Question	Scheme	Marks
6(a)	Way 1: Eqn is $(x-3)^2+(y+4)^2-9-16+k=0$	M1
	So radius must be 4 $\Rightarrow 25-k=16$	M1
	$\Rightarrow k=9$	A1
		(3)
	Way 2: $y=0 \Rightarrow x^2-6x+k=0$ has one solution	M1
	$\Rightarrow 6^2-4\times1\times k=0$	M1
	$\Rightarrow k=9$	A1
		(3)
(b)	C intersects x axis at (3,0)	B1
	Intersects y axis when $y^2+8y+9=0 \Rightarrow y=...$ or $y="-4"\pm\sqrt{"16"-"9"}$ Or uses base of triangle is $2\sqrt{"16"-"9"}$	M1
	Area $RST=\frac{1}{2}\times2\sqrt{7}\times3$	M1
	$=3\sqrt{7}$	A1
		(4)
		(7 marks)

Notes:

(a) Way 1

M1: Attempts to complete square on both terms. May be implied by a centre of $(\pm3,\pm4)$

M1: Uses a valid method to find k, e.g. y coordinate of centre and sets $"9"+"16"-k=|\text{their “4”}|^2$. Can be implied by sight of $k=$ (their x coordinate of centre)^2

A1: Correct value for k

Way 2

M1: Substitutes equation for x axis ($y=0$) into the circle equation.

M1: Sets the discriminant of the resulting quadratic to 0 (since as a tangent there is only one point of intersection).

A1: Correct value for k

(b)

B1: Identifies or implies the coordinates where circle touches the x axis. Probably from having completed the square on the equation. The 0 ordinate need not be seen and may be seen anywhere.

M1: Attempts the y coordinates of the intersections with the y axis, or the distance between these two points. E.g. may set $x=0$ in the circle equation, or may use centre is 3 units from y axis etc.

M1: Uses a correct method for the area of the triangle RST. Longer methods are possible, such as use of cosine rule to find an angle in the triangle, followed by $\frac{1}{2}ab\sin C$, or may use the shoelace method, e.g. $\frac{1}{2}\begin{vmatrix}3 & 0 & 0\\ 0 & -4+\sqrt{7} & -4-\sqrt{7}\end{vmatrix}=\frac{1}{2}\left|3\left(-4+\sqrt{7}\right)+0+0-0-0-3\left(-4-\sqrt{7}\right)\right|$

A1: Correct answer.

Question	Scheme	Marks
7(a)	$2=\log_3 3^2$ oe seen or implied by working	**B1**
	$3\log_3(2x-1)=\log_3(2x-1)^3$ or $\log_3"3^2"+\log_3(14x-25)=\log_3\left("3^2"(14x-25)\right)$	**M1**
	$\Rightarrow(2x-1)^3=9(14x-25)$	**dM1**
	$\Rightarrow 8x^3-12x^2+6x-1=126x-225$ $\Rightarrow 8x^3-12x^2-120x+224=0\Rightarrow 2x^3-3x^2-30x+56=0$*	**A1***
		(4)
(b)	$2(\pm4)^3-3(\pm4)^2-30(\pm4)+56=...$	**M1**
	$2(-4)^3-3(-4)^2-30(-4)+56=-128-48+120+56=0$ Hence −4 is a root of the equation.	**A1**
		(2)
Alt (b)	$2x^3-3x^2-30x+56=(x\pm4)\left(2x^2+...\pm14\right)$	**M1**
	$2x^3-3x^2-30x+56=(x+4)\left(2x^2-11x+14\right)$ so −4 is a root of the equation.	**A1**
		(2)
(c)	$2x^3-3x^2-30x+56=0\Rightarrow(x+4)\left(2x^2+...\pm14\right)=0$	**M1**
	$(x+4)\left(\underline{2x^2-11x+14}\right)=0$	**A1**
	$(x+4)(2x-7)(x-2)=0\Rightarrow x=...$	**dM1**
	(Equation not defined for $x=-4$ so) solutions are 2 and $\frac{7}{2}$	**A1**
		(4)
		(10 marks)

Notes:

(a)

B1: States or implies $2=\log_3 3^2$ or equivalent. May be gained via $\log_3 f(x)=2\Rightarrow f(x)=9$

M1: Uses a correct log law, either power law on $3\log_3(2x-1)=\log_3(2x-1)^3$ or sum law on $\log_3"3^2"+\log_3(14x-25)=\log_3\left("3^2"(14x-25)\right)$ or equivalent work (e.g. difference law if combining the two log terms on one side first).

dM1: Uses correct log work to remove the logs. Allow slips, but all log work must have been correct.

A1*: Expands and simplifies to the given cubic. Must see an intermediate step between the factorised sides and final answer.