**Combining Matrix Transformations**

Find the matrices that represent the following transformations:

(a) A reflection in the $x$-axis, followed by a rotation through $180°$ centre the origin.

(b) An enlargement with centre the origin and scale factor 2, followed by a reflection in the line $y=x$.

(c) A reflection in the $y$-axis followed by a reflection in the line $y=x$.

(d) A reflection in the line $y=x$ followed by enlargement about the origin with scale factor 3.

Point $\left(3,-2\right)$ is transformed by the matrix $\left(\begin{matrix}1&-1\\0&1\end{matrix}\right)$ followed by a further transformation by the matrix $\left(\begin{matrix}0&2\\1&0\end{matrix}\right)$.
(i) Work out the matrix for the combined transformation.
(ii) Work out the co-ordinates of the image point of $P$.

Point $\left(-1,4\right)$ is transformed by the matrix $\left(\begin{matrix}3&-1\\-2&2\end{matrix}\right)$ followed by a further transformation by the matrix $\left(\begin{matrix}1&0\\3&-2\end{matrix}\right)$.
(i) Work out the matrix for the combined transformation.
(ii) Work out the co-ordinates of the image point of $W$.

The transformation matrix $\left(\begin{matrix}0&-1\\-1&0\end{matrix}\right)$ maps a point $P$ to $Q$. The transformation matrix $\left(\begin{matrix}1&0\\0&-1\end{matrix}\right)$ maps point $Q$ to point $R$. Point $R$ is $\left(-4,3\right)$. Work out the coordinates of point $P$.

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