1	(a)		9, 28, 45, 63, 76, 80	1	B1	
	(b)			2	B2	for a correct cf graph with points at ends of intervals and joined with a curve or line segments If not B2 then B1 for 5 or 6 of their points (ft from a table with only one arithmetic error) at ends of intervals and joined with a curve or line segments **OR** for 5 or 6 points plotted correctly at ends of intervals not joined **OR** for 5 or 6 of their points from table plotted consistently within each interval (not at upper ends of intervals) at their correct heights and joined with a curve or line segments
	(c)	e.g. reading across from 40 and reading down		2	M1	ft reading from a cf graph provided method is shown
			35 - 38		A1	ft from their cf graph
						Total 5 marks

2	a		10, 26, 70, 99, 114, 120	1	B1	
	b		correct cumulative frequency graph	2	B2	fully correct cf graph – points at ends of intervals and joined with curve or line segments If not B2 then B1 for 5 or 6 (ft from a table with only one arithmetic error) of their points at ends of intervals and joined with curve or line segments **OR** for 5 or 6 points plotted correctly at ends of intervals not joined **OR** for 5 or 6 of their points from table plotted consistently within each interval (not at upper ends of intervals) at their correct heights and joined with smooth curve or line segments
	c				M1	For use of 30 and 90, or 30.25 and 90.75 (eg reading of 21 and 37 stated or indicated by marks on horizontal axis that correspond to 30 (or 30.25) and 90 (or 90.75) on the vertical axis or correct readings ft their cf graph provided method to show readings is shown)
			16	2	A1	accept 14 – 18, ft from their cf graph (ft provided method to show readings is shown)
	d				M1	For use of cf from number of minutes late being 48 (eg an indication by a mark on the vertical axis corresponding to 48 mins late or a correct reading ft their cf graph)
			9	2	A1	accept 7 – 10, ft from their cf graph
						Total 7 marks

3	a		23	1	B1	accept 22 – 24
	b	e.g. 29 – 17			M1	For subtracting readings from 15 and 45
			12	2	A1	accept 10 – 14
	c				B1	ft comparison of the medians
			Two comparisons (at least one of which must be in context)	2	B1	ft comparison of the IQR **Note: to award 2 marks at least one comparison must be in context**
						Total 5 marks

4	(a)	E.g. 56 – 38		2	M1	for subtracting readings from 60 and 20 oe
			18		A1	for answer in the range 17 – 19
	(b)	[40.5, 43]		3	B1	
		'42' ÷ 0.6 oe			M1	for complete method to find the number of men
			70		A1	
						Total 5 marks

5	(a)			2	M1	for at least 4 points plotted correctly at end of interval **or** for all points plotted consistently within each interval of the associated frequency table (eg at 2.5, 7.5, 12.5, 17.5, 22.5, 27.5 or 0, 5, 10, 15, 20, 25) at the correct height
		(NB: a 'bar chart' type graph scores zero marks)	correct cf graph		A1	All points plotted correctly at end of interval (tolerance 1 small square) and joined with a curve or line segments accept curve that is not joined at (0, 0).
	(b)	If answer is in the given range, then award the mark – unless from obvious incorrect working	10.5 to 12	1	B1ft	accept answer in range 10.5 – 12 or ft *their* cumulative frequency graph (must be an ascending graph) (allow 1 small square tolerance)
	(c)	NB: readings are 5.5 – 7 and 15.5- 17 (but for this M1 these do not have to be correct if correct working is shown – eg lines or marks indicating use of CF 20 (or 20.25)and CF 60 (or 60.75) with an indication on the Distance axis at the correct points (or they can just show the correct readings))		2	M1ft	For correct use of LQ and UQ, ft from a cum freq graph provided method is shown – eg a line horizontally to the graph from readings of CF 20 and CF 60 to meet the graph and then a vertical line to the Distance axis(even if wrongly read scale) **or** clear marks on the graph and Distance axis that correspond to the correct readings **or** correct values from the Distance axis
		If answer is in the given range, then award the marks – unless from obvious incorrect working	8.5 to 11.5		A1ft	Accept a single value in range 8.5 to 11.5 or ft from their cumulative frequency graph provided method is shown
	(d)	**not in context**: office *B* workers have a higher median than office *A* workers oe **in context**: office *B* workers [tend to] travel further oe		2	B1	ft comparison of medians e.g. Office *B* workers travel further [but if they have a wrong median then correct comparison of this with the 15 km] (Must compare to median in (b))
		not in context: the IQR for office *A* workers is bigger than the IQR for office *B* workers oe **in context**: The distances for the office *A* workers are more spread out/more varied oe			B1	ft comparison of IQR eg Office *A* distances are more spread (must compare to IQR in (c)) **NB: To award both marks at least one comparison must be in context**
						Total 7 marks

