

17. Find the distance of a point $(2, 4, -1)$ from the line $\frac{x+5}{1} = \frac{y+3}{4} = \frac{z-6}{-9}$.

Sol. We have, equation of the line as $\frac{x+5}{1} = \frac{y+3}{4} = \frac{z-6}{-9} = \lambda$

$$\Rightarrow x = \lambda - 5, y = 4\lambda - 3, z = 6 - 9\lambda$$

Let the coordinates of L are $(\lambda - 5, 4\lambda - 3, 6 - 9\lambda)$

Then direction ratios of PL are $(\lambda - 5 - 2, 4\lambda - 3 - 4, 6 - 9\lambda + 1)$ or $(\lambda - 7, 4\lambda - 7, 7 - 9\lambda)$.

Also, the direction ratios of given line are $1, 4, -9$.

Since, PL is perpendicular to the given line.

$$\therefore (\lambda - 7) \cdot 1 + (4\lambda - 7) \cdot 4 + (7 - 9\lambda) \cdot (-9) = 0$$

$$\Rightarrow \lambda - 7 + 16\lambda - 28 + 81\lambda - 63 = 0$$

$$\Rightarrow 98\lambda = 98$$

$$\Rightarrow \lambda = 1$$

So, the coordinates of L are $(\lambda - 5, 4\lambda - 3, 6 - 9\lambda) \equiv (-4, 1, -3)$.

$$\begin{aligned} \therefore \text{Also } PL &= \sqrt{(-4 - 2)^2 + (1 - 4)^2 + (-3 + 1)^2} \\ &= \sqrt{36 + 9 + 4} = 7 \text{ units} \end{aligned}$$