Extended Mathematics
Topic :Statistics
Year :May 2013 -May 2024
Paper -4
Answers

Question 1

(a)	**(i)**	14	1	
	(ii)	8	1	
	(iii)	30 – *their* (ii)	1FT	
(b)		$\frac{11}{80}$	2	**SC1** for $\frac{69}{80}$
(c)		16, 4	2	**B1** for each correct value
(d)		18.0625 rot to 3sf or better or 18.1 www	3	**M1** for Σmf for m as mid values of 5, 12.5, 22.5, 35 and 45 (= 1445) **and M1 dep** for $\Sigma mf \div 80$, dep on **M1** earned
(e)		Correct widths with no gaps 2nd block w = 5, fd = 2.4 3rd block w = 15 fd = 1.2 4th block w = 10 and fd = 1.6 5th block w = 10 and fd = 0.4	1 1 1 1FT 1FT	 **Strict FT** from *their* (c) **Strict FT** from *their* (c) After **0** scored for blocks, **SC1** for 4 correct fds soi by correct heights

Question 2

(a)	171.25 (or 171 or 171.2 or 171.3) www	**3**	**M1** for $5 \times 155 + 9 \times 162.5 + 18 \times 172.5 + 10 \times 185$ [= 7192.5] and **M1** (dep on **M1**) for *their* $\Sigma fx \div 42$
(b)	$160 < x \leq 165$ oe	**1**	
(c)	Blocks with heights of 1.8, 1.2, 1, with correct interval widths and no gaps	**4**	**B3** for 2 correct blocks or **B2** for 1 correct block or **B1** for 3 correct frequency densities or heights or 3 correct widths

Question 3

(a)	**(i)**	3.2	**1**	
	(ii)	4.2	**1**	
	(iii)	4.6	**1**	
	(iv)	196	**1**	
(b)	**(i)**	100, 46, 12	**2**	**B1** for 2 correct
	(ii)	4	**2**	**M1** for frequency of 60 or 140 seen in workspace

Question 4

(i)	3.81 or 3.812 to 3.813 or 3h 49min nfww	**4**	**M1** for midpoints soi (condone 1 error or omission) and **M1** for use of $\sum fx$ with x in correct interval including both boundaries (condone 1 further error or omission) and **M1** (**dep** on 2nd M1) for $\sum fx \div 80$ $(305 \div 80)$
(ii)	Correct histogram	**4**	**B1** for each correct block and **B1** for correct widths

Question 5

(a)	24.7 or 24.66 to 24.67		**4**	**M1** for midpoints soi (condone 1 error or omission) (5, 15, 25, 35, 45, 55) **and** **M1** for use of $\sum fx$ with x in correct interval including both boundaries (condone 1 further error or omission) **and** **M1** (dependent on second **M**) for $\sum fx \div 120$
(b)	**(i)**	50, 90, 114	**2**	**B1** for 2 correct
	(ii)	Correct curve or ruled polygon	**3**	Ignore section to left of $t = 10$ **B1** for 6 correct horizontal plots **and B1FT** for 6 correct vertical plots If 0 scored **SC1** for 5 out of 6 correct plots **and**

				and **B1FT** for curve or polygon through at least 5 of *their* points dep on an increasing curve/polygon that reaches 120 vertically
	(iii)	21.5 to 23 15 to 16.5 24 to 26	**4**	**B1** **B1** **B2** or **B1** for 72 or 72.6 seen
(c)	**(i)**	50, 30	**2**	**B1** each
	(ii)	Correct histogram	**3FT**	**B1** for blocks of widths 0 – 20, 30 – 60 (no gaps) **B1FT** for block of height 2.5 or *their* 50 ÷ 20 **and B1FT** for block of height 1 or *their* 30 ÷ 30

Question 6

(a)	$10 < x \leq 25$ $25 < x \leq 30$ $30 < x \leq 35$ $35 < x \leq 50$ $50 < x \leq 60$	**2**	5 correct **B1** for 3 or 4 correct **or SC1** for all correct but in the form 10 to 25 or 10 – 25
	13 33 19 [4] 15 6	**3**	**B2** for 4 correct **or B1** for 3 correct
(b)	25.1[0] or 25.13 to 25.14 nfww	**4**	**M1** for mid-values soi, condone one error or omission 5 17.5 27.5 32.5 42.5 55 soi

Question 7

(a)	**(i)**	(100 – 70) × 0.4 [= 12] or better	**1**	Accept $\frac{24}{78} \times 39$ oe
	(ii)	60.9 or 60.89… nfww	**5**	**B1** for 3 or 4 correct extra frequencies 3, 6, 10, 8 soi **M1** for at least 4 of mid-interval values 15, 40, 55, 65, 85 soi **M1** for Σfx where x is any value in each interval allow *their* frequencies provided integers and they must be shown [3 × 15 + 6 × 40 + 10 × 55 + 8 × 65 + 12 × 85] [2375]
				M1 (dependent on second M1) for ÷ 39 **or** ÷ (3 + 6 + 10 + 8 +12)
(b)		60.5	**3**	**M2** for 20 × 70 – 19 × 70.5 oe **or M1** for either 20 × 70 or 19 × 70.5

Question 8

(a)	**(i)**	37.5 to 38.5	**1**	
	(ii)	19.5 to 20.5 nfww	**2**	**B1** for [LQ =] 23.5 to 24 or [UQ =] 43.5 to 44
	(iii)	43	**2**	**B1** for 56 seen or horizontal line drawn at cf = 56
(b)	**(i)**	31.8[4…] nfww	**4**	**M1** for midpoints soi (condone 1 error or omission) and **M1** for use of $\sum ft$ with t in correct interval including both boundaries (condone 1 further error or omission) and **M1** (**dep** on 2nd M1) for $\sum ft \div 80$ ($2547.5 \div 80$)
	(ii)	Correct histogram	**4**	**B1** for each correct block with correct width and height If **B0** then **SC1** for four correct f.d.s or four correct widths

Question 9

(i)	7	**4**	**M2** for $\frac{16\times11+17\times10+18p+19\times4+20\times8}{11+10+4+8+p}=17.7$ or better or **M1** for sum of two correct products or better or for [total =] $11 + 10 + 4 + 8 + p$ and **B1** for $582 + 18p = 17.7\ (33 + p)$
(ii)	17	**1FT**	**STRICT FT** median for *their p* if integer

Question 10

(a)	$35 < t \leqslant 40$	**1**	
(b)	22.5, 27.5, 32.5, 37.5, 42.5, 47.5	**M1**	At least 4 correct mid-values soi
	$(2 \times 22.5 + 6 \times 27.5 + 7 \times 32.5 + 19 \times 37.5 + 9 \times 42.5 + 7 \times 47.5)$	**M1**	$\sum fx$ where x is in the correct interval allow one further slip [45 + 165 + 227.5 + 712.5 + 382.5 + 332.5 = 1865]

		÷ 50 or their $\sum f$	**M1dep**	**Dependent** on second method
		37.3	**A1**	**SC2** for correct answer with no working
(c)	**(i)**	15, 19, 16	**1**	
	(ii)	rectangular bars of height 1, 3.8 and 1.6	**B2FT**	**FT** their **(c)(i)**, on correct boundary lines **B1FT** for 2 correct heights If 0 scored for heights then **SC1** for 3 correct frequency densities soi
		correct widths of 15, 5,10 and no gaps	**B1**	

Question 11

(a)	$140 < h \leqslant 144$	**1**	
(b)	144.875 nfww	**4**	**M1** for at least 4 correct mid-values soi **M1** for $\sum fx$ where x is in the correct interval, allow one further error/omission **M1 dep** for ÷ 40 dependent on second method mark
(c)	4 correct blocks	**4**	**B3** for 3 correct blocks **B2** for 2 correct blocks **B1** for 1 correct block or at least 3 correct frequency densities (1.4, 1, 1, 0.65)

Question 12

(a)	72.5	**3**	**M1** for Σfm with correct frequencies and correct mid-interval values **M1** for ÷ 200 **dep** on first **M1**
(b)	Correct histogram	**4**	**B1** four correct widths – no gaps **B3** for blocks of correct heights 0.5, 5, 16, 4 or **B2** for 3 blocks of correct heights or **B1** for 2 blocks of correct heights If 0 scored for the heights then **SC1** for all four frequency densities soi