6	a		8, 23, 40, 68, 101, 120	1	B1	
	b			2	M1	ft from table for at least 5 points plotted correctly at end of interval **or** ft from sensible table for all 6 points plotted consistently within each interval in the **freq table** at the correct height
			Correct cf graph		A1	accept curve or line segments accept graph that is not joined to (0,0)
	c		17 – 20	1	B1	ft their cf graph
	d	E.g. Reading at 23 minutes (= *a*) **and** then $(120 - a) \div 120 \times 100$		2	M1	ft from their cf graph reading off at 23 minutes and a method to work out 120 minus this value as a percentage of 120
			25(%) – 29(%)		A1	ft from their cf graph dep on M1 seen
						Total 6 marks

7	(a)			2	M1	for use of cf at 45
			146		A1	accept in the range 145 – 147
	(b)	93.75 ÷ 3.75 (= 25)		3	M1	
		Using cf diagram at 90 – "25" (= 65)			M1	for use of cf at "65"
			151		A1	accept in the range 150 – 152
						Total 5 marks

8	(a)	*If a graph is ascending you can ft for the marks in parts (b), (c) an (d) – method should be shown by way of marks on the axes for all but the median in part (b)*	Correct cf graph	2	B2	**(use overlay)** Fully correct cf graph – points at ends of intervals and joined with curve or line segments. B1 for for 6 or 7 points plotted correctly at ends of intervals not joined OR for 6 or 7 points from table plotted consistently within each interval (eg at lower bound of interval or midpoint of interval) at their correct heights and joined with smooth curve or line segments. ignore the curve < age 20
	(b)		26 – 28	1	B1ft	If out of range ft their graph
	(c)	e.g. readings at 15 and 45 from the vertical axis eg LQ = 19 – 21 eg UQ = 45 - 47 (the reading at 45 is 45/46 so be careful with the award of this mark)		2	M1ft	For use of 15 and 45, or 15.25 and 45.75 (eg reading of 21 and 46 stated or indicated by marks on horizontal axis that correspond to 15 (or 15.25) and 45 (or 45.75) on the vertical axis or correct readings ft their cf graph provided method to show readings is shown)
			24 - 28		A1ft	Any value in range (if out of range ft their cf graph reading across at 15 and 45 oe but method must be shown)
	(d)	eg reading of 49 or 50 from cf axis		2	M1ft	For correct reading at 55 eg 50 (ft from incorrect graph if method shown (lines up and across))
		must be a whole number	10 or 11		A1ft	If out of range ft their cf curve if method shown
						Total 7 marks

