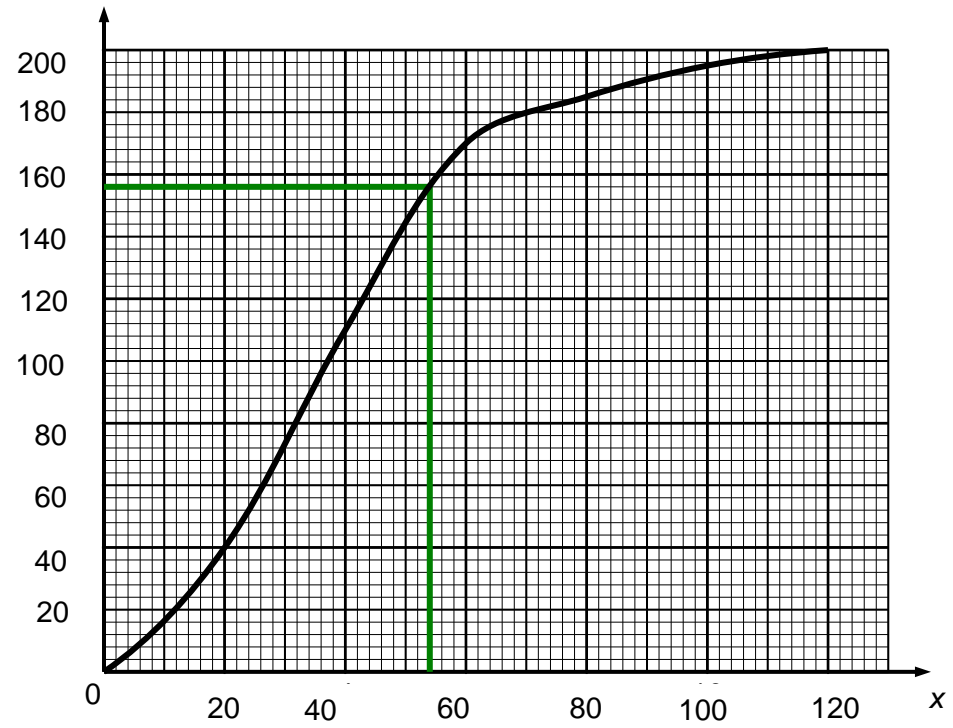
62



Question	Working	Answer	Notes
<b>63</b> (a)		(4,10)	B1 cao
(b)(i)		Line drawn	B1 Straight line drawn passing between (2, 16) and (2, 28) AND (13, 80) and (13, 92)
(b)(ii)		Positive	C1 positive OR description of dynamic relationship
(c)		Value between 60 and 70	C1 a correct value given
(d)		Statement	C1 for referring to the danger of extrapolation outside the given range or for a given point
<b>64</b> (a)	$(720+408+304+252)\div 50$ $1684 \div 50$	33.68	M1 for finding 4 products $fw$ consistently within interval (including end points) M1 (dep on 1st M) for ' $\Sigma fw'$ $\div 50$ A1 (accept 33.7 from correct working)
(b)		Manager with reasons	M1 for strategy to compare number of small size sold to number ordered C1 clear comparison that small size is not $\frac{3}{4}$ and so Jenny is not correct or the manager is correct

Question	Working	Answer	Notes
85" (a)		improvement	C1 appropriate improvement eg do not have axes starting at (0, 0)
(b)		explanation	C1 explanation eg pine cone has a very short width for its length
88" (a)		histogram	C1 for 2 correct bars of different widths or at least 3 correct frequency densities C1 all bars in correct proportions or 4 correct bars with axes scaled and labelled C1 fully correct histogram with axes scaled and labelled
(b)	$81 \div 2 = 40.5$ 90 to 105 is 29	108.2	C1 for $81 \div 2 = 40.5$ and $11.5 \div 18 \times 5 (= 3.19..)$ C1 For answer in range 108 to 109

Question	Working	Answer	Mark	Notes												
89 (a)		Frequency polygon	2	B2 correct frequency polygon (B1 for points plotted correctly but not joined OR for points plotted at the correct heights, consistently placed within the class intervals (including ends) and joined OR for an otherwise correct frequency polygon with one point incorrect OR correct frequency polygon with first and last points joined directly)  NB: ignore parts of graph drawn to the left of the 1st point or the right of the last point; ignore any histograms drawn.												
(b)		$60 < A \leq 80$	1	B1 ft frequency polygon												
8: (a)	40, 110, 170, 185, 195, 200	Table	1	B1												
(b)		Cumulative frequency diagram	2	M1 ft their cumulative frequency table for at least 5 points plotted correctly at the ends of the intervals provided tables values are cumulative, condoning one arithmetical error, <b>or</b> if the shape of the graph is correct for 5 or 6 points plotted not at the ends but consistently within each interval and joined. A1 for a correct graph (allow curve or line segments)												
(c)		40 to 48	2	M1 for reading their cumulative frequency graph from mark of 54 (= 152 to 160) where the points are plotted consistently within each interval and joined. A1 for answer in the range 40 to 48 or ft from their cumulative frequency graph												
*8;	<table border="1"> <tr> <td></td> <td>M</td> <td>F</td> </tr> <tr> <td>Median</td> <td>40</td> <td>40</td> </tr> <tr> <td>Range</td> <td>90</td> <td>106</td> </tr> <tr> <td>IQR</td> <td>31</td> <td>42</td> </tr> </table>		M	F	Median	40	40	Range	90	106	IQR	31	42	Compare: medians and spread	3	C1 for any correct comparison of the medians C1 for any correct comparison of the IQRs or range C1 for a comparison of medians, IQRs or ranges written in context
	M	F														
Median	40	40														
Range	90	106														
IQR	31	42														



Question	Working	Answer	Mark	Notes												
70 (a)		$50 < a \leq 60$	1	B1 for correctly identifying the modal class interval e.g. 50 – 60 oe												
(b)		Polygon	2	B2 for fully correct frequency polygon - points plotted at the midpoint (B1 for all points plotted accurately but not joined with straight line segments <b>or</b> all points plotted accurately and joined with last joined to first to make a polygon <b>or</b> all points at the correct heights and consistently within or at the ends of the intervals <b>and</b> joined (can include joining last to first to make a polygon)) NB: ignore parts of graph drawn to the left of the 1 <sup>st</sup> point or the right of the last point; ignore any histograms drawn.												
71		10	3	M1 for $15 \times 7 (= 105)$ or $9 \times 5 (= 45)$ M1 for $(15 \times 7 - 9 \times 5) \div (15 - 9)$ A1 cao												
*94	<table style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td>Boys</td> <td>Girls</td> </tr> <tr> <td>Median:</td> <td>115</td> <td>112</td> </tr> <tr> <td>Range:</td> <td>41</td> <td>33</td> </tr> <tr> <td>IQR:</td> <td>17</td> <td>9</td> </tr> </table>		Boys	Girls	Median:	115	112	Range:	41	33	IQR:	17	9	Comparison of data	4	<p>B1 for correct median for girls or boys B1 for any correct range or IQR C1 for a correct comparison of the medians C1 ft for a correct comparison of the ranges or IQRs For the award of both C marks at least one of the comparisons made must be in the context of the question and all figures used for comparisons correct.</p> <p>OR</p> <p>B2 for an accurately drawn boxplot ( superimposed) C1 for a correct comparison of the medians C1 for a correct comparison of the ranges or IQRs For the award of both C marks at least one of the comparisons made must be in the context of the question</p>
	Boys	Girls														
Median:	115	112														
Range:	41	33														
IQR:	17	9														



