A level Statistics Paper 2 MARK SCHEME

Question 1

Question Number	Scheme	Marks
(a)	4.5	B1 (1)
(b)	Time / Frequency density: 2-4: 5; 5-6: 4.5; 7: 6; 8: 24; 9-10: 7; 11-15: 2.4	M1 A1
	f.d = 24 is represented as 6cm, so f.d. = 7 is represented as **1.75(cm)**	A1 (3)
(c)	$\frac{1}{3}\times 15+9+\frac{1}{2}\times 6,=17$	M1, A1 (2)
(d)	$\text{Median} = 7.5+\frac{40-30}{24}\times 1 = 7.91666.....$ **awrt** 7.92 or 7.93(75)	M1 A1
	$Q_1 = 4.5+\frac{20-15}{9}\times 2 = 5.6111111...$ **awrt** 5.61 or 5.66(666…)	A1
	$Q_3 = 8.5+\frac{60-54}{14}\times 2 = 9.357142.....$ **awrt** 9.36 or 9.46(4285….)	A1 (4)

Notes

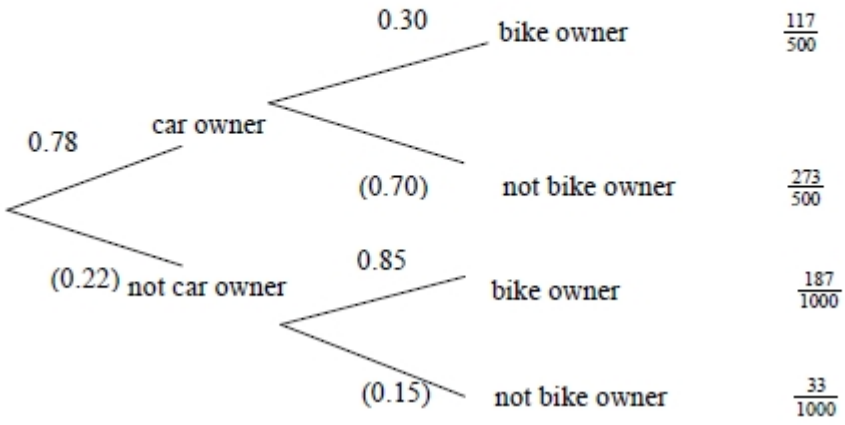
(a) B1 for 4.5 (o.e.) only. NB 1.5~4.5 is B0

(b) M1 for evidence of f/w (at least 3 f.d. found). May be implied by a correct answer.
A1 for identifying 9-10 as 2nd highest bar from correct working e.g. $24x = 6\times 7$
A1 for 1.75(cm). Correct answer only 3/3

(c) M1 for a correct expression. May interpolate e.g. $\left[24+\frac{1}{2}\times 6-\frac{2}{3}\times 15\right]$ or (27 – 10)
A1 for 17

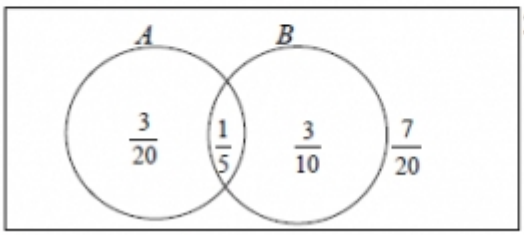
(d) M1 for one correct fraction in an expression for Q_1, Q_2 or Q_3
1st A1 for Q_2 **awrt** 7.92 (or 7.94 if $(n+1)$ used – look for 40.5 instead of 40)
2nd A1 for Q_1 **awrt** 5.61 (or 5.67 if $(n+1)$ used – look for 20.25 instead of 20)
3rd A1 for Q_3 **awrt** 9.36 (or 9.46 if $(n+1)$ used – look for 60.75 instead of 60)
NB watch out for working down e.g. $8.5-\frac{14}{24}\times 1$ for Q_2

Question 2

Question Number	Scheme	Marks
(a)		B1 B1 B1 **(3)**
(b)	P(car or bike but not both)$=0.78\times0.70+0.22\times0.85=0.733$	M1 A1 **(2)**
(c)	$[\text{P(car}\mid\text{bike)}]=\frac{\text{P(car}\cap\text{bike)}}{\text{P(bike)}}=\frac{0.78\times0.30}{0.78\times0.30+0.22\times0.85},=0.555819....$ **awrt** 0.556	M1A1 A1 **(3)**
(d)	$\text{P(bike)}=0.78\times0.30+0.22\times0.85=0.421$, $\text{P(not bike)}=1-0.421$ $0.421\times0.579+0.579\times0.421$ $=0.487518$ **awrt** 0.488	M1 dM1 A1 **(3)** **[Total 11]**

