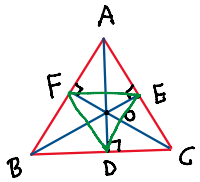
Important Formulae and Concepts

For a ΔABC,

$a, b, c \rightarrow$ sides of the triangle

$A, B, C \rightarrow$ angles of the triangle

$O \rightarrow$ Orthocentre of the triangle



$D, E, F \rightarrow$ foot of the perpendiculars on sides BC, AC & AB

$r, R \rightarrow$ inradius, circumradius

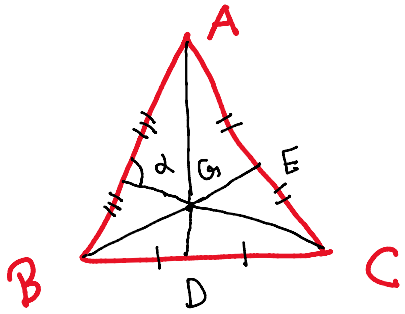
* Incentre & Circumcentre of a Pedal Triangle:→

$$r' = 2R \cos A \cdot \cos B \cdot \cos C$$

$$R' = \frac{R}{2}$$

Properties related to Median: →

* The line joining the mid-point of a side to the opposite vertex is called median.
* The 3 medians of a triangle are concurrent.
* The point of intersection of the 3 medians is called Centroid (G) of the triangle.
* The centroid divides the median in the ratio of 2:1.



* Length of the medians of the triangle:→

* **Length of the medians of the triangle:→**

$$AD = \frac{\sqrt{2b^2 + 2c^2 - a^2}}{2}$$

$$BE = \frac{\sqrt{2a^2 + 2c^2 - b^2}}{2}$$

$$CF = \frac{\sqrt{2a^2 + 2b^2 - c^2}}{2}$$

* **Angles made by medians with the sides:→**

In the above triangle,

$$2\sin\alpha = \frac{2b\sin A}{\sqrt{2b^2 + 2a^2 - c^2}}$$

* For a ΔABC with centroid G,

$$ar(\Delta GAB) = ar(\Delta GBC) = ar(\Delta GCA) = \frac{1}{3} ar(\Delta ABC)$$

where $ar(\Delta ABC)$ denotes area of ΔABC.

Properties related to Ex-Centre:→

* The point of intersection of the angle bisectors of the exterior angles of a triangle is known as the Ex-centre.
* There are 3 ex-centres of triangle namely I_1, I_2, I_3
* I_1, I_2, I_3 form a triangle $\Delta I_1 I_2 I_3$ called ex-central triangle.

* **Angles of Ex-Central triangle:→**

$$\angle I_1 = \frac{\pi}{2} - \frac{A}{2}, \quad \angle I_2 = \frac{\pi}{2} - \frac{C}{2}, \quad \angle I_3 = \frac{\pi}{2} - \frac{B}{2}$$

where I_1 is the ex-centre opposite to vertex A.
Similarly for I_2 and I_3.

* Sides of Ex-central triangle :→

$$I_1I_2 = 4R\cos\frac{B}{2}, \quad I_2I_3 = 4R\cos\frac{A}{2}$$

$$I_3I_1 = 4R\cos\frac{C}{2}$$

where I_1 is the ex-centre opposite to vertex A.

Similarly for I_2 and I_3.

X X