

PP38294

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In all triangles ABC holds:

$$\begin{aligned} 1. \quad & \sum_{cyc} \frac{1}{m_a w_a} \leq \frac{4R+r}{s^2 r} \\ 2. \quad & \sum_{cyc} \frac{1}{m_a w_a m_b w_b} \leq \frac{1}{s^2 r^2} \end{aligned}$$

Mihály Bencze

Solution by Daniel Sitaru.

$$\begin{aligned} 1. \quad & \sum_{cyc} \frac{1}{m_a w_a} \leq \sum_{cyc} \frac{1}{s(s-a)} = \\ & = \frac{1}{s} \cdot \sum_{cyc} \frac{1}{s-a} = \frac{1}{s} \cdot \frac{4R+r}{rs} = \frac{4R+r}{s^2 r} \\ 2. \quad & \sum_{cyc} \frac{1}{m_a w_a m_b w_b} \leq \sum_{cyc} \frac{1}{s(s-a)s(s-b)} = \\ & = \frac{1}{s^2} \sum_{cyc} \frac{1}{(s-a)(s-b)} = \frac{1}{s^2} \cdot \frac{1}{r^2} = \frac{1}{s^2 r^2} \end{aligned}$$

Equality holds for $a = b = c$.

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