1 (a)			$30 < t \leq 40$	1	B1	
(b)	e.g. $5 \times 4 + 15 \times 10 + 25 \times 15 + 35 \times 25 + 45 \times 6$ (= 1690) **or** 20 + 150 + 375 + 875 + 270 (= 1690)			4	M2	For correct products using midpoints (allowing one error) with intention to add. If not M2 then award M1 for products using frequency and a consistent value within the range (allowing one error) with intention to add or correct products using midpoint without addition.
	"1690" ÷ 60				M1	dep on M1
			28.2		A1	accept 28.1 – 28.2
						Total 5 marks

2 (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

3			3	M1	for one of - 5 numbers with a median of 8 - 5 numbers with a mode of 5 - 5 numbers with a range of 10 - 5 numbers with a sum of 45
				M1	for two of - 5 numbers with a median of 8 - 5 numbers with a mode of 5 - 5 numbers with a range of 10 - 5 numbers with a sum of 45
		5, 5, 8, 12, 15		A1	Note: The numbers can be in any order SC If no marks awarded, give B1 for 8 in the middle cell, not contradicted.
					Total 3 marks

4	15×24 (= 360) **or** 25×18 (= 450)		3	M1	may be implied by 810 seen
	$\frac{'360'+'450'}{40}$ $(=\frac{810}{40})$			M1	dep on M1
		20.25 oe		A1	for 20.25 accept 20.3 (allow 20 from correct working)
					Total 3 marks

5 (a)	35 37 38 39 41 42 43 44 45 47 47		3	M1	Ordering values (allow 1 error) error may include missing a value May be implied by correct values for LQ **and** UQ.
				M1	LQ = 38 **and** UQ = 45 identified
		7		A1	
(b)		January and reason using IQR	1	B1	ft from part (a) January as the IQR is lower oe ignore irrelevant statements about the median if given in addition to correct statements about IQR.
					Total 4 marks

6	$\frac{x+10}{2}=9$ **or** $x=8$		4	M1	(indep)
	$\frac{4+7+x+10+y+y}{6}=11$ oe **or** '66' – 4 – 7 – 10 (= 45)			M1	where x may be a number $7 < x < 10$
	(y =) (6 × 11 – 4 – 7 – 10 – '8') ÷ 2			M1	ft their median provided $7 < x < 10$ for a fully correct method
		$x = 8$ and $y = 18.5$ oe		A1	
					Total 4 marks

7	a		$50 < L \leq 60$	1	B1	oe eg 50 - 60
	b	25 × 6 + 35 × 26 + 45 × 31 + 55 × 40 + 65 × 17 (150 + 910 + 1395 + 2200 + 1105)(= 5760)			M2	For correct products using midpoints (allow one error) with intention to add. M1 for products using frequency and a consistent value within the range (allow one error) with intention to add or correct products using midpoints (allow one error) without addition
		"5760" ÷ "120"			M1	dep on M1
			48	4	A1	
						Total 5 marks

8	28 × 5 (= 140) **OR** 26.5 × 2 (= 53)			M1	or 87
	(28 × 5 – 26.5 × 2) ÷ (5 – 2)			M1	for a complete method
		29	3	A1	
					Total 3 marks

9	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

10	5, 7, 11, 12, 13, 14, 15, 16, 17, 18, 18		3	M1	Ordering marks (allow 1 error)
	11 and 17 selected			M1	LQ = 11 and UQ =17 identified
		6		A1	
					Total 3 marks

11	(a)		$3 < w \leq 4$	1	B1
	(b)	(12 × 2.5) + (16 × 3.5) + (9 × 4.5) + (2 × 5.5) + (1 × 6.5) **or** 30 + 56 + 40.5 + 11 + 6.5 (= 144)		4	M2 for at least **4** correct products added (need not be evaluated) **or** If not M2 then award M1 for consistent use of value within interval (including end points) for at least **4** products which must be added **or** correct midpoints used for at least **4** products and not added
		[(12 × 2.5) + (16 × 3.5) + (9 × 4.5) + (2 × 5.5) + (1 × 6.5)] ÷ 40 **or** '144' ÷ 40			M1 (dep on at least M1) Allow division by their Σf provided addition or total under column seen
			3.6		A1 oe
	(c)	$\frac{2}{40}+\frac{1}{40}$		2	M1 for $\frac{a}{40}$ where $0 < a < 40$ or $\frac{3}{b}$ where $b > 3$ where a and b are integers
			$\frac{3}{40}$		A1 0.075 oe
					Total 7 marks

