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Solution to Problem 1032.

Label the vertices of the triangle starting from the left lower corner counterclockwise A, B and C. And let CH be the height of $\triangle ABC$. Then $CH = \frac{\sqrt{3}}{2}$. We also know $AB = BC = AC$.

Then we have

$$\begin{aligned} \triangle ABC &= \triangle APB + \triangle BPC + \triangle APC \\ \frac{AB \cdot CH}{2} &= \frac{AB \cdot PQ}{2} + \frac{BC \cdot PR}{2} + \frac{AC \cdot PS}{2} \\ &= \frac{AB \cdot (PQ + PR + PS)}{2} \\ CH &= PQ