Question number	Scheme	Marks
9 (a)	$a=-1,\ b=-2$	B1,B1 [2]
(b)	Gradient of $l_1=-2,\Rightarrow$ Gradient of $l_2=\frac{1}{2}$	B1,B1
	$180=(x+1)^2+(y-6)^2$	M1
	$\frac{1}{2}=\frac{y-6}{x+1}\Rightarrow x=2y-13$	M1
	Solves simultaneous equations; $180=([2y-13]+1)^2+(y-6)^2\Rightarrow 0=5y^2-60y$	M1M1
	or $\quad 180=(x+1)^2+\left(\frac{1}{2}x+\frac{13}{2}-6\right)^2\Rightarrow 0=x^2+2x-143=0$	
	$y=0,\ y=12\Rightarrow x=-13,\ x=11\quad$ or $\quad x=-13,\ x=11\Rightarrow y=0,\ y=12$ Coordinates are $(-13,\ 0)$ and $(11,\ 12)$	A1A1 [8]
(c)	Area of triangle PQR $PQ=\sqrt{(6+2)^2+(-1-3)^2}=4\sqrt{5}$	M1
	Area $=\frac{1}{2}\times 4\sqrt{5}\times 6\sqrt{5}=60$ (units)^2	M1A1 [3]
	ALT Area $=\frac{1}{2}\begin{pmatrix}-13 & -1 & 3 & -13\\ 0 & 6 & -2 & 0\end{pmatrix}=\frac{1}{2}(-78+2+0-0-18-26)=-60$	{M1}{M1}
	$\Rightarrow 60$ (units)^2	{A1} [3]
(d)	Coordinates of R required are $(-13,\ 0)$	
	$\angle RPQ=90^\circ$ so RQ is a diameter	
	$\left(\frac{-13+3}{2},\frac{0-2}{2}\right)\Rightarrow(-5,\ -1)$	M1A1 [2]
		Total 15 marks
(a) **B1** **B1**	 $a=-1$ $b=-2$	

(b)	
B1	Gradient of $l_1 = -2$
B1	Gradient of $l_2 = \frac{1}{2}$
M1	Use of $PR = 6\sqrt{5}$ to obtain an equation
M1	Use of gradient of the perpendicular to obtain an equation
M1	Solves simultaneously
M1	Simplifies to $5y^2 - 60y = 0$ or $x^2 + 2x - 143 = 0$
A1	All 4 values identified 0, 12, –13, 11
A1	$(11,\ 12)$ and $(-13,\ 0)$ (must be paired correctly and if written as a coordinate then must be in the correct order)
(c)	
M1	$PQ = 4\sqrt{5}$
M1	Use of Area $= \frac{1}{2} \times PQ \times PR$
A1	60 (units)^2
ALT	
M1	Use of Area $= \frac{1}{2}\begin{pmatrix} -13 & -1 & 3 & -13 \\ 0 & 6 & -2 & 0 \end{pmatrix}$ ft R provided $e < 0$
M1	$\frac{1}{2}(-78 + 2 + 0 - 0 - 18 - 26)$ ft R provided $e < 0$
A1	60 (units)^2
(d)	
M1	$\left(\frac{-13+3}{2}, \frac{0-2}{2}\right)$ ft R provided $e < 0$
A1	$(-5,\ -1)$