12		16 — 9		2	M1	9 and 16 clearly identified either in list or stated. Some may have also identified the second 13 which we will allow as working so long as not intended as the LQ or UQ
		Working required	7		A1	Dep on M1
						Total 2 marks

13	(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

14	$a = 7$		4	B1	
	$\frac{b + \text{their } a}{2} = 8.5$ oe **or** $b = 10$			M1	ft their value of a **or** for setting up an equation for b **or** $b = 10$
	$\frac{\text{their } a + \text{their } a + \text{their } b + c}{4} = 9$ oe or ($c =$) $9 \times 4 - (2 \times \text{their } a + \text{their } b)$ oe			M1	for a calculation involving c using their values **or** for a calculation leading to c using their values
		7, 10, 12		A1	
					Total 4 marks

15	E.g. $28 \div 2$ (= 14) **or** $1\text{cm}^2 = 2$ students		5	M1	for method to find the frequency density for the first bar **or** any correct value on the fd axis **or** can be implied by a correct frequency (30 or 24 or 36)
	2×20 (= 40) 1×30 (= 30) 1×24 (= 24) 3×12 (= 36) **or** 40, 30, 24, 36			M1	for method to find the missing frequencies (at least 3 correct)
	$1 \times 28 + 3 \times$ '40' $+ 4.5 \times$ '30' $+ 5.5 \times$ '24' $+ 7.5 \times$ '36' (= 685) or 28 + 120 + 135 + 132 + 270 (= 685)			M1	(indep ft) for a method to find the total (mid value × frequency) for at least **4** products using **their** values in the table (need not be evaluated) Allow consistent use of end points for at least **4** products which must be added
	'685' ÷ (28 + '40' + '30' + '24' + '36') (= 4.335...) or '685' ÷ 158 (= 4.335...)			M1	(dep on previous M1)
		4.34		A1	accept 4.33 - 4.34
					Total 5 marks

16	$(11 \times 3) + (8 \times 5) + (6 \times 7) + (5 \times 9)$ (= 160) (= 33 + 40 + 42 + 45 = 160)		4	M1	Correct numerical products using midpoints (allowing one error) with intention to add. May be seen in table.
	"160" + x = 4. 25 × (11 + 8 + 6 + 5 + x) oe or $\frac{"160"+x}{"30"+x} = 4.25$ or "160" + x = 4.25 × "30" + 4.25x			M1	dep M1 for correct equation ft *their* 160.
	"160" − "127.5" = 4.25x − x or 32.5 = 3.25x			M1	Isolating x and number terms
		10		A1	dep 1st M1
					Total 4 marks
Alternative Mark Scheme for question 16					
16	$(11 \times 3) + (8 \times 5) + (6 \times 7) + (5 \times 9)$ (= 33 + 40 + 42 + 45 =160)		4	M1	Correct numerical products using midpoints (allowing one error) with intention to add. May be seen in table.
	4.25y = "160" + [y − (11 + 8 + 6 + 5)] oe 4.25y = "160" + y − 30			M1	dep M1 for correct equation ft *their* 160, where y = total number of pupils
	4.25y − y = "160" − 30 or 3.25y = 130 or y = 40			M1	Isolating y and number terms **or** y = 40
		10		A1	dep 1st M1
					Total 4 marks

