BAAP OF ALL FORMULA LISTS

FOR IIT JEE

TRIANGLE

SL#	FORMULA
1	**Centroid (Intersection of Medians) of a Triangle** $x_0 = \frac{x_1 + x_2 + x_3}{3}, y_0 = \frac{y_1 + y_2 + y_3}{3}, where A(x_1, y_1), (B(x_2, y_2), \text{ and } C(x_3, y_3)$ **are vertices of the** $\triangle ABC$
2	**Incenter (Intersection of Angle Bisectors) of a Triangle** $x_0 = \frac{ax_1 + bx_2 + cx_3}{a + b + c}, y_0 = \frac{ay_1 + by_2 + cy_3}{a + b + c}$ **where** $a = BC, b = CA, c = AB.$
3	**Circumcenter (Intersection of the side Perpendicular Bisectors) of a Triangle** $x_0 = \frac{\begin{vmatrix} x_1^2 + y_1^2 & y_1 & 1 \\ x_2^2 + y_2^2 & y_2 & 1 \\ x_3^2 + y_3^2 & y_3 & 1 \end{vmatrix}}{2\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}}, y_0 = \frac{\begin{vmatrix} x_1 & x_1^2 + y_1^2 & 1 \\ x_2 & x_2^2 + y_2^2 & 1 \\ x_3 & x_3^2 + y_3^2 & 1 \end{vmatrix}}{2\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}}$
4	**Orthocenter (Intersection of Altitudes) of a Triangle** $x_0 = \frac{\begin{vmatrix} y_1x_2 & x_3 + y_1^2 & 1 \\ y_2 & x_3x_1 + y_2^2 & 1 \\ y_3 & x_1x_2 + y_3^2 & 1 \end{vmatrix}}{\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}}, y_0 = \frac{\begin{vmatrix} x_1^2 + y_2y_3 & x_1 & 1 \\ x_2^2 + y_3y_1 & x_2 & 1 \\ x_3^2 + y_1y_2 & x_3 & 1 \end{vmatrix}}{\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}}$
5	**Area of a Triangle** $S = (\pm)\frac{1}{2}\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = (\pm)\frac{1}{2}\begin{vmatrix} x_2 - x_1 & y_2 - y_1 \\ x_3 - x_1 & y_3 - y_1 \end{vmatrix}$
6	**Area of a Quadrilateral** $S = (\pm)\frac{1}{2}[(x_1 - x_2)(y_1 + y_2) + (x_2 - x_3)(y_2 + y_3) + (x_3 - x_4)(y_3 + y_4) + (x_4 - x_1)(y_4 + y_1)]$