1)

$$\mathbf{A} = \begin{pmatrix} 2 & 4 \\ 5 & 3 \end{pmatrix} \qquad\qquad \mathbf{B} = \begin{pmatrix} 3 & -4 \\ -5 & 2 \end{pmatrix}$$

**(a)** Work out **AB**.

*Answer(a)* [2]

**(b)** Find $|\mathbf{B}|$, the determinant of **B**.

*Answer(b)* [1]

**(c)** **I** is the (2 × 2) identity matrix.
Find the matrix **C**, where $\mathbf{C} = \mathbf{A} - 7\mathbf{I}$ .

*Answer(c)* [2]

2)    **(a)**

$$\mathbf{A} = \begin{pmatrix} 2 & 3 \\ 4 & 5 \end{pmatrix} \qquad \mathbf{B} = \begin{pmatrix} 2 \\ 7 \end{pmatrix} \qquad \mathbf{C} = \begin{pmatrix} 1 & 2 \end{pmatrix}$$

Find the following matrices.

**(i)  AB**

*Answer(a)*(i)                                                                [2]

**(ii)  CB**

*Answer(a)*(ii)                                                               [2]

**(iii)  A$^{-1}$, the inverse of A**

*Answer(a)*(iii)                                                              [2]

**(b)**  Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$.

*Answer(b)*                                                                   [2]

**(c)**  Find the 2 by 2 matrix that represents an anticlockwise rotation of 90° about the origin.

*Answer(c)*    $\begin{pmatrix} & \\ & \end{pmatrix}$

[2]

3)     Work out.

**(a)**  $\begin{pmatrix} 2 & 1 \\ 4 & 3 \end{pmatrix}^{2}$

*Answer(a)*  $\begin{pmatrix} & \\ & \end{pmatrix}$  [2]

**(b)**  $\begin{pmatrix} 2 & 1 \\ 4 & 3 \end{pmatrix}^{-1}$

*Answer(b)*  $\begin{pmatrix} & \\ & \end{pmatrix}$  [2]

4)   **(a)  N** $= \begin{pmatrix} 2 \\ 6 \end{pmatrix}$. The order of the matrix **N** is $2 \times 1$.

**P** $= (1 \quad 3)$. The order of the matrix **P** is $1 \times 2$.

**(i)**  Write down the order of the matrix **NP**.

*Answer(a)*(i) .................................................... [1]

**(ii)**  Calculate **PN**.

*Answer(a)*(ii) .................................................... [1]

**(b)  M** $= \begin{pmatrix} 2 & 3 \\ 2 & 4 \end{pmatrix}$.

Find **M**$^{-1}$, the inverse of **M** .

*Answer(b)* **M**$^{-1}$ = .................................................... [2]

5)

$$\mathbf{M} = \begin{pmatrix} 5 & -4 \\ 2 & 3 \end{pmatrix}$$

Find

**(a)** $\mathbf{M}^2$,

*Answer(a)* $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

**(b)** $2\mathbf{M}$,

*Answer(b)* $\begin{pmatrix} & \\ & \end{pmatrix}$ [1]

**(c)** $|\mathbf{M}|$, the determinant of $\mathbf{M}$,
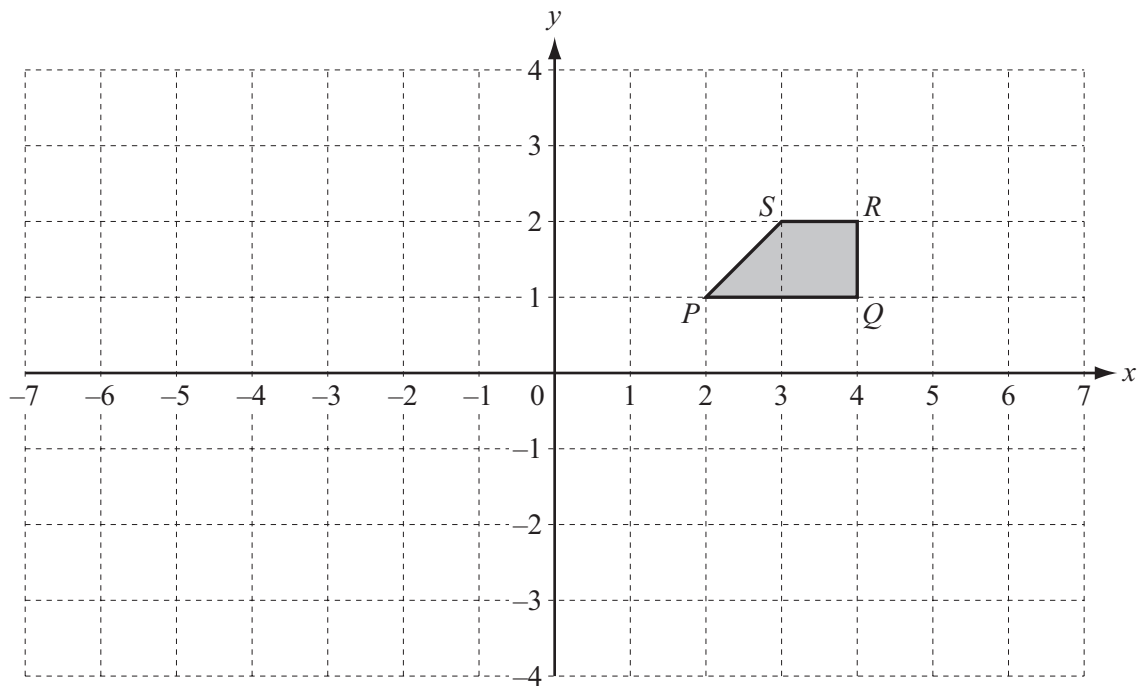
*Answer(c)* [1]

**(d)** $\mathbf{M}^{-1}$.

*Answer(d)* $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

6)

$$\mathbf{A} = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \qquad \mathbf{B} = \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$$

draw the image of *PQRS* after the transformation represented by **BA**.



[5]

7)

**(a)** $\mathbf{M} = \begin{pmatrix} 3 & 2 \\ -1 & 1 \end{pmatrix}$

Find $\mathbf{M}^{-1}$, the inverse of $\mathbf{M}$.

*Answer(a)* $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

**(b)** $\mathbf{D}$, $\mathbf{E}$ and $\mathbf{X}$ are $2 \times 2$ matrices.
$\mathbf{I}$ is the identity $2 \times 2$ matrix.

    **(i)** Simplify $\mathbf{DI}$.

*Answer(b)*(i) [1]

    **(ii)** $\mathbf{DX} = \mathbf{E}$
    Write $\mathbf{X}$ in terms of $\mathbf{D}$ and $\mathbf{E}$.

*Answer(b)*(ii) $\mathbf{X} =$ [1]

8)

    **(a)**      $\mathbf{a} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$    $\mathbf{b} = \begin{pmatrix} 2 \\ -7 \end{pmatrix}$    $\mathbf{c} = \begin{pmatrix} -10 \\ 21 \end{pmatrix}$

    **(i)** Find $2\mathbf{a} + \mathbf{b}$.

*Answer(a)*(i) $\begin{pmatrix} & \\ & \end{pmatrix}$    [1]

    **(ii)** Find $|\,\mathbf{b}\,|$.

*Answer(a)*(ii)    [2]

    **(iii)** $m\mathbf{a} + n\mathbf{b} = \mathbf{c}$

        Find the values of $m$ and $n$.
        Show all your working.

*Answer(a)*(iii) $m =$

$n =$    [6]