→ Reduction of the general equation of the plane to the intercept form.

Sol'n :- Let the plane be

$$ax+by+cz+d=0 \quad \text{——} (1)$$

$$\Rightarrow ax+by+cz=-d$$

$$\Rightarrow \frac{ax}{-d}+\frac{by}{-d}+\frac{cz}{-d}=1$$

$$\Rightarrow \frac{x}{(-d/a)}+\frac{y}{(-d/b)}+\frac{z}{(-d/c)}=1$$

$$\Rightarrow \frac{x}{A}+\frac{y}{B}+\frac{z}{C}=1$$

where $A=-d/a$, $B=-d/b$, $C=-d/c$

which is the required equation of the plane in the intercept form.

Note: To find the intercept on x-axis

Sol'n :- Put $y=0$, $z=0$ in (1)

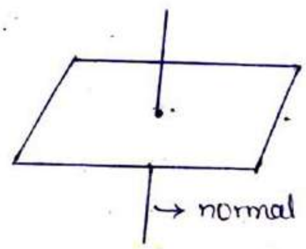
$$ax+d=0 \Rightarrow x=-d/a$$

Similarly on Y-axis is $-d/b$

Z-axis is $-d/c$

***Normal to a plane** :-

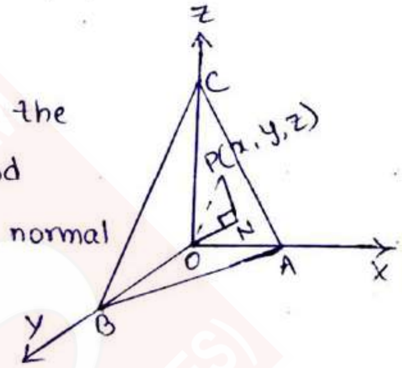
A line which is perpendicular to a plane is called a normal to the plane.



***Normal Form** :-

To find the equation of a plane in terms of p, the length of a perpendicular from the origin on the plane, and l, m, n the direction cosines of the perpendicular.

Sol'n :-



Let ABC be the given plane and let ON be the normal (i.e. ⊥) from 'O' to the plane.

$\therefore$ $ON = p$ and the d.c's of ON are l, m, n.

Let $P(x,y,z)$ be any point on the plane.

Now join OP and PN then $ON \perp PN$

$\therefore$ ON = Projection of OP on ON

$$p = l(x-0)+m(y-0)+n(z-0)$$

$$(\because l(x_2-x_1)+m(y_2-y_1)+n(z-z_1))$$

$$\Rightarrow p = lx+my+nz$$

which is the required equation of the plane.

Note :- 1. The equation $lx+my+nz=p$ is called the normal form of the equation of a plane.

2. The equation of a plane in the form $x\cos\alpha+y\cos\beta+z\cos\gamma=p$ where $l=\cos\alpha$, $m=\cos\beta$, $n=\cos\gamma$ and p is always positive.