▲ For multiplication to be defined the "inner" numbers must match. The result will be determined by the "outer" numbers.

<u>example</u>:- $\begin{bmatrix} 2 & 1 & 4 \\ 0 & 1 & 1 \end{bmatrix}_{2\times 3} \times \begin{bmatrix} 6 & 3 & -1 & 0 \\ 1 & 1 & 0 & 4 \\ -2 & 5 & 0 & 2 \end{bmatrix}_{3\times 4}$

So here according to statement, inner numbers must match, so here in 1st matrix the inner number is 3 and in the 2nd matrix the inner number is also 3, so here multiplication is possible. And after multiplication we will get the matrix of an order 2×4.

$$\begin{bmatrix} 2 & 1 & 4 \\ 0 & 1 & 1 \end{bmatrix}_{2\times 3} \times \begin{bmatrix} 6 & 3 & -1 & 0 \\ 1 & 1 & 0 & 4 \\ -2 & 5 & 0 & 2 \end{bmatrix}_{3\times 4}$$

must match

Result

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example :- $\begin{bmatrix} 2 & 1 & 4 \\ 0 & 1 & 1 \end{bmatrix}_{2\times3} \times \begin{bmatrix} 6 & 3 & -1 & 0 \\ 1 & 1 & 0 & 4 \\ -2 & 5 & 0 & 2 \end{bmatrix}_{3\times4}$

Let,

$$\begin{array}{ll} a_1 \rightarrow & \\ a_2 \rightarrow & \end{array} \begin{bmatrix} 2 & 1 & 4 \\ 0 & 1 & 1 \end{bmatrix} \times \begin{array}{cccc} b_1 & b_2 & b_3 & b_4 \\ \uparrow & \uparrow & \uparrow & \uparrow \end{array} \begin{bmatrix} 6 & 3 & -1 & 0 \\ 1 & 1 & 0 & 4 \\ -2 & 5 & 0 & 2 \end{bmatrix}$$

$$\begin{bmatrix} a_1b_1 + a_1b_1 + a_1b_1 & a_1b_2 + a_1b_2 + a_1b_2 & a_1b_3 + a_1b_3 + a_1b_3 & a_1b_4 + a_1b_4 + a_1b_4 \\ a_2b_1 + a_2b_1 + a_2b_1 & a_2b_2 + a_2b_2 + a_2b_2 & a_2b_3 + a_2b_3 + a_2b_3 & a_2b_4 + a_2b_4 + a_2b_4 \end{bmatrix}$$

Putting the values;

$$\begin{bmatrix} 2\cdot6 + 1\times1 + 4\cdot(-2) & 2\times3 + 1\times1 + 4\times5 & 2\times(-1) + 1\times0 + 4\times0 & 2\times0 + 1\times4 + 4\times2 \\ 0\cdot6 + 1\times1 + 1\times(-2) & 0\times3 + 1\times1 + 1\times5 & 0\times(-1) + 1\times0 + 1\times0 & 0\times0 + 1\times4 + 1\times2 \end{bmatrix}$$

$$\begin{bmatrix} 12 + 1 - 8 & 6 + 1 + 20 & -2 + 0 + 0 & 0 + 4 + 8 \\ 0 + 1 - 2 & 0 + 1 + 5 & 0 + 0 + 0 & 0 + 4 + 2 \end{bmatrix}$$

$$\begin{bmatrix} 5 & 27 & -2 & 12 \\ -1 & 6 & 0 & 6 \end{bmatrix}_{2\times4}$$