Cartesian Form

(i) $Let\ p\ be\ the\ length\ of\ perpendicular\ drawn\ from\ a\ point\ P(x_1, y_1, z_1)\ to\ the\ plane\ ax + by + cz + d = 0. Then,$

$$p = \frac{|ax_1 + by_1 + cz_1 + d|}{\sqrt{a^2 + b^2 + c^2}}$$

(ii) $Let\ p\ be\ the\ length\ of\ perpendicular\ drawn\ from\ the\ origin\ to\ the\ plane\ plane\ ax + by + cz + d = 0. Then,$

$$p = \frac{|d|}{\sqrt{a^2 + b^2 + c^2}}$$

(8) **Equation of a Plane parallel to a given Plane**

Vector Form

$Any\ plane\ parallel\ to\ \vec{r}.\vec{n} = q_1\ \ is\ given\ by\ \vec{r}.\vec{n} = q_2, where\ the\ constant\ q_2\ is\ determined\ by\ a\ given\ condition.$

Cartesian Form

$Any\ plane\ parallel\ to\ ax + by + cz + d = 0\ \ is\ given\ by\ ax + by + cz + k = 0, where\ the\ constant\ k\ is\ determined\ by\ a\ given\ condition.$

(9) **Plane passing through the intersection of two planes**

Vector Form

$The\ vector\ equation\ of\ a\ plane\ passing\ through\ the\ intersection\ of\ two\ planes$ $\vec{r}.\overrightarrow{n_1} = q_1\ \ and\ \ \vec{r}.\overrightarrow{n_2} = q_2\ \ is\ given\ by$

$$\vec{r}.\left(\overrightarrow{n_1} + \lambda\overrightarrow{n_2}\right) = (q_1 + \lambda q_2).$$

Cartesian Form

$The\ equation\ of\ a\ plane\ passing\ through\ the\ intersection\ of\ two\ planes$ $a_1x + b_1y + c_1z + d_1 = 0\ \ and\ \ a_2x + b_2y + c_2z + d_2 = 0\ \ is\ given\ by$

$$a_1x + b_1y + c_1z + d_1 + \lambda(a_2x + b_2y + c_2z + d_2) = 0.$$

(10) **Equation of a Plane passing through Three Non-collinear Points**

Vector Form

$The\ vector\ equation\ of\ a\ plane\ passing\ through\ three\ non-collinear\ points\ having$ $p.v.'s\ \ \vec{a}, \vec{b}, \vec{c}\ \ is\ given\ by$

$$(\vec{r} - \vec{a}).\left[\left(\vec{b} - \vec{a}\right) \times (\vec{c} - \vec{a})\right] = 0.$$

Cartesian Form

$The\ cartesian\ equation\ of\ a\ plane\ passing\ through\ three\ non-collinear\ points$ $A(x_1, y_1, z_1), B(x_2, y_2, z_2)\ and\ C(x_3, y_3, z_3)\ is\ given\ by$