Question	Working	Answer	Mark	Notes
95 (i)		38 30	3	M1 for evidence of frequency density calculation, eg 6 on the frequency density axis for the height of the first column or 5 is 1 cm <sup>2</sup> can be implied by 30 as the second missing frequency A1 for 38 and 30
(ii)		30–50 bar height 0.8 cm		B1 for 30 – 50 bar of height 0.8 cm

Question	Working	Answer	Mark	Notes																												
96		60	3	M1 for $\frac{16}{80}$ or $\frac{300}{80}$ oe M1 (dep) for " $\frac{16}{80}$ " $\times$ 300 or " $\frac{300}{80}$ " $\times$ 16 A1 cao																												
97	<table border="1"> <tr> <td></td> <td>S</td> <td>A</td> <td>B</td> <td></td> </tr> <tr> <td>M</td> <td>4</td> <td>9</td> <td>10</td> <td>23</td> </tr> <tr> <td>F</td> <td>6</td> <td>11</td> <td>26</td> <td>43</td> </tr> <tr> <td></td> <td>10</td> <td>20</td> <td>36</td> <td>66</td> </tr> </table>		S	A	B		M	4	9	10	23	F	6	11	26	43		10	20	36	66	11	4	M1 for a correct first step which results in a value that could be in the table: ie. $66 - 10 - 20 (= 36)$ or $66 - 43 (= 23)$ or $10 - 4 (= 6)$ M1 for correct method to find a second value that could be in the table using their first value eg " $23$ " - 4 - 10 (= 9) or " $36$ " - 10 (= 26) M1 for a fully correct and complete method. A1 cao								
	S	A	B																													
M	4	9	10	23																												
F	6	11	26	43																												
	10	20	36	66																												
*98	<table border="1"> <tr> <td></td> <td>Age</td> <td></td> <td>Age</td> </tr> <tr> <td></td> <td>16</td> <td></td> <td>18</td> </tr> <tr> <td>HV</td> <td>310</td> <td>&lt;</td> <td>380</td> </tr> <tr> <td>LV</td> <td>80</td> <td>&lt;</td> <td>130</td> </tr> <tr> <td>Median</td> <td>180</td> <td>&lt;</td> <td>240</td> </tr> <tr> <td>Range</td> <td>230</td> <td>&lt;</td> <td>250</td> </tr> <tr> <td>IQR</td> <td>80</td> <td>&gt;</td> <td>70</td> </tr> </table>		Age		Age		16		18	HV	310	<	380	LV	80	<	130	Median	180	<	240	Range	230	<	250	IQR	80	>	70	Compares: medians and spread	3	C1 for any correct comparison of the medians C1 for any correct comparison of the IQRs or the ranges C1 (dep on one C1) for either statement written in context
	Age		Age																													
	16		18																													
HV	310	<	380																													
LV	80	<	130																													
Median	180	<	240																													
Range	230	<	250																													
IQR	80	>	70																													
	(b)	150	2	M1 for $\frac{3}{4} \times 200$ oe A1 cao																												

Question		Working	Answer	Mark	Notes
99			20	3	M1 for $30 \times 14$ (=420) or $18 \times 10$ (=180) M1 for $30 \times 14 - 18 \times 10$ or "420" - "180" (=240) A1 cao
9:	(a)		19, 36, 51, 63, 73, 80	1	B1 cao
	(b)		cf graph	2	M1 for at least 5 of the 6 points plotted at each upper end of the interval (not joined) or 5 of the 6 points plotted consistently within interval (not upper end) and joined (dep on a cf table with no more than one arithmetic error) A1 correct graph
	*(c)		comparable value and conclusion	3	M1 for indication of a reading taken from a cf graph using weight = 3.4 kg or find UQ from 60 A1 for value given between 55 & 57 or 3.6 & 3.8 C1 (dep on at least M1) for conclusion (justified)

Question		Working	Answer	Mark	Notes
9;	(a)		15   6 9 16   4 5 7 7 8 9 17   2 3 6 6 8 9 18   0 2 3 8 19   0 2 with key	3	B2 for a correct ordered stem and leaf diagram (B1 for fully correct unordered or ordered with one error or omission) B1 (indep) for key (units not required)
	(b)		15	2	M1 for a method to find "3" as a percentage of the total number of men, eg $\frac{"3"}{"20"} \times 100$ oe $\frac{"3" \times 5}{100}$ or ft from their diagram A1 for 15 cao
: 2	(a)		Relationship	1	B1 for a description of a dynamic relationship eg "The older the car the lower the price" or "The newer the car the greater the price" oe (accept negative correlation)
	(b)		6400 to 7000	2	M1 for a single straight line segment with negative gradient that could be used as a line of best fit or vert. line from 3.5 or a point plotted at (3.5, y), where y is in the range 6400 to 7000 A1 for 6400 - 7000
: 3	(a)		4, 20, 56, 80, 94, 100	1	B1 cao
	(b)		graph	2	M1 ft from their table for at least 5 points plotted correctly at the ends of the intervals provided table values are cumulative, condoning one arithmetic error, or if the shape of the graph is correct for 5 or 6 points plotted not at the ends but consistently within each interval and joined A1 cao for correct graph with points joined by curve or straight line segments
	(c)		47 to 49	1	B1 for 47 to 49 or ft their cf graph at cf = 50
	(d)		13 to 16	2	M1 for reading a value from their cf graph at time = 63 (84 to 87) A1 for answer in the range 13 to 16 or ft from their graph

Question		Working		Answer	Mark	Notes										
: 4		8	4 8 9	correct stem and leaf with key	3	B2 for a fully correct ordered diagram (B1 for a correct unordered diagram or ordered with at most two errors or omissions with stems 8, 9, 10 and 11 present)  B1 for a correct key (units not necessary)  Accept stem written as 80, 90, etc. but key only if consistent with this										
		9	0 0 1 1 2 3 5 7 8													
		10	2 3 6 8													
		11	0 5													
		8   4 represents 84(cm)														
: 5	(a)			correct box plot	2	M1 for a box drawn with at least 2 correct points from LQ, Median and UQ <b>or</b> with maximum value of 290 plotted A1 for a fully correct box plot										
	* (b)	<table border="1"> <thead> <tr> <th></th> <th>girls</th> <th>boys</th> </tr> </thead> <tbody> <tr> <td>Med</td> <td>170</td> <td>190</td> </tr> <tr> <td>Rang e</td> <td>230</td> <td>210</td> </tr> <tr> <td>IQR</td> <td>120</td> <td>100</td> </tr> </tbody> </table>		girls	boys	Med	170	190	Rang e	230	210	IQR	120	100	2 comparisons	2
	girls	boys														
Med	170	190														
Rang e	230	210														
IQR	120	100														

