Question Number	Scheme	Notes	Marks
6.	$\mathbf{A}=\begin{pmatrix}2 & 3\\ 1 & -4\end{pmatrix}$; $A: R(3p-13,\ p-4) \mapsto R'(7,-2)$		
(a) **Way 1**	$\left\{\begin{pmatrix}x_{R'}\\ y_{R'}\end{pmatrix}=\begin{pmatrix}2 & 3\\ 1 & -4\end{pmatrix}\begin{pmatrix}3p-13\\ p-4\end{pmatrix}=\right\}$	Correct method of multiplying out either $\begin{pmatrix}2 & 3\end{pmatrix}\begin{pmatrix}3p-13\\ p-4\end{pmatrix}$ or $\begin{pmatrix}1 & -4\end{pmatrix}\begin{pmatrix}3p-13\\ p-4\end{pmatrix}$ to give a linear expression in terms of p for either $x_{R'}$ or $y_{R'}$ **Note:** Allow one slip in their multiplication	M1
	$=\begin{pmatrix}2(3p-13)+3(p-4)\\ 1(3p-13)-4(p-4)\end{pmatrix}$		
	• $2(3p-13)+3(p-4)=7 \Rightarrow p=...$ • $1(3p-13)-4(p-4)=-2 \Rightarrow p=...$	**dependent on the previous M mark** Solves either their $x_{R'}=7$ or their $y_{R'}=-2$ to give $p=...$	dM1
	$\{9p-38=7$ or $-p+3=-2 \Rightarrow\}$ $p=5$	$p=5$	A1
			(3)
(a) **Way 2**	$\{\mathbf{AR}=\mathbf{R}' \Rightarrow \mathbf{R}=\mathbf{A}^{-1}\mathbf{R}' \Rightarrow\}$		
	$\mathbf{R}=\frac{1}{-8-3}\begin{pmatrix}-4 & -3\\ -1 & 2\end{pmatrix}\begin{pmatrix}7\\ -2\end{pmatrix}=\begin{pmatrix}2\\ 1\end{pmatrix}$	Applies $\mathbf{A}^{-1}\begin{pmatrix}7\\ -2\end{pmatrix}$ to find the value for either x_R or y_R **Note:** Allow one slip in finding $\mathbf{A}^{-1}$	M1
	• $3p-13=2 \Rightarrow p=...$ • $p-4=1 \Rightarrow p=...$	**dependent on the previous M mark** Solves either $3p-13=$ their x_R or $p-4=$ their y_R to give $p=...$	dM1
	$p=5$	$p=5$	A1
			(3)
(a) **Way 3**	$\{\mathbf{AR}=\mathbf{R}' \Rightarrow\}$ $\begin{pmatrix}2 & 3\\ 1 & -4\end{pmatrix}\begin{pmatrix}a\\ b\end{pmatrix}=\begin{pmatrix}7\\ -2\end{pmatrix}$	Correct method of applying $\begin{pmatrix}2 & 3\\ 1 & -4\end{pmatrix}\begin{pmatrix}a\\ b\end{pmatrix}=\begin{pmatrix}7\\ -2\end{pmatrix}$ to form a pair of simultaneous equations and attempts to find either $a=...$ or $b=...$ **Note:** Allow one slip in their multiplication	M1
	$2a+3b=7$ $a-4b=-2$ $\Rightarrow a=2$ or $b=1$		
	• $3p-13=2 \Rightarrow p=...$ • $p-4=1 \Rightarrow p=...$	**dependent on the previous M mark** Solves either $3p-13=$ their a or $p-4=$ their b to give $p=...$	dM1
	$p=5$	$p=5$	A1
			(3)
(b) **Way 1**	$\{R(3(5)-13,\ 5-4)=R(2,1)\}$ $\{\text{Area}(ORS)=\}$ $\frac{1}{2}(7)("2")$	A correct method for finding their x_R **and** applies $\frac{1}{2}(7)(\text{their } x_R)$	M1
	$=7$ (units)^2	7	A1 **cao**
			(2)
