Q9. The length of the perpendicular from the point (2, - 1, 4) on the straight line, $\frac{x+3}{10} = \frac{y-2}{-7} = \frac{z}{1}$ is :

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A greater than 3 but less than 4

B less than 2

C greater than 2 but less than 3

D greater than 4

Solution:

Let P be the foot of perpendicular from point

$T(2, -1, 4)$ on the given line. So P can be assumed as

P $(10\lambda - 3, -7\lambda + 2, \lambda)$

DR's of TP is proportional to $10\lambda - 5, -7\lambda + 3, \lambda - 4$

TP and given line are perpendicular, so

$$10(10\lambda - 5) - 7(-7\lambda + 3) + 1(\lambda - 4) = 0$$

$$\Rightarrow \lambda = \frac{1}{2}$$

$$\Rightarrow TP = \sqrt{(10\lambda - 5)^2 + (-7\lambda + 3)^2 + (\lambda - 4)^2}$$

$$= \sqrt{0 + \frac{1}{4} + \frac{49}{4}} = \sqrt{12.5} = 3.54$$

Hence, the length of perpendicular is greater than 3 but less than 4.

Q2. The shortest distance between the lines $\frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$ is $\frac{x-3}{1} = \frac{y-8}{-1} = \frac{z-8}{1}$,

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A $3\sqrt{30}$

B $2\sqrt{30}$

C $\sqrt{30}$

D $4\sqrt{30}$

Solution:

$$\vec{p} = 3\hat{i} - \hat{j} + \hat{k}$$

$$\vec{q} = -3\hat{i} + 2\hat{j} + 4\hat{k}$$

$$\vec{p} \times \vec{q} = \begin{vmatrix} i & j & k \\ 3 & -1 & 1 \\ -3 & 2 & 4 \end{vmatrix} = -6\hat{i} - 15\hat{j} + 3\hat{k}$$

$$S.D. = \frac{\left|\overrightarrow{AB} \cdot \left(\vec{p} \times \vec{q}\right)\right|}{\left|\vec{p} \times \vec{q}\right|} = \frac{|36+225+9|}{\sqrt{36+225+9}} = 3\sqrt{30}$$