Question 13

(a)	**(i)**	316	**4**	**M1** for 100, 250, 325, 375, 450 soi **M1** for Σfm with m's in intervals including boundaries [15800] **M1** (dep on 2nd **M1**) for *their* $\Sigma fm \div 50$
	(ii)	Three correct blocks with heights 0.09, 0.36, 0.24 with correct widths and no gaps	**3**	**B2** for two correct blocks or **B1** for one correct block or three correct frequency densities soi
(b)		Students have a greater range of estimates oe	**B1**	
		[On average] adults estimated a greater mass oe	**B1**	

Question 14

(a)	**(i)**	$24 < t \leqslant 30$	**1**	
	(ii)	30.9 or 30.875 nfww	**4**	**M1** for midpoints **soi** (condone 1 error or omission) 5, 17, 27, 35, 50, 65 soi **M1** for use of $\sum fx$ with x in correct interval including both boundaries (condone 1 further error or omission) (50, 1530, 3645, 2975, 3500, 650) and **M1** (dep on 2nd **M1**) for $\sum fx \div 400$
(b)	**(i)**	[10 100] 235 320 390 [400]	**2**	**B1** for any two correct **SC1** for 235, n, $n + 70$ $n > 235$
	(ii)	Correct curve or polygon	**3**	**B1** for correct horizontal placement **B1FT** for correct vertical placement **B1FT dep on at least B1** for reasonable increasing curve or polygon through their 6 points If zero scored **SC1** for 5 out of 6 points correctly plotted

(c)	(i)	27.5 to 29	1	
	(ii)	12 to 14	2	**B1** for 36 to 38 or 24 seen
	(iii)	18 to 20	2	**B1** for 60 seen or marked on grid
	(iv)	30 to 45	2	**B1** for 355 to 370 seen

Question 15

(a)		101.5625 or 102 or 101.5 to 101.6 nfww	4	**M1** for 55, 90, 110, 160 soi **M1** for Σfm with frequencies and each m in or on a boundary of a correct interval 2750, 2700, 4400, 6400 **M1 dep on 2nd M** for ÷ 160
(b)		Correct histogram drawn with correct widths and heights 1, 1.5 and 2 (no gaps)	3	**B1** for each correct block If zero scored, **SC1** for correct heights or frequency densities
(c)		$\frac{40}{160}$ oe	1	
(d)	(i)	$\frac{1560}{25440}$ oe	2	**M1** for $\frac{40}{160} \times \frac{39}{159}$
	(ii)	$\frac{4000}{25440}$ oe	3	**M2** for $\frac{40}{160} \times \frac{50}{159} + \frac{50}{160} \times \frac{40}{159}$ oe or **M1** for one of these products soi

Question 16

(a)		Correct diagram	3	**B1** for correct vertical plots and **B1** for correct horizontal plots and **B1 dep on at least B1** for reasonable <u>increasing</u> curve or polygon through *their* 6 points If zero scored, **SC1** for 5 out of 6 correct plots
(b)	(i)	32 to 34	1	
	(ii)	120 – reading at $r = 50$	2FT	**B1FT** for reading at $r = 50$ seen

(c)	8 18 27	**2**	**B1** for 2 correct
(d)	35.2 or $35\frac{1}{6}$ or 35.16 to 35.17 nfww	**4**	**M1** for mid-values soi **M1 FT** for $\sum fx$ with x in the correct interval including boundaries **M1dep** for $\sum fx \div 120$ dependent on second **M1** earned
(e)	1.6 1.35 0.3	**4FT**	**FT** from **(c)** *their* 8 ÷ 5 and *their* 27 ÷ 20 **B3FT** for any 2 correct or **B2FT** for first **or** second answer correct or **B1** for 0.3 only

Question 17

(a)	1.35 nfww	**4**	**M1** for 0.5, 1.5, 2.5, 3.5, 4.5, 5.5 soi, **M1** for Σfm soi by 162 where m is in correct interval including boundaries **M1**dep for $\Sigma fm \div 120$ or $\Sigma fm \div \Sigma f$ dependent on **second M1** earned
(b) (i)	93, 102, 113, 118	**2**	**SC1FT** for 1 error
(ii)	Correct diagram	**3**	**B1FT** for correct vertical plots and **B1** for correct horizontal plots and **B1FT dep on at least B1** for reasonable increasing curve or polygon through *their* 6 points If zero scored, **SC1FT** for 5 out of 6 correct plots
(iii) (a)	0.6 to 0.85	**1**	
(b)	1.3 to 1.7	**2**	**B1** for UQ = 1.7 to 1.9 or LQ = 0.2 to 0.4
(c)	0.3 to 0.6	**2FT**	Allow in correct range provided there is no evidence of reading at 35 or **FT** *their* reading at 42 **B1** for 42 soi
(c) (i)	30 and 18	**2**	**B1** for each
(ii)	0.75 and 0.3	**3FT**	**FT** (*their* 30) ÷ 40 and (*their* 18) ÷ 60 **B2FT** for either 0.75 or 0.3 or **M1** for *their* 30 ÷ 2 or ÷ 20 or for *their* 18 ÷ 3 or ÷ 20

Question 18

(a) (i)	64	**1**	
(ii)	16 to 16.5	**2**	**M1** for UQ = 71 to 71.5 or LQ =55
(iii)	62	**2**	**B1** for 24 indicated
(iv)	6	**2**	**B1** for 54 seen
(b)	[8] 12 23 11 [4] 2	**3**	**B2** for 1 incorrect reading FT others **B1** for 2 correct
(c)	Blocks of height 0.6 2.3 1.1 0.4 with correct widths	**4FT**	**FT** *their* **(b)** for heights **B1FT** for each correct block If **B0, SC1** for blocks of widths 20, 10, 10, 10 or for *their* correct frequency densities

Question 19

(c)	376 nfww	**4**	**M1** for midpoints soi (condone 1 error or omission) (225, 275, 325, 375, 425, 475) and **M1** for use of Σfx with x in correct interval including both boundaries (condone 1 further error or omission) and **M1** (dependent on second M) for $\Sigma fx \div 200$
(d) (i)	16	**1**	
(ii)	33	**2**	**M1** for $0.8 \times 50 + 0.26 \times 100$

Question 20

(a) (i)	400	**1**	
(ii)	350	**1**	
(iii)	70	**1**	
(iv)	170	**2**	**B1** for 30 seen
(b) (i)	Mid-values 40, 80, 125, 200 soi	**M1**	
	Σfx with correct frequencies and x's in correct intervals or on boundaries of correct intervals	**M1**	
	$\div 200$	**M1(dep)**	Dependent on second M1
	106 nfww	**A1**	**SC2** for correct answer without working

(ii)	Correct histogram	**4**	**B1** for correct widths **and B1** for each rectangle of correct height at 0.8, 1.6, 1.6 (up to **B3**) After 0 scored, **SC1** for 3 correct frequency densities seen
(iii)	$\frac{10712}{39800}$ oe isw	**2**	**M1** for $\frac{104}{200}\times\frac{103}{199}$ oe

Question 21

(a) (i)	6000 [7600] 10200 4200	**2**	**B1** for 6000 or 10200 If **B0** then **B1FT** for *their* (UQ – LQ)
(ii)(a)	True, median price is lower	**1**	No inclusion of other statistic
(ii)(b)	False, A's UQ < 13 600 oe	**1FT**	**FT** *their* UQ in **(a)(i)**
(b)	11 025	**4**	Listed values are in thousands **M1** for 3, 7, 9, 11, 13, 18 soi **M1** for Σfm [1323] **M1** (dep on second **M1**) for *their* $\Sigma fm \div 120$
(c)	323.25 nfww	**3**	**M2** for $9948 - 0.25 \times 8760$ or **M1** for 0.25×8760

Question 22

(a)	15	**2**	**M1** for $10 \div 40$ [$\times 60$]
(b)	49.2 nfww	**4**	**M1** for 35, 42.5, 47.5, 52.5, 57.5, 70 soi **M1** for Σfx $8 \times 35 + 22 \times 42.5 + 95 \times 47.5 + 55 \times 52.5 + 14 \times 57.5 + 6 \times 70$ **M1 dep** for *their* $\Sigma fx \div 200$
(c)	Fully correct histogram	**4**	**B3** for 4 correct blocks or **B2** for 2 or 3 correct blocks or **B1** for 1 correct block