9	(a)		7, 32, 52, 66, 74, 80	1	B1	
	(b)	*If a graph is ascending you can ft for the marks in parts (c) and (d)*		2	B2	**(use overlay)** Fully correct cf graph – points at ends of intervals and joined with curve or line segments. If not B2 then B1(ft from a table with only one arithmetic error) for 5 or 6 of their points **either** plotted correctly at ends of intervals not joined **or** plotted consistently within each interval (not at upper ends of intervals) at their correct heights and joined with smooth curve or line segments. (ignore curve/line from 0 to first plotted point)
	(c)		32-34	1	B1	Any value in range (ft their CF graph reading across at 40 or 40.5)
	(d)			3	M1	For a correct method to take readings at 18 and 65 (eg 6 and 77) even if not given values or error reading the CF scale (ft a CF graph if method shown)
		eg (77 – 6) × 0.6 oe			M1	ft dep on previous M1 for their **difference** (working must be shown if incorrect values used) ft finding 60% of their difference dep on previous M1
			42, 43, 44		A1	ft award full marks for an integer answer in the range if not from incorrect working and ft their CF graph if value outside range (but for this accuracy mark all readings must be correct) ft their graph but answer must be whole number (value rounded or truncated)
						Total 7 marks

10	(a)		48	1	B1 allow 47 – 49 Accept $\dfrac{n}{110}$ where n is in the range 47 – 49
	(b)		46	1	B1 allow 45.5 – 46.5
	(c)	40 **and** 56		2	M1 for both values. LQ of 40 – 41 and UQ in the range 56 – 58. **or** for use of 15 and 45 (eg indicated by marks on horizontal axis that correspond to 15 and 45 on the vertical axis.) **or** for use of 15.25 and 45.75 (eg indicated by marks on horizontal axis that correspond to 15.25 and 45.75 on the vertical axis.
			16 to 18		A1 accept 16 to 18
	(d)		Yes and correct reason	1	B1ft dep on M1 in (c) but ft their reading of the horizontal axis. For stating yes **and** the <u>IQR</u> for the <u>Algebra</u> test is <u>greater</u> than IQR for the Geometry test oe If using value in (c) less than 9, only accept 'no' and <u>IQR</u> for the <u>Algebra</u> test is <u>less</u> than the IQR for the Geometry test oe.
	(e)	60 – '50' (= 10)		3	M1 may be seen embedded as $\dfrac{10}{60}$ $(=\dfrac{1}{6})$ oe (eg reading of 50 from graph stated or indicated by marks on vertical axis that correspond to 64 on the horizontal axis). Allow 60 – '50' – 1 (= 9) oe
		$\dfrac{'10'}{60} \times \dfrac{'10'-1}{59}$			M1 for use of $\dfrac{n}{60} \times \dfrac{n-1}{59}$ with any integer n such that $2 \le n \le 59$
			$\dfrac{3}{118}$		A1 oe (accept 0.025 or better) Allow $\dfrac{6}{295}$ (= 0.02 or better) if using $\dfrac{9}{60} \times \dfrac{8}{59}$
					Total 8 marks

11	(a)		7, 33, 57, 71, 78, 80	1	B1	
	(b)			2	B2	Fully correct cf graph – points at ends of intervals and joined with curve or line segments. If not B2 then B1(ft from a table with only one arithmetic error) for 5 or 6 of their points at ends of intervals and joined with curve or line segments **OR** for 5 or 6 points plotted correct at ends of intervals not joined **OR** for 5 or 6 points from table plotted consistently within each interval (not at upper ends of intervals) at their correct heights and joined with smooth curve or line segments.
	(c)		21 – 24	1	B1ft	any value in range or ft their cf curve
	(d)			2	M1ft	eg reading of 72 – 74 or 6 – 8 could be seen as the numerator of a fraction ft their cf graph
			$\dfrac{8}{80}$		A1ft	oe, ft their cf graph fractional answers must have an integer numerator and denominator
						Total 6 marks

