Question Number	Scheme	Marks
9 (i)	$2\log_3(4x+5)-\log_3(x+3)=2 \Rightarrow \log_3\dfrac{(4x+5)^2}{(x+3)}=2$	M1, M1
	$\Rightarrow \dfrac{(4x+5)^2}{(x+3)}=9$	A1
	$\Rightarrow 16x^2+31x-2=0$	
	$(16x-1)(x+2)=0 \Rightarrow x=\dfrac{1}{16}$ only	dM1, A1
		(5)
(ii) (a)	States that $\log a+\log b=\log(ab)$ or else uses rule and proceeds from given equation $\log a+\log b=\log(a+b)$ to $\log ab=\log(a+b)$	B1
	Deduces $ab=a+b \Rightarrow ab-a=b \Rightarrow a(b-1)=b \Rightarrow a=\dfrac{b}{b-1}$ *	M1, A1*
(b)	States either $b>1$ or $b\neq 1$ as a would not be defined	B1
	$b>1$ as logs only exist for positive numbers	B1
		(5)
		(10 marks)

Question Number	Scheme	Marks
4 (a)	-35	B1
		(1)
(b)	Attempts $f\left(\pm\frac{2}{3}\right)=0 \rightarrow \left(\frac{2}{3}-3\right)\left(3\left(\frac{2}{3}\right)^2+\left(\frac{2}{3}\right)+a\right)-35=0$	M1
	$-\frac{7}{3}(2+a)=35 \Rightarrow a=-17$ *	A1*
		(2)
(c)	$f(x)=(x-3)(3x^2+x-17)-35=3x^3-8x^2-20x+16$	B1
	$=(3x-2)(x^2-2x-8)$	M1 A1
	$=(3x-2)(x+2)(x-4)$	M1 A1
		(5)
		(8 marks)

Question Number	Scheme	Marks
6 (a)	$2\log_4(x+3)=\log_4(x+3)^2$ or $\frac{1}{2}=\log_4 2$ o.e	B1
	Combines two terms e.g. $2\log_4(x+3)+\log_4 x=\log_4 x(x+3)^2$	M1
	e.g. $x(x+3)^2=2(4x+2)$	A1
	e.g. $x(x^2+6x+9)=8x+4\Rightarrow x^3+6x^2+x-4=0$ *	A1*
		(4)
(b) (i)	$x^3+6x^2+x-4=(x+1)(x^2+5x-4)$	M1
	$x=\frac{-5\pm\sqrt{25+16}}{2}\Rightarrow x=\frac{-5\pm\sqrt{41}}{2}$	dM1 A1
		(3)
(ii)	$x=\frac{-5+\sqrt{41}}{2}$	B1
		(1)
		(8 marks)

Question Number	Scheme	Marks
5. (i)	$\log_a x+\log_a 3=\log_a 27-1 \Rightarrow \log_a\frac{3x}{27}=-1$	M1A1
	$\Rightarrow \frac{3x}{27}=a^{-1}$	dM1
	$\Rightarrow x=9a^{-1}$ or $x=\frac{9}{a}$	A1 **(4)**
(ii)	$p^2-7p+12=0$ and attempt to solve to give $p=$ or $\log_5 y=$	M1
	p (or $\log_5 y$) = 3 or 4	B1
	$y=5^3$ or 5^4	M1
	y = 125 and 625	A1 **(4)**
		8 marks

Question Number	Scheme	Marks
9 (a)	Substitute $t=4$ in $3\log_2(t+4)-2\log_2(t-2) \Rightarrow 3\log_2 8-2\log_2 2$	M1
	$=3\times3-2\times1=7$ ✓	A1
		(2)
(b)	One correct log law applied. E.g $3\log_2(t+4)=\log_2(t+4)^3$	M1
	Correctly removes logs $\dfrac{(t+4)^3}{(t-2)^2}=2^7$	A1
	$t^3+12t^2+48t+64=128\left(t^2-4t+4\right) \Rightarrow t^3-116t^2+560t-448=0$	A1*
		(3)
(c)	$t^3-116t^2+560t-448=(t-4)\left(t^2+.....\pm112\right)$	M1
	$t^3-116t^2+560t-448=(t-4)\left(t^2-112t+112\right)$	A1
	Solves their $t^2-112t+112$ and finds at least the value of t greater than 2	dM1
	$t=4,\ 56+12\sqrt{21}$	A1
		(4)
		Total 9

Question Number	Scheme	Marks
6. (i)	$2\log_2(4-x)=3+\log_2\left(\dfrac{x+11}{2}\right)$	
	One correct law applied – examples (not exhaustive): $2\log_2(4-x)=\log_2(4-x)^2$, $\log_2\left(\dfrac{x+11}{2}\right)=\log_2(x+11)-\log_2 2$, $3=\log_2 8$	B1
	Correctly combines two original terms e.g. $2\log_2(4-x)=\log_2(4x+44)$	M1
	Correct equation not involving logs $(4-x)^2=4x+44$	A1
	$x^2-12x-28=0 \Rightarrow (x-14)(x+2)=0 \Rightarrow x=\ldots$	dM1
	$\Rightarrow x=-2$ only	A1
		(5)
(ii)	Combines $y=6\times3^x$ and $y=3^{2x+1} \Rightarrow 3^{2x+1}=6\times3^x$	M1
	$\Rightarrow 3^x\times3=6$	
	$\Rightarrow 3^x=2 \Rightarrow x=\log_3 2$	dM1, A1
	$y=6\times3^{\log_3"2"}=6\times"2"$	ddM1
	coordinates of P are: $\left(\log_3 2,\ 12\right)$	A1
		(5)
		(10 marks)

Question Number	Scheme	Marks
6(a)	States or uses $M=(5,4)$ **or** grad $AB=\frac{1}{3}$ o.e.	B1
	States or uses $M=(5,4)$ **and** grad $AB=\frac{1}{3}$ o.e.	B1
	Equation of l is $y-4=-3(x-5)$	M1
	$y=-3x+19$	A1
		(4)
(b)	$k=-2$	B1 ft
		(1)
(c)	Attempts radius or radius ^{2} E.g. $(11-7)^2+(6--2)^2$	M1
	States $(x-7)^2+(y+'2')^2=(11-7)^2+(6--2)^2$	dM1
	$(x-7)^2+(y+2)^2=80$	A1
		(3)
		(8 marks)