(d)	**(i)**	125, 180	**1**	
	(ii)	Correct diagram	**3**	**B1FT** *their* **(d)(i)** for 6 correct heights within correct square(including boundaries) or touching correct line if should be on a grid line and **B1** for 6 points at upper ends of intervals on correct vertical line and **B1FT** (dep on at least B1) for increasing curve or polygon through 6 points If zero scored, **SC1FT** for 5 correct points plotted
	(iii) **(a)**	48 to 49	**1**	
	(b)	55	**1**	
	(c)	8 to 14	**2FT**	**B1FT** for 186 to 192 seen

Question 23

(a)	**(i)**	15 to 15.2	**1**	
	(ii)	10.8 to 11	**1**	
	(iii)	9 to 9.2	**1FT**	**FT** 20 – *their* **(a)(ii)**
	(iv)	10	**1**	
	(v)	24	**2**	**B1** for 176 written
(b)	**(i)**	16.75 nfww	**4**	isw attempted time conversion after correct answer **M1** for 5, 12.5, 17.5, 25, 45 soi **M1** for Σfx **M1 dep** for their $\Sigma fx \div 200$
	(ii)	Fully correct histogram	**4**	**B1** for each correct block If zero scored, **SC1** for frequency densities of 9.6, 12, 2.6 and 0.6 seen

Question 24

(a)		72.7 or 72.70 to 72.71 nfww	**4**	**M1** for midpoints **soi** (condone 1 error or omission) (47.5, 55, 65, 80, 95, 110) **M1** for use of $\sum fx$ with x in correct interval including both boundaries (condone 1 further error or omission) (1092.5, 3520, 7930, 10880, 2470, 3190) **M1** (dep on 2nd M1) for $\sum fx \div 400$
(b)	**(i)**	[23] 87 209 345 371 [400]	**2**	**B1** for 2 or 3 correct
	(ii)	Correct graph	**3**	**B1FT** *their* **(b)(i)** for 6 correct heights **B1** for 6 points at upper ends of intervals on correct vertical line **B1FT** (dep on at least B1) for increasing curve or polygon through 6 points After 0 scored, **SC1FT** *their* **(b)(i)** for 5 correct points plotted
	(iii) **(a)**	69 to 70	**1**	
	(b)	20 to 23	**2FT**	**FT** *their* cumulative freq curve **M1** for correct UQ or LQ for *their* cumulative freq curve
	(c)	72 to 75	**2**	**M1** for 240 soi

Question 25

(a)(i)	4 points correctly plotted	**2**	**B1** for 2 or 3 points correctly plotted
(a)(ii)	Positive	**1**	
(b)	mean 3.1	**3**	**M2** for $\frac{\text{sum of products}}{30}$ or **M1** for at least 4 correct products soi
	median 3	**2**	**M1** for 15.5 oe indicated
	mode 5	**1**	
	range 5	**1**	
(c)	24 nfww	**3**	**M1** for $\frac{x\times 52 + 45\times 75 + 11\times 91}{x + 45 + 11}$ [= 70.3] **M1** for clearing *their* fraction

Question 26

(a)(i)	80 33 20	**1, 1, 1**	
(a)(ii)	17.3 nfww	**4**	**M1** for 5, 15, 22.5, 27.5, 40 soi **M1** for $\sum fx$ with *their f* s and *x* in correct interval including both boundaries **M1** (dep on 2nd **M1**) for $\sum fx \div 200$
(b)(i)	$\frac{30}{210}$ oe	**2**	**M1** for $\frac{6}{15}\times\frac{5}{14}$ If zero scored, **SC1** for answer $\frac{36}{225}$ oe
(b)(ii)	$\frac{108}{210}$ oe	**3**	**M2** for $\frac{6}{15}\times\frac{9}{14}+\frac{9}{15}\times\frac{6}{14}$ oe or $1-\frac{9}{15}\times\frac{8}{14}-\frac{6}{15}\times\frac{5}{14}$ or **M1** for $\frac{6}{15}\times\frac{9}{14}$ or $\frac{9}{15}\times\frac{6}{14}$ or $\frac{9}{15}\times\frac{8}{14}+\frac{6}{15}\times\frac{5}{14}$ If zero scored, **SC1** for answer $\frac{108}{225}$ oe
(c)	150	**1**	

Question 27

(a)(i)	175.5 nfww	**4**	**M1** for at least four of 50, 125, 175, 225, 325 soi **M1** for Σfx with x inside or on boundary of each interval **M1** (dep on second **M1**) for $\frac{\textit{their } \Sigma fx}{200}$
(a)(ii)	Fully correct histogram	**4**	**B1** for each correct bar If zero scored, **B1** for 0.2, 1.32, 0.7, 0.16 seen
(b)(i)	Fully correct cumulative frequency diagram	**3**	**B1** for correct horizontal plots **B1** for correct vertical plots **B1FT** dep on at least **B1** earned for points joined with smooth increasing curve or polygon If zero scored, **SC1** for 4 correct plotted points
(b)(ii)(a)	170 to 175	**1**	
(b)(ii)(b)	152 to 158	**2**	**M1** for 42 to 48 written

Question 28

(a)	$71 < t \leqslant 72$	**1**	
(b)	72.3 or 72.27 to 72.28 nfww	**4**	**M1** for midpoints soi (condone 1 error or omission) **M1** for use of $\sum fx$ with x in correct interval including both boundaries **M1** (dep on 2nd **M1**) for $\sum fx \div 90$
(c)(i)	41, 62, 80, 90	**2**	**B1** for 2 correct values
(c)(ii)	Correct curve	**3**	**B1FT** *their* **(c)(i)** for 5 correct heights **B1** for 5 points plotted at upper ends of intervals **B1FT** (dep on at least **B1**) for increasing curve or increasing polygon through 5 points If zero scored, **SC1FT** for 4 correct points plotted
(c)(iii)	72.1 to 72.4	**1**	
(c)(iv)	1.9 to 2.2	**2**	**M1** for UQ = 73.2 to 73.4 or LQ = 71.2 to 71.3

(d)	180 cao nfww	**4**	**B3** for 50 [m/s] nfww OR **M3** for $\frac{3725 \div 1000}{74.5 \div 3600}$ OR **M2** for 3725 ÷ 74.5 or **M1** for 3725 or 74.5 seen or for (3715 to 3725) ÷ (74.5 to 75.5) **M1** indep for multiply by 3.6 oe

Question 29

(a)	$80 < t \leqslant 100$	**1**	
(b)	86 nfww	**4**	**M1** for midpoints soi **M1** for use of Σfx with x in correct interval including both boundaries **M1** (dep on 2nd **M1**) for $\Sigma fx \div 150$
(c)(i)	Reference to not knowing the individual values so we do not know the highest or the lowest values	**1**	
(c)(ii)	62.4	**2**	**M1** for 26 ÷ 150 or 360 ÷ 150 soi
(d)	$\frac{22}{150}$ oe	**1**	
(e)(i)	$\frac{90}{22350}$ oe	**2**	**M1** for $\frac{10}{150} \times \frac{9}{149}$ After zero scored, **SC1** for answer $\frac{100}{22500}$ oe
(e)(ii)	$\frac{440}{22350}$ oe	**3**	**M2** for $\frac{10}{150} \times \frac{22}{149} + \frac{22}{150} \times \frac{10}{149}$ oe or **M1** for $\frac{10}{150} \times \frac{22}{149}$ or $\frac{22}{150} \times \frac{10}{149}$ oe After zero scored, **SC1** for answer $\frac{440}{22500}$ oe

(f)	13, 8.5, 7.25, 1.1	**3**	**B2** for 3 correct or **B1** for 1 correct or for 3 correct FD.s 5.2, 3.4, 2.9, 0.44 oe

