![AQA Realising potential logo]
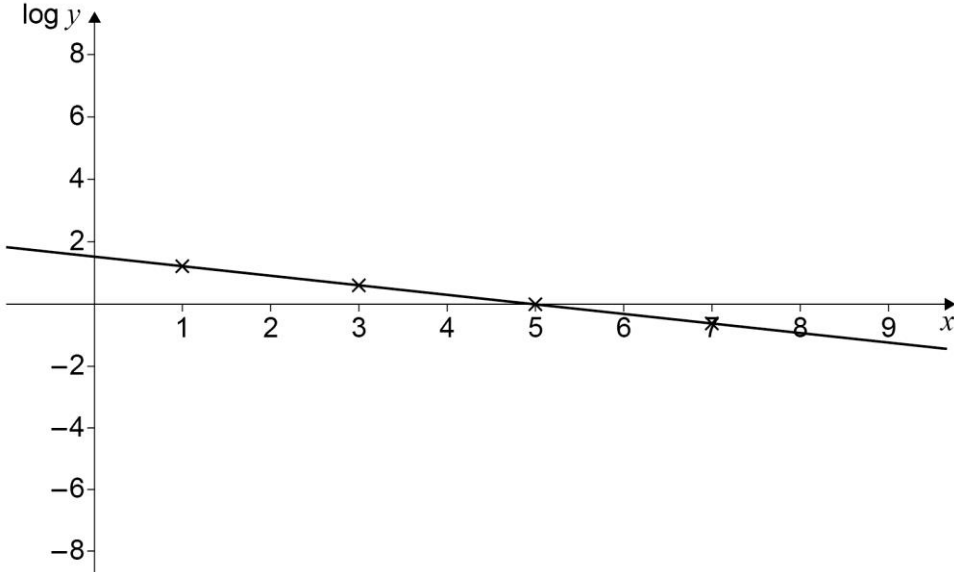
AS and A-level MATHS

Ex ponentials II

Mark Sch eme

Specification content coverage: F5, F6, F7

Question	Solutions	Mark
1	$x = \dfrac{1}{2}\left(\dfrac{\log 6}{\log 4} - 5 \right)$	1
2	$(x + 2) \log 3 = \log 0.4$	1
	$x = \dfrac{\log 0.4}{\log 3} - 2$	1
	$x = -2.83$	1
3 (a)	$50 + 35e^0 = 85°C$	1
3 (b)	Rate of change $= (35 \times -0.8)e^{-0.8t} = -28e^{-0.8t}$	1
	when $t = 2$ rate of change $= -28e^{-0.8 \times 2} = -5.65$	1
3 (c)	$60 = 50 + 35e^{-0.8t}$	1
	$\ln\left(\dfrac{10}{35}\right) = -0.8t$	1
		1
	$t = 1.565...\text{mins} = 94$ seconds (nearest second)	
3 (d)	For large values of t, $T \approx 50$	1
	this is too high for a room temperature	1

4 (a)	Plot (for example) $\log y$ against x	
		1

x	1	3	5	7
$\log y$	1.25	0.646	0.0453	−0.558

	k in range 30 – 36	1
	b in range 0.45 – 0.55	1
4 (b)	y in range 1.9 – 2.3	1
5	$240 = 200e^{2k}$	1
	$2k = \ln\left(\dfrac{240}{200}\right)$	1
		1
	$k = \dfrac{\ln\left(\dfrac{6}{5}\right)}{2}$ $\qquad$ (0.0912)	
		1
	$y = 200e^{12\ln\frac{\left(\frac{6}{5}\right)}{2}}$ or $240e^{10\ln\frac{\left(\frac{6}{5}\right)}{2}}$	1
	$y = £597.20$	

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6	$1.2 = 1.75e^{5k}$	1
	$5k = \ln\left(\dfrac{1.2}{1.75}\right)$	1
	$k = \ln\dfrac{\left(\dfrac{24}{35}\right)}{5}$ (-0.0755)	1
	$0.8 = 1.75e^{(t+5)\ln\frac{\left(\frac{24}{35}\right)}{5}}$ or $0.8 = 1.2e^{t\ln\frac{\left(\frac{24}{35}\right)}{5}}$	1
	$t = 10.37\ldots$ hours or $t = 5.37\ldots$ hours found	1
	$t = 5$ hours 22 mins or 322 mins (nearest minute)	1 1
7	gradient $= (10 - 2)/(3 - 1)$ $(= 4)$	1
	$\log y - 2 = 4(\log x - 1)$	1
	$\log y = 4\log x - \log 100$	1
	$y = \dfrac{x^4}{100}$	1
	$y = \dfrac{10^4}{100} = 100$	1

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