Question	Scheme	Marks	AOs	
9 (a) Way 1	$\{d = kV^n \Longrightarrow\} \log_{10} d = \log_{10} k + n\log_{10} V$ or $\log_{10} d = m\log_{10} V + c$ or $\log_{10} d = m\log_{10} V - 1.77$ seen or used as part of their argument	M1	2.1	
	Alludes to $d = kV^n$ and gives a full explanation by comparing their result with a linear model e.g. $Y = MX + C$	A1	2.4	
	$\{k =\} 10^{-1.77} = 0.017$ or $\log 0.017 = -1.77$ linked together in the same part of the question	B1 *	1.1b	
		(3)		
9 (a) Way 2	$\log_{10} d = m \log_{10} V + c \text{ or } \log_{10} d = m \log_{10} V - 1.77$ or $\log_{10} d = \log_{10} k + n \log_{10} V$ seen or used as part of their argument	M1	2.1	
	$\{d = kV^n \Longrightarrow\} \log_{10} d = \log_{10}(kV^n)$ $\implies \log_{10} d = \log_{10} k + \log_{10} V^n \implies \log_{10} d = \log_{10} k + n\log_{10} V$	A1	2.4	
	$\{k =\} 10^{-1.77} = 0.017$ or $\log 0.017 = -1.77$ linked together in the same part of the question	B1 *	1.1b	
		(3)		
(a)	Starts from $\log_{10} d = m \log_{10} V + c$ or $\log_{10} d = m \log_{10} V - 1.77$	M1	2.1	
Way 3	$\log_{10} d = m \log_{10} V + c \implies d = 10^{m \log_{10} V + c} \implies d = 10^{c} V^{m} \implies d = kV^{n}$			
	or $\log_{10} d = m \log_{10} V - 1.77 \implies d = 10^{m \log_{10} V - 1.77}$	A1	2.4	
	$\Rightarrow d = 10^{-1.77} V^m \Rightarrow d = kV^n$			
	$\{k=\} 10^{-1.77} = 0.017 \text{ or } \log 0.017 = -1.77$	R1 *	1 1b	
	linked together in the same part of the question	DI	1.10	
		(3)		
(b)	$\{d = 20, V = 30 \Longrightarrow\}$ $20 = k(30)^n$ or $\log_{10} 20 = \log_{10} k + n \log_{10} 30$	M1	3.4	
	$20 = k(30)^n \implies \log 20 = \log k + n \log 30 \implies n = \frac{\log 20 - \log k}{\log 30} \implies n = \dots$	M1	1 16	
	$\log_{10} 20 = \log_{10} k + n \log_{10} 30 \Longrightarrow n = \frac{\log_{10} 20 - \log_{10} k}{\log_{10} 30} \Longrightarrow n = \dots$	1411	1.10	
	$\{n = \text{awrt } 2.08 \Longrightarrow\} d = (0.017)V^{2.08}$ or $\log_{10} d = -1.77 + 2.08\log_{10} V$	A1	1.1b	
	Note: You can recover the A1 mark for a correct	(3)		
	model equation given in part (c) $(0.017)(0.020)^{2.08}$) (1	2.4	
(C)	$a = (0.017)(60)^{-10}$	M1	5.4	
	• $13.333+84.918=98.251 \Rightarrow$ Sean stops in time	MI	3.16	
	• $100-13.333 = 80.000 $ $\alpha a = 84.918 \Rightarrow$ Sean stops in time	Altt (2)	3.2a	
		(3)) marke)	
	ADVICE: Ignore labelling (a), (b), (c) when marking this question			

Note: Give B0 in (a) for $10^{-1.77} = 0.01698...$ without reference to 0.017 in the same part

Note:In their solution to (a) and/or (b) condone writing log in place of log10(a)Way 1M1:See schemeB1:See schemeB1:See scheme(a)Way 2M1:See schemeA1:Starts from $d = kV^n$ (which they do not have to state) and progresses to $log10 d = log10 k + n log10 V$ with an intermediate step in their working.B1*:See scheme(a)Way 3M1:Starts their argument from $log10 d = m log_10 V + c$ or $log10 d = m log_{10} V - 1.77$ A1:Mathematical explanation is seen by showing any of either • $log10 d = m log10 V + c \rightarrow d = 10^{1.77} V^m$ or $d = kV^n$ • $log10 d = m log10 V - 1.77 \rightarrow d = 10^{-1.77} V^m$ or $d = kV^n$ with no errors seen in their workingB1*:See schemeNote:Allow B1 for $log10 0 - 1.77 \rightarrow d = 10^{-1.77} V^m$ or $d = kV^n$ with no errors seen in their workingB1*:See schemeNote:Allow B1 for $log10 0 - 1.77 \rightarrow d = 10^{-1.77} V^m$ or $d = kV^n$ with no errors seen in their workingB1*:See schemeNote:Allow B1 for $log10 0 - 1.77 \rightarrow d = 10^{-1.77} V^m$ or $d = kU^n$ with no errors seen in their workingB1*:See schemeNote:Allow B1 for $log10 d = -1.77 + 2.08 log10 V$ or $log10 d = log10 (0.017) + 2.08 log10 V$ M1:Applies $V = 30$ and $d = 20$ to their model (correct way round)M1:Applies $V = 60$ to their exponential model or their log10 d = log10 (0.017) + 2.08 log10 VNote:Allow k = awrt 0.017 and/or $n = awrt 2.08$ in their final model equationNote:Mod M A0 is a possible	Notes for Question 9		