Question		Working	Answer	Mark	Notes
: 6	(a)		correct graph	2	M1 for 5 or 6 or 7 points plotted correctly at the ends of the intervals (overlay) A1 cao for correct graph with points joined by curve or straight line segments  [SC: B1 if the shape of the graph is correct and 5 or 6 or 7 of their points are <b>not</b> at the ends but are plotted consistently within (10,20) (20,30) (30,40) etc.]
	(b)		No with supporting figures	2	M1 for $0.1 \times 200 (=20)$ <b>or</b> $0.9 \times 200 (=180)$ <b>or</b> sight of 180 used on cf axis <b>or</b> $200 - 186 (=14)$ A1 ft for correct decision with 20 and “9” <b>or</b> 20 and 14 <b>or</b> “age” from reading graph at 180  <b>OR</b> M1 for method to find percentage of workers who are over 65, eg $\frac{200 - "191"}{200} \times 100 (=4.5\%)$ <b>or</b> method to find percentage of workers who are over 60 (from table), eg $\frac{200 - 186}{200} \times 100 (=7\%)$ or $\frac{200 - 190}{200} \times 100 (=5\%)$ A1 ft for correct decision with “4.5”% or 7% or 5%

Question		Working	Answer	Mark	Notes																				
: 7			0   5 9 1   3 5 6 8 9 9 2   1 2 3 3 5 7 8 9 3   1 2 4 4   0	3	B2 for fully correct diagram. Accept a stem of 10, 20, etc. (B1 for ordered with at most 2 errors or omissions or for correct unordered diagram) B1 for a correct key (units may be omitted) consistent with diagram.																				
: 8		<table border="1"> <thead> <tr> <th></th> <th>Sq</th> <th>G</th> <th>S</th> <th>Tot</th> </tr> </thead> <tbody> <tr> <td>F</td> <td>2</td> <td>4</td> <td>15</td> <td>21</td> </tr> <tr> <td>M</td> <td>6</td> <td>14</td> <td>9</td> <td>29</td> </tr> <tr> <td>Tot</td> <td>8</td> <td>18</td> <td>24</td> <td>50</td> </tr> </tbody> </table>		Sq	G	S	Tot	F	2	4	15	21	M	6	14	9	29	Tot	8	18	24	50	4	4	M1 for a correct first step which results in a value that could be in the table: eg. $50 - 18 - 8 (= 24)$ or $50 - 21 (= 29)$ or $8 - 6 (= 2)$ M1 for a correct method to find a second value that could be in the table using their first value eg “29” – 9 – 6 (=14) or “24” – 9 (=15) M1 for a fully correct and complete method. A1 cao
	Sq	G	S	Tot																					
F	2	4	15	21																					
M	6	14	9	29																					
Tot	8	18	24	50																					
: 9	(a)		0.75	2	M1 for “5.6” – “4.85” with at least one value correct A1 cao																				
	(b)		20	2	M1 for a complete method e.g. $80 \div 4$ A1 cao																				
	(c)	<table border="1"> <thead> <tr> <th></th> <th>1<sup>st</sup> half</th> <th>2<sup>nd</sup> half</th> </tr> </thead> <tbody> <tr> <td>Med</td> <td>5.3</td> <td>4.75</td> </tr> <tr> <td>Range</td> <td>2.2</td> <td>2.45</td> </tr> <tr> <td>IQR</td> <td>0.75</td> <td>0.75</td> </tr> </tbody> </table>		1 <sup>st</sup> half	2 <sup>nd</sup> half	Med	5.3	4.75	Range	2.2	2.45	IQR	0.75	0.75	2 comparisons	2	B1 ft from (a) for a correct comparison of a measure of spread B1 for a correct comparison of medians (accept averages) For the award of both marks at least one of the comparisons made must be in the context of the question.								
	1 <sup>st</sup> half	2 <sup>nd</sup> half																							
Med	5.3	4.75																							
Range	2.2	2.45																							
IQR	0.75	0.75																							

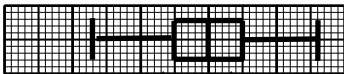
Question		Working	Answer	Mark	Notes
∴	(a)		Plot (90,17)	1	B1 cao
	(b)		Positive	1	B1 Positive
	(c)		In range 16 to 20	2	M1 for a single straight line segment with positive gradient that could be used as a line of best fit or a vertical line from 110 or a point plotted at (110, $y$ ) where $y$ is in the range 16 to 20 A1 for an answer in the range 16 to 20 inclusive
∴		$35 \times 10 = 350$ $33 \times 11 = 363$ $363 - 350 = 13$  OR  $10 \times (35 - 33) = 20$ $33 - 20 = 13$	13	3	M1 $35 \times 10 (= 350)$ or $33 \times 11 (= 363)$ M1 (dep) finding the difference in their totals e.g. '363' – '350' A1 cao  OR  M1 $10 \times (35 - 33) (=20)$ or $11 \times (35 - 33) (=22)$ M1 (dep) $33 - '20'$ or $35 - '22'$ A1 cao
; 2	(a)		68	1	B1 cao
	* (b)		Yes as $28 > 20$ or $35\% > 25\%$ or $53 < 60$	3	M1 for reading a value from graph at time = 60 (=28, accept 27 to 28) M1 for ' $28$ ' $\div 80 \times 100 (= 35)$ or $25 \div 100 \times 80 (= 20)$ C1 (dep on M2) for correct decision based on their figures  OR  M1 for $25 \div 100 \times 80 (= 20)$ M1 for reading a value from graph at cf = 20 (=53, accept 52 to 54) C1 (dep on M2) for correct decision based on their figures
	(c)	28, 53, 68, 76, 96	Box plot plotted	3	B1 for ends of whiskers at 28 and 96 with a box B1 ft for median at '68' inside a box B1 for ends of box at 53 (accept 52 to 54) and 76



Question		Working	Answer	Mark	Notes
91			2  4 7 8 3  0 3 3 5 7 8 8 4  1 1 2 4 4 5 Key, eg 4 1 is 4.1(kg)	3	B2 for correct ordered stem and leaf (B1 for fully correct unordered or ordered with one error or omission) B1 (indep) for key (units not required)
92			7	3	M1 for $4 \times 10$ or 40 or $\frac{12+6+15+x}{4}$ or a correct equation M1 for a complete and correct method A1 cao
; 5	(a)	Cf table: 4, 9, 25, 52, 57,60 cf graph	Correct Cf graph	3	B1 Correct cumulative frequencies (may be implied by correct heights on the grid) M1 for at least 5 of "6 points" plotted consistently within each interval A1 for a fully correct CF graph
	(b)(i)		172	3	B1 for 172 or read off at cf = 30 or 30.5 from a cf graph, ft provided M1 is awarded in (a)
	(ii)	IQR = UQ – LQ	12 - 14		M1 for readings from graph at cf = 15 or 15.25 and cf = 45 or 45.75 from a cf graph with at least one of LQ or UQ correct from graph ( $\pm \frac{1}{2}$ square). A1 ft provided M1 is awarded in (a)
; 6		12 ÷ 10 = 1.2 15 ÷ 5 = 3 13 ÷ 5 = 2.6 18 ÷ 10 = 1.8 3 ÷ 15 = 0.2	Histogram	3	B3 for fully correct histogram (B2 for 4 correct blocks) (B1 for 3 correct blocks)  (If B0, SC B1 for correct key eg $1\text{cm}^2 = 2$ (calls) Or frequency ÷ class interval for at least 3 frequencies)  <b>NB</b> Apply the same mark scheme if a different frequency density is used.

