

1. The transformation  $P$  is an enlargement, centre the origin, with scale factor  $k$ , where  $k > 0$ . The transformation  $Q$  is a rotation through angle  $\theta$  degrees anticlockwise about the origin. The transformation  $P$  followed by the transformation  $Q$  is represented by the matrix

$$\mathbf{M} = \begin{pmatrix} -4 & -4\sqrt{3} \\ 4\sqrt{3} & -4 \end{pmatrix}$$

(a) Determine

(i) the value of  $k$ ,

(ii) the smallest value of  $\theta$

(4)

A square  $S$  has vertices at the points with coordinates  $(0, 0)$ ,  $(a, -a)$ ,  $(2a, 0)$  and  $(a, a)$  where  $a$  is a constant.

The square  $S$  is transformed to the square  $S'$  by the transformation represented by  $\mathbf{M}$ .

(b) Determine, in terms of  $a$ , the area of  $S'$

(2)