17	(a)		$70 < s \leq 80$	1	B1	
	(b)	$10 \times 45 + 16 \times 55 + 19 \times 65 + 23 \times 75 + 12 \times 85$ **or** 450 + 880 + 1235 + 1725 + 1020 (= 5310)		4	M2	$f \times d$ for at least 4 products with correct mid-interval values and intention to add. If not M2 then award M1 for d used consistently for at least 4 products within interval (including end points) and intention to add **or** for at least 4 correct products with correct mid-interval values with no intention to add
		"5310" ÷ 80			M1	dep on at least M1 allow division by their $\sum f$ provided addition or total under column seen
			66.4		A1	accept 66.37 – 66.4
						Total 5 marks

18		3, 7, 8, 8 and one of 4 or 5 or 6	3	B3	For a list of 5 correct numbers (B2 for a list of 5 numbers with 2 of: median of 7, mode of 8, range of 5 B1 for a list of 5 or 6 numbers with 1 of: median of 7, mode of 8, range of 5)
					Total 3 marks

19		5 × 398 (= 1990) or 6 × 401 (= 2406)		3	M1	Correct total for 5 or for 6 cocoa pods
		"2406" – "1990"			M1	(M2 for 398 + 6 × 3 or 401 + 5 × 3)
			416		A1	
						Total 3 marks

20		13 − 4		2	M1	For selecting 4 and 13
			9		A1	
						Total 2 marks

21	$5 \times 12\ (=60)$ **or** $\frac{15+7-2+23+x}{5}=12$ oe **or** $\frac{x+"43"}{5}=12$		3	M1	for a method to find the total of the 5 numbers **or** setting up an equation in x "43" comes from 15 + 7 – 2 + 23
	$x + 15 + 7 - 2 + 23 =$ "60" **or** $x +$ "43" = "60" **or** "60" – (15 + 7 – 2 + 23)			M1	for forming an equation with their 60 **or** for a complete calculation to find the value of x "43" comes from 15 + 7 – 2 + 23
		17		A1	
					Total 3 marks

22	12 (–) 3		2	M1	for both values unambiguously identified
		9		A1	
					Total 2 marks

23	eg $\frac{158+C}{2}=160$ **or** $(C=)\ 160 + (160 - 158)\ (=162)$ oe **or** $C = 162$		3	M1	for method to find Candela's height or Candela's height or Candela's height in the wrong place on the answer line
	eg $(D=)\ 175 - 21$ **(=** 154) oe			M1	indep for method to find Diana's height or Diana's height or Diana's height in the wrong place on the answer line
		Candela 162 Diana 154		A1	Correctly attributed If no marks awarded, SCB1 for Candela's height 179
					Total 3 marks

24			3	M1	for $d = 9$ **or** $(c + d) \div 2 = 8$ (algebraically or clearly labelled integers) **or** $d - a = 4$ (algebraically or clearly labelled integers)
				M1	for at least two of $a = 5$ or $c = 7$ or $d = 9$ **or** $(c + d) \div 2 = 8$ (algebraically or clearly labelled integers) **or** or $d - a = 4$ (algebraically or clearly labelled integers)
		$a = 5, b = 6,$ $c = 7, d = 9$		A1	All correct
					Total 3 marks

25			4	B1 for 80
	for $\frac{a+75}{2}=74$ oe **or** 73			M1 for setting up an equation using the median **or** for 73
	for 80 – 16 (= 64) oe			M1 for using the range correctly **or** for 64
		64, 73, 80		A1 answers can be in any order
				Total 4 marks

26	$7200 \times 0.025\ (=180)$ or $7200 \times 1.025\ (=7380)$ oe or $7200 \times 1.075\ (=7740)$ oe or $7200 \times 0.075\ (=540)$ oe		3	M1	M2 for $7200 \times (1.025)^3$
	('7200' + '180') × 0.025 (= 184.5) and ('7200' + '180' + '184.5') × 0.025 (= 189.1125) and '7200' + '180' + '184.5' + '189.1…' (= 7753.6125)			M1 NB year end values are 7380 and 7564.5(0) 7753.6125	
		7754		A1 answer in range 7753 – 7754	
				Total 3 marks	

