

Common Matrix Transformations

$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$	Identity matrix. Right remains right, up remains up.	$\begin{bmatrix} x \\ y \end{bmatrix} \mapsto \begin{bmatrix} x \\ y \end{bmatrix}$
$\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$	Reflection in the y -axis. Right has become left, up remains up.	$\begin{bmatrix} x \\ y \end{bmatrix} \mapsto \begin{bmatrix} -x \\ y \end{bmatrix}$
$\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$	Reflection in the x -axis. Right remains right, up has become down.	$\begin{bmatrix} x \\ y \end{bmatrix} \mapsto \begin{bmatrix} x \\ -y \end{bmatrix}$
$\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$	Rotation by 180° Right has become left, up has become down.	$\begin{bmatrix} x \\ y \end{bmatrix} \mapsto \begin{bmatrix} -x \\ -y \end{bmatrix}$
$\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$	Reflection in the line $y = x$. Right has become up, up has become right.	$\begin{bmatrix} x \\ y \end{bmatrix} \mapsto \begin{bmatrix} y \\ x \end{bmatrix}$
$\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$	Rotation by 90° anticlockwise. Right has become up, up has become left.	$\begin{bmatrix} x \\ y \end{bmatrix} \mapsto \begin{bmatrix} -y \\ x \end{bmatrix}$
$\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$	Rotation by 90° clockwise. Right has become down, up has become right.	$\begin{bmatrix} x \\ y \end{bmatrix} \mapsto \begin{bmatrix} y \\ -x \end{bmatrix}$
$\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$	Reflection in the line $y = -x$. Right has become down, up has become left.	$\begin{bmatrix} x \\ y \end{bmatrix} \mapsto \begin{bmatrix} -y \\ -x \end{bmatrix}$

$\begin{bmatrix} a & 0 \\ 0 & 1 \end{bmatrix}$	Enlargement by scale factor a in the x direction. Right is multiplied by a , up remains up.	$\begin{bmatrix} x \\ y \end{bmatrix} \mapsto \begin{bmatrix} ax \\ y \end{bmatrix}$
$\begin{bmatrix} 1 & 0 \\ 0 & a \end{bmatrix}$	Enlargement by scale factor a in the y direction. Right remains right, up is multiplied by a .	$\begin{bmatrix} x \\ y \end{bmatrix} \mapsto \begin{bmatrix} x \\ ay \end{bmatrix}$
$\begin{bmatrix} a & 0 \\ 0 & a \end{bmatrix}$	Enlargement by scale factor a from the origin. Right is multiplied by a , up is multiplied by a .	$\begin{bmatrix} x \\ y \end{bmatrix} \mapsto \begin{bmatrix} ax \\ ay \end{bmatrix}$
$\begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix}$	Enlargement by scale factor a in the x direction and scale factor b in the y direction. Right is multiplied by a , up is multiplied by b .	$\begin{bmatrix} x \\ y \end{bmatrix} \mapsto \begin{bmatrix} ax \\ by \end{bmatrix}$

Combinations of these matrices give multiple transformations. For instance, two reflections generate a rotation.