

9. The orders of the matrices **A**, **B** and **C** are 2×3 , 4×2 and 3×4 respectively.

State the order of each of the following products if it exists.

- (a) **AB**, (b) **AC**,
 (c) **BA**, (d) **BC**,
 (e) **CA**, (f) **CB**,
 (g) **ABC**, (h) **ACB**.

10. Perform the following matrix multiplications.

(a) $\begin{pmatrix} 4 & 5 \end{pmatrix} \begin{pmatrix} 3 \\ -1 \end{pmatrix}$

(b) $\begin{pmatrix} 3 & -8 \\ 0 & -1 \end{pmatrix} \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

(c) $\begin{pmatrix} 1 & -4 & -3 \\ 6 & 1 & 3 \end{pmatrix} \begin{pmatrix} 5 \\ -3 \\ 2 \end{pmatrix}$

(d) $\begin{pmatrix} 1 & -2 \\ 3 & -4 \end{pmatrix} \begin{pmatrix} -5 & 6 \\ -4 & 3 \end{pmatrix}$

(e) $\begin{pmatrix} 1 & -2 \\ -3 & 4 \end{pmatrix} \begin{pmatrix} 2 & -4 & 5 \\ 3 & 0 & 8 \end{pmatrix}$

(f) $\begin{pmatrix} 3 \\ 1 \\ -5 \end{pmatrix} \begin{pmatrix} -1 & 0 & -4 \end{pmatrix}$

(g) $\begin{pmatrix} 3 & -4 & 0 \\ 4 & 1 & -2 \\ 0 & -3 & 6 \end{pmatrix} \begin{pmatrix} 0 & 2 & 8 \\ -3 & -2 & 3 \\ 5 & 6 & 0 \end{pmatrix}$

(h) $\begin{pmatrix} 2 & -6 \\ -3 & 4 \\ 5 & -1 \end{pmatrix} \begin{pmatrix} -2 & 5 \\ 7 & -3 \end{pmatrix}$

11. It is given that $\mathbf{P} = \begin{pmatrix} -3 & 1 & -2 & 3 \\ 2 & -2 & 1 & -4 \\ 0 & 3 & 5 & -2 \\ 5 & -4 & 2 & 5 \end{pmatrix}$, $\mathbf{Q} = \begin{pmatrix} 1 & -3 & 5 & -1 \\ 6 & 1 & -3 & 6 \\ 3 & -1 & 4 & 9 \\ -2 & 0 & -1 & -3 \end{pmatrix}$,

$\mathbf{PQ} = \mathbf{S}$ and $\mathbf{QP} = \mathbf{T}$.

- (a) Without computing the entire matrix **S**, find the element in
 (i) the third row and the fourth column of **S**,
 (ii) the fourth row and the second column of **S**.
 (b) Without computing the entire matrix **T**, find the element in
 (i) the third row and the fourth column of **T**,
 (ii) the fourth row and the second column of **T**.