Question		Working	Answer	Mark	Notes	
; 7	(a)	Plot (2, 250) and (3.1, 190)	Plot points	1	B1 for both points plotted accurately	
	(b)		Relationship	1	B1 for “As the distance from the centre increases the monthly rent decreases” or the nearer you are to the centre the more you have to pay oe (accept negative correlation)	
	(c)		200 to 260	2	M1 for attempting a correct method, eg a line of best fit <b>or</b> any other indication, on a line that could be used as a line of best fit eg line to graph at $x = 2.8$ or a mark on the line at 2.8 A1 for value in the range 200 to 260	
; 8	(a)		8, 23, 53, 70, 77, 80	1	B1 cao	
	(b)		graph	2	M1 fit from their table for at least 5 points plotted correctly at the ends of the intervals provided table values are cumulative, condoning one arithmetic error A1 cao for correct graph with points joined by curve or straight line segments  [SC B1 if the shape of the graph is correct and 5 points of their points are <b>not</b> at the ends but consistently within each interval <b>and</b> joined.]	
	(c)		Readings at 60 and 20 420 to 440 – 280 to 295	120 – 160	2	M1 (dep on cf graph) for use of either cf = 20 or cf = 60 A1 ft from a cf graph
	(d)		80 – 71 to 74	6 – 9	2	M1 (dep on cf graph) for evidence of reading off the cf axis from £530 on the wages axis (could be the answer) A1ft for 6 - 9

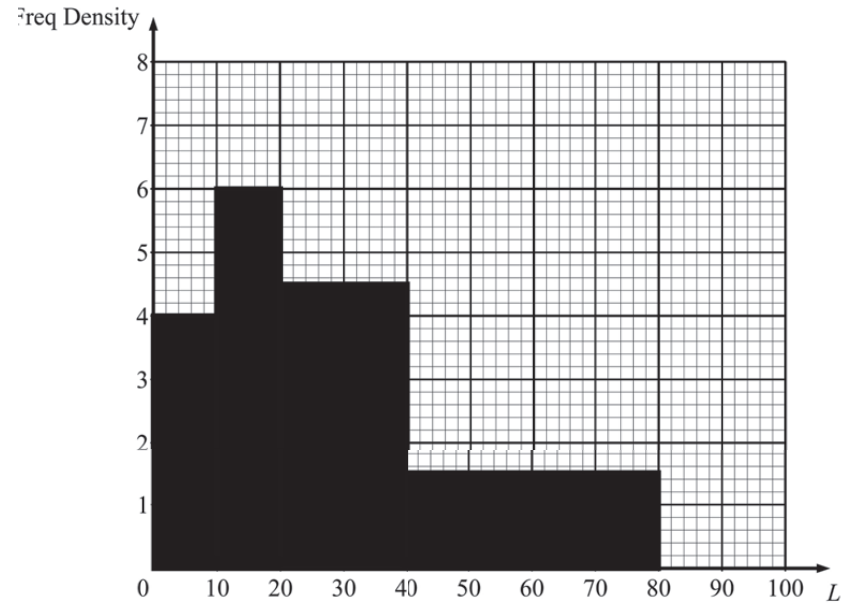
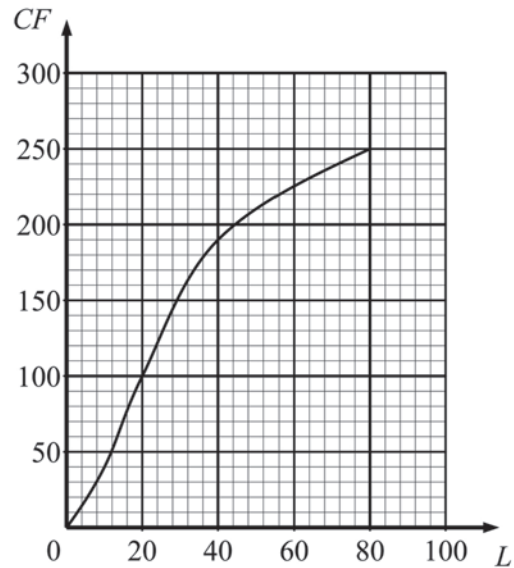
Question		Working	Answer	Mark	Notes
; 9	(a)		Positive (correlation)	1	B1 for positive (correlation) [do not accept a relationship]
	(b)		85	2	B2 for an answer in the range 83 to 87 OR M1 for a single straight line segment with positive gradient that could be used as a line of best fit or for an indication on the diagram from 148 on the height axis A1 ft from their line of best fit
;;	(a)		Box plot	2	B2 cao (B1 for ends of whiskers at 18 and 44 (as part of a box plot diagram) <b>OR</b> for ends of box at 25 and 33 with median at 29)
	(b)		2 comparisons	2	B2 ft for two comparisons with at least one referring to IQR or median values (B1 ft for one comparison of IQRs, medians, or other values)  As well as median or interquartile range accept other valid references to spread if explained correctly within a statistical context. Statements need to be true.
;;	(a)		11, 34, 65, 92, 100	1	B1 ca
	(b)		cf graph	2	B1 for or 6 points plotted correctly $\pm 1$ full 2 mm square at the upper end of the interval dep on sensible table (condone one error in addition) B1 (dep) r points joined by curve or line segments provided no gradient is negative. Ignore any point or graph outside range of their points.  SC B1 for 5 or 6 points plotted not at end but consistently within each interval and joined.
	(c)		18 – 24	2	M1 for indication of taking a reading from 90 or ft from their cf graph A1 for 18 – 24

Question		Working	Answer	Mark	Notes
322		$\begin{array}{r l} 2 & 9 \\ 3 & 1\ 3\ 5\ 6\ 9 \\ 4 & 2\ 3\ 3\ 4\ 6\ 8\ 9 \\ 5 & 2\ 4\ 5 \end{array}$ <p><b>OR</b></p> $\begin{array}{r l} 20 & 9 \\ 30 & 1\ 3\ 5\ 6\ 9 \\ 40 & 2\ 3\ 3\ 4\ 6\ 8\ 9 \\ 50 & 2\ 4\ 5 \end{array}$	$\begin{array}{r l} 2 & 9 \\ 3 & 1\ 3\ 5\ 6\ 9 \\ 4 & 2\ 3\ 3\ 4\ 6\ 8\ 9 \\ 5 & 2\ 4\ 5 \end{array}$ <p>Key: <math>2 \mid 9 = 29</math></p>	3	<p>B3 for fully correct diagram with appropriate key (B2 for ordered leaves, with at most two errors or omissions <b>and</b> a key <b>OR</b> correct unordered leaves <b>and</b> a key <b>OR</b> correct ordered leaves)</p> <p>(B1 for unordered or ordered leaves, with at most two errors or omissions <b>OR</b> key)</p> <p>NB : Order of stem may be reversed; condone commas between leaves</p>
323	(a)		170	1	B1 accept answers in range 170 - 170.5 inclusive
	(b)			3	<p>B3 for box plot with all 3 aspects correct (overlay)</p> <p>aspect 1 : ends of whiskers at 153 and 186 aspect 2 : ends of box at 165 and 175 aspect 3 : median marked at 170 <b>or</b> ft (a) provided <math>165 &lt; (a) &lt; 175</math></p> <p>(B2 for box plot with two aspects correct) (B1 for one aspect <b>or</b> correct quartiles and median identified)</p> <p>SC : B2 for all 5 values (153, 165, '170', 175, 186) plotted</p>
	(c)		Two correct comparisons	2	<p>B1 ft from (b) for a correct <b>comparison</b> of range <b>or</b> inter-quartile range eg. the range / iqr is smaller for group B than group A</p> <p>B1 ft from (b) for a correct <b>comparison</b> of median <b>or</b> upper quartile <b>or</b> lower quartile <b>or</b> minimum <b>or</b> maximum eg. the median in group A is greater than the median in group B</p>