Question 30

(a)(i)	280	**1**	
(a)(ii)	320	**1**	
(a)(iii)	90	**1**	
(a)(iv)	10	**2**	**M1** for 90 written
(b)(i)	250.2 nfww cao	**4**	**M1** for at least 4 correct mid-values **M1** for Σfx **M1 dep on second M1** for $\Sigma fx \div 100$
(b)(ii)	Correct completion of histogram	**4**	**B1** for each correct block If zero scored, then **SC1** for correct frequency densities seen
(c)	[22 m] further oe	**1**	

Question 31

(a)(i)	$\frac{9}{160}$ oe	**1**	
(a)(ii)	58.125 nfww	**4**	**M1** for mid-points soi **M1** for use of Σfx with x in correct interval including both boundaries **M1** (dep on 2nd M1) for $\Sigma fx \div 160$
(b)	[3 42] 85 140 151 160	**2**	**B1** for 1 error **FT** other values
(c)	correct curve	**3**	**B1FT** *their* **(b)** for 6 correct heights **B1** for 6 points at upper ends of intervals on correct vertical line **B1FT dep on at least B1** for increasing curve through *their* 6 points After 0 scored, **SC1** for *their* 5 correct points plotted

(d)(i)	57 to 59	**1**	
(d)(ii)	36 to 42	**2**	**B1** for UQ = 76 to 80 or LQ = 38 to 40 soi
(d)(iii)	92 to 94	**2**	**B1** for 144 seen
(d)(iv)	130 to 137	**2**	**B1** for 23 to 30 seen

Question 32

(a)(i)	Positive	**1**	Ignore strong, weak, etc.
(a)(ii)	Correct ruled line	**1**	
(a)(iii)	2	**1**	
(b)	[mode =] 0 [median =] 1 [mean =] 1.04 or 1.041 to 1.042	**5**	**B1** **B1** **B3** or **M2** for ([10 × 0] + 8 × 1 + 3 × 2 + 2 × 3 + [0 × 4] + 1 × 5) ÷ 24 oe or **M1** for [10 × 0] + 8 × 1 + 3 × 2 + 2 × 3 + [0 × 4] + 1 × 5 oe
(c)(i)	60.9 or 60.91... nfww	**4**	**M1** for 49, 57, 71 correct **M1** for use of Σfx with x in the correct interval including both boundaries **M1** (dep on 2nd **M1**) for *their* (78 × 49 + 180 × 57 + 162 × 71) ÷ (78 + 180 + 162)
(c)(ii)	Correct histogram	**4**	**B1** for correct widths in correct position **B1** height 13 **B1** height 18 **B1** height 9 If 0 scored **B1** for 13, 18 and 9 seen

Question 33

(a)(i)	20 [$< t \leqslant$] 25	**1**	
(a)(ii)	25 [$< t \leqslant$] 30	**1**	
(a)(iii)	28.3 or 28.33..	**4**	**M1** for 22.5, 27.5, 32.5, 37.5, 42.5 soi **M1** for $\sum fx$ where x is in the correct interval including boundaries **M1**dep for $\sum fx \div 120$ or $\sum fx \div (44 + 32 + 28 + 12 + 4)$
(a)(iv)	$\frac{4}{120}$ oe isw	**1**	
(b)(i)	76, 104, 116, 120	**2**	**B1** for one error FT other values or for 3 correct
(b)(ii)	Correct curve	**3**	**B1** for correct horizontal placement for 6 plots **B1FT** for correct vertical placement for 6 plots **B1FT dep on at least B1** for reasonable increasing curve or polygon through *their* 6 points If 0 scored **SC1FT** for 5 out of 6 points correctly plotted
(b)(iii)	27 to 27.5	**1**	
(b)(iv)	8.5 to 9.5	**2**	**B1** for [UQ=] 32 to 32.5 or [LQ=] 23 to 23.5
(b)(v)	8, 9, 10, 11 or 12	**2**	**B1** for 108 to 112 seen or **B1FT** *their* graph reading at 37 mins seen

Question 34

(a)(i)	42.8 or 42.79 … nfww	**4**	**M1** for mid-values soi **M1** for Σfm where m is any value in interval including boundaries **M1** (dep on second **M1**) for *their* $\Sigma fm \div 120$
(a)(ii)	Blocks of height 1.8 4.4 8 2.1 with correct widths	**4**	**B1** for each correct block If **B0**, **SC1** for correct frequency densities seen

(b)	Valid general comment about distributions	**1**	e.g. [On average], shoppers spend less time shopping on Wednesday oe

Question 35

(a)	100.2 nfww	**4**	**M1** for midpoints soi 65, 80, 95, 105, 112.5, 120 **M1** for use of $\sum fx$ with x in correct interval including both boundaries **M1**dep for $\sum fx \div 180$ dep on previous **M1**
(b)	0.8 2.8 0.65	**3**	**B1** for each If zero scored, **SC1** for 1.6, 5.6 and 1.3 seen
(c)	8 34 69 136 164	**2**	**B1** for one error **FT** other values or for 3 or 4 correct
(d)	Correct diagram	**3**	**B1FT** for correct vertical placement for 6 plots **B1** for correct horizontal placement for 6 plots **B1FT dep on at least B1** for reasonable increasing curve or polygon through *their* 6 points If zero scored, **SC1FT** for 5 out of 6 correct plots
(e)(i)	15 to 17	**2**	**B1** for [LQ =] 93 to 94 or [UQ =] 109 to 110
(e)(ii)	107 to 109	**2**	**B1** for 126 seen
(e)(iii)	66 to 72	**2**	**FT** their graph for 2 marks **B1** for answer 106 to 114 or **B1FT** *their* graph reading at 106 cm seen

Question 36

(a)(i)	111.25	**4**	**M1** for midpoints **soi** (25, 75, 112.5, 137.5, 175) **M1** for $\sum fx$ with x in correct interval including both boundaries **M1** (dep on 2nd **M1**) for $\sum fx \div 20$
(a)(ii)	2 7 11 17	**2**	**B1** for three correct
(a)(iii)	$\frac{3}{20}$ oe	**1**	

'(b)	20 6	**2**	**B1** for one correct value or [SF =] 5 or $\frac{1}{5}$ oe
'(c)(i)	5 nfww	**3**	**M2** for $\sum fx \div \sum f = 4.28$ oe or **M1** for $179 + 7x$ oe or $4.28 \times (45 + x)$ oe seen
(c)(ii)	3	**1**	
(c)(iii)	4	**1**	

Question 37

(a)	40.5 or 40.45[8..] or 40.46 nfww	**4**	**M1** for 25, 32.5, 37.5, 50, 80 soi **M1** for Σft **M1 dep** for their $\Sigma ft \div 120$
(b)	Fully correct histogram	**4**	**B1** for each correct bar If 0 scored, **SC1** for frequency densities of 5.4, 4.2, 0.8 and 0.45 seen

Question 38

(a)	12.8[0]	**4**	**M1** for midpoints **soi** **M1** for use of $\sum fm$ with m in correct interval including both boundaries **M1** (dep on 2nd **M1**) for $\sum fm \div 100$
(b)	54 84 93	**2**	**B1** for 2 correct or 1 error and 2 correct or **FT**
(c)	correct diagram with all points correctly plotted	**3**	**B1FT** *their* **(b)** for plots at 5 correct heights **B1** for 5 points at upper ends of intervals on correct vertical line **B1FT** (dep on at least **B1**) for increasing curve or polygon through 5 points After 0 scored, **SC1FT** for 4 correct points plotted

)(d)(i)	9 to 9.8 final answer	**1**	
)(d)(ii)	8.5 to 11.5	**2**	**B1** for [UQ =] 15.5 to 17.5 or [LQ =] 6 to 7 seen
(d)(iii)	10, 11 or 12	**2**	**B1** for 88 to 90 seen or for answer between 10 and 12

Question 39

(a)(i)	range = 7	**1**	
	mode = 21	**1**	
	median = 22.5	**2**	**M1** for evidence of middle value
	mean = 22.7 or 22.71…	**2**	**M1** for use of $\Sigma x \div 14$
(a)(ii)	$\frac{3}{14}$ oe	**1**	
(b)	$x - n + 1$ final answer	**3**	**M2** for $nx - (n-1)(x+1)$ or **M1** for $(n-1)(x+1)$
(c)(i)	16.6 or 16.60 to 16.61 nfww	**4**	**M1** for 5, 12.5, 17.5, 22.5, 30 soi **M1** for Σfx where x is in correct interval, including boundaries **M1 dep** on second M1 for $\frac{\Sigma fx}{50+85+100+120+10}$
(c)(ii)	Correct histogram	**4**	**B1** for each correct block If 0 scored, **SC1** for 5, 20, 24, 1 seen

