

Excentral triangle

$$II_1 = 2(2R) \cos I_1 = 4R \sin \frac{A}{2}$$

$$II_2 = 4R \sin \frac{B}{2}$$

$$II_3 = 4R \sin \frac{C}{2}$$

$$I_1 I_2 = 2(2R) \sin I_3 = 4R \cos \frac{A}{2}$$

$$I_2 I_3 = 4R \cos \frac{B}{2}$$

$$I_3 I_1 = 4R \cos \frac{C}{2}$$

$$\angle I_1 = \frac{\pi}{2} - \frac{A}{2}$$

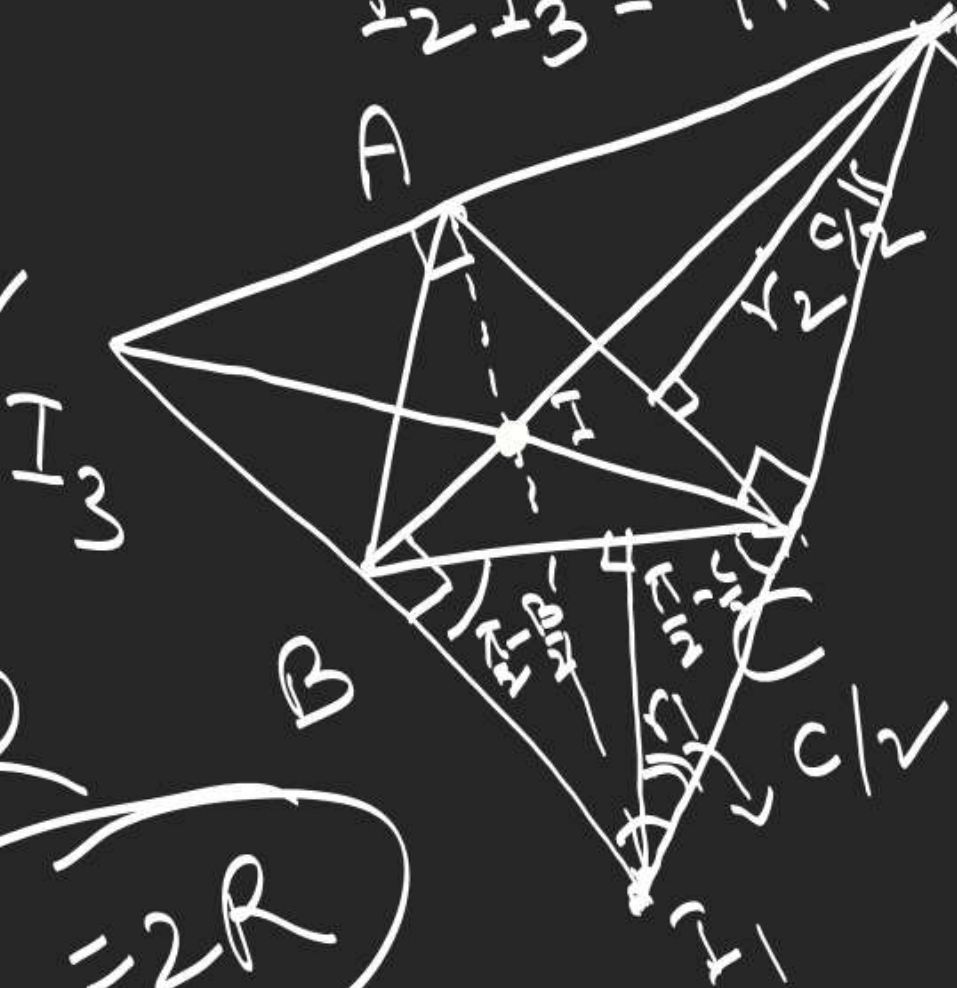
$$\angle I_2 = \frac{\pi}{2} - \frac{B}{2}$$

