Matrix Multiplication

Exercise 9A

① $\mathbf{A} = \begin{bmatrix} 2 & 3 \\ 1 & 1 \end{bmatrix}$ $\mathbf{B} = \begin{bmatrix} -2 & 0 \\ 3 & 1 \end{bmatrix}$

$\mathbf{C} = \begin{bmatrix} 6 & -2 \\ -3 & -1 \end{bmatrix}$ $\mathbf{D} = \begin{bmatrix} 0 & 0 \\ -3 & -5 \end{bmatrix}$

$\mathbf{E} = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$ $\mathbf{F} = \begin{bmatrix} 7 \\ 3 \end{bmatrix}$

$\mathbf{G} = \begin{bmatrix} -3 \\ 4 \end{bmatrix}$ $\mathbf{H} = \begin{bmatrix} -2 \\ -1 \end{bmatrix}$

Work out

(i) $4\mathbf{A}$ (ii) $2\mathbf{D}$ (iii) $\mathbf{AF}$
(iv) $\mathbf{CE}$ (v) $\mathbf{DH}$ (vi) $\mathbf{BH}$
(vii) $\mathbf{AB}$ (viii) $\mathbf{BA}$ (ix) $\mathbf{BC}$
(x) $\mathbf{CB}$ (xi) $\mathbf{DA}$ (xii) $\mathbf{BD}$
(xiii) $\mathbf{AC}$ (xiv) $\mathbf{DC}$

② Work out the value of p in each of the following.

(i) $\begin{bmatrix} 4 & 2 \\ 1 & -1 \end{bmatrix}\begin{bmatrix} p \\ 3 \end{bmatrix} = \begin{bmatrix} 2 \\ -4 \end{bmatrix}$

(ii) $\begin{bmatrix} 2 & -1 \\ p & 3 \end{bmatrix}\begin{bmatrix} 2 \\ -1 \end{bmatrix} = \begin{bmatrix} 5 \\ 9 \end{bmatrix}$

(iii) $\begin{bmatrix} p & 1 \\ 5 & 4 \end{bmatrix}\begin{bmatrix} 3 \\ p \end{bmatrix} = \begin{bmatrix} 2 \\ 17 \end{bmatrix}$

(iv) $\begin{bmatrix} p & 4p \\ p & -2p \end{bmatrix}\begin{bmatrix} -2 \\ -1 \end{bmatrix} = \begin{bmatrix} -9 \\ 0 \end{bmatrix}$

(v) $\begin{bmatrix} 3 & 0 \\ 1 & 2 \end{bmatrix}\begin{bmatrix} 2 & 1 \\ p & 4 \end{bmatrix} = \begin{bmatrix} 6 & 3 \\ 16 & 9 \end{bmatrix}$

(vi) $\begin{bmatrix} 4 & -1 \\ 0 & 0 \end{bmatrix}\begin{bmatrix} 2 & 2p \\ -1 & p \end{bmatrix} = \begin{bmatrix} 9 & -14 \\ 0 & 0 \end{bmatrix}$

③ Work out the values of x and y in each of the following.

(i) $\begin{bmatrix} 2 & 1 \\ 1 & y \end{bmatrix}\begin{bmatrix} x \\ 3 \end{bmatrix} = \begin{bmatrix} 11 \\ 10 \end{bmatrix}$

(ii) $\begin{bmatrix} 1 & x \\ 2y & 3y \end{bmatrix}\begin{bmatrix} -1 \\ 2 \end{bmatrix} = \begin{bmatrix} -3 \\ -8 \end{bmatrix}$

(iii) $\begin{bmatrix} -3 & 0 \\ 1 & -2 \end{bmatrix}\begin{bmatrix} 2 & 0 \\ x & y \end{bmatrix} = \begin{bmatrix} -6 & 0 \\ -4 & 10 \end{bmatrix}$

(iv) $\begin{bmatrix} x & 1 \\ -1 & 0 \end{bmatrix}\begin{bmatrix} 2 & 4 \\ x & y \end{bmatrix} = \begin{bmatrix} -9 & -5 \\ -2 & -4 \end{bmatrix}$