Question 40

(a)(i)	52	**1**	
(a)(ii)	36	**1**	
(a)(iii)	26	**1**	**FT** 62 – *their* (a)(ii) evaluated correctly
(b)	Valid comment	**1**	Strict **FT** *their* (a)(iii), e.g. distances for females are more varied
(c)	$\frac{11}{20}$ oe	**2**	**M1** for 27 written or answer of $\frac{27}{60}$ oe
(d)(i)	[18 9] 14 12 5 [2]	**2**	**B1** for 1 correct value

(d)(ii)	48.75 nfww	**4**	**M1** for midpoints soi **M1** for use of $\sum fx$ with *their* frequencies **M1** (dep on 2nd M1) for $\sum fx \div$ (60 or by *their* $\sum f$)

Question 41

!(a)(i)	54	**1**	
(a)(ii)	29	**2**	**M1** for [UQ =] 65 or [LQ =] 36
(a)(iii)	32	**1**	
(a)(iv)	17, 18 or 19	**2**	**M1** for 61 to 63 written or for decimal answer in range 17 to 19
!(b)(i)	18, 26, 26	**2**	**B1** for 1 or 2 correct
(b)(ii)	51 nfww	**4**	**M1** for 10 , 30 , 50 , 70 , 90 soi **M1** for Σfx **M1 dep** for *their* $\Sigma fx \div \Sigma f$
!(c)(i)	75	**1**	
(c)(ii)	IQR is bigger for the girls with [boys =] 20 seen oe	**2**	**FT** *their* IQR from (a)(ii) **M1** for IQR for boys = 20 isw or for girls IQR is bigger than boys IQR oe isw **FT** *their* IQR from (a)(iii)

Question 42

(a)(i)	34	**1**	
(a)(ii)	18	**2**	**B1** for [l.q. =] 25 or [u.q. =] 43 seen
a)(iii)	60	**2**	**M1** for 140 written
(b)(i)	49	**1**	
(b)(ii)	20	**1**	
b)(iii)	10	**1**	
b)(iv)	220	**2**	**M1** for $3 \times 1 + 1 \times 2 + 3 \times 5 + 2 \times 10 + 4 \times 20 + 2 \times 50$
(b)(v)	14.7 or 14.66 to 14.67	**1**	**FT** *their* (iv) ÷ 15

(c)	13.25 nfww	**6**	**B2** for frequencies 30, 40, 30 soi or **B1** for 2 of these **M1** for 5, 12.5, 22.5 **M1** Σfx with *their* frequencies (if seen) and each x in correct interval including boundaries **M1 dependent** for $\frac{\Sigma fx}{100}$ (dependent on second M1)

Question 42

(a)	correct diagram	**4**	**B1** for median line correctly drawn at 148 **B1** for 105 soi **B1** for whisker at 159 soi
(b)	6.48	**3**	**M1** for $(5 \times 8) + (6 \times 2) + (12 \times 7) + \ldots$ **M1dep** for *their* $\sum fx \div$ *their* $(8 + 2 + 12 + 2 + 0 + 1)$

Question 43

(a)	41.4	**4**	**M1** for 10, 30, 42.5, 47.5, 55, 70 **M1** for Σfx where x lies in or on the boundary of each interval. **M1 dep** for $\frac{\Sigma fx}{200}$ dep on second M1
(b)(i)	112, 170	**1**	
(b)(ii)	Correct diagram	**3**	**B1** for correct horizontal plot **B1FT** for correct vertical plots **B1 FT** dep on at least B1 earned for reasonable increasing curve or polygon through their 6 points If 0 scored **SC1FT** for 5 out of 6 points plotted correctly
(b)(iii)(a)	48	**1**	
(b)(iii)(b)	160	**2**	**M1** for 40 seen

(c)	$\frac{87}{3980}$ oe	**2**	**M1** for $\frac{30}{200}\times\frac{29}{199}$ oe
(d)	Correct histogram	**3**	**B1** for each column If 0 scored **SC1** for correct frequency densities soi 1.25, 12, 1

Question 44

(a)(i)	$1.5 < h \leqslant 1.6$	**1**	
(a)(ii)	1.62 or 1.623… nfww	**4**	**M1** for 1.35, 1.45, 1.55, 1.65, 1.75 1.85 soi **M1** for Σfx **M1 dep** for *their* $\Sigma fx \div 120$
(b)(i)	$\frac{14}{120}$ oe	**1**	
(b)(ii)	$\frac{21}{20060}$ oe	**4**	**M3** for $3\left(\frac{14}{120}\times\frac{7}{119}\times\frac{6}{118}\right)$ or **M2** for $\frac{14}{120}\times\frac{7}{119}\times\frac{6}{118}$ isw or **M1** for $\frac{14}{120},\frac{7}{119},\frac{6}{118}$ After 0 scored, **SC1** for answer $\frac{343}{864000}$ or $\frac{343}{288000}$ oe
(c)(i)	55, 79, 106, 120	**2**	**B1** for 2 or 3 correct
(c)(ii)	Correct diagram	**3**	**B1** for correct horizontal plots **B1FT** for correct vertical plots **B1FT dep on at least B1** for reasonable increasing curve or polygon through *their* 6 points If 0 scored **SC1** for 5 out of 6 points correctly plotted
(d)(i)	1.62 to 1.63	**1**	
(d)(ii)	1.57 to 1.58	**2**	**B1** for 48 soi

Question 45

(a)(i)	43	**1**	
(a)(ii)	65	**1**	
(a)(iii)	13	**1**	
(b)	80	**3**	**M2** for $\frac{400}{18}\times\frac{60\times60}{1000}$ oe Or **M1** for $\frac{400}{18}$ or for *their* speed in m/s $\times\frac{60\times60}{1000}$ or for $\frac{400}{1000}$ and $\frac{18}{60\times60}$ soi

Question 46

(a)(i)	25	**1**	
(a)(ii)	10 nfww	**2**	**B1** for [lq =] 22 or [uq =] 32
(a)(iii)	27	**1**	
(a)(iv)	6	**2**	**B1** for 114 written
(b)(i)	27.9 or 27.91 to 27.92 nfww	**4**	**M1** for mid-values **M1** for $\sum fx$ where x lies within or on boundary of correct interval **M1 dep** $\sum fx \div 120$ dep on second M1
(b)(ii)	7.6	**2**	**M1** for $\frac{18}{10}$ oe or $\frac{38}{20}$ oe or **B1** for [multiplier] 4 or ¼

Question 47

(a)	Disagree: the median for the women is greater (than the median for the men) oe Disagree: the men have a smaller [interquartile] range of times oe	**2**	**B1** for each correct statement oe

(b)(i)	87.4 nfww	**4**	**M1** for mid-points **soi** (30, 80, 130, 190, 270) **M1** for use of Σfm with m in correct interval including both boundaries **M1** (dep on 2nd M1) for $\Sigma fm \div (41 + 24 + 23 + 8 + 4)$
(b)(ii)(a)	90	**1**	
(b)(ii)(b)	8	**2**	**B1** for 92 seen
(b)(iii)	2.4	**2**	**M1** for $\frac{24}{40}$ or $\frac{8}{60}$ Or **B1** for [multiplier] 18 or $\frac{1}{18}$

Question 48

(a)(i)	70	**1**	
(a)(ii)	78	**1**	
(a)(iii)	Value in range $86 < V \leq 90$	**1**	
(a)(iv)	One general comment interpreting the median comparison nfww e.g. Students did better on second test oe OR One general comment interpreting IQR/range comparison nfww e.g. Students marks were more consistent on the 2nd test oe	**1**	
(b)	31.2	**4**	**M1** for mid-values soi **M1** for Σfm where m is any value in interval including boundaries **M1** (dep on second **M1**) for *their* $\Sigma fm \div 50$
(c)(i)	38	**1**	
(c)(ii)	Blocks of heights 4.4 and 3.4 with correct widths	**2**	**B1** for each correct block If **B0** scored, **SC1** for both correct frequency densities soi