$$\angle I_3 = \frac{\pi}{2} - \frac{C}{2}$$

$$\pi - 2I_1 = A$$

$$\pi - 2I_2 = B$$

$$\pi - 2I_3 = C$$



$$\frac{R I_1 I_2 I_3}{2} = R$$

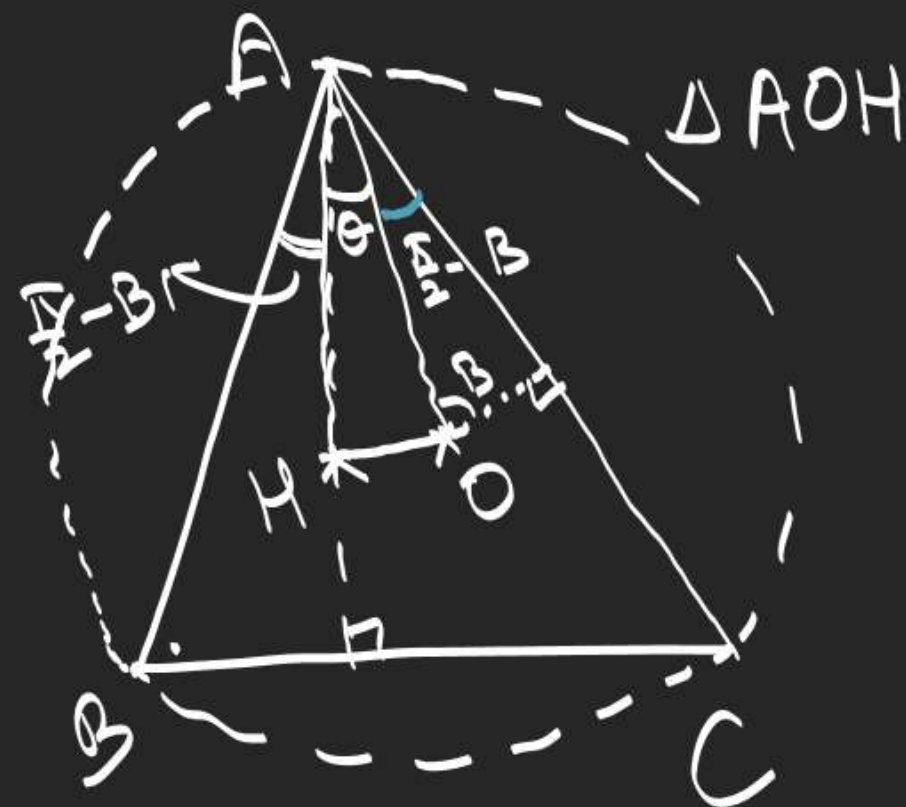
$$R I_1 I_2 I_3 = 2R$$

$$\pi - \left(\frac{\pi}{2} - \frac{B}{2} + \frac{\pi}{2} - \frac{C}{2} \right)$$

$$= \frac{B+C}{2}$$

$$= \frac{\pi}{2} - \frac{A}{2}$$

Distance between Orthocentre & Circumcentre



$$\begin{aligned}\theta &= A - (\pi - 2B) \\ &= A + 2B - (A + B + C) \\ &= B - C.\end{aligned}$$

$$\cos \theta = \frac{AH^2 + OA^2 - OH^2}{2(AH)(OA)}$$

$$\Rightarrow OH^2 = AH^2 + OA^2 - 2(AH)(OA) \cos \theta$$

$$R^2(1 - 8 \cos A \cos B \cos C) = R^2 + 4R^2 \cos^2 A - 4R^2 \cos A \cos(B - C)$$

