## Step-1

$$A = \begin{pmatrix} 2 & 1 & 4 \\ 0 & -1 & 1 \end{pmatrix}, B = \begin{pmatrix} 1 & 1 \\ 0 & 1 \\ 1 & 0 \end{pmatrix}$$
 and the first row of  $AB$  is a linear combination of all the rows of  $B$ . We have to find the coefficients in this combination and the first row of  $AB$ .

Step-2

## Step-2

$$AB = \begin{pmatrix} 2 & 1 & 4 \\ 0 & -1 & 1 \end{pmatrix} \begin{pmatrix} 1 & 1 \\ 0 & 1 \\ 1 & 0 \end{pmatrix}$$

In A the first row is  $\begin{pmatrix} 2 & 1 & 4 \end{pmatrix}$  and the first column of B is  $\begin{pmatrix} 1 & 0 & 1 \end{pmatrix}^T$  and the second column is  $\begin{pmatrix} 1 & 0 & 1 \end{pmatrix}^T$  so the first row of AB is

$$= \begin{bmatrix} (2 & 1 & 4) \begin{pmatrix} 1 \\ 0 \\ 1 \end{pmatrix} & (2 & 1 & 4) \begin{pmatrix} 1 \\ 1 \\ 0 \end{pmatrix} \end{bmatrix}$$
$$= \begin{pmatrix} 2.1 + 1.0 + 4.1 & 2.1 + 1.1 + 4.0 \end{pmatrix}$$
$$= \begin{pmatrix} 2.1 + 1.0 + 4.1 & 2.1 + 1.1 + 4.0 \end{pmatrix}$$

=(2+0+4 2+1+0) $=(6\ 3)$ 

The first row of AB is  $(6 \ 3)$ .

## Step-3

Let the linear combination of all the rows of B is a(1,1)+b(0,1)+c(1,0) where a,b and c are the coefficients which we want to find.

Since the first row of AB is a linear combination of all the rows of B, we have

$$a(1,1)+b(0,1)+c(1,0)=(6 3)$$

$$(a+c,a+b)=(6\ 3)$$

Therefore a = 2, b = 1 and c = 4