Question 49

(a)(i)	4	**1**	
(a)(ii)	7	**1**	
(a)(iii)	8	**1**	
(b)(i)	14	**1**	
(b)(ii)	4	**2**	**B1** for [l.q. =] 11 or [u.q =] 15
(c)	8.09	**3**	**M1** for $5 \times 3 + 10 \times 6 + 43 \times 7 + 75 \times 8 + 48 \times 9 + 21 \times 10$ **M1 dep** ÷ 200
(d)	30, 70, 40, 36, 24 seen	**B2**	**B1** for 3 or 4 correct or **M1** for $1 \times (80 - 50)$, $3.5 \times (100 - 80)$, $4 \times (110 - 100)$, $3.6 \times (120 - 110)$ and $0.6 \times (160 - 120)$ oe
	(their 30×65 + *their* 70×90 + *their* 40×105 + *their* 36×115 + *their* $24 \times 140) \div 200$	**M3**	**M1** for midpoints soi **M1** for Σfx, x in interval or boundary of interval **M1 dep on second M1** for ÷ 200
	99.75	**A1**	

Question 50

(a)(i)	Correct histogram	**3**	**B1** for each correct block If 0 scored, **SC1** for any two of fds 7.5, 3.33…, 0.8 oe soi
(a)(ii)	3.7875 or 3.79 or 3.787 or 3.788	**4**	**M1** for 0.75, 1.5, 3, 5.5, 9.5 soi **M1** for Σfx **M1 dep** for *their* $\Sigma fx \div 40$
(a)(iii)	$\frac{11}{40}$ oe	**1**	
(a)(iv)	$\frac{30}{203}$ oe	**3**	**M2** for $[2\times]\frac{4}{29}\times\frac{15}{28}$ oe or **M1** for $\frac{4}{29}$ or $\frac{15}{29}$ oe seen After 0 scored, **SC1** for $[2\times]\left(\frac{4}{40}\times\frac{26}{39}\right)$ oe or for answer $\frac{120}{841}$ oe
(b)(i)	4.6	**1**	
(b)(ii)	3.2	**1**	
(b)(iii)	[median] remains the same oe and one is below [the median/middle] and one is above oe	**2**	**B1** for each statement

Question 51

(a)(i)	3 22 43 48 50	**2**	**B1** for 4 correct or **M1** for one error in adding.
(a)(ii)	correct diagram	**3**	**B1FT** *their* **(a)(i)** for 5 correct heights **B1** for 5 points at upper ends of intervals on correct vertical line **B1FT dep on at least B1** for increasing curve through *their 5* points After 0 scored, **SC1** for 4 of *their* points correctly plotted
(a)(iii)	35 to 38	**1**	
(b)	Correct box-and-whisker diagram  1.45 1.57 1.64 1.71 1.83	**4**	**B1** for median 1.64 drawn **B1** for LQ 1.57 drawn **B1** for UQ 1.71 drawn If 0 scored **SC1** for 1.64, 1,57 or 1.71 seen

Question 52

(a)(i)	$\frac{60}{360}\times 600$ oe	**1**	
(a)(ii)	45	**2**	**M1** for $\frac{27}{360}\times 600$ oe
(a)(iii)	Correct straight line on the pie chart	**2**	**B1** for 75
(b)	Correct diagram  0.6 3.4 5.2 7.5 8.7	**3**	**B1** for any three of 0.6, 3.4, 5.2, 7.5, 8.7 correctly placed **B1** for 7.5 and 8.7 seen

(c)(i)	5	**1**	
(c)(ii)	2	**1**	
(c)(iii)	3	**1**	
(d)	39.2	**4**	**M1** for mid-values soi **M1** for Σfx with x in correct interval including boundaries **M1 dep** for $\frac{\Sigma fx}{50}$ dep on second M1

Question 53

(a)(i)	90	**1**	
(a)(ii)	68	**1**	
(a)(iii)	52	**1**	**FT** 120 – *their* (a)(ii)
(a)(iv)	20	**2**	**B1** for 60 in working or as answer
(b)(i)	97.5	**4**	**M1** for mid-points soi (50, 70, 90, 115, 145, 180) **M1** for use of Σfm with m in correct interval including both boundaries **M1** for (dep on 2nd M1) for $\Sigma fm \div 80$
(b)(ii)	Bars with heights 0.9, 0.5, 0.3, 0.175 and with correct widths	**4**	**B1** for each correct bar If 0 scored, **SC1** for 3 or 4 correct frequency densities
(b)(ii)	Bars with heights 0.9, 0.5, 0.3, 0.175 and with correct widths	**4**	**B1** for each correct bar If 0 scored, **SC1** for 3 or 4 correct frequency densities
(b)(iii)	$\frac{28}{395}$ oe	**3**	**M2** for [2 ×] $\frac{16}{80}\times\frac{14}{79}$ oe or **M1** for $\frac{16}{80}$ or $\frac{16}{79}$ oe or $\frac{14}{80}$ oe or $\frac{14}{79}$ oe seen If 0 scored, **SC1** for answer $\frac{7}{100}$ oe

Question 54

(a)	Correct box-and-whisker plot	**4**	**B1** for lowest value and highest value at 30 and 90 **B1** for LQ and UQ at 50 and 72 **B1** for median at 63
(b)(i)	56	**2**	**M1** for 24 soi
(b)(ii)	16	**2**	**B1** for 64 written
(c)(i)	14, 22	**1**	
(c)(ii)	61.5	**4**	**M1** for 35, 45, 55, 65, 75, 85 soi **M1** for Σfx **M1 dep** for *their* $\Sigma fx \div (8 + 12 +$ *their* $14 +$ *their* $22 + 14 + 10)$ or $\Sigma fx \div 80$
(c)(iii)	$\frac{35}{69}$ oe	**3**	**M2** for $[2]\left(\frac{10}{24}\times\frac{14}{23}\right)$ oe or **M1** for $\frac{10}{24}$ or $\frac{14}{24}$ oe seen If 0 scored, **SC1** for answer $\frac{35}{72}$ oe

Question 55

(a)	121 or 120.8… or $120\ \frac{5}{6}$	**4**	**M1** for midpoints soi **M1** for use of $\sum fx$ with x in correct interval including both boundaries but **not** if x is 50, 50, 100 and 300 **M1** (dep on 2nd M1) for $\sum fx \div 120$
(b)	12.4 5 1.4	**3**	**B1** for each If 0 scored **SC1** for fd's [0.86,] 0.62, 0.25 and 0.07 oe
(c)	43 74 99 120	**2**	**B1** for 2 or 3 correct
(d)	Correct diagram	**3**	**B1** for correct horizontal placement for 4 plots **B1FT** for correct vertical placement for 4 plots **B1FT dep on at least B1** for reasonable increasing curve or polygon through *their* 4 points If 0 scored **SC1 FT** for 3 out of 4 points correctly plotted
(e)(i)	Strict FT *their* **median** reading	**1**	
(e)(ii)	Strict FT *their* **UQ** reading	**1**	
(e)(iii)	Strict FT *their* reading at **40th percentile**	**2**	**B1** for 48 written or mark at cf = 48 on graph
(e)(iv)	Strict FT *their* reading at 400 – *their* reading at 250	**2**	**B1** for either correct reading at 250 or 400

Question 56

(a)	25.2 or 25.23…	**4**	**M1** for midpoints **soi** **M1** for use of $\sum fx$ with x in correct interval including both boundaries **M1** (**dep** on 2nd M1) for $\sum fx \div 150$
(b)	5 correct blocks	**4**	**B3** for 4 correct blocks or **B2** for 3 correct blocks or **B1** for 2 correct blocks or block widths 10, 10, 5, 15, 10 If 0 scored **SC1** for 4 correct frequency densities from 1.2, 3.8, 6.4, 3.33[3…] and 1.8 oe soi
(c)(i)	12, 50, 82, 132, 150	**2**	**B1** for 3 or 4 correct
(c)(ii)	92	**2**	**M1** for $150 - 12$ oe seen If 0 scored, **SC1** for answer 8[%]

