Question Number	Scheme	Notes	Marks
5.	$\mathbf{A}=\begin{pmatrix}\frac{1}{2} & -\frac{\sqrt{3}}{2}\\ \frac{\sqrt{3}}{2} & \frac{1}{2}\end{pmatrix}$, $\mathbf{B}=\begin{pmatrix}2\sqrt{3} & -7\\ -4 & 5\sqrt{3}\end{pmatrix}$		
(a)	Rotation	Rotation or rotate (condone turn)	B1
	60 degrees {anti-clockwise}	60 degrees or $\frac{\pi}{3}$ or 300 degrees clockwise or $\frac{5\pi}{3}$ clockwise	B1 o.e.
	about $(0, 0)$	**This mark is dependent on at least one of the previous B marks being given.** about $(0, 0)$ or about *O* or about the origin	dB1
	Note: Give 2nd B0 for 60 degrees clockwise o.e.		**(3)**
(b)	$\{\mathbf{A}^6=\}\begin{pmatrix}1 & 0\\ 0 & 1\end{pmatrix}$	Correct matrix	B1
			(1)
(c) **Way 1**	$\mathbf{B}^{-1}=\frac{1}{2}\begin{pmatrix}5\sqrt{3} & 7\\ 4 & 2\sqrt{3}\end{pmatrix}$	Correct matrix for $\mathbf{B}^{-1}$, which can be simplified or un-simplified	B1
	$\{\mathbf{C}=\mathbf{B}^{-1}\mathbf{A}\}=\frac{1}{2}\begin{pmatrix}5\sqrt{3} & 7\\ 4 & 2\sqrt{3}\end{pmatrix}\begin{pmatrix}\frac{1}{2} & -\frac{\sqrt{3}}{2}\\ \frac{\sqrt{3}}{2} & \frac{1}{2}\end{pmatrix}=\ldots$	Applies (their $\mathbf{B}^{-1}$)$\mathbf{A}$, where (their $\mathbf{B}^{-1}$) $\neq \mathbf{B}$, and finds at least one element (or at least one element calculation) of their matrix $\mathbf{C}$ **Note:** Allow one slip in copying down $\mathbf{A}$	M1
	$=\frac{1}{2}\begin{pmatrix}6\sqrt{3} & -4\\ 5 & -\sqrt{3}\end{pmatrix}$ **or** $=\begin{pmatrix}3\sqrt{3} & -2\\ \frac{5}{2} & -\frac{1}{2}\sqrt{3}\end{pmatrix}$	**dependent on the previous B1M1 marks** At least 2 elements in $\mathbf{C}$ are correct	A1
		All elements in $\mathbf{C}$ are correct	A1
			(4)
(c) **Way 2**	$\{\mathbf{BC}=\mathbf{A}\Rightarrow\}$ $\begin{pmatrix}2\sqrt{3} & -7\\ -4 & 5\sqrt{3}\end{pmatrix}\begin{pmatrix}a & b\\ c & d\end{pmatrix}=\begin{pmatrix}\frac{1}{2} & -\frac{\sqrt{3}}{2}\\ \frac{\sqrt{3}}{2} & \frac{1}{2}\end{pmatrix}$	Correct statement using 2×2 matrices. All 3 matrices must contain four elements. **Can be implied by the 4 correct equations that are below.**	B1
	$2\sqrt{3}a-7c=\frac{1}{2}$, $2\sqrt{3}b-7d=-\frac{\sqrt{3}}{2}$ $-4a+5\sqrt{3}c=\frac{\sqrt{3}}{2}$, $-4b+5\sqrt{3}d=\frac{1}{2}$ **and** finds at least one of either *a*, *b*, *c* or *d*	Applies $\mathbf{BC}=\mathbf{A}$ and attempts to solve simultaneous equations in *a* and *c* **or** b and *d* **and** finds at least one of either *a, b, c* or *d*	M1
	$=\frac{1}{2}\begin{pmatrix}6\sqrt{3} & -4\\ 5 & -\sqrt{3}\end{pmatrix}$ **or** $=\begin{pmatrix}3\sqrt{3} & -2\\ \frac{5}{2} & -\frac{1}{2}\sqrt{3}\end{pmatrix}$	**dependent on the previous B1M1 marks** At least 2 elements in $\mathbf{C}$ are correct	A1
	or $a=3\sqrt{3}, b=-2, c=\frac{5}{2}, d=-\frac{1}{2}\sqrt{3}$	All elements in $\mathbf{C}$ are correct	A1
			(4)
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		Question 5 Notes
5. (a)	**Note**	Writing "60 degrees" by itself implies by convention "60 degrees anti-clockwise". So, • "Rotation 60 degrees about *O*" is B1 B1 B1 • "Rotation 60 degrees clockwise about *O*" is B1 B0 B1
	Note	Writing down "60 degrees anti-clockwise about *O*" with no reference to "rotation" or "turn" is B0 B1 B1
	Note	"original point" is not acceptable in place of the word "origin".
	Note	Give B0 B0 B0 for a combination of 2 or more transformations.
(b)	**Note**	Give B0 for writing down $\mathbf{I}$ without reference to $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$
	Note	Allow B1 for writing down $\mathbf{I}_2$ without reference to $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$
(c)	**Note**	Allow B1 for $\frac{1}{(2\sqrt{3})(5\sqrt{3})-(-7)(-4)}\begin{pmatrix} 5\sqrt{3} & 7 \\ 4 & 2\sqrt{3} \end{pmatrix}$ or $\frac{1}{30-28}\begin{pmatrix} 5\sqrt{3} & 7 \\ 4 & 2\sqrt{3} \end{pmatrix}$
	Note	Allow B1 for $\begin{pmatrix} 5\sqrt{3} & 7 \\ 4 & 2\sqrt{3} \end{pmatrix}\frac{1}{(2\sqrt{3})(5\sqrt{3})-(-7)(-4)}$ or $\begin{pmatrix} 5\sqrt{3} & 7 \\ 4 & 2\sqrt{3} \end{pmatrix}\frac{1}{30-28}$
	Note	You can ignore previous working prior to their finding $\mathbf{B}^{-1}\mathbf{A}$ (i.e. you can ignore an incorrect statement such as $\mathbf{A}=\mathbf{CB}$)