Question		Working	Answer	Mark	Notes										
324	(a)	<table border="1" data-bbox="439 392 804 472"> <tr> <td>F</td> <td>15</td> <td>25</td> <td>36</td> <td>24</td> </tr> <tr> <td>Fd</td> <td>3</td> <td>5</td> <td>3.6</td> <td>1.2</td> </tr> </table>	F	15	25	36	24	Fd	3	5	3.6	1.2	Correct histogram	3	<p>B3 for fully correct histogram (overlay) (B2 for 3 correct blocks) (B1 for 2 correct blocks of different widths)</p> <p>SC : B1 for correct key, eg. <math>1 \text{ cm}^2 = 5 \text{ (cars)}</math> <b>or</b> correct values for (freq <math>\div</math> class interval) for at least 3 frequencies (3, 5, 3.6, 1.2)</p> <p>NB: The overlay shows one possible histogram, there are other correct solutions.</p>
F	15	25	36	24											
Fd	3	5	3.6	1.2											
	(b)	$\frac{3}{4} \times 24$	18	2	<p>M1 for <math>\frac{3}{4} \times 24 (=18)</math> oe <b>or</b> <math>\frac{1}{4} \times 24 (=6)</math> oe A1 cao</p> <p><b>OR</b></p> <p>M1 ft histogram for <math>15 \times "1.2"</math> <b>or</b> <math>5 \times "1.2"</math> A1 ft</p>										

Question	Working	Answer	Mark	Additional Guidance																								
103	<table border="1"> <thead> <tr> <th>L</th> <th>F</th> <th>FD</th> <th>CF</th> </tr> </thead> <tbody> <tr> <td>0! 10</td> <td>40</td> <td>4</td> <td>40</td> </tr> <tr> <td>10! 20</td> <td>60</td> <td>6</td> <td>100</td> </tr> <tr> <td>20! 40</td> <td>90</td> <td>4.5</td> <td>190</td> </tr> <tr> <td>40! 80</td> <td>60</td> <td>1.5</td> <td>250</td> </tr> <tr> <td>&gt;80</td> <td>0</td> <td>0</td> <td>250</td> </tr> </tbody> </table>	L	F	FD	CF	0! 10	40	4	40	10! 20	60	6	100	20! 40	90	4.5	190	40! 80	60	1.5	250	>80	0	0	250	<p>Histogram OR Cumulative Frequency polygon</p> <p>82%</p>	6	<p>B1 Scales labelled and also marked on the vertical axis with frequency density or with cumulative frequency M1 frequency densities calculated, at least one non-trivial one correct. A1 all correctly plotted (M1 cumulative frequencies correct)</p> <p>M1 Use 50 on the horizontal scale of CF diagram read off vertical axis (200-210) or Use 50 on the horizontal scale of a histogram and covert area to the left to a frequency M1 convert to a percentage A1 80 ! 85</p>
L	F	FD	CF																									
0! 10	40	4	40																									
10! 20	60	6	100																									
20! 40	90	4.5	190																									
40! 80	60	1.5	250																									
>80	0	0	250																									
<b>Total for Question: 6 marks</b>																												

103



Question	Working	Answer	Mark	Notes
326 (a)		positive	1	B1 cao
(b)		17 – 21.5	2	M1 for a single line segment with positive gradient that could be used as a line of best fit or a horizontal line from 21 or a point plotted at (x, 21) where x is in the range 17 – 21.5 A1 for answer in range 17 – 21.5
327 (a)		$1.40 \leq h < 1.50$	1	B1 any unambiguous description of the correct interval
(b)	$1.35 \times 11 = 14.85$ $1.45 \times 9 = 13.05$ $1.55 \times 7 = 10.85$ $1.65 \times 6 = 9.9$ $1.75 \times 2 = 3.5$	1.49	4	M1 for $fx$ consistently within interval including ends (allow 1 error) M1 consistently using appropriate midpoints M1 (dep on first M1) for $\Sigma fx \div \Sigma f$ eg $52.15 \div 35$ A1 cao
328		0.94 or 94% or $\frac{76}{81}$	3	M1 for method to work out total area eg $1.3 \times 10 + 3.2 \times 5 + 3.6 \times 5 + 2.4 \times 10 + 0.5 \times 20$ (=81) or area up to 100 grams eg $1.3 \times 10 + 3.2 \times 5 + 3.6 \times 5 + 2.4 \times 10 + 0.5 \times 10$ (=76) (In either case allow one error in reading a bar height) M1 for $1 - ((0.5 \times 10) / "81")$ oe or for method to work out the total area and the area up to 100 grams (In both cases allow one error in reading a bar height) A1 for answer in range 0.938 to 0.94 or 93.8% to 94% or $\frac{76}{81}$ oe

Question	Working	Answer	Mark	Notes								
329	<table border="1"> <tr><td>3</td><td>1 3 7</td></tr> <tr><td>4</td><td>1 4 4 7 8 8</td></tr> <tr><td>5</td><td>1 2 3 5 6 6 6</td></tr> <tr><td>6</td><td>0 1 3 4</td></tr> </table>	3	1 3 7	4	1 4 4 7 8 8	5	1 2 3 5 6 6 6	6	0 1 3 4	Diagram and key	3	<p>B2 for fully correct diagram (accept a stem of 30, 40, 50, 60, the order of the numbers in the stem may be reversed)</p> <p>(B1 for one error or omission or unordered diagram with no errors)</p> <p>B1 for a correct key (units may be omitted but must be correct if stated)</p> <p>eg <math>3 \mid 1 = 31</math> (mm)</p>
3	1 3 7											
4	1 4 4 7 8 8											
5	1 2 3 5 6 6 6											
6	0 1 3 4											
32:		5, 30, 60, 75, 80	1	B1 for correct cumulative frequencies (may be implied by correct heights on the grid)								
(a)												
(b)		cf graph	2	<p>M1 for at least 4 of the 5 points plotted correctly at the ends of the intervals or 4 of the 5 points plotted not at the ends but consistently within each interval and joined (dep on a cf table with no more than one arithmetic error)</p> <p>A1 for a fully correct cf graph (points may be joined by a curve or straight line segments)</p>								
(c)	$IQR = UQ - LQ$	26-28	2	<p>M1 for reading values from their cf graph at <math>cf = 20</math> or <math>20.25</math> <b>and</b> <math>cf = 60</math> or <math>60.75</math></p> <p>A1 ft provided M1 is awarded in (b)</p>								
(d)		55-59	3	<p>M1 for reading a value from their cf graph at weight 150 grams</p> <p>M1 for <math>\frac{"45"}{"80"} \times 100</math></p> <p>A1 ft provided M1 is awarded in (b)</p>								