Question 57

(a)(i)	1 | 7 7 8 8 9 9 2 | 1 1 1 1 2 3 3 4 5	**2**	**B1** for one row correctly ordered or for fully correct unordered stem-and-leaf diagram or for a correct diagram with one error or omission
(a)(ii)	21	**1**	
(a)(iii)	23	**1**	
(a)(iv)	48	**2**	**M1** for $\frac{2}{15}[\times 360]$ or $\frac{360}{15}[\times 2]$
(b)(i)	120	**1**	
(b)(ii)	130	**1**	
(b)(iii)	60	**1**	
(c)(i)	93.4	**4**	**M1** for mid-values soi **M1** for Σfx **M1 dep on second M** for $\Sigma fx \div 200$
(c)(ii)	19	**2**	**M1** for $\frac{86}{50}$ or $\frac{114}{60}$

Question 58

(a)	Correct histogram	**3**	**B1** for each correct block If 0 scored, **SC1** for two of $\frac{28}{15}$, $\frac{33}{20}$, $\frac{13}{10}$ or 1.87 or 1.866 to 1.867, 1.65, 1.3
(b)	38.65	**4**	**M1** for 12.5, 20, 32.5, 50, 65 soi **M1** for $\sum fx$ where x is in the correct interval including boundaries **M1dep** for $\sum fx \div 100$

Question 59

(a)(i)	211.275	**4**	**M1** for mid-points **soi** (90, 125, 175, 250, 350) **M1** for use of Σfm with m in correct interval including both boundaries **M1** for (dep on 2nd M1) for $\Sigma fm \div 200$
(a)(ii)	$32 \times 350 - 32 \times 330$ oe or better, or the reverse of this	**M1**	
	3.2 or – 3.2 final answer	**B1**	
(a)(iii)	1.75 7.6 1.6	**3**	**B2** for two correct heights or **B1** for one correct height or 3 correct frequency densities or **M1** for scale factor of 5 or 0.2
(b)	$\frac{4}{25}$ oe	**1**	
(c)(i)	$\frac{39}{995}$ oe	**2**	**M1** for $\frac{40}{200} \times \frac{39}{199}$ oe
(c)(ii)	$\frac{147}{4975}$ oe	**3**	**M2** for [2×] $\frac{84}{200} \times \frac{7}{199}$ oe or **B1** for $\frac{84}{200}$ and $\frac{7}{199}$ or $\frac{84}{199}$ and $\frac{7}{200}$ oe If 0 scored, **SC1** for answer $\frac{147}{5000}$ oe

Question 60

(a)(i)	9.4	**1**	
(a)(ii)	2.4	**2**	**B1** for [uq =] 10.4 or [lq =] 8 but not as final answer
(a)(iii)	18	**2**	**B1** for 82 seen
(b)(i)	34.65 or $34\frac{13}{20}$	**4**	**M1** for midpoints 10, 25, 32.5, 40, 52.5 soi **M1** for Σfx where values of x are in interval or on boundary **M1 dep on second M** for $\frac{\Sigma fx}{150}$
(b)(ii)	0.3, 5.7, ..., 7.95, 1.5	**3**	**B2** for any two correct or **B1** for one correct or for at least three frequency densities seen 0.2, 3.8, 8, 5.3, 1 oe or **M1** for [factor] 1.5
(b)(iii)	$\frac{7}{745}$ oe	**2**	**M1** for $\frac{15}{150} \times \frac{14}{149}$

Question 61

(a)(i)	7	**1**	
(a)(ii)	8	**1**	
(a)(iii)	8.31	**3**	**M1** for $3\times6 + 32\times7 + 19\times8 + 29\times9 + 11\times10 + 6\times11$ oe **M1dep on M1** for $\frac{\sum fx}{100}$
(a)(iv)	$\frac{23}{110}$ oe	**2**	**M1** for $\frac{k}{100}\times\frac{k-1}{99}$ oe, $k < 100$ or **B1** for $\frac{46}{100}$ and $\frac{45}{99}$
(b)(i)	53	**1**	
(b)(ii)	20	**1**	
(c)(i)	151.975	**4**	**M1** for 80, 155, 250 soi **M1** for $\sum fx$ where x is in correct interval including boundaries **M1 dep** for $\frac{\sum fx}{200}$ dep on second M1
(c)(ii)	Correct histogram completed with widths 110 to 200 and 200 to 300 and heights 1.1 and 0.41	**2**	**B1** for one correct block If 0 scored, **SC1** for 1.1 and 0.41 seen

Question 62

(a)(i)	Correct curve	**3**	**B1** for correct horizontal placement for 6 plots **B1** for correct vertical placement for 6 plots **B1 dep on at least B1** for reasonable increasing curve through *their* 6 points If 0 scored, **SC1** for 4 out of 6 points correctly plotted
(a)(ii)(a)	87 to 89.5	**1**	
(a)(ii)(b)	12.5 to 14	**2**	**B1** for [LQ =] 80.5 to 81.5 or [UQ =] 94 to 94.5
(a)(ii)(c)	Strict FT, 200 – *their* cumul freq reading from *their* graph at 110 given to nearest integer	**2**	**B1FT** for correct cumul freq at 110 seen or for non-integer answer

(b)(i)	3576	**4**	**M1** for midpoints soi **M1** for use of $\sum fx$ where x is in the correct interval including boundaries **M1** (dep on 2nd **M1**) for $\sum fx \div 50$
(b)(ii)	5 3.2 3	**3**	**B1** for each If 0 scored, **SC1** for 3 frequency densities $\frac{12}{600}, \frac{15}{900}, \frac{16}{1500}, \frac{7}{700}$ seen oe to 3sf or better or multiplier 3 or 300

Question 63

(a)(i)	1 | 3 5 7 8 2 | 1 1 2 7 8 9 3 | 1 1 1 8 1 | 7 represents 17 [messages]	**3**	**B2** for fully correct stem-and-leaf diagram OR **B1** for two rows correct or for fully correct unordered stem-and-leaf diagram or for a correct diagram with one error or omission **B1** for correct key
(a)(ii)	24.5	**1**	
(a)(iii)	31	**1**	
(a)(iv)	25	**1**	
(b)	$\frac{14}{33}$ oe	**2**	**M1** for $\frac{8}{12} \times \frac{7}{11}$

Question 64

(a)(i)	$1.65 < h \leq 1.8$	**1**	
(a)(ii)	1.63875	**4**	**M1** for midpoints **soi** **M1** for use of $\sum fh$ with h in correct interval including both boundaries **M1dep on 2nd M1** for $\sum fh \div 80$
(b)(i)	$\frac{1}{40}$ oe	**1**	
(b)(ii)	$\frac{63}{395}$ oe	**3**	**M2** for $\frac{56}{80} \times \frac{9}{79}$ [×2] oe or **B1** for $\frac{56}{80}$ or $\frac{9}{79}$ or $\frac{9}{80}$ or $\frac{56}{79}$ oe seen If 0 or B1 scored, instead award **SC2** for answer $\frac{117}{632}$ oe or **SC1** for answer $\frac{63}{400}$ oe
(c)(i)	15, 39, 71, 80	**2**	**B1** for 3 correct or **M1** for 1 error in addition with other values then consistent
(c)(ii)	Correct curve	**3**	**B1** for correct horizontal placement for 5 plots **B1FT** for correct vertical placement for 5 plots **B1FT dep on at least B1** for reasonable increasing curve or polygon through *their* 5 points If 0 scored **SC1 FT** for 4 out of 5 points correctly plotted
(d)(i)	Strict FT *their* UQ – *their* LQ	**2dep**	**B1dep** for *their* UQ or *their* LQ seen Dep on increasing curve/polygon for 2 marks or B1
(d)(ii)	Strict FT *their* reading at 48	**2dep**	**B1** for 48 written

Question 66

(a)(i)	55.87	**4**	**M1** for midpoints soi **M1** for use of $\sum fm$ where m is in the correct interval including boundaries **M1** (dep on 2nd M1) for $\sum fm \div 1000$
(a)(ii)	$\frac{177}{500}$ cao	**2**	**M1** for $\frac{154+200}{1000}$ oe

