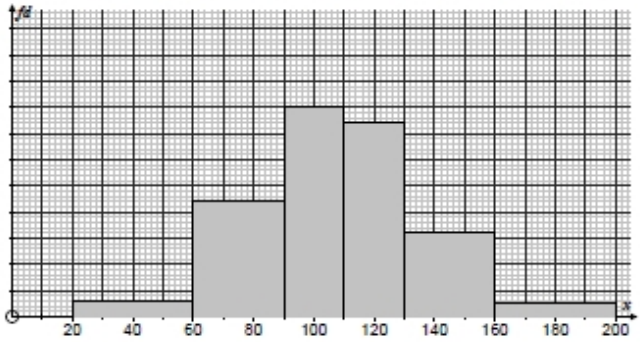
Histograms Mark Scheme

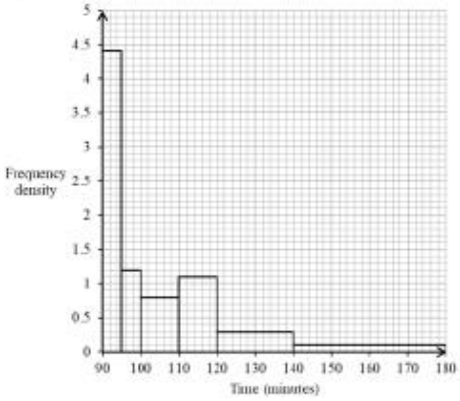
Q1.

Question number	Answer	Additional guidance	Mark
(a)	B1 quantitative B1 continuous	B1 for one identified B1 for both identified with no extras	(2)
(b)(i)	M1 16 44 A1 30	M1 for correctly applying a scale to find a second value (implied either by labelling a scale or correctly finding one other frequency). A1 for all values correct.	(2)
(b)(ii)	M1M1A1 $\frac{2\times10+4\times16+6\times44+8\times30}{100}=5.88$	M1 for consistent use of fx with x within interval M1 for correct use of Σfx with x the mid-interval value A1 for 5.88	(3)

Q2.

Question	Scheme	Marks
	6÷40, etc Frequency densities: (may see multiples of...) 0.15, 1.1, 2.0, 1.85, 0.8, 0.125  	M1 A1 A1 B1 (4)
	If all bars correct (±½ square tolerance) award M1A1A1 - OVERLAY Otherwise: **M1** for attempt at least one f ÷ c/w (implied by <u>one</u> correct fd, or by <u>any</u> histogram bar) **A1** if three of their <u>bars</u> correct height **A1** for all bars fully correct **B1** for labels 'frequency density' and 'weight (kg)' (allow fd and x as minimum) (Figures on vertical axis are not required.)	

Q3.

Question	Answer	Additional guidance	Mark
(a)	B2 Histogram with unequal class widths is best choice since data is continuous and unequal class widths will reduce the number of rectangles where frequency densities are low.	B2 for a decision of histogram with both supporting reasons (B1 for decision of histogram with just one supporting reason)	(2)
(b)	M1 freq density = freq / cw 22 ÷ 5 etc. A1 fd 4.4, 1.2, 0.8, 1.1, 0.3, 0.1 A2  	M1 for attempt at a calculation of freq density = freq / cw implied by any correct fd or bar height 4.4, 1.2, 0.8, 1.1, 0.3, 0.1 (allow multiples of these) A1 all correct fd may be implied by graph A2 for correct histogram – tolerance $\frac{1}{2}$ square (A1 for at least 3 bars correct width and height)	(4)
(c)	M1 11 + 6 competitors between 110 and 140 minutes (area of bars four and five) A1 $\frac{1}{2}$ of the third bar/class is between 105 and 110 minutes $\frac{1}{4}$ of the last bar/class is between 140 and 150 minutes so $\frac{1}{2} \times 8 + 11 + 6 + \frac{1}{4} \times 4 = 22$	M1 for showing working and explanation for adding bars/classes four and five A1 for full complete explanation including working out the fraction of the bars/classes and adding all the values	(2)

Q4.

Question	Scheme	Marks
(a)	$190 \div 5$ (= 38)	B1 (1)
(b)	Frequency densities: (38, 20,) **28, 25, 18, 11** All correct bar heights Class boundaries: 25, 45, 65, 100 Axes numbered and labelled age/frequency density	M1 A1 B1 B1 (4)
(c)	$\frac{360}{4} + 385$ or $5 \times$ '18' + 385 = 475 (hence 4 750 000)	M1 A1 (2) [7]
	Notes	
(a)	Accept equivalent calculation/verification but must use class width 5	
(b)	M1 for at least two of last four bar heights or frequency densities correct (check table) A1 for all bar heights correct. (½ square tolerance) 1st B1 for correct horizontal placement of all bars. (½ square tolerance) 2nd B1 accept minimum labels of f.d. and age/years ('class width' is B0) AND minimum two correct figures on each axis	
(c)	For M1 accept shading of correct region on their histogram A1 for final answer of 475 or 4 750 000	

Q5.