Question	Working	Answer	Mark	Notes
32;		1   4 6 8 9 2   1 2 3 5 7 9 3   0 4 6 8 8 4   1 3 6 6 8	3	B2 for correct ordered stem and leaf (B1 for fully correct unordered, or ordered with one error or omission) B1 (indep) for key (units not required but must be correct if stated) eg. $1 \mid 4 = 14$ (marks)
130	$2 \times 8 = 16$ $6 \times 21 = 126$ $10 \times 12 = 120$ $14 \times 7 = 98$ $18 \times 2 = 36$	7.92	4	M1 for $fx$ with $x$ consistently within interval including ends (allow 1 error) M1 for consistently using appropriate midpoints in $fx$ M1 (dep on first M1) for " $\Sigma fx$ " $\div 50$ (or divided by " $\Sigma f$ " if clearly calculated), eg $396 \div 50$ A1 for 7.92 cao
333	(a)	128	1	B1 for answer in the range 128 to 128.5
	(b)	10.5 to 11.5	2	M1 for a LQ in the range 122 to 122.5 <b>or</b> an UQ in the range 133 to 133.5  A1 for answer in the range 10.5 to 11.5
334	$0 < t \leq 5$ $fd = 8 \div 5 = 1.6$ $5 < t \leq 15$ $fd = 32 \div 10 = 3.2$ $15 < t \leq 30$ $fd = 36 \div 15 = 2.4$ $30 < t \leq 40$ $fd = 18 \div 10 = 1.8$ $40 < t \leq 60$ $fd = 6 \div 20 = 0.3$	Correct histogram	3	B3 for a fully correct histogram with vertical axis correctly scaled or with a key, eg. $2 \text{ cm}^2 = 1$  (B2 for at least 4 correct blocks with or without a scale or a key OR for all five fd correct)  (B1 for 2 correct blocks of different widths or for at least three correct fd values)

Question		Working	Answer	Mark	Notes
335		2 3 5 8 9 3 2 5 7 8 9 4 1 2 4 5 1 6 1 3	Stem and leaf with key	3	B2 for a fully correct ordered stem and leaf (B1 for a correct unordered stem and leaf or for an ordered stem and leaf with at most 1 error or omission) B1 (indep) for a correct key (units not required)
336	(a)		Point plotted	1	B1 cao
	(b)		positive	1	B1 cao
	(c)		18 - 22	2	M1 for a single line segment with a positive gradient that could be used as a line of best fit or a vertical line from 10 or a point plotted at (10, y) where y is in the range 18 - 22 A1 18 - 22
	(d)		45	1	B1 cao
337	(a)		37	1	B1 cao
	(b)		36	2	M1 for identifying LQ and UQ e.g 35 – 71 A1 cao
	*(c)			2	C1 for a correct comparison of medians ft (a) C1 for a correct comparison of a measure of spread with correct figures ft (b) For the award of both marks at least one of the comparisons must be interpretative
338			9 or 10	2	M1 for $35 \div 148 \times 40$ A1 9 or 10

Question		Working	Answer	Mark	Notes
339	(a)		Polygon drawn	2	B2 for correct plotting of 5 points and joining with line segments (B1 for points plotted correctly at midpoints of intervals <b>OR</b> joining points with line segments at the correct heights and consistent within the class interval (including end values) <b>OR</b> correct frequency polygon with one point incorrect <b>OR</b> correct frequency polygon with first and last point joined) NB Ignore any histogram drawn and any part of frequency polygon outside range of first and last points plotted
	* (b)		Yes with reason	2	M1 for finding a quarter of 51 and for finding how many teachers sent more than 30 emails C1 for 12.75 or 13 compared to 15 and yes she is correct  OR  M1 for finding how many teachers sent more than 30 emails and '15' × 4 C1 for comparing 60 with 51 and yes she is correct  OR  M1 for $15 \div 51 (= 0.29\dots)$ or $\frac{15}{51} \times 100 (= 29\dots\%)$ C1 for comparing 0.29.. with $\frac{1}{4}$ or 0.25 OR 29...% with 25% and yes she is correct
33:		$10 \times 75 + 14 \times 105 + 9 \times 135 + 5 \times 165 + 2 \times 195$  $750 + 1470 + 1215 + 825 + 390$ $4650 \div 40$	116.25	4	M1 for finding at least 4 products $ft$ consistently within interval (including end points) M1 (dep) for use of at least 4 correct midpoints. M1 (dep on 1st M) for ' $\Sigma ft$ ' ÷ 40 A1 for 116.25

Question		Working	Answer	Mark	Notes
33;	(a)		Diagram type	1	B1 for box plot or box and whisker or cumulative frequency
	*(b)		Comparison given	2	C1 for a correct comparison of medians C1 for a correct comparison of a measure of spread with correct figures NB for the award of both marks at least one of the comparisons must be in context
342	(a)		(4), 9, 8, 10, 12	2	M1 for correct calculation to find one frequency e.g. $0.9 \times 10$ or $1.6 \times 5$ or $1 \times 10$ or $0.8 \times 15$ or for one frequency correct or shows that $1 \text{ cm}^2 = 1$ A1 for all frequencies correct
	(b)		$\frac{8}{43}$	2	M1 for 8 (people) or $\frac{2}{3}$ of "12" A1ft for 8 out of 43 stated as a percentage or fraction or decimal
	(c)		26000	2	M1 ft for finding the interval in which the "21.5 <sup>th</sup> " or "22 <sup>nd</sup> " value lies or 26 or 25.5 A1 for 26000 or 25500

Question		Working	Answer	Mark	Notes
343	(a)		Relationship	1	B1 for description of relationship eg “As the length of the pine cone increases the width increases” oe (accept positive correlation)
	(b)		6.1 to 6.4	2	M1 for a single straight line segment with positive gradient that could be used as a line of best fit or a vertical line from 8.4 or a point at (8.4, y) where y is from 6.1 to 6.4 A1 for given answer in the range 6.1 to 6.4
344			Polygon drawn	2	B2 for fully correct frequency polygon - points plotted at the midpoint (B1 for all points plotted accurately but not joined with straight line segments) <b>or</b> all points plotted accurately and joined with last joined to first to make a polygon <b>or</b> all points at the correct heights and consistently within or at the ends of the intervals and joined (can include joining last to first to make a polygon) NB: ignore parts of graph drawn to the left of the 1 <sup>st</sup> point or the right of the last point; ignore any histograms drawn.
345	(a)	$5 \times 8 = 40$ $12.5 \times 15 = 187.5$ $17.5 \times 11 = 192.5$ $25 \times 10 = 250$ $40 \times 6 = 240$ $910 \div 50 = 18.2$	18.2	4	M1 for $fx$ consistently within interval including ends (allow 1 error) M1 consistently using appropriate midpoints M1 (dep on first M1) for $\Sigma fx \div \Sigma f$ A1 for 18.2 cao
	(b)	$0 \leq t < 10$ fd 0.8 $10 \leq t < 15$ fd 3 $15 \leq t < 20$ fd 2.2 $20 \leq t < 30$ fd 1 $30 \leq t < 50$ fd 0.3	Correct histogram	3	B3 fully correct histogram with vertical axis correctly scaled. (B2 for 4 correct blocks or 5 correct blocks with incorrect or no scale) (B1 for 2 correct blocks of different widths or any 3 correct blocks or correct FD values for at least 3 frequencies) eg fd of 0.8, 3, 2.2, 1, 0.3

Question		Working	Answer	Mark	Notes
346	(a)		Points plotted	1	B1 for points plotted at (12, 6) and (13, 2)
	(b)		Description	1	B1 for description; accept negative correlation.
	(c)		5 – 7	2	M1 for evidence of use of graph eg a single straight line segment with negative gradient that could be used as a line of best fit <b>or</b> an indication on the diagram from 12 on the y axis. A1 for 5 – 7
347	(a)		$\frac{29}{100}$	2	M1 for $13 + 11 + 5 (=29)$ A1 for $\frac{29}{100}$ oe (SC B1 for $\frac{16}{100}$ oe)
	(b)		195	2	M1 for $1500 \times \frac{13}{100}$ oe A1 for 195
	(c)		reasons	2	B2 for 2 valid reasons eg sample too small, customers at this time may not be representative of ages of all customers (B1 for 1 reason)
348			75.5	3	M1 for $25 \times 67.8 (= 1695)$ or $55 \times 72.0 (= 3960)$ M1 (dep) for $(“3960” - “1695”) \div 30$ A1 cao