Question 67

(a)	28 and 45 on table	**B2**	**B1** for each
	Histogram correctly completed	**B3**	**B1** for each correct bar If 0 scored, **SC1** for two of FD's 3.8, 1.9 or 0.6 oe soi
(b)	30.7 or 30.66 to 30.67	**4**	**M1** for midpoints **soi** **M1** for use of $\sum fh$ with h in correct interval including both boundaries **M1** (dep on 2nd M1) for $\sum fh \div$ (*their* 28 + *their* 45 + 57 + 38 + 12)
(c)	Exact values are not known oe	**1**	
(d)	$\frac{1254}{39\,697}$ oe	**4**	**M3** for $N\left(\frac{38+57}{57+38+12}\times\frac{12}{56+38+12}\times\frac{11}{56+38+11}\right)$ oe where $N = 1$, 2 or 3 or **M2** for $\frac{38+57}{57+38+12}$ and $\frac{12}{56+38+12}$ or $\frac{12}{57+38+12}$ and $\frac{11}{57+38+11}$ oe seen or **M1** for $\frac{38+57}{57+38+12}$ or $\frac{12}{57+38+12}$ oe seen If 0 scored **SC1** for answer $\frac{41040}{1225043}$ or 0.0335…

Question 68

(a)	36.7 or 36.66 to 36.67 or $36\frac{2}{3}$	**2**	**M1** for $\frac{11}{8+6+11+5}$ [× 100] oe
(b)(i)	72, 132 and 60	**2**	**M1** for 360 ÷ (8 + 6 + 11 + 5) oe or 96 ÷ 8
(b)(ii)	Correct pie chart drawn	**2**	For 2 marks, strict **FT** *their* angles for correct pie chart only if angles add up to 360. **B1FT** for one correct sector
(c)	29	**2**	**M1** for $8 \times \left(1+\frac{262.5}{100}\right)$ oe or **B1** for 21
(d)(i)	1.5×10^9	**1**	
(d)(ii)	70.8 or 70.75…	**2**	**M1** for 1500 [million] ÷ 21.2 [million]

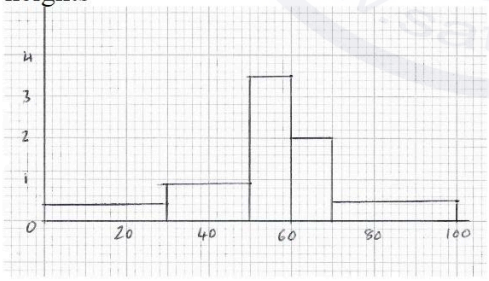
Question 69

(a)(ii)	17	**1**	
(a)(iii)	18	**1**	
(a)(iv)	17.88	**3**	**M2** for (1×15 + 3×16 + 19×17 + 11×18 + 10×19 + 6×20) ÷ 50 oe or **M1** for 1×15 + 3×16 + 19×17 + 11×18 + 10×19 + 6×20 oe
(b)(i)	1 | 8 2 | 0 0 1 1 1 2 5 3 | 0 3 4	**2**	**B1** for two rows correct or for fully correct unordered stem-and-leaf diagram
(b)(ii)	21	**1**	
(b)(iii)	10 nfww	**2**	**B1** for [upper qtile] = 30 or [lower qtile] = 20 soi

Question 70

(a)	226 nfww or 226.2 to 226.3[0] nfww	**4**	**M1** for mid-points **soi** (217.5, 221.5, 229, 239, 254) **M1** for use of Σfm with m in correct interval including both boundaries **M1** (dep on 2nd M1) for $\Sigma fm \div$ (9 + 14 + 14 + 2 + 3)
(b)	Blocks with heights 2.8, 1.4, 0.2 and with correct widths	**3**	**B1** for each correct block If 0 scored, **SC1** for two correct frequency densities soi

Question 71

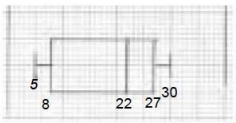
(a)(i)	5	**1**	
(a)(ii)	16.8	**3**	**M1** for 15 × 4 + 16 [× 1] + 17 × 2 + 18 [× 1] [+ 19 × 0] + 20 × 2 oe **M1** dep on previous M1 for *their* $\Sigma fx \div 10$
(a)(iii)	16.5	**1**	
(a)(iv)	15	**1**	
(b)	21	**3**	**M2** for 8×17.5 and 7×17 oe or **M1** for 7×17 or 8×17.5 oe seen
(c)	5 correct blocks, with correct widths, heights 	**4**	**B3** for 4 correct blocks or **B2** for 3 correct blocks or **B1** for 2 correct blocks If 0 scored **SC1** for correct frequency densities (0.4 0.9 3.5 2 0.5) soi

Question 72

(a)	5	**B1**	
	4	**B1**	
	3.55	**3**	**M2** for $(10 \times 1 + 6 \times 2 + 11 \times 3 + 13 \times 4 + 14 \times 5 + 6 \times 6) \div 60$ oe or **M1** for $10 \times 1 + 6 \times 2 + 11 \times 3 + 13 \times 4 + 14 \times 5 + 6 \times 6$ oe
(b)(i)	42.55 or 42.6	**4**	**M1** for 25, 40, 62.5 soi **M1** for Σfx with x values in correct intervals, including boundaries **M1 dep** on second M1 for $\frac{\Sigma fx}{100}$
(b)(ii)	10.8 2.16	**2**	**B1** for each or for frequency densities 3.6 and 0.72 seen

Question 73

(a)(i)	25.4375	**4**	**M1** for mid-points soi (5, 17.5, 32.5, 50) **M1** for use of Σfm with m in correct interval including both boundaries **M1** for (dep on 2nd M1) for $\Sigma fm \div 40$
(a)(ii)	correct histogram	**3**	**B2** for 3 correct blocks or **B1** for 2 correct blocks If 0 scored **SC1** for 4 correct frequency densities 0.3, 1.2, 1, 0.2 oe soi
(a)(iii)	$\frac{19}{260}$ oe	**3**	**M2** for $\frac{19}{40} \times \frac{3}{39}[\times 2]$ oe or **M1** for any of $\frac{19}{40}$, $\frac{3}{40}$, $\frac{19}{39}$, $\frac{3}{39}$ oe seen If 0 scored, **SC1** for $\frac{57}{800}$ oe

(b)(i)	5	**1**	
(b)(ii)	 Correct box plot	**3**	**B2** for with LQ at 8 and median at 22 and UQ at 27 and boxed or **M1** for LQ at 8 and median at 22 or for UQ at 27 **B1** for lowest = 5 and highest = 30 Max **B1** if not box and whisker diagram
(b)(iii)	Correct explanation which states the median is 22 and correct reference to 100 or 101 e.g. • Median is 22 which is 50% of the people and 101 is more than 50% oe • The median is 22 which is the 100th number (accept 100.5th number)	**1**	

Question 74

(a)(i)	9.3	**1**	
(a)(ii)	3.4	**1**	
(a)(iii)	63	**5**	**M4** for $\frac{195}{6}\times\frac{3600}{1000}-\frac{195}{13}\times\frac{3600}{1000}$ oe or **M3** for $\frac{195}{6}\times\frac{3600}{1000}$ oe or $\frac{195}{13}\times\frac{3600}{1000}$ oe or for $(\frac{195}{6}-\frac{195}{13})[\times k]$ oe OR **M1** for $\frac{195}{6}$ or $\frac{195}{13}$ or *their* speed $\times\frac{3600}{1000}$ seen **M1** for selecting 6 and 13
(b)(i)	$420 < d \leqslant 450$	**1**	
(b)(ii)	411.25	**4**	**M1** for 275, 350, 410, 435, 475 soi **M1** for Σfx **M1 dep** for *their* $\Sigma fx \div 80$
(b)(iii)	2.6 19 14	**3**	**B1** for each If 0 scored, **SC1** for 3 of 0.14, 0.13, 0.95 or 0.7 oe
(b)(iv)	$\frac{7}{158}$ oe	**3**	**M2** for $[2\times]\frac{20}{80}\times\frac{7}{79}$ oe or **M1** for $\frac{20}{80}$ or $\frac{7}{79}$ or $\frac{7}{80}$ or $\frac{20}{79}$ oe seen After 0 scored, **SC1** for $\frac{7}{160}$ oe