(a)Way 1M1:See schemeB1*:See schemeB1*:See scheme(a)Way 2M1:See schemeA1:Starts from $d = kV^n$ (which they do not have to state) and progresses to $log_{10} d = log_{10} k + nlog_{10} V$ with an intermediate step in their working.B1*:See scheme(a)Way 3M1:Starts their argument from $log_{10} d = mlog_{10} V + c \text{ or } log_{10} d = mlog_{10} V - 1.77$ A1:Matematical explanation is seen by showing any of either • $log_{10} d = mlog_{10} V + c \rightarrow d = 10^{-177} V^m \text{ or } d = kV^n$ • $log_{10} d = mlog_{10} V - 1.77 \rightarrow d = 10^{-177} V^m \text{ or } d = kV^n$ with no errors seen in their workingB1*:See schemeNote:Allow B1 for $log_{10} 0.017 = -1.77$ or $log 0.017 = -1.77$ (b)M1:Applies $V = 30$ and $d = 20$ to their model (correct way round)M1:Applies $(V, d) = (30, 20)$ or $(20, 30)$ and applies logarithms correctly leading to $n =$ A1: $d = (0.017)V^{2.08}$ or $log_{10} d = -1.77 + 2.08 log_{10} V$ or $log_{10} d = log_{10} (0.017) + 2.08 log_{10} V$ Note:Allow k = awrt 0.017 and/or $n = awrt 2.08$ in their final model equationNote:M0 M1 A0 is a possible score for (b)(c)M1:Applies $V = 60$ to their exponential model or their logarithmic modelM1:Applies $V = 60$ to their exponential model or their d and a correct problem-solving process of either • adding a "thinking distance" and finds their value of dMote: $\frac{1}{75}$ or 48 are examples of acceptable thinking distancesA1ft:Either add	Note:	In their solution to (a) and/or (b) condone writing log in place of \log_{10}	
MI:See schemeA1:See schemeB1*:See scheme(a)Way 2MI:See schemeA1:Starts from $d = kV^n$ (which they do not have to state) and progresses to $log_{10} d = log_{10} k + nlog_{10} V$ with an intermediate step in their working.B1*:See scheme(a)Way 3M1:Starts their argument from $log_{10} d = mlog_{10} V + c$ or $log_{10} d = mlog_{10} V - 1.77$ A1:Mathematical explanation is seen by showing any of either • $log_{10} d = mlog_{10} V + c \rightarrow d = 10^{r} V^m$ or $d = kV^n$ • $log_{10} d = mlog_{10} V - 1.77 \rightarrow d = 10^{-1.77} V^m$ or $d = kV^n$ with no errors seen in their workingB1*:See schemeNote:Allow B1 for $log_{10} 0.17 = -1.77$ or $log 0.017 = -1.77$ (b)M1:Applies $V = 30$ and $d = 20$ to their model (correct way round)M1:Applies $V = 30$ and $d = 20$ to their model logarithms correctly leading to $n =$ A1: $d = (0.017)V^{2:68}$ or $log_{10} d = -1.77 + 2.08 log_{10} V \text{ or } log_{10} d = log_{10} (0.017) + 2.08 log_{10} V$ Note:Allow k a awrt 0.017 and/or $n = awrt 2.08$ in their final model equationNote:MOM 1 A0 is a possible score for (b)(c) $muther indefinition in their d on their value of d in distance?M1:Uses their model in a correct problem-solving process of either• adding a "thinking distance" and finds their value of dNote:\frac{1}{75} or 48 are examples of acceptable thinking distancesA1ft:Either adds 13.3 to their d to find a total stopping distance and gives a correct ft conclusionor finds their d and a co$	(a)	Way 1	
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Note: Allow "Sean stops in time" or "Yes he stops in time" or "he misses the puddle" as relevant	Note:	Allow "Sean stops in time" or "Yes he stops in time" or "he misses the puddle" as relevant	
Conclusions. Note: A mark of M0 M1 A0 is possible in (c)	Note	conclusions. A mark of M0 M1 A0 is possible in (c)	