Step-1

Given that A is the Northwest matrix and B is the Southeast matrix then we have to find the nature of the matrices AB and BA.

Step-2

We know that the Northwest and Southeast means zeros below and above the antidiagonal going from $(1,n)\text{to}(n,1)$.

For instance

let $A=\begin{pmatrix}0 & 1\\ 2 & 0\end{pmatrix}, B=\begin{pmatrix}0 & 3\\ 1 & 0\end{pmatrix}$ are Northwest and the Southeast matrices respectively then

$$AB=\begin{pmatrix}0 & 1\\ 2 & 0\end{pmatrix}\begin{pmatrix}0 & 3\\ 1 & 0\end{pmatrix}$$
$$=\begin{pmatrix}1 & 0\\ 0 & 6\end{pmatrix}$$

$$BA=\begin{pmatrix}0 & 3\\ 1 & 0\end{pmatrix}\begin{pmatrix}0 & 1\\ 2 & 0\end{pmatrix}$$
$$=\begin{pmatrix}6 & 0\\ 0 & 1\end{pmatrix}$$

Step-3

Therefore the matrices AB and BA are the Diagonal matrices.