Question			Answer	Marks	AO	Guidance	
11	(a)		$\log_{10}S = \log_{10}(ab^t)$ $\log_{10}S = \log_{10}a + \log_{10}b^t$	**M1**	**3.3**	Attempt to show reduction to linear form	Introduce logs on both sides, and correctly split to the sum of two terms
			$\log_{10}S = t\log_{10}b + \log_{10}a$	**A1**	**3.3**	Obtain correct equation	Condone no base; any bases seen must be 10 **A0** for $\log_{10}bt$ unless previously seen as $t\log_{10}b$
			which is of the form $Y = mX + c$	**A1**	**3.3**	Link to equation of straight line	Could instead refer to linear relationship
				[3]			If **M0** then allow **SC B1** for statement such as S against t is an exponential function so log$S$ against t will give a straight line
11	(a)		**Alternative method**				
			$\log_{10}S = mt + c$ $S = 10^{mt + c}$	**M1**		Attempt equation of straight line, and attempt expression for S	Must be using $\log_{10}S$ against t Must use base of 10
			$S = 10^{mt} \times 10^c$	**A1**		Correctly split into two terms	
			which is of the form $S = ab^t$	**A1**		Link to exponential model	

11	**(b)**		$m = \log_{10} b = 0.06$ so $b = 10^{0.06} = 1.15$ $c = \log_{10} a = 2.08$ so $a = 10^{2.08} = 120$	**B1** **B1** **[2]**	**2.1** **2.1**	Link gradient of line of best fit to linear form and confirm $b \approx 1.15$ Allow m in range [0.055, 0.065] Link intercept of line of best fit to linear form and confirm $a \approx 120$ Allow c in range [2.075, 2.085]	Or $\log_{10} 1.15 = 0.06$ and compare to gradient Or $\log_{10} 120 = 2.08$ and compare to intercept Plotted points are linear so may not see line of best fit drawn If substituting into formula (either given model or linear reduction) then **B1** for finding and verifying any point that would be on the line of best fit **B1** for finding and verifying a second point
11	**(c)**		$S = 120 \times 1.15^{7}$ predicted sales are 319 items	**M1** **A1** **[2]**	**3.4** **3.4**	Substitute $t = 7$ into given model Conclude with integer value	soi Accept 320 items

11	**(d)**	**(i)**	GP with $a = 138$ and $r = 1.15$	**B1**	**3.1b**	State or imply sum of GP with a as 120 or 138, and r as 1.15	Could be implied by attempt to use GP sum formula (but not just n^{th} term) – allow slip as long as clearly sum being considered
			$\frac{138(1-1.15^t)}{1-1.15} = 70000$	**M1***	**3.1b**	Attempt sum of GP, with $a = 120$ or 138 and $r = 1.15$, related to 70000	Must be correct sum formula May have n not t throughout Allow $r = 1.15^{t+1}$ with $a = 120$ but this is **B1 M1** only, as not a valid method)
			$1.15^t = 77.087$	**M1 dep***	**1.1**	Attempt to rearrange equation as far as $1.15^t =$	Must now have $a = 138$ (or equiv) Allow sign errors only Allow T&I as not DR
			$t = 31.088\ldots$ hence 32 months	**A1**	**3.2a**	Obtain 32 ('months not required')	www If 32 given as **answer only** then allow full marks; if any method shown then mark using the main scheme
				[4]			Allow BOD with any inequality signs

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11	(d)	(ii)	Unlikely to be reliable as sales may not continue in same pattern as market could become saturated	B1 [1]	3.2b	State or imply that the model is unlikely to be valid, with a sensible reason why – could refer to reason why pattern may not continue or extrapolation not being reliable	Decrease in demand Increase in competition No values beyond $t = 6$ so pattern unknown Reason why sales are likely to level off / plateau or unlikely to continue to increase ('other factors' not enough) Item sales may vary according to season