Step-1

We have to construct a matrix whose null space consists of all combinations of $(2,2,1,0)$ and $(3,1,0,1)$.

Let $x = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix}$ is a solution of the required matrix *A*.

Step-2

Let $\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = x_3 \begin{bmatrix} 2 \\ 2 \\ 1 \\ 0 \end{bmatrix} + x_4 \begin{bmatrix} 3 \\ 1 \\ 0 \\ 1 \end{bmatrix}$

$$\Rightarrow x_1 = 2x_3 + 3x_4$$
$$x_2 = 2x_3 + x_4$$

Or

$$x_1 - 2x_3 - 3x_4 = 0,$$
$$x_2 - 2x_3 - x_4 = 0$$

Step-3

$$\Rightarrow \begin{bmatrix} 1 & 0 & -2 & -3 \\ 0 & 1 & -2 & -1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = 0$$

This is of the form $Rx = 0$

Therefore

$$R = \begin{bmatrix} 1 & 0 & -2 & -3 \\ 0 & 1 & -2 & -1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

Hence *R* is a matrix whose null space is all combination of $(2,2,1,0)$ and $(3,1,0,1)$.