

Question 9: If $x = a, y = b, z = c$ is a solution of the system of linear equations

$$x + 8y + 7z = 0$$

$$9x + 2y + 3z = 0$$

$$x + y + z = 0$$

such that the point (a, b, c) lies on the plane $x + 2y + z = 6$, then $2a + b + c$ equals :

(a) -1 (b) 0 (c) 1 (d) 2

Answer: (c)

Solution:

Given system of linear equations

$$x + 8y + 7z = 0 \dots(i)$$

$$9x + 2y + 3z = 0 \dots(ii)$$

$$x + y + z = 0 \dots(iii)$$

Operate: (ii) - 3 x (iii)

$$6x - y = 0 \text{ or } y = 6x \dots(iv)$$

Using (iv) in (i)

$$x + 8(6x) + 7z = 0$$

$$z = -7x \dots(v)$$

Since $x = a, y = b, z = c$ (Given)

$$b = 6a \text{ and } c = -7a$$

Also, (a, b, c) lies on the plane $x + 2y + z = 6$.

Therefore, $a + 2b + c = 6 \dots(vi)$

Putting the values of b and c in (vi),

$$a + 2(6a) - 7a = 6$$

$$\Rightarrow a = 1$$

Also, we get $b = 6$ and $c = -7$

$$\text{Now, } 2a + b + c = 2(1) + 6 - 7 = 1$$