## Intersection point of a line and plane.

To find the point of intersection of the line $\frac{x-x_{1}}{l}=\frac{y-y_{1}}{m}=\frac{z-z_{1}}{n}$ and the plane $a x+b y+c z+d=0$.
The co-ordinates of any point on the line
$\frac{x-x_{1}}{l}=\frac{y-y_{1}}{m}=\frac{z-z_{1}}{n}$ are given by

$\frac{x-x_{1}}{l}=\frac{y-y_{1}}{m}=\frac{z-z_{1}}{n}=r$ (say) or $\left(x_{1}+l r, y_{1}+m r, z_{1}+n r\right)$
If it lies on the plane $a x+b y+c z+d=0$, then

$$
\begin{aligned}
& a\left(x_{1}+l r\right)+b\left(y_{1}+m r\right)+c\left(z_{1}+n r\right)+d=0 \Rightarrow\left(a x_{1}+b y_{1}+c z_{1}+d\right)+r(a l+b m+c n)=0 \\
& \therefore r=-\frac{\left(a x_{1}+b y_{1}+c z_{1}+d\right)}{a l+b m+c n} .
\end{aligned}
$$

Substituting the value of $r$ in (i), we obtain the co-ordinates of the required point of intersection.

## Algorithm for finding the point of intersection of a line and a plane

Step I:Write the co-ordinates of any point on the line in terms of some parameters $r$ (say).
Step II:Substitute these co-ordinates in the equation of the plane to obtain the value of $r$.
Step III:Put the value of $r$ in the co-ordinates of the point in step I.

