Step-1

Given that the equations of two planes are x + y + 3z = 6 and x - y + z = 4

We have to find a point with z = 2 on the intersection line of the given planes; we have to find a point with z = 0 on the intersection line of the given planes, and we have to find a third point halfway between these two.

Step-2

When z = 2 the equations becomes,

$$x + y = 0$$

$$x - y = 2$$

The column vector of the above equations is

$$x \begin{pmatrix} 1 \\ 1 \end{pmatrix} + y \begin{pmatrix} 1 \\ -1 \end{pmatrix} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$$

Step-3

The linear combination for the vectors is 1(first column) + (-1)(second column) that gives right hand side vector and for taking z = 2, the required point is

Step-4

When z = 0 the equations becomes,

$$x + y = 6$$

$$x - y = 4$$

The column vector of the above equations is

$$x \begin{pmatrix} 1 \\ 1 \end{pmatrix} + y \begin{pmatrix} 1 \\ -1 \end{pmatrix} = \begin{pmatrix} 6 \\ 4 \end{pmatrix}$$

Step-5

The linear combination for the vectors is 5 (first column) + 1 (second column) that gives right hand side vector and by taking z = 0, the required point is (5,1,0)

Step-6

The point that is half way between (1,-1,2) and (5,1,0) is (3,0,1)

Since it is the mid point of the points (1,-1,2) and (5,1,0)