Question	Working	Answer	Mark	Notes
349 (a)		$20 < T \leq 24$	1	B1 for $20 < T \leq 24$
(b)	$6 \times 10 + 8 \times 14 + 13 \times 18 + 21 \times 22 + 2 \times 26 = 920$ $920 \div 50$	18.4	4	M1 for finding $fx$ with $x$ consistent within intervals (including the end points) allow 1 error; implied by 820, 1020 M1 (dep) for use of all correct mid-interval values eg 920 M1 (dep on 1st M1) for $\sum fx \div \sum f$ A1 for 18.4 oe
(c)		correct frequency polygon	2	B2 for fully correct frequency polygon - points plotted at the midpoint (B1 for all points plotted accurately but not joined with straight line segments) <b>or</b> all points plotted accurately and joined with last joined to first to make a polygon <b>or</b> all points at the correct heights and consistently within or at the ends of the intervals and joined (can include joining last to first to make a polygon) NB: ignore parts of graph drawn to the left of the 1 <sup>st</sup> point or the right of the last point
34:	$12 \times 20 + 10.8 \times 10 + 7 \times 15 + 5 \times 15 + 1.8 \times 30 + 0.6 \times 30$ $= 240 + 108 + 105 + 75 + 54 + 18$ $= 528 + 72 = 600$	12%	3	M1 for attempt to work out total area (eg =600) or area greater than 60 (eg =72) by using fd or counting squares M1 (dep) for $\frac{'72'}{'600'} \times 100$ oe (=12) A1 cao (must have % otherwise 2 marks)

Question		Working	Answer	Mark	Notes
34;	(a)		Points plotted at (1,8200) and (3.5,5000)	1	B1 for points accurately plotted $\pm 1/2$ square tolerance
	(b)		'the older the car the lower the value' 'the greater the value the newer the car'	1	B1 for an acceptable relationship eg. 'the older the car the lower the value' (accept 'negative correlation' but not just 'negative')
	(c)		5200 to 6600	2	M1 for a single line segment with negative gradient that could be used as a line of best fit or a vertical line from 2.5 or a point at (2.5,y) where y is from 5200 to 6600 A1 for given answer in the range 5200 – 6600
352	(a)		Box plot overlay	2	M1 for a box drawn with at least 2 correct points from LQ, Med and UQ A1 for a fully correct box plot
	(b)		Comparison of a measure of spread plus a comparison of medians (in context)	2	B1 for a correct comparison of a measure of spread (using either range or iqr) B1 for a correct comparison of medians  For the award of both marks at least one of the comparisons made must be in the context of the question.



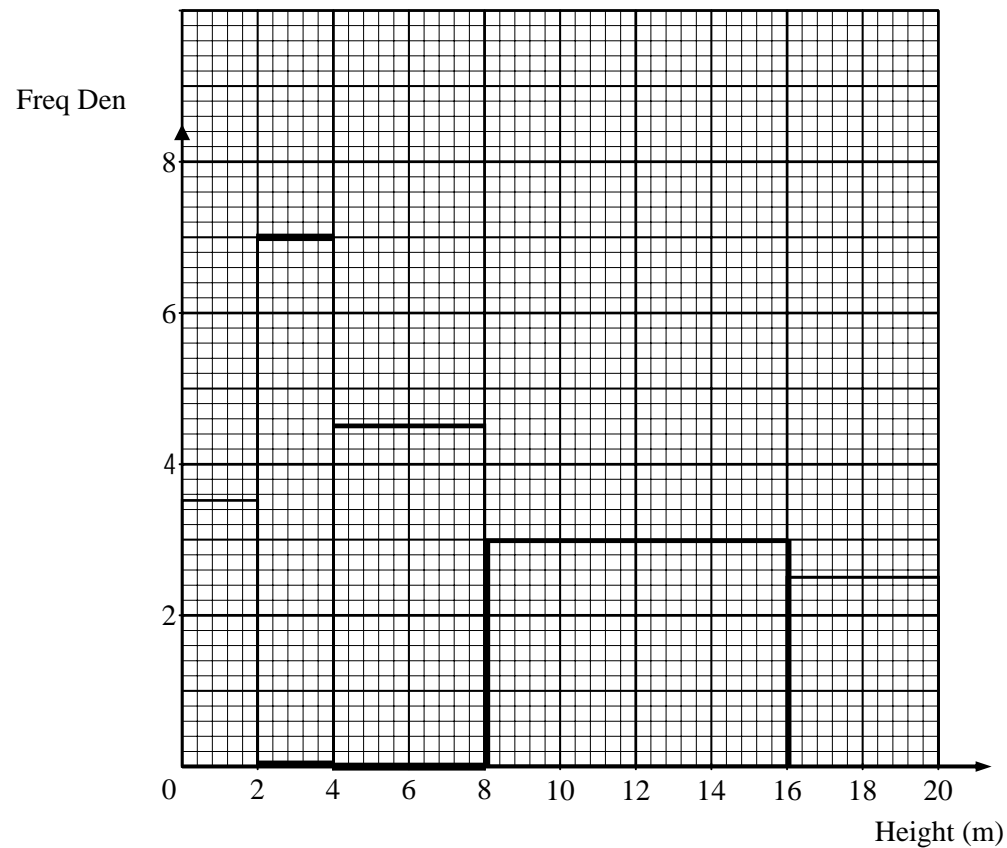
Question	Working	Answer	Mark	Notes	
353		$  \begin{array}{l l}  1 & 7 \ 8 \ 8 \ 9 \\  2 & 0 \ 0 \ 1 \ 2 \ 3 \ 5 \ 9 \\  3 & 3 \ 7 \ 7 \\  4 & 2 \\  \hline  1 & 8 \text{ represents } 18  \end{array}  $	3	B2 for a fully correct ordered diagram (B1 for correct unordered diagram or ordered with at most two errors or omissions)  B1 for a correct key  Accept stem written as 10, 20 etc but key only acceptable if consistent with this	
354	(a)	minimum = 5 lower quartile = 14 median = 25 upper quartile = 30 maximum = 44	box plot	3	B3 for fully correct box plot  (B2 for at least 3 correct values plotted including box <b>and</b> tails <b>or</b> 5 correct values indicated)  (B1 for at least 2 correct values plotted including box <b>or</b> tails <b>or</b> 3 or 4 correct values indicated)
	(b)		comparisons	2	B1 for a correct comparison (ft) of medians B1 for a correct comparison (ft) of ranges or IQRs
355		Total area = $(0.12 \times 40) + (0.36 \times 20) + (0.7 \times 20) + (0.56 \times 20) + (0.18 \times 40) = 44.4$  Area $(140 < w < 200) = (0.36 \times 20) + (0.7 \times 20) + (0.56 \times 20) = 32.4$  $32.4 \div 44.4$	0.73	4	M1 for a method to find the frequency <b>or</b> the area of any one block  M1 for a method (with correct values) to find total area of all blocks <b>or</b> 44.4 <b>or</b> 1110 <b>or</b> a correct method (with correct values) to find total area of middle 3 blocks <b>or</b> 32.4 <b>or</b> 810  M1 (dep on M2) for a correct method to find required proportion (could lead to a decimal or a percentage or a fraction) A1 for answer which rounds to 0.73 or 73% or $\frac{27}{37}$ or equivalent fraction

