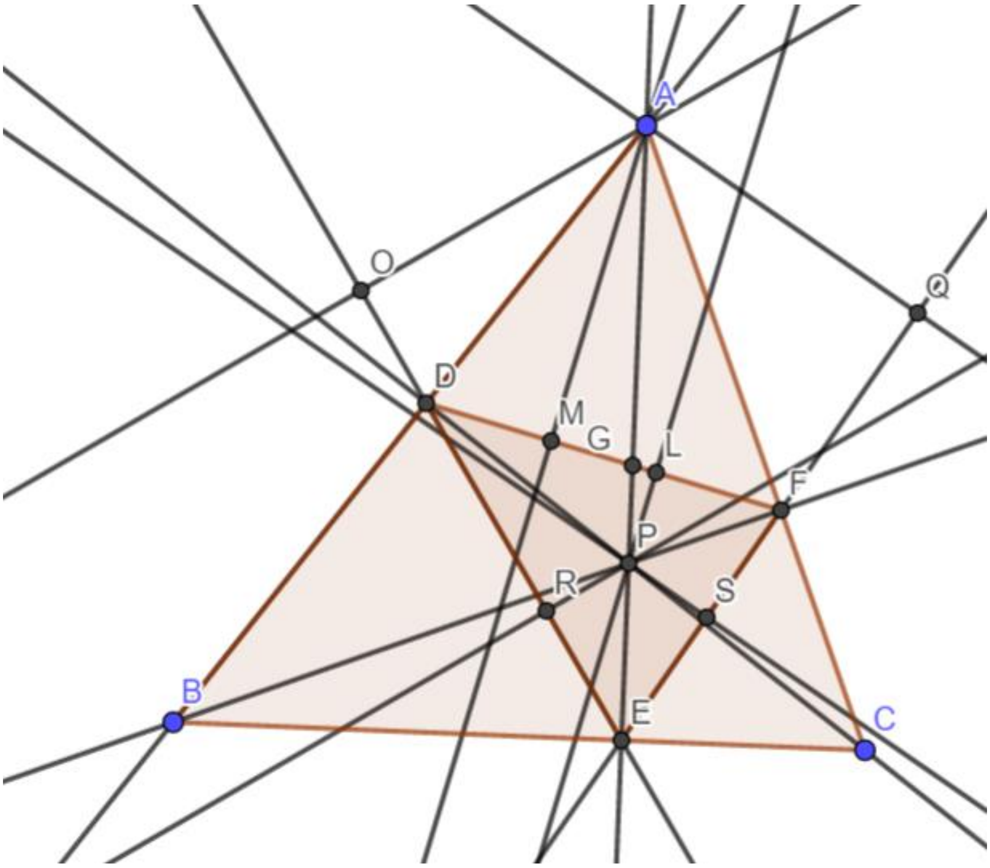
12190. *Proposed by Leonard Giugiuc, Drobeta Turnu Severin, Romania, and Gabriela Negutescu, Telea, Romania.* Let *ABC* be a triangle, and let *D*, *E*, and *F* be points on *AB*, *BC*, and *CA*, respectively, such that *AD*, *BE*, and *CF* are concurrent at *P*. It is well known that if *P* is the orthocenter of *ABC*, then *P* is the incenter of *DEF*. Prove the converse.

Solution of Ricardo Barroso Campos. Sevilla. Spain.

First it must be AE, BF and CD concurrent at P.



If P is the incenter of DEF, let G =AE∩ DF
Let O, M,and Q projection of A on ED, DF, and EF.
Let R, L and S projection of P on ED, DF, and EF.

Is: $\frac{AO}{PR} = \frac{AM}{PL} = \frac{AQ}{PS} = \frac{AG}{PG}$
Thus A is the exincenter of DEF triangle.
For analogous reasoning, B and C are exincenters of DEF triangle.
Thus, $AE \perp BC$, $BF \perp AC$, $and\ CD \perp BA$, and P is the orthocenter of ABC.