	Notes
(a)	1st B1 for a (2+4) tree with 6 branches 2nd B1 for 0.78 with label 3rd B1 for 0.30 and 0.85 with label
(b)	M1 for correct expression of follow through their correct tree branches A1 for 0.733 or exact equivalent e.g. $\frac{733}{1000}$ and allow 73.3%
(c)	M1 for a correct expression correct ft or correct formula and $\frac{\text{1 product}}{\text{sum of 2 products}}$ With at least 2 products correct or correct ft. Ratio must be smaller than 1 1st A1 for finding the denominator correctly. Fully correct expression or = 0.421 (oe) 2nd A1 for awrt 0.556 or exact equivalent e.g. $\frac{234}{421}$ and allow 55.6%
(d)	M1 for their $\text{P(bike)}\times(1-\text{P(bike)})$ dM1 for $\times 2$ A1 for awrt 0.488

Question 3

Question Number	Scheme	Marks
(a)	$P(A \cap B) = P(A \mid B) \times P(B)$ $P(A \cap B) = \frac{2}{5} \times \frac{1}{2} = \frac{1}{5}$	M1 A1 (2)
(b)	 2 intersecting circles and '$P(A \cap B)$' $\frac{3}{20}$ and $\frac{3}{10}$ Box and $\frac{7}{20}$	B1ft B1 B1 (3)
(c)	$\left[P(A) = \frac{3}{20} + \frac{1}{5}\right] = \frac{7}{20}$ or 0.35	B1ft (1)
(d)	$P(B \mid A) = \frac{P(A \cap B)}{P(A)} = \frac{\frac{1}{5}}{\frac{7}{20}}$ $= \frac{4}{7}$	M1 A1 cao (2)
(e)	0.3	B1ft (1) [Total 9]

	Notes
(a)	M1 for $\frac{2}{5} \times \frac{1}{2}$ or a correct probability product expression and one correct prob. Ans only 2/2
(b)	1st B1 for 2 intersecting circles labelled A and B and ft their prob. for intersection Condone missing labels for 2nd and 3rd B marks
(c)	B1ft for 0.35 (o.e.) if no Venn diagram or correct follow through from their diagram or allow 0.35 (or correct ft) from correct working e.g. 0.65 – 0.5 + (a) B0 for 0.35 if their diagram does not give 0.35 unless it comes from correct work Don't insist on P(A) =... but do not award for $P(A' \cap B') = \frac{7}{20}$
(d)	M1 for $\frac{\text{their (a)}}{\text{their (c)}}$ or a correct ratio of probabilities from their diagram NB incorrect use of $P(A' \cap B') = \frac{7}{20}$ scores M0 and num $\geq$ denom scores M0 A1 for $\frac{4}{7}$ only
(e)	B1ft for 0.3 or correct ft from their Venn diagram or ft from $\frac{13}{20}$ – their (c)

Question 4

Question	Scheme	Marks
	$H_0 : p = 0.2$ $H_1 : p < 0.2$	B1
	$[X \sim B(40, 0.2)]$ $P(X \leq 3) = 0.0285$ or CR of $X \leq 3$	M1A1
	$[0.0285 < 0.05]$ significant, reject H_0	M1dep
	There is evidence to support the supplier's **claim** or The probability of a **ball** failing the bounce **test** is **less** than **0.2**	A1cso **(5)**
	Notes	
	1st B1 for both H_0 and H_1 must use p or π 1st M1 for writing or using B(40, 0.2) , may be implied by correct answer 1st A1 awrt 0.0285 or CR of $X \leq 3$ as their final answer 2nd M1 dependent on the previous method mark being awarded. A correct statement (this may be contextual) comparing "their probability" and 0.05 (or comparing 3 with their critical region). Do not allow conflicting statements. 2nd A1cso This is cso so can only be awarded for a fully correct solution. A correct contextualised conclusion (to include the words underlined in bold)	

Question 5

Q5	Scheme	Marks	AOs	Pearson Progression Step and Progress descriptor
a	r = 0.171	**A1**		
b	The data shows a very weak positive correlation, almost no correlation as it is closer to zero so a linear model may not be best There may be other variables affecting the relationship or a different model might be a better fit	**A1** **A1**		
c	$\log n = 0.7606 + 0.0635t$ $c = 10^{0.7606+0.0635t}$ $c = 5.76 \times 1.16^t$ (3 s.f.)	**M1** **M1** **A1**	1.1a 1.1b 1.1b	6th Understand exponential models in bivariate data.
		(3)		
d	a is a constant of proportionality.	**A1**	3.2a	6th Understand exponential models in bivariate data.
		(1)		
e	Extrapolation/out of the range of the data.	**A1**	2.4	4th

				Understand the concepts of interpolation and extrapolation.
		(1)		
				(8 marks)

Question 6

Q6	Scheme	Marks	AOs	Pearson Progression Step and Progress descriptor
a	The type and strength of linear correlation between two vriables	**A1**		
b	0.935	**A1**		
c	$H_0: \rho = 0$, $H_1: \rho > 0$ Critical value = 0.4973 Reject H_0 : there is reason to believe that students who do well in english test are likely to do well in mathematics tets	**M1** **M1** **A1**	1.1a 1.1b 1.1b	6th Understand exponential models in bivariate data.
		(3)		
d	There is a probability of 0.05 that the null hypothesis is true	**A1**	3.2a	6th Understand exponential models in bivariate data.