12	(a)		7, 17, 32, 64, 80	1	B1	values seen in table
	(b)			2	M1ft	for at least 4 points plotted correctly at end of interval **or** for all points plotted consistently within each interval of the associated frequency table (eg at 5, 15, 25, 35, 45 or 0, 10, 20, 30, 40) at the correct height. ft their table dep on one error only in the table
		(NB: a 'bar chart' type graph scores zero marks)	correct cf graph		A1	All points plotted correctly at end of interval (tolerance 1 small square – **there is an overlay**) and joined with a curve or line segments accept curve that is not joined at (0, 0).
	(c)	*Accept a single value in the range OR ft their cf graph*	33	1	B1ft	Accept a single value in range 32 – 34 **or** ft their cf graph
	(d)	NB: readings are 21 - 23 and 37 - 39 (but for this M1 these do not have to be correct if correct working is shown – eg lines or marks indicating use of CF 20 (or 20.25) and CF 60 (or 60.75) with an indication on the Time axis at the correct points (or they can just show the correct readings))		2	M1ft	For correct use of LQ and UQ and subtraction, ft from a cum freq graph provided method is shown – eg a line horizontally to the graph from readings of CF 20 and CF 60 to meet the graph and then a vertical line to the Time axis(even if wrongly read scale) **or** clear marks on the graph and Time axis that correspond to the correct readings **or** correct values from the Time axis
		Accept a single value in the range OR ft their cf graph	16		A1ft	Accept a single value in range 15 to 17 or ft from their cumulative frequency graph provided method is shown eg subtraction of values that would be correct for their graph
						Total 6 marks

13	(a)		43.5 - 44.5	1	B1	±0.5 small square
	(b)	eg reading of 48 - 49		2	M1	For correct method to start the question eg a vertical line from 55 up to the line and a horizontal line from the correct point on the curve or a mark on the curve at the correct point and a mark on the vertical axis at the correct point or a correct reading of 48 to 49
		Correct answer scores full marks (unless from obvious incorrect working)	11 or 12		A1	Allow an answer of 11 or 12 (ie must be whole number)
	(c)			2	B2	All values correctly filled in (NB: first 2 are already completed) (B1 for 3 or 4 correct values from 7, 10, 15, 15, 5)
						Total 5 marks

Table for 13(c):

Time taken to shop in the market (m minutes)	Frequency
$0 < m \le 10$	3
$10 < m \le 20$	5
$20 < m \le 30$	7
$30 < m \le 40$	10
$40 < m \le 50$	15
$50 < m \le 60$	15
$60 < m \le 70$	5

14	(a)		15, 31, 52, 66, 74, 80	1	B1	
	(b)			2	M1	ft from table for at least 5 points plotted correctly at end of interval **or** ft from sensible table for all 6 points plotted consistently within each interval in the **freq table** at the correct height
			Correct cf curve		A1	accept curve or line segments accept curve that is not joined at (50,0)
	(c)	*Correct answer scores full marks (unless from obvious incorrect working)*	73 – 75	1	B1ft	ft their cumulative frequency graph
	(d)	NB: readings are 62.5 – 64 and 85 – 86.5 (but for this M1 these do not have to be correct if correct working is shown – eg lines or marks indicating use of CF 20 (or 20.25)and CF 60 (or 60.75) with an indication on the Time Taken axis at the correct points (or they can just show the correct readings))		2	M1ft	For correct use of LQ and UQ, ft from a cum freq graph provided method is shown – eg a line horizontally to the graph from readings of CF 20 and CF 60 to meet the graph and then a vertical line to the Time Taken axis (even if wrongly read scale) **or** clear marks on the graph and Time Taken axis that correspond to the correct readings **or** correct values from the Time Taken axis
		If answer is in the given range, then award the marks – unless from obvious incorrect working	21 to 24		A1ft	Accept a single value in range 21 to 24 or ft from their cumulative frequency graph provided method is shown
		Correct answer scores full marks (unless from obvious incorrect working)				**Total 6 marks**

15	(a)		28	1	B1	allow 27.5 – 28.5
	(b)		14	1	B1	cao
	(c)			2	M1	for a reading of 38 from vertical axis **or** 50 – (their reading from a height of 35)
		Correct answer scores full marks (unless from obvious incorrect working)	12		A1	cao
						Total 4 marks