Cumulative Frequency Mark Scheme

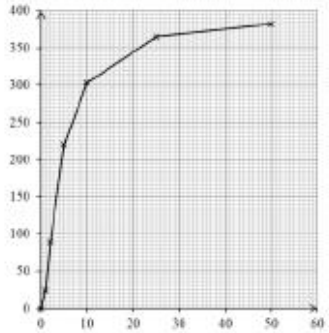
Q1.

Question	Scheme	Marks
(a)(i)	15	B1
(ii)	16 – 12 = 4	M1 A1
(iii)	17	B1 (4)
(b)	20 cao	B1 (1)
(c)	48 – 37 or 9 + 1 + 1 = 11	M1 A1 (2) [7]
	Notes	
(a)(ii)	M1 for attempt at $Q_3 - Q_1$ with at least one correct value. (Note subtraction can be implied by candidate's answer. e.g. 12, 17 followed by answer 5)	
(b)	Accept 20 on its own only. e.g. 20 – 22 is B0	
(c)	M1 for **37** seen OR for **9** and **1** and **1** seen (with no other figures – addition not required for this mark)	

Q2.

Question number	Answer	Additional guidance	Mark
(a)	B1 e.g. only 14 values are less than 160, or 15th (value) is in this class, or 14 < 30/2	B1 for recognising that the middle value has not been reached until after 160. Allow use of n or n+1 for '15th' allow15.5th, or 15th & 16th allow 14 < 31÷2	(1)
(b)	B1ft (Median) was lower / has increased (by 54 minutes) or 110 < '164' or difference is '54' B1ft e.g. Matches/finals/games now take longer / were quicker (on average)	Allow correct answers, or correct ft from answer in (b) 1st B1ft for correct statistical comparison (words or figures) 2nd B1ft for correct contextual interpretation (must mention matches, o.e.), but note that 'they take longer' alone is B0 (Condone 'slower'/'faster' for 'take more time' / 'take less time' For both marks follow through their answer to part (b)	(2)

Q3.

Question	Answer	Additional guidance	Mark
(a)	B1 89, 220, 303, 365, 382	B1 for all correct cumulative frequencies	(1)
(b)	B1 for correct horizontal plots B1 ft for correct vertical plots B1 ft for correct cumulative frequency graph allow with straight lines or curve  	B1 for correct horizontal plots B1 ft for correct vertical plots ($\frac{1}{2}$ square tolerance for plots) SC if B0 B0 then six correct points out of seven is B1 B1 ft for correct cumulative frequency graph allow with straight lines or curve must be increasing curve for the ft	(3)
(c)	B2 ft Hamish's conclusion is correct because the train median is higher than the median of the car which is 4.3	B2 ft for correct conclusion from their graph with supporting figure for median Allow median in the range 4 to 5 or ft their graph providing their graph is increasing (B1 ft for median in range 4 to 5 or correct conclusion with incorrect supporting figure)	(2)
(d)	B1 A cumulative frequency step polygon is more appropriate because data is discrete	B1 for any correct description why a cumulative frequency step polygon is more appropriate	(1)

Q4.

Question	Scheme	Marks
(a)	35 or 36	B1 (1)
(b)	$45 - 8 = 37$	M1 A1 (2)
(c)	Cumulative frequency at 86 metres is 38 So 12 are taller than 86 metres $\frac{12}{50} \times 100 = 24(\%)$	M1 A1 A1 (3) **[6]**
	Notes	
(a)	35.5 is B0	
(b)	M1 for the subtraction of two values read off the graph at 60 and 110 ($45 - k$ or $k - 8$ scores this mark) A1 cao	
(c)	M1 for a vertical line drawn up at 86 or 38 seen or marked on cumulative frequency axis or 76% 1st A1 for $50 - 38$ (= 12) or $100 - 76$ (may be implied by correct answer) 2nd A1 for 24 (%)	

Q5.

Question number	Answer	Additional guidance	Mark
	B2 Accept answers in the range $6.0 \leq Q_1 \leq 6.5$, $Q_2 = 10$, $15.0 \leq Q_3 \leq 15.5$	B2 for all three values correct (quartiles in ranges) OR B1 for one value correct	(2)

Q6.

