# Assignment 1

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**Question 7(c)**

$$\begin{pmatrix} 4 & 2 \\ -1 & 1 \end{pmatrix} \mathbf{M} = 6\mathbf{I}$$

,where M is a matrix and I is unit matrix of order $2 \times 2$.

(i) State the order of matrix $\mathbf{M}$

(ii) Find the matrix $\mathbf{M}$

**Solution (i)**

$$\implies \begin{pmatrix} 4 & 2 \\ -1 & 1 \end{pmatrix} \mathbf{M} = 6\mathbf{I} \tag{1}$$

here $\mathbf{I}$ is unit matrix.
we have to find order of matrix $\mathbf{M}$
let the order the matrix $\mathbf{M}$ is

$$a \times b \tag{2}$$

we know that for multiply two matrix their order must be in the form of (x,y) (y,z) here $x, y, z \in N$
hence order of matrix will be $2 \times b$.
so overall left hand side order is

$$(2 \times 2) \times (2 \times b) = (2 \times b) \tag{3}$$

for comparing LHS=RHS their order must be same so
order of LHS$= (2 \times b)$, RHS=$(2 \times 2)$ hence b = 2.
hence the order of matrix $\mathbf{M}$ is $(2 \times 2)$.

**solution (ii)**

$$\mathbf{A} = \begin{pmatrix} 4 & 2 \\ -1 & 1 \end{pmatrix} \tag{4}$$

$$\mathbf{AM} = 6\mathbf{I} \tag{5}$$

multiply by $\mathbf{A}^{-1}$

$$\mathbf{M} = \mathbf{A}^{-1} \times 6\mathbf{I} \tag{6}$$

$$\therefore \mathbf{I} \times \mathbf{M} = \mathbf{M} \tag{7}$$

as we know that $\mathbf{A} \times \mathbf{I} = \mathbf{I} \times \mathbf{A}^{-1}$

$$\left(\begin{array}{cc|cc} 4 & 2 & 1 & 0 \\ -1 & 1 & 0 & 1 \end{array}\right) \tag{8}$$

$$R_2 \to 4R_2 + R_1,$$

$$\left(\begin{array}{cc|cc} 4 & 2 & 1 & 0 \\ 0 & 6 & 1 & 4 \end{array}\right) \tag{9}$$

$$R_1 \to 3R_1 - R_2$$

$$\left(\begin{array}{cc|cc} 12 & 0 & 2 & -4 \\ 0 & 6 & 1 & 4 \end{array}\right) \tag{10}$$

$$R_1 \to \frac{R_1}{2}$$

$$\left(\begin{array}{cc|cc} 6 & 0 & 1 & -2 \\ 0 & 6 & 1 & 4 \end{array}\right) \tag{11}$$

$$\left(\begin{array}{cc|cc} 1 & 0 & \frac{1}{6} & \frac{-2}{6} \\ 0 & 1 & \frac{1}{6} & \frac{4}{6} \end{array}\right) \tag{12}$$

$$\mathbf{A}^{-1} = \begin{pmatrix} \frac{1}{6} & \frac{-1}{3} \\ \frac{1}{6} & \frac{2}{3} \end{pmatrix} \tag{13}$$

by calculation we get

$$\mathbf{A}^{-1} = \begin{pmatrix} \frac{1}{6} & \frac{-1}{3} \\ \frac{1}{6} & \frac{2}{3} \end{pmatrix} \tag{14}$$

$$6\mathbf{I} = \begin{pmatrix} 6 & 0 \\ 0 & 6 \end{pmatrix} \tag{15}$$

by calculation we get

$$\mathbf{M} = \begin{pmatrix} 1 & -2 \\ 1 & 4 \end{pmatrix} \tag{16}$$