

Question		Answer	Marks	Part Marks and Guidance	
1	(a)	1	1		
	(b)	$\frac{1}{9}$ isw	3	Or M1 for $9^{\frac{1}{2}}$ oe And A1 for 9^{-1} Or if evaluation attempted B1 for 729 and 243 and B1 for 27 seen in correct context	

2	(a)	8.5×10^{-6} , 6.8×10^{-5} , 8.6×10^5 , 5.6×10^8	2	B1 for one value misplaced	ie if any one value is covered, are the other three in order?
	(b)	107 to 108 or 1.07×10^2 to 1.08×10^2	2	M1 for $(1.4 \times 10^{11}) \div (1.3 \times 10^9)$ oe	

3	(a)	6	1		
	(b)	$\frac{1}{2}$ or equivalent fraction or 0.5	2	M1 for $\frac{1}{8^p}$ soi or $\sqrt[3]{8}$ soi	eg $\pm \frac{1}{8}$, $\pm \frac{1}{64}$, ± 2 , $-\frac{1}{2}$, $\frac{1}{\sqrt[3]{8}}$, 2^{-1} all get M1

4	(a)	$2 \frac{11}{12}$	1		
	(b)	0.015625 isw	1		
	(c)	125	1	Condone 125.0	
	(d)	3.458×10^8	2	B1 for 345800000 soi Or SC1 for 3.458×10^8 rot	

5	(a)	(i)	1		
		(ii)	1		
	(b)	Single ruled line within overlay	2	Any length M1 for any 2 points plotted or implied by eg line through (0, 0) and (1, 55)	Line, if it were to be extended, must stay within tramlines. $\frac{1}{2}$ square tolerance
	(c)	A1, 30 - 50	1 + 1	If 0 scored M1 for 330 or 290	
	(d)	3 hrs 20 mins	1	Allow anything (and any format) from 3h 10m to 3h 30m O Or FT their crossing point ± 2 small squares, 12mins	Condone 3:1(0) but not 3.1, however 3.2 to 3.5 are in range so OK If lines (nearly) parallel allow the mark for 'No crossing point'. oe

6	(a)		9	1		
	(b)		$2.56 \text{ to } 2.6 \times 10^8$	2	B1 for 256000000 to 260000000 oe seen	

7	(a)		1875	1		
	(b)		13.88 to 14	2	M1 for evidence of at least 2 values of t substituted.	

8	(a)		$9a^6b^8$ final answer	3	B1 for each of 9, a^6 and b^8 where final answer is in correct form Or SC1 for incorrect form with at least one of 9, a^6 and b^8 correct	eg $9a^6 + b^8$ scores SC1
	(b)		6 nfw	3	B2 if 4 and (-2) seen Or B1 if 4 or (-2) seen	As answers to f(3) and f(1), eg $1 - 3 = -2$ scores 0
	(c)		$\frac{1}{5}$ or 0.2	2	B1 for $\frac{1}{125^{\frac{1}{3}}}$ or $\frac{1}{\sqrt[3]{125}}$ or 5^{-1} or $\sqrt[3]{125}$ or $\sqrt[3]{-125}$ or 5 or -5 or $-\frac{1}{5}$	
	(d)		$4\sqrt{6}$ or $4\sqrt{2}\sqrt{3}$ final answer	2	B1 for $\frac{24}{\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}}$ or better	

9	(a)	(i)	1	1		
		(ii)	$\frac{1}{64}$	2	M1 for 64, -64, $\frac{1}{4^3}$, $-\frac{1}{4^3}$, $\frac{1^3}{4}$, $-\frac{1^3}{4}$, $-\frac{1}{64}$	NB isw
	(b)	(i)	3	2	B1 for $9^{\frac{1}{2}}$ or $\sqrt{\quad}$ seen	
		(ii)	96	3	B1 for 144 or 12^2 soi M1dep for <i>their</i> $12^2 \times \frac{2}{3}$ oe	

10	(a)		$4\frac{7}{12}$ final answer	1		
	(b)		3125	1		

11	(a)	$6a + 6b$ cao	1	condone with brackets	
	(b)	$3b$ cao	1		
	(c)	$6a + \textit{their } 3b$	1		
	(d)	$3b - 2a$	2	M1 for MC + CN	M1 implied by $3b + 2a$ or an unsimplified version of the correct answer allow $\begin{pmatrix} 3b \\ -2a \end{pmatrix}$ for 2 marks if "form" penalised previously

12	(a)	(i)	1		
		(ii)	1		
	(b)	(i) 10	1		
		(ii) r^9	1		
	(c)	(i)	1		
		(ii)	2		

13	(a)	186 000	1		
	(b)	$4.5[0..] \times 10^{13}$	2	M1 for correct substitution of all values into formula or for answer figs 45	For M1 , condone any errors in conversion to ordinary numbers
	(c)	$c = \sqrt{\frac{E}{m}}$ or $c = \frac{\sqrt{E}}{\sqrt{m}}$ or $c = \sqrt{E \div m}$	2	B1 for correct form but with 'c =' omitted or for $c^2 = \frac{E}{m}$ Or SC1 for $c = \frac{\sqrt{E}}{m}$	