

Q	Marking instructions	AO	Marks	Typical solution
13(a)	Explains that A is the number of points at the start of the level. Must be in context. Accept 'initial points' or 'maximum points'	3.2a	E1	The points available at the start of the level
	Subtotal		1	

Q	Marking instructions	AO	Marks	Typical solution
13(b)	Takes natural log of both sides and correctly uses addition law of logs	1.1a	M1	$P = Ae^{kt}$ $\ln P = \ln Ae^{kt}$
	Completes reasoned argument to show given result	2.1	R1	$\ln P = \ln A + \ln e^{kt}$ $\ln P = \ln A + kt$
	Subtotal		2	

Q	Marking instructions	AO	Marks	Typical solution
13(c)	States $k = -0.08$	2.2a	B1	Gradient = $k \Rightarrow k = -0.08$ $\ln A = 5.30$ $A = e^{5.30}$ $A = 200$
	Equates $\ln A$ to 5.30	2.2a	M1	
	Obtains $A = \text{AWRT } 200$	1.1b	A1	
	Subtotal		3	

Q	Marking instructions	AO	Marks	Typical solution
13(d)	Substitutes their values of A and k appropriately into the model PI by $5.3 - 0.08t$	3.4	M1	$200e^{-0.08t} = 20$ $e^{-0.08t} = \frac{1}{10}$ $-0.08t = \ln \frac{1}{10}$ $t = 28.782$ $\therefore \text{time is } 29 \text{ seconds}$
	Obtains a correct equation in t	1.1b	A1	
	Obtains $t = 28$ or AWRT 29	1.1b	A1	
	Subtotal		3	

	Question 13 Total		9	
--	-------------------	--	---	--