Question Number	Scheme	Marks
6(a)	Attempts line with gradient -2 and point $(4,-1)$ $y+1=-2(x-4)$ $y=-2x+7$	M1 A1 **(2)**
(b)	$y=\frac{1}{2}x$ meets $y=-2x+7$ when $\frac{1}{2}x=-2x+7\Rightarrow x=\frac{14}{5}, y=\frac{7}{5}$ oe	M1 A1
	Attempts $r^2=\left(4-"\frac{14}{5}"\right)^2+\left(-1-"\frac{7}{5}"\right)^2=\frac{36}{5}$ oe	dM1 A1
	$(x-4)^2+(y+1)^2=\frac{36}{5}$ oe	A1 **(5)** **(7 marks)**

(a)

M1 Attempts the equation of the line with gradient -2 and point $(4,-1)$
Condone a slip on one of the signs of the $(4,-1)$. For example $y-1=-2(x-4)$
If the form $y=mx+c$ is used they must proceed as far as $c=...$

A1 $y=-2x+7$

……

Alt (a)

M1 Differentiates implicitly the equation of the circle $(x-4)^2+(y+1)^2=r^2\Rightarrow 2(x-4)+2(y+1)\frac{dy}{dx}=0$
and substitutes in $\frac{dy}{dx}=\frac{1}{2}$

A1 $y=-2x+7$

……

(b)

M1 Attempts to find where $y=\frac{1}{2}x$ meets their $y=-2x+7$. Expect to see candidates proceed to $x=...$

A1 $\left(\frac{14}{5},\frac{7}{5}\right)$ or any other form eg $(2.8,1.4)$ or $x=\frac{14}{5}, y=\frac{7}{5}$

dM1 Attempts to find the distance between their $\left(\frac{14}{5},\frac{7}{5}\right)$ and $(4,-1)$ using Pythagoras' theorem. Look for an attempt to subtract the coordinates, square and add. It is dependent on the previous method mark. Condone a slip on one of the signs.

A1 For $(r=)\ \sqrt{\frac{36}{5}}$ or $(r^2=)\ \frac{36}{5}$ oe

A1 $(x-4)^2+(y+1)^2=\frac{36}{5}$ or $(x-4)^2+(y+1)^2=7.2$ or $5(x-4)^2+5(y+1)^2=36$ only

……

Alt (b)

M1 Substitutes $y=\frac{1}{2}x$ into $(x-4)^2+(y+1)^2=r^2$, multiplies out and rearranges $\ldots=0$

A1 $5x^2-28x+68-4r^2=0$ or $5y^2-14y+17-r^2$

dM1 Uses the discriminant $b^2-4ac=0$ and proceeds to $r=\ldots$ or $r^2=\ldots$ It is dependent on the previous method mark.

A1 For $r=\sqrt{\frac{36}{5}}$ or $r^2=\frac{36}{5}$

A1 $(x-4)^2+(y+1)^2=\frac{36}{5}$ oe eg $(x-4)^2+(y+1)^2=7.2$ or $5(x-4)^2+5(y+1)^2=36$

Note: Candidates who substitute $y=-2x+"7"$ into $(x-4)^2+(y+1)^2=r^2$ and attempt the discriminant approach will score 0 marks in (b)

Question Number	Scheme	Marks
7. (i)	$\log_a\left(\frac{\sqrt{a}}{b}\right)=\frac{1}{2}\log_a a-\log_a b=\frac{1}{2}-k$	M1 A1 **(2)**
(ii)	$\frac{\log_a a^2b}{\log_a b^3}=\frac{2\log_a a+\log_a b}{3\log_a b}=\frac{2+k}{3k}$	M1 A1 **(2)**
(iii)	$\sum_{n=1}^{50}\left(k+\log_a b^n\right)=50k+\left(1k+2k+3k+...+50k\right)$ or $\left(2k+3k+4k+...+51k\right)$	
	Uses the sum formula an AP with $n=50, d=k$	M1
	$S=50k+\frac{50}{2}\left(2k+49k\right)$ $\quad$ $S=\frac{50}{2}\left(2k+51k\right)$	A1
	$=1325k$	A1 **(3)** **(7 marks)**

(i)

M1 Uses log laws to achieve $\frac{1}{2}\log a-\log b$ or eg $0.5\log a-\log b$

A1 $\frac{1}{2}-k$ oe

(ii)

M1 Uses correct log laws on the numerator or denominator. Score for $\frac{...}{3\log b}$ or $\frac{...}{3k}$ or sight of the numerator $2\log a+\log b$ which does not have to be part of a fraction (May be implied by $2+k$)

A1 $\frac{2+k}{3k}$ or $\frac{2}{3k}+\frac{1}{3}$ do not isw

(iii)

M1 **Either** uses the sum formula for an AP in terms of *k* on part or all of the expression with $n=50, d=k, a=k$ or $n=50, d=k, a=2k$. It is sufficient to see the terms substituted in for this mark.

$\sum_{n=1}^{50}nk=\frac{50}{2}\left(2k+49k\right)$ or $\sum_{n=1}^{50}(k+nk)=\frac{50}{2}(2k+51k)$.

You may see the equivalent sum $\frac{n}{2}(a+L)$ eg $\frac{50}{2}(k+50k)$

Or uses the sum formula for an AP in terms of $\log_a b$ on part of the expression with

$n=50, d=\log b, a=\log b$

$\sum_{n=1}^{50}\log b^n=\frac{50}{2}\left(2\log b+49\log b\right)$

You may see the equivalent sum $\frac{n}{2}(a+L)=\sum_{n=1}^{50}\log b^n=\frac{50}{2}\left(\log b+50\log b\right)$