Question	Working	Answer	Mark	Notes															
356	<table border="1"> <thead> <tr> <th>Bird</th> <th>Frequency</th> <th>Angles</th> </tr> </thead> <tbody> <tr> <td>Magpie</td> <td>15</td> <td>75</td> </tr> <tr> <td>Thrush</td> <td>10</td> <td>50</td> </tr> <tr> <td>Starling</td> <td>20</td> <td>100</td> </tr> <tr> <td>Sparrow</td> <td>27</td> <td>135</td> </tr> </tbody> </table> <p>Angles <math>\frac{15}{72} \times 360</math>, <math>\frac{10}{72} \times 360</math>, <math>\frac{20}{72} \times 360</math>,  <math>\frac{27}{72} \times 360</math></p> <p>OR</p> <p><math>360 \div 72 = 5</math> <math>5 \times 15 = 75</math> etc</p>	Bird	Frequency	Angles	Magpie	15	75	Thrush	10	50	Starling	20	100	Sparrow	27	135	Correct pie chart	3	<p>M1 for any one of <math>\frac{15}{72} \times 360</math>, <math>\frac{10}{72} \times 360</math>,  <math>\frac{20}{72} \times 360</math>, <math>\frac{27}{72} \times 360</math> oe  ('72' must clearly come from adding frequencies)</p> <p>A1 for 75 seen from correct working <b>or</b>  50 seen <b>or</b> 100 seen <b>or</b> 135 seen <b>or</b>  one sector of angle <math>50^\circ</math> or <math>100^\circ</math> or <math>135^\circ</math> labelled  correctly with bird's name <b>or</b>  all sectors correctly drawn</p> <p>A1 for correct pie chart fully labelled with birds'  names</p> <p><b>OR</b></p> <p>M1 for <math>\frac{75}{15} \times 10</math> <b>or</b> <math>\frac{75}{15} \times 20</math> <b>or</b> <math>\frac{75}{15} \times 27</math>  ('75' should be in the range 73 - 77)</p> <p>A1 for 50 seen <b>or</b> 100 seen <b>or</b> 135 seen <b>or</b>  one sector of angle <math>50^\circ</math> or <math>100^\circ</math> or <math>135^\circ</math> labelled  correctly with bird's name <b>or</b>  all sectors correctly drawn</p> <p>A1 for correct pie chart fully labelled with birds'  names</p> <p><b>NB. Allow a tolerance of <math>\pm 2^\circ</math> on all drawn angles</b></p>
Bird	Frequency	Angles																	
Magpie	15	75																	
Thrush	10	50																	
Starling	20	100																	
Sparrow	27	135																	

Question		Working	Answer	Mark	Notes
357	(a)		32	1	B1 cao
	(b)	LQ = 21 UQ = 45	24	2	<p>M1 for 45 or 21 or 43.5 or 19.5 or 7.75<sup>th</sup> or 8<sup>th</sup> or 23.25<sup>th</sup> or 24<sup>th</sup>  (all of above may be seen in working space or indicated on S&amp;L)  or  clear attempt to find UQ and LQ from a list of values or in stem and leaf diagram  A1 cao</p>

Question		Working	Answer	Mark	Notes
358	(a)		Correct Frequency Polygon	2	B2 Fully correct polygon. Points plotted at the midpoint (B1 All points plotted accurately not joined, <b>or</b> one error in plotting but joined <b>or</b> all points plotted accurately and joined with, additionally, first joined to last <b>or</b> all points at the correct heights and consistently within or at the ends of the intervals <b>and</b> joined (Includes joining last to first to make a polygon))  NB: ignore polygon before 1 <sup>st</sup> point, and after last point. Ignore any histograms.
	(b)		$30 < t \leq 40$	1	B1 Allow any notation eg, 30-40 ft polygon
	(c)	$(6 + 2) = 8, (4 + 8 + 14 + 16 + 6 + 2) = 50$	$\frac{8}{50}$ oe	2	M1 $(6 + 2) \div (4 + 8 + 14 + 16 + 6 + 2)$ <b>or</b> ft figures from polygon <b>or</b> $\frac{8}{a}$ with $a > 8$ <b>or</b> $\frac{c}{50}$ with $c < 50$ <b>or</b> 8 and 50 used but notation incorrect (eg. 8:50 , 8 out of 50)  A1 $\frac{8}{50}$ oe (eg. 0.16) <b>or</b> ft figures from polygon

Question	Working	Answer	Mark	Notes																		
359	<table border="1"> <thead> <tr> <th>Height <math>h</math> m</th> <th>Freq</th> <th>FD</th> </tr> </thead> <tbody> <tr> <td><math>0 &lt; h \leq 2</math></td> <td>7</td> <td>3.5</td> </tr> <tr> <td><math>2 &lt; h \leq 4</math></td> <td>14</td> <td>7</td> </tr> <tr> <td><math>4 &lt; h \leq 8</math></td> <td>18</td> <td>4.5</td> </tr> <tr> <td><math>8 &lt; h \leq 16</math></td> <td>24</td> <td>3</td> </tr> <tr> <td><math>16 &lt; h \leq 20</math></td> <td>10</td> <td>2.5</td> </tr> </tbody> </table>	Height $h$ m	Freq	FD	$0 < h \leq 2$	7	3.5	$2 < h \leq 4$	14	7	$4 < h \leq 8$	18	4.5	$8 < h \leq 16$	24	3	$16 < h \leq 20$	10	2.5	3	3	<p>B3 fully correct histogram with horizontal axis correctly scaled            (B2 for 4 correct blocks <b>or</b> 5 correct blocks with incorrect or no scale )            (B1 for 2 correct blocks of different widths <b>or</b> any 3 correct blocks)            SC : B1 for key, eg. <math>1 \text{ cm}^2 = 2</math> (trees) <b>or</b> correct values shown for <math>(\text{freq} \div \text{class interval})</math> for at least 3 frequencies (3.5, 7, 4.5, 3, 2.5)</p>
Height $h$ m	Freq	FD																				
$0 < h \leq 2$	7	3.5																				
$2 < h \leq 4$	14	7																				
$4 < h \leq 8$	18	4.5																				
$8 < h \leq 16$	24	3																				
$16 < h \leq 20$	10	2.5																				



Question		Working	Answer	Mark	Notes
35:	(a)		negative	1	B1 for negative
	(b)		10.3 – 11.7	2	M1 for a single straight line segment with negative gradient that could be used as a line of best fit or an indication on the diagram from 2.5 on the $x$ axis A1 for an answer in the range 10.3 – 11.7 inclusive
35;		$5 \times 3 + 15 \times 8 + 25 \times 11 + 35 \times 9 + 45 \times 9$ $= 1130$ $1130 \div 40$	28.25	4	M1 for finding $fx$ with $x$ consistent within intervals (including the end points) allow 1 error M1 (dep) for use of all correct mid-interval values M1 (dep on first M1) for $\Sigma fx \div 40$ or $\Sigma fx \div \Sigma f$ A1 for 28.25 or $28\frac{1}{4}$