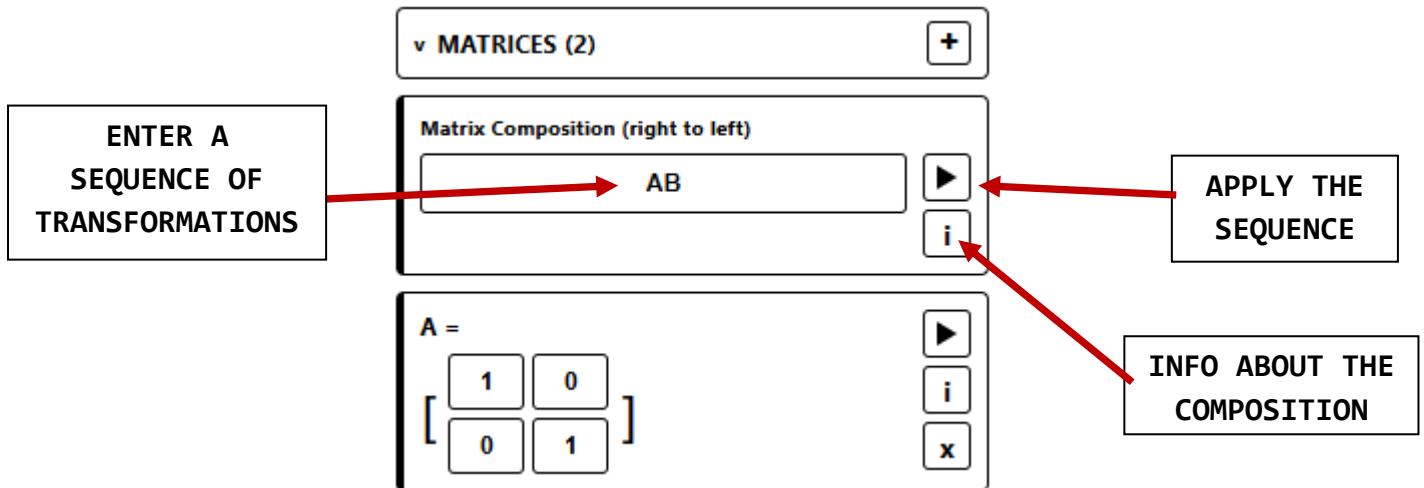


# Combining 2D Transformations



- Open Vectorama ([www.korovatron.co.uk/vectorama](http://www.korovatron.co.uk/vectorama))
- Add **transformation matrices** to the panel for standard **rotations, reflections** and **enlargements**.
- Add a **UNIT SQUARE** from the **VECTOR PRESETS**.



For each of the following, find a **single equivalent matrix** transformation and **fully describe** the single equivalent transformation.

<p>Rotation <math>90^\circ</math> anticlockwise</p> <p>followed by</p> <p>Reflection in the x axis</p> $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ <p>Reflection in <math>y = -x</math></p>	<p>Reflection in the x axis</p> <p>followed by</p> <p>Rotation <math>90^\circ</math> anticlockwise</p> $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ <p>Reflection in <math>y = x</math></p>
<p>Reflection in the <math>y = x</math></p> <p>followed by</p> <p>Rotation <math>90^\circ</math> clockwise</p> $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ <p>Reflection in x axis</p>	<p>Rotation <math>90^\circ</math> clockwise</p> <p>followed by</p> <p>Reflection in the <math>y = x</math></p> $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ <p>Reflection in y axis</p>

# Combining 2D Transformations



Shape **A** maps to shape **B** by an **enlargement**, scale factor 3, centre the origin.

Shape **B** maps to shape **C** by a **rotation** through  $180^\circ$ , centre the origin.

Shape **A** can be mapped to shape **C** by a **single** transformation.

Find this matrix and describe the single equivalent transformation

$$\begin{pmatrix} -3 & 0 \\ 0 & -3 \end{pmatrix}$$

**Enlargement Scale Factor -3**

The transformation matrix **P** represents a  $90^\circ$  anticlockwise rotation about the origin.

Describe fully the **single** transformation represented by the matrix  $\mathbf{P}^3$

$$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$$

**Rotation  $90^\circ$  clockwise or  $270^\circ$  anticlockwise**

The transformation matrix  $\mathbf{Q} = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$

The transformation matrix  $\mathbf{R} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$

Describe fully the **single** transformation represented by the matrix  $\mathbf{QR}$ .

**Rotation  $180^\circ$**

The transformation matrix  $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$  maps point **P** to point **Q**

The transformation matrix  $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$  maps point **Q** to point **R**

Point **R** is  $(-4, 3)$ . Work out the coordinates of point **P**.

**$(3,4)$**