

## Section 2: Matrix transformations

### Exercise

- The unit square OABC has vertices O (0, 0), A (1, 0), B (1, 1) and C (0, 1).  
For each of the following matrices, find the image of each point, and describe the transformation.
  - $\begin{pmatrix} -0.5 & 0 \\ 0 & -0.5 \end{pmatrix}$
  - $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$
- Find the images of A (3, 1), B (3, 3), C(6, 3), D(6, 1) under the transformation  $\begin{pmatrix} 1 & 0 \\ -2 & 1 \end{pmatrix}$ .
- Find the images of P (0, 0), Q (1, 1), R (0, 2) and S (-1, 1) under the transformation  $\begin{pmatrix} 4 & 3 \\ -3 & -2 \end{pmatrix}$ .
- Find  $2 \times 2$  matrices to represent the transformations **P**, which is a reflection in the y axis and **Q**, which is a rotation of  $90^\circ$  clockwise about the origin. Hence find a single matrix to represent a reflection in the y axis followed by a rotation of  $90^\circ$  clockwise about the origin. Describe this as a single transformation.
- The unit square with vertices (0, 0), (1, 0), (1, 1) and (0, 1) is transformed to give a square of area 2.  
  
Find two possible matrices which represent transformations which will do this.
- The transformation represented by the matrix  $\begin{pmatrix} 5 & 2 \\ 4 & a \end{pmatrix}$  transforms the point (1, -2) to  $(k, -2k)$ .  
Find the values of  $a$  and  $k$ .