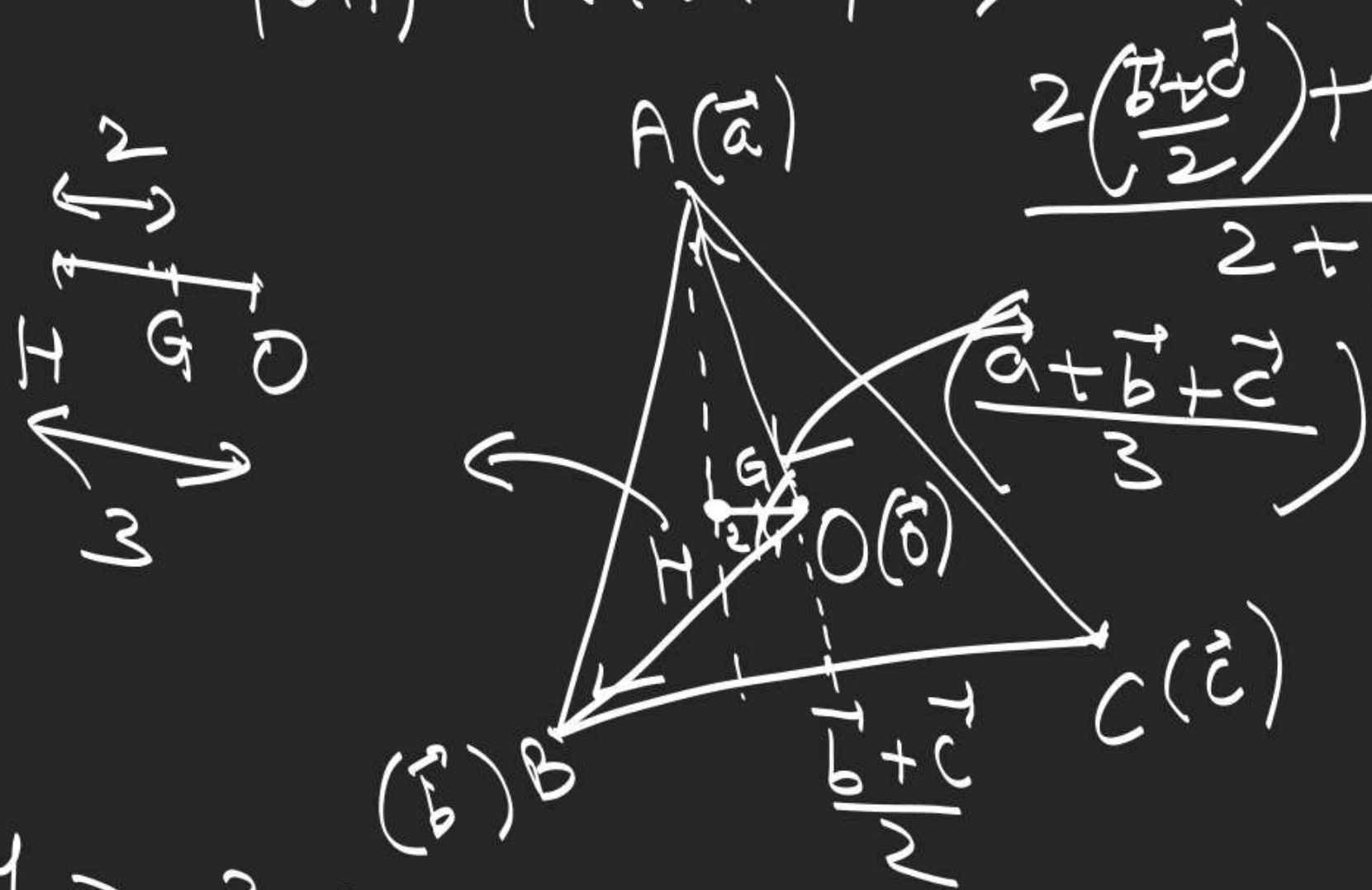
$$(AH)(HD) = (\underline{HE})(HF)$$

$$F = (2R \cos A) + (4R \cos B \cos C)$$

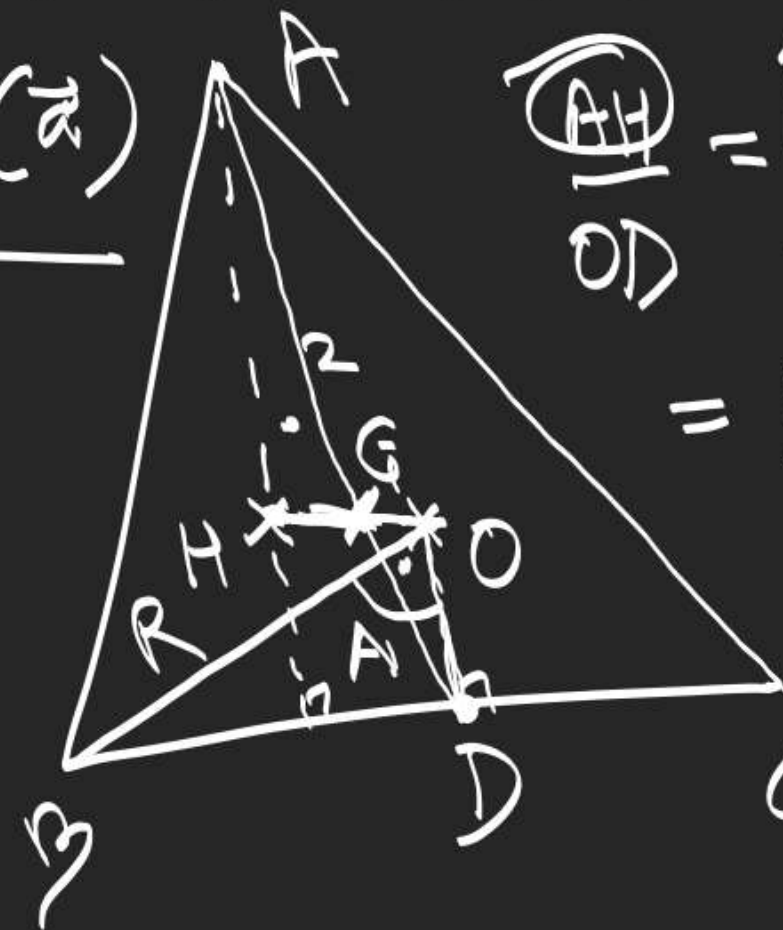
$$= (R - OH)(R + OH)$$

$$= R^2-OH^2$$

$$|\vec{OH}|^2 = |\vec{a} + \vec{b} + \vec{c}|^2 = 3R^2 + 2R^2(\cos 2A + \cos 2B + \cos 2C)$$

