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 ax + by + cz + 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 $(x_1 + lr, y_1 + mr, z_1 + nr)$ (i) If it lies on the plane ax + by + cz + d = 0, then $a(x_1 + lr) + b(y_1 + mr) + c(z_1 + nr) + d = 0 \Rightarrow (ax_1 + by_1 + cz_1 + d) + r(al + bm + cn) = 0$ $\therefore r = -\frac{(ax_1 + by_1 + cz_1 + d)}{al + bm + cn}$.



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.