(c)	$\{\text{Area}(OR'S')=\}$ $\lvert 2(-4)-3(1)\rvert \times (7)$	$\pm(2(-4)-3(1)) \times$ (their area(ORS))	M1
	$=$ 77	Correct answer of 77, which must be positive Only allow follow through of the value for $11\times$ their positive answer to (b)	A1 ft
			(2)
			7

Question Number	Scheme	Notes	Marks
6. (b) **Way 2**	{Area (ORS)} $= \frac{1}{2}\begin{vmatrix} 0 & 2 & 0 & 0 \\ 0 & 1 & 7 & 0 \end{vmatrix} = \frac{1}{2}\lvert(0+14+0)-(0+0+0)\rvert$	A correct method for finding their $R(2, 1)$ with a complete applied method for finding area(ORS) using $S(0, 7)$ and their $R(2, 1)$	M1
	$= 7$ (units)^2	7	A1 **cao**
			(2)

	Question 6 Notes	
6.	**Note**	$ORS \mapsto OR'S' \Rightarrow \begin{pmatrix} 0 & 2 & 0 \\ 0 & 1 & 7 \end{pmatrix} \mapsto \begin{pmatrix} 0 & 7 & 21 \\ 0 & -2 & -28 \end{pmatrix}$
(b) **Way 1**	**Note**	A correct method for finding their x_R includes any of • $x_R = 3("5") - 13 = 2$, where $p = "5"$ is found using part (a), Way 1 • their x_R found by applying $\mathbf{A}^{-1}\mathbf{R}'$ using part (a), Way 2 • $x_R =$ their a found using part (a), Way 3
(b) **Way 2**	**Note**	Give M1 A1 for $\frac{1}{2}\begin{vmatrix} 2 & 0 \\ 1 & 7 \end{vmatrix} = \frac{1}{2}\lvert 14-0\rvert = 7$
	Note	Give M0 A0 for $\begin{vmatrix} 0 & 2 & 0 & 0 \\ 0 & 1 & 7 & 0 \end{vmatrix} = \lVert(0+14+0)-(0+0+0)\rVert = 14$
	Note	There are other ways to find Area(ORS). All ways require a complete correct method for the M mark and a correct area of 7 for the A mark.
	Note	Give M1 for $\frac{1}{2}(1)("2") + \frac{1}{2}(6)("2")$ as this method is equivalent to writing $\frac{1}{2}(7)("2")$
	Note	Give M0 for the calculation $\frac{1}{2}(7)(7)$ $\left\{= \frac{49}{2}\right\}$
(c)	**Note**	Give M1 A0 for applying $(2(-4)-3(1)) \times (7)$ to give -77 with no reference to 77
	Note	Part (c) requires the use of the answer to part (b). So give M0 A0 for • Area $(OR'S') = \frac{1}{2}\begin{vmatrix} 0 & 7 & 21 & 0 \\ 0 & -2 & -28 & 0 \end{vmatrix} = \frac{1}{2}\lvert(0-196+0)-(0-42+0)\rvert = \frac{1}{2}(154) = 77$ • Area $(OR'S') = \frac{1}{2}\begin{vmatrix} 7 & 21 \\ -2 & -28 \end{vmatrix} = \frac{1}{2}\lvert(-196)-(-42)\rvert = \frac{1}{2}(154) = 77$ • Area $(OR'S') = (28)(21) - \frac{1}{2}(21)(28) - \frac{1}{2}(7)(2) - \frac{1}{2}(2+28)(14)$ $= 588 - 294 - 7 - 210 = 77$
	Note	Allow M1 A1 for • $\frac{\begin{vmatrix} 7 & 21 \\ -2 & -28 \end{vmatrix}}{\begin{vmatrix} 2 & 0 \\ 1 & 7 \end{vmatrix}} \times 7 = \frac{\lvert(-196)-(-42)\rvert}{\lvert 14-0\rvert} \times 7 = \frac{154}{14} \times 7 = 11 \times 7 = 77$