27	(a)		(5), 8, 8, 20, x, (24)	3	B3	for (5), 8, 8, 20, x, (24) where $x = 21$ **or** 22 **or** 23 (B2 for (5), 8, 8, 20, x, (24) where x is blank or **any** value other than 21, 22 or 23) (B1 for a list with a median of 14 **or** a mode of 8 **or** the 3rd and 4th cards having a sum of 28 (ignoring other cards))
	(b)	eg 5×21 (= 105) **or** 6×23 (= 138)		3	M1	
		eg $6 \times 23 - 5 \times 21$			M1	
			33		A1	
						Total 6 marks

28	$(0\times13)+1\times17+2\times8+3x+4\times11$ or $(0+)\ 17+16+3x+44\ (=77+3x)$		M1	at least **3** correct products with intention to add. eg award for 77 seen as this is sum of 3 products
	$(13+17+8+x+11)$ oe eg $49+x$ **or** $98+2x$		M1	Sum for total frequency or (frequency × 2)
	$\frac{"77+3x"}{"49+x"} = 2$ oe e.g. $"77+3x" = 2("49+x")$		M1	for use of mean in valid equation (ft their values for sum of products and their total frequency if M2 awarded previously)
		21	A1	
				Total 4 marks

29	5 5 7 8 10 12 13 14 16 21 23		3	M1	For ordering the numbers Allow one error or omission in the list.
	16 & 7 identified for LQ and UQ			M1	For identifying 16 and 7 – may also have identified the median (12)
		9		A1	
					Total 3 marks

30	(a)		$48 < S \leqslant 54$	1	B1	Allow $48 - 54$ oe
	(b)	$(33 \times 4) + (39 \times 14) + (45 \times 18) + (51 \times 19) + (57 \times 5)$ or $132 + 546 + 810 + 969 + 285\ (= 2742)$ [lower bound products are: 120, 504, 756, 912, 270] [upper bound products are: 144, 588, 864, 1026, 300]		4	M2	M2 for at least **4** correct products added (need not be evaluated) **or** If not M2 then award: M1 for consistent use of value within interval (including end points) for at least **4** products which must be added or correct midpoints used for at least **4** products and not added
		$\frac{"2742"}{60}$			M1	dep on M1 Allow division by their Σf provided addition or total under column seen
		Correct answer scores full marks (unless from obvious incorrect working)	45.7		A1oe	$45\frac{7}{10}$ or $\frac{457}{10}$ (accept 46 from correct working)
						Total 5 marks

31		(x =) 3	3	B1	
		(y =) 6		B1	
		(z =) 10		B1	
					Total 3 marks

32	55×32 (= 1760) **or** 52×28 (= 1456) **or** $55 \times 32 + 52 \times 28$ (= 3216)		3	M1	for one correct product or method to find the total mark for both classes
	eg $\frac{"1760"+"1456"}{32+28}$ **or** $\frac{3216}{60}$			M1	for a complete method
	Correct answer scores full marks (unless from obvious incorrect working)	53.6		A1	
					Total 3 marks

33 (a)	11 – 2		2	M1	2 and 11 clearly identified either in list or stated
	Working required	9		A1	dep on M1
(b) (i)		Kim as she has a higher median	1	B1	oe, ft their median if value given **Acceptable examples** Kim as she has a higher median Kim as/because her median is 11 and/but/whereas Rutger's is 8 Kim's median is 3 more (than Rutger's) Kim as Rutger's median is 3 less **Not acceptable examples** Kim's median is 11 and Rutger's is 8 Kim as she has a higher median and a lower IQR
(ii)		Kim as she has a smaller IQR	1	B1	oe, ft their part (a) **Acceptable examples** Kim as she has a smaller IQR Kim as/because her IQR is 5 and/but/whereas Rutger's is 9 Kim's IQR is 4 less (than Rutger's) Kim as Rutger's IQR is 4 more **Not acceptable examples** Kim's IQR is 5 and Rutger's is 9 Kim as she has a higher median and a lower IQR
					Total 4 marks