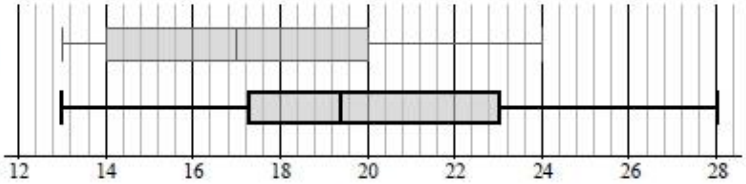
Question	Scheme	Marks
(a)(i)	30 (accept 29)	B1
(ii)	95 – 87 = 8	M1 A1 (3)
(b)	For a suitable reason from: • Only people from the USA were included in the survey (o.e.) • Percentages may be different in UK and USA (o.e.) • Data is out of date (from 2012) • Small sample size ... so it is not sensible (to use the results for the prediction)	B1 dB1 (2)
*(c)	Median is 39 (for tablet owners) Median for tablets owners is higher/tablet owners are older (on average) IQR is (51.5 – 28 =) 23.5 (years) ... so similar variation in ages / IQR is (slightly) higher	B1 B1ft B1 B1ft (4) **[9]**

Notes	
(a)(ii)	M1 for subtraction of two figures between 80 and 100 (not inclusive) which may be seen on their graph e.g. 87 – 95 on its own is M0 but condone 87 – 95 = 8 for M1A1 A1 for 7, 8 or 9
(b)	1st B1 for a suitable reason why it may not be sensible 2nd B1 dependent on first B1 for correct conclusion **SC**: For a complete argument that it is sensible to use the results e.g. 'People from USA and UK have similar social/economic background so could be sensible' B1B0.
*(c)	QWC: Must use correct statistical terms. 1st B1 for median identified as 39 (allow ±0.5) or difference of 3 2nd B1 for correct comparison. Allow ft on their median if stated. 3rd B1 for IQR found as 23.5 (allow answers in the range [22.5 - 24.5]) 4th B1 **dependent on a figure stated for IQR**, for correct comparison. Allow ft on their IQR. More than one mark can be scored in a single comment, e.g. 'median is 3 years older' scores 1st B1, 2nd B1 and e.g. 'both IQRs are 23' scores 3rd B1, 4th B1 **SC**: 'both IQRs are the same' scores 3rd B1, 4th B1 (For 2nd and 4th B1 assume comment is about tablet owners if not stated.)

Q7.

Question	Scheme	Marks
	30, $(39 \leq M < 40)$, $(49 < UQ \leq 50)$	B2 (2)

Q8.

Question number	Answer	Additional guidance	Mark
(a)(i)	B1 (30 × 0.9 = 27th value =) 26.2	B1 for answer in range 26 – 26.4	(1)
(a)(ii)	B1 e.g. **Temperature** does not exceed '26.2°C' on 27 days, or 10% chance any day of max **temperature** exceeding '26.2°C'	B1 for correct equivalent interpretation of 90th percentile. Do not accept interpretations not in context	(1)
(b)	M1 Q1 = 17.3 or Q3 = 23 M1 23 + 1.5 × (23 – 17.3) A1 = 31.6 A1 Maximum value (or 28) is less than 31.6	M1 accept Q1 in range 17.2 – 17.6 Q3 in range 22.8 – 23.6 Values may be seen on graph or next to box plot. M1 for correct calculation using their Q1 & Q3 (their Q1≠7.5, their Q3≠22.5) A1 for answer in range 30.6 – 33.2 A1 for correct conclusion making reference to two correct values	(4)
(c)	B1 B1ft  	1st B1 for a **box + whiskers** with correct min at 13 and max at 28 2nd B1ft for 'correct' **box** using their Q1/Q3 and median 19.2 – 19.6	(2)
(d)	B1ft Bingley has higher <u>median</u> (as 19.4 > 17), o.e. B1ft Similar <u>IQR</u>s (as both are approximately 6) OR Bingley has greater <u>range</u> (as 15 > 11), o.e. B1ft Bingley has <u>positive skew</u> (but Aultbea has no skew)	Allow follow through from their box plot or Q1/Q3 values. Accept equivalent or converse statements. Accept Bingley has smaller IQR (as 5.7<6) For IQR comment condone higher/lower. Accept more spread out/less spread out only if linked to comment on IQR or range. Do not condone wider/narrower. Statements may be in context but underlined statistical words must be used. Ignore additional non-contradictory comments. Comment on Aultbea skew does not have to be present, but if present must not be incorrect.	(3)

Q9.

Question number	Answer	Additional guidance	Mark
(a)(i)	M1 Reading off the graph at 0.75×48 (36) A1 answer in the range 3200 to 3600	M1 for reading off graph at 75% A1 for answer in range Condone use of $n + 1$	(2)
(ii)	B1 e.g. '75% of counties have an area of '3400' sq km or less'	B1 for correct interpretation in context	(1)
(b)	M1 Reading a cumulative frequency off graph at 2000 M1 '19' + 24 (= 43) A1 answer in the range $4400 < k < 4800$	M1 may be implied by 19 identified. M1 for adding 24 to their value A1 for answer in range Note: working may be seen on or next to the graph	(3)