Question	Scheme	Marks
(a)	Positive skew	B1 (1)
(b)	Frequency ÷ class width, OR $4 \div (95\text{-}90)$ (=0.8)	B1 (1)
(c)	$2.6 \times 5 + 0.7 \times 10$ (= 13 + 7) =20	M1 A1 (2)
(d)	Identifies 100 to 110 class $\left(\frac{4}{7} \times 10 + 100\right) = 106$ (minutes) awrt 106	M1 A1 (2)
(e)	He should not use the results, WITH a reason May expect different course / different conditions / different racers etc	B1 B1 (2) [8]
	Notes	
(b)	Answer 0.8 is given in the paper. B1 for calculation/explanation. Allow $\frac{4}{5}$ OR e.g. $0.8 \times 5 = 4$	
(c)	M1 At least one correct product seen. (Implied by 13 or 7) Working may be on graph.	
(d)	M1 Either identifies the class 100 to 110, OR states an answer in range $100 < \text{answer} < 110$	
(e)	1st B1 for rejecting use of results (or 'no') with any reason 2nd B1 for a contextual reason that data apply to a different situation OR too few results / small sample Note: e.g. 'too few results **on which to base a prediction**' scores B1B1 SC: Allow B1 for a complete argument for using the results. e.g. ok to use the results if the 'conditions' are **similar**.	

Q6.

Question	Scheme	Marks
(a)	Positive skew	B1 (1)
(b)	Frequency ÷ class width, OR $4 \div (95-90)$ (=0.8)	B1 (1)
(c)	$2.6 \times 5 + 0.7 \times 10$ $(= 13 + 7)$ $=20$	M1 A1 (2)
(d)	Identifies 100 to 110 class $\left(\frac{4}{7} \times 10 + 100\right) = 106$ (minutes) awrt 106	M1 A1 (2)
(e)	He should not use the results, WITH a reason May expect different course / different conditions / different racers etc	B1 B1 (2) [8]
	Notes	
(b)	Answer 0.8 is given in the paper. B1 for calculation/explanation. Allow $\frac{4}{5}$ OR e.g. $0.8 \times 5 = 4$	
(c)	M1 At least one correct product seen. (Implied by 13 or 7) Working may be on graph.	
(d)	M1 Either identifies the class 100 to 110, OR states an answer in range $100 < \text{answer} < 110$	
(e)	1st B1 for rejecting use of results (or 'no') with any reason 2nd B1 for a contextual reason that data apply to a different situation OR too few results / small sample Note: e.g. 'too few results **on which to base a prediction**' scores B1B1 SC: Allow B1 for a complete argument for using the results. e.g. ok to use the results if the 'conditions' are **similar**.	

Q7.

Question number	Answer	Additional guidance	Mark
(a)	B1 A suitable reason: • the data is continuous • the data is grouped	B1 for either suitable reason Condone 'categories have different class widths' for B1	(1)
(b)	B1 for two bars drawn at correct width (5.5-7.5 and 7.5-11.5) M1 for use of frequency density A1 for both bars drawn at correct height (2.5 and 1)	Allow ½ small square tolerance on the widths but not the heights. M1 for $\frac{5}{7.5-5.5}$ or $\frac{4}{11.5-7.5}$ (working may be seen in table) or one correct bar height A1 must come from correct working if seen, i.e. f.d. = 2.5 and f.d. =1 f.d. = 1.3(3…) or 4/3 seen or plotted is A0. Both bars drawn at correct height with no working scores M1A1	(3)
(c)	M1 $\frac{7}{14+11+9}$ A1 $\frac{7}{34}$	M1 for attempt at conditional probability in the form $\frac{k}{14+11+9}$ where $0 < k \leq 14$ A1 for $\frac{7}{34}$ or awrt 0.21	(2)

Q8.

Question number	Answer	Additional guidance	Mark
(a)	e.g. M1 LB = mean – 6.29 (= 48.62) M1 UB = mean + 6.29 (= 61.2) M1 (mean – 52) × 2.6 + (52 – LB) × 2.2 (= 15.002) (57 – mean) × 2.6 + (61.2 – 57) × 2 (= 13.834) '15.002' + '13.834' (= 28.836) M1 28.836 ÷ 43 A1 = 0.671	M1 for correct method to find number of presidents 1 sd below mean M1 for correct method to find number of presidents 1 sd above mean M1 for correct method to find total number of presidents within 1 sd of mean M1 for correct method to find proportion of presidents within 1 sd of mean A1 for answers rounding to 0.67 or 67%	(5)
(b)	B1 for e.g. yes, close to 68%	B1 for referring to 68%	(1)

Q9.

Question	Answer	Additional guidance	Mark
(a)	B1 13	B1 for correct evaluation of remaining counties	(1)
(b)	M1 $200 + \ldots$ A1 $\ldots \frac{(28-15)}{14} \times 200$ A1 = 386 awrt	M1 for identifying 2nd class and attempting to find median value within the class. A1 for use of correct fraction and class width (condone use of 28.5 for 28) A1 for value rounding to 386 (or awrt 393 if 28.5 used)	(3)
(c)(i) (c)(ii)	B1 mean greater (than median) B1 median more appropriate with attempt to give a reason B1 ...due to (positive) <u>skew</u>	B1 for equivalent statement recognising mean will be greater than median B1 for correct choice AND attempt to justify B1 for stating data is skewed. This may be seen in **either (i) or (ii)**	(3)
(d)	B1 Appropriate as data is grouped / continuous	B1 for conclusion recognising appropriateness with equivalent reason	(1)
(e)	M1 0.0125×400 A1 $r = 5 \quad s = 8$	M1 for attempting area of bar A1 cao	(2)