There is no trick or shortcut in multiplying an nxn matrix with more than 3x3 entries. What is done is we simplify the process of multiplying, instead of doing it one way, we partition it. If we multiply an 8x8 by 8x1 matrix straight it would be so tedious that we need 8 rows with a column of 8 algebraic equation. You'll need a lot of paper for that matter.

In the example we now found this matrix,

$$\mathbf{AB} = \begin{vmatrix} A_{11}B_{11} + A_{12}B_{21} \\ A_{21}B_{11} + A_{22}B_{21} \end{vmatrix}$$

We need first to multiply the submatrices A_{11} x $B_{11,}$ A_{12} x B_{21},

A_{21} x $B_{11,}$ and A_{22} x B_{21}. After you get the results add the matrices $A_{11}B_{11} + A_{12}B_{21}$ and $A_{21}B_{11} + A_{22}B_{21.}$ Note: (AxB is the same as AB). Then write the answer in matrix form above. That means $A_{11}B_{11} + A_{12}B_{21}$ is the first row with 4x1 entries and $A_{21}B_{11} + A_{22}B_{21}$ is the last row with also a 4x1 entries since there is only two rows in the form. In doing so, you arrive at an 8x1 entries.

Look at the partition in the previous note I'm assuming that you know basic matrix operations. In the figure, $A_{11,}$ $A_{12,}$ $A_{21,}$ and A_{22} each has 4x4 entries. And B_{11} and B_{21} each has a 4x1 entries.