## Section Formulas.

## (1) Section formula for internal division:Let $P(x_1, y_1, z_1)$ and $Q(x_2, y_2, z_2)$ be

two points. Let R be a point on the line segment joining P and Q such that it divides the join of P and Q internally in the ratio  $m_1 : m_2$ . Then the co-

ordinates of R are  $\left(\frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \frac{m_1y_2 + m_2y_1}{m_1 + m_2}, \frac{m_1z_2 + m_2z_1}{m_1 + m_2}\right)$ .



(2) **Section formula for external division:**Let  $P(x_1, y_1, z_1)$  and  $Q(x_2, y_2, z_2)$  be two points, and let R be a point on PQ produced, dividing it externally in the ratio  $m_1 : m_2 (m_1 \neq m_2)$ . Then the

co-ordinates of R are  $\left(\frac{m_1x_2 - m_2x_1}{m_1 - m_2}, \frac{m_1y_2 - m_2y_1}{m_1 - m_2}, \frac{m_1z_2 - m_2z_1}{m_1 - m_2}\right)$ .

Note: **Co-ordinates of the midpoint:** When division point is the mid-point of PQ then ratio will be 1: 1, hence co-ordinates of the midpoint of PQ are  $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}, \frac{z_1 + z_2}{2}\right)$ .

**Co-ordinates of the general point:** The co-ordinates of any point lying on the line joining points  $P(x_1, y_1, z_1)$  and  $Q(x_2, y_2, z_2)$  may be taken as  $\left(\frac{kx_2 + x_1}{k+1}, \frac{ky_2 + y_1}{k+1}, \frac{kz_2 + z_1}{k+1}\right)$ , which divides PQ in the ratio k : 1. This is called general point on the line PQ.