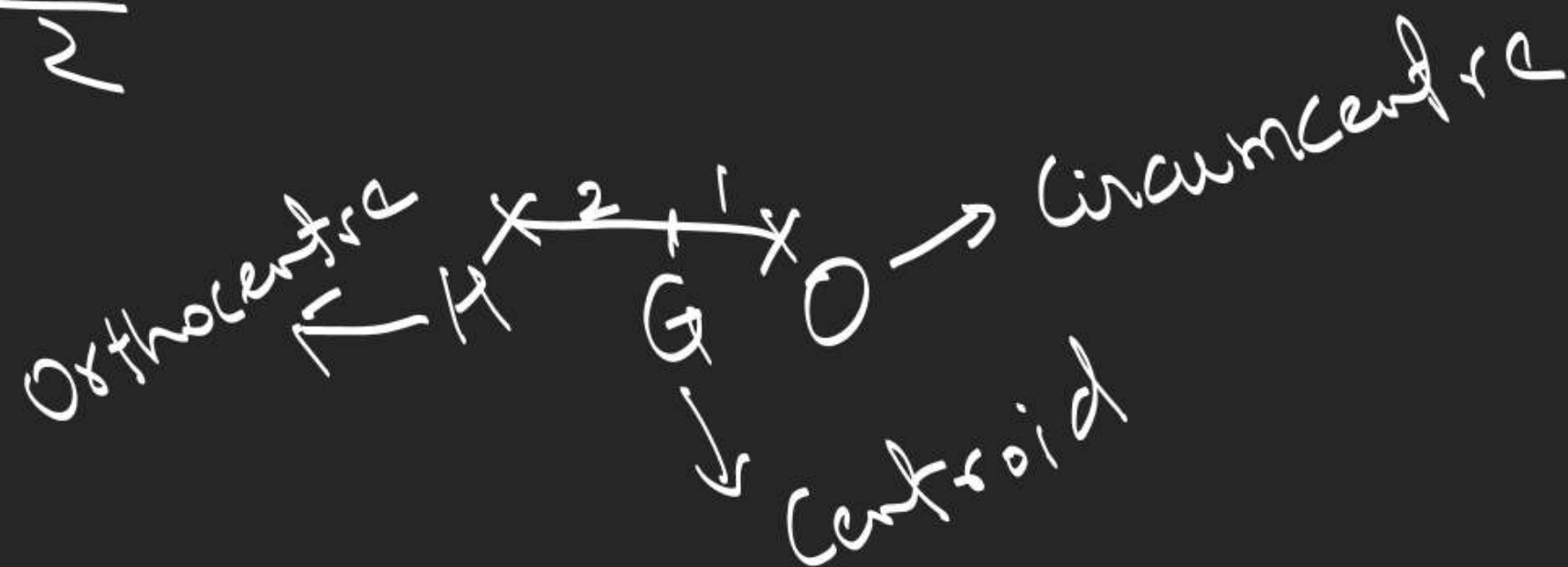


$$\frac{2\left(\frac{\vec{b} + \vec{c}}{2}\right) + 1(\vec{a})}{2+1}$$



$$\frac{AH}{OD} = \frac{AG}{GD} = \frac{HG}{GO} = \frac{2R \cos A}{R \cos A} = \frac{2}{1}$$

$$H = \frac{3G - 2O}{3 - 2} = \vec{a} + \vec{b} + \vec{c}$$



$$\frac{2x-37}{-}$$

6, 7, 11, 10, 19, 20, 27, 31, 32
34, 35, 36