## Step-1

Suppose **P** is a plane through (0,0,0) and **L** is a line through (0,0,0).

The smallest vector space containing both P and L is either P or  $R^3$ .

Because,

- 1. If the line L is in the plane P, then P is itself a smallest vector space containing both L and P
- 2. If the line L is not in the plane P then dimension of the vector space is greater than the maximum of dimension of L dimension of P.

Therefore it must have dimension 3

(Since 
$$\dim \mathbf{L} = 1, \dim \mathbf{P} = 2$$
)

Therefore, it must be  $\mathbb{R}^3$ .