Step-1

Given that adding row 1 of A to row 2 produces B. Adding column 1 to column 2 produces C.

So the matrices are $A=\begin{bmatrix}1 & 2\\ 2 & 4\end{bmatrix}, B=\begin{bmatrix}1 & 2\\ 3 & 6\end{bmatrix}, C=\begin{bmatrix}1 & 3\\ 2 & 6\end{bmatrix}$.

A combination of columns of matrix C is also a combination of the columns of A.

We have to find which two matrices have the same column space.

Step-2

Let $\begin{bmatrix}b_1\\ b_2\end{bmatrix}\in \mathbf{C}(A)$

Then

$$\begin{aligned}\begin{bmatrix}b_1\\ b_2\end{bmatrix} &= c_1\begin{bmatrix}1\\ 2\end{bmatrix}+c_2\begin{bmatrix}2\\ 4\end{bmatrix}\\ &= c_1\begin{bmatrix}1\\ 2\end{bmatrix}+c_2\begin{bmatrix}1\\ 2\end{bmatrix}-c_2\begin{bmatrix}1\\ 2\end{bmatrix}+c_2\begin{bmatrix}2\\ 4\end{bmatrix}\\ &= [c_1-c_2]\begin{bmatrix}1\\ 2\end{bmatrix}+c_2\begin{bmatrix}3\\ 6\end{bmatrix}\end{aligned}$$

Therefore $\begin{bmatrix}b_1\\ b_2\end{bmatrix}$ is linear combination of $\begin{bmatrix}1\\ 2\end{bmatrix},\begin{bmatrix}3\\ 6\end{bmatrix}$, the column of C.

Step-3

If $\begin{bmatrix}b_1\\ b_2\end{bmatrix}\in \mathbf{C}(C)$

Then $\begin{bmatrix}b_1\\ b_2\end{bmatrix}=d_1\begin{bmatrix}1\\ 2\end{bmatrix}+d_2\begin{bmatrix}3\\ 6\end{bmatrix}$

$$\Rightarrow \begin{bmatrix}b_1\\ b_2\end{bmatrix}=d_1\begin{bmatrix}1\\ 2\end{bmatrix}+d_2\left[\begin{bmatrix}1\\ 2\end{bmatrix}+\begin{bmatrix}2\\ 4\end{bmatrix}\right]$$

$$= d_1\begin{bmatrix}1\\2\end{bmatrix} + d_2\begin{bmatrix}1\\2\end{bmatrix} + d_2\begin{bmatrix}2\\4\end{bmatrix}$$

$$= (d_1 + d_2)\begin{bmatrix}1\\2\end{bmatrix} + d_2\begin{bmatrix}2\\4\end{bmatrix}$$

Therefore $\begin{bmatrix}b_1\\b_2\end{bmatrix} \in \mathbf{C}(A)$

Hence the matrices $\boxed{A \text{ and } C}$ have same column spaces.