## Section Formulas.

(1) Section formula for internal division:Let $P\left(x_{1}, y_{1}, z_{1}\right)$ and $Q\left(x_{2}, y_{2}, z_{2}\right)$ 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 coordinates of R are $\left(\frac{m_{1} x_{2}+m_{2} x_{1}}{m_{1}+m_{2}}, \frac{m_{1} y_{2}+m_{2} y_{1}}{m_{1}+m_{2}}, \frac{m_{1} z_{2}+m_{2} z_{1}}{m_{1}+m_{2}}\right)$.

(2) Section formula for external division:Let $P\left(x_{1}, y_{1}, z_{1}\right)$ and $Q\left(x_{2}, y_{2}, z_{2}\right)$ be two points, and let $R$ be a point on PQ produced, dividing it externally in the ratio $m_{1}: m_{2}\left(m_{1} \neq m_{2}\right)$. Then the co-ordinates of R are $\left(\frac{m_{1} x_{2}-m_{2} x_{1}}{m_{1}-m_{2}}, \frac{m_{1} y_{2}-m_{2} y_{1}}{m_{1}-m_{2}}, \frac{m_{1} z_{2}-m_{2} z_{1}}{m_{1}-m_{2}}\right)$.

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 $P\left(x_{1}, y_{1}, z_{1}\right)$ and $Q\left(x_{2}, y_{2}, z_{2}\right)$ may be taken as $\left(\frac{k x_{2}+x_{1}}{k+1}, \frac{k y_{2}+y_{1}}{k+1}, \frac{k z_{2}+z_{1}}{k+1}\right)$, which divides PQ in the ratio $\mathrm{k}: 1$. This is called general point on the line PQ.