34	$6 \times 11 + 18 \times 25 + 30 \times 23 + 42 \times 15 + 54 \times 6$ (= 2160) **or** 66 + 450 + 690 + 630 + 324 (= 2160) [lower bound products are: 0, 300, 552, 540, 288] [upper bound products are: 132, 600, 828, 720, 360]		4	M2 for at least **4** correct products added (need not be evaluated) **or** If not M2 then award: M1 for consistent use of value within interval (including end points) for at least **4** products which must be added or correct midpoints used for at least **4** products and not added
	"2160" ÷ "80"			M1 dep on at least M1 Allow division by their Σf provided addition or total under column seen
	Correct answer scores full marks (unless from obvious incorrect working)	27		A1
				Total 4 marks

35			3	M1	4 and 34 clearly indicated – either in list or in working (condone 26 also indicated in list)
				A1	For IQR for team **A** = 34 – 4 (= 30)
		The IQR for Team **B** was higher than the IQR for Team **A** oe or Team **B** had an interquartile range of "12" more than team **A** **or** The runs scored were more spread out for Team **B** than for Team **A** oe **or** The runs for Team **A** were more consistent oe		B1ft	Must ft dep on IQR stated for team **A** Either comparing the IQR correctly or for giving a comparison in context about spread as long as not contradicted by further statements as this would be choice **NOT** Team **B** scored more runs than team **A** The average score of **B** is higher than the average score of **A** The IQR of **A** was 30 while the IQR of **B** was 42 The range of **B** was more than the range of **A**
					Total 3 marks

36	104×5 (= 520) or 127×7 (= 889) or $\frac{m+tu+w+th+f}{5} = 104$ oe		3	M1
	"889" – "520" – 132 or "369" – 132 or $\frac{"520"+132+x}{7} = 127$ oe or $\frac{132+x}{2} = \frac{369}{2}$ oe $652 + x = 127 \times 7$			M1 (x = Sunday)
	Correct answer scores full marks (unless from obvious incorrect working)	237		A1
				Total 3 marks

37	(a)	20 20 22 23 25 26 26 27 28 29 29		3	M1 for ordering the numbers Allow one omission or error in the list
		22 and 28 identified for LQ and UQ eg 20 20 22 23 25 26 26 27 28 29 29			M1 for identifying 22 **and** 28 (22 **and** 28 implies the first M1)
		Correct answer scores full marks (unless from obvious incorrect working)	6		A1
	(b)		Akari and reason using IQR	1	B1 ft from part (a) Akari as the IQR is lower/smaller oe (IQR must be part of the statement) Must have a value in (a) to compare the IQRs
					Total 4 marks

38	Correctly identifying 15 and 25		2	M1	could be clearly shown in list (condone 19 also being indicated)
	Correct answer scores full marks (unless from obvious incorrect working)	10		A1	
					Total 2 marks

39	17×11 (= 187) **or** 18.5×12 (=222) **or** 18×9 (=162) **or** 18.5×10 (= 185)		4	M1	Expression for total of **A** or **B** either including or excluding last round	M2 for $1.5 \times 11 + 18.5$ (= 35) **or** $9 \times 0.5 + 18.5$ (= 23) OR 1.5×11 (= 16.5) **or** 0.5×9 (= 4.5)
	$18.5 \times 12 - 17 \times 11$ ("222" – "187")(= 35) **or** $18.5 \times 10 - 18 \times 9$ ("185" – "162")(= 23) **or** $\frac{"187"+x}{12} = 18.5$ $(x = 35)$ **or** $\frac{"162"+y}{10} = 18.5$ $(y = 23)$ **or** Diff between **A** and **B** in first rounds "187" – "162" (= 25) **or** Diff between **A** and **B** after further round "222" – "185" (= 37) [or 2×18.5 (= 37) (2 must come from correct working)]			M1	expression for number of points gained by **A** or **B** in the last round or for an equation that could lead to the number of points gained by **A** or **B** in the last round	
	"35" – "23" or "37" – "25" or "16.5" – "4.5"			M1	calculation for difference between number of points scored in last round	
	Correct answer scores full marks (unless from obvious incorrect working)	12		A1		
						Total 4 marks
The 2 is 2 further rounds of 18.5 ie 37 comes from $18.5 \times 12 - 18.5 \times 10$ so the 2×18.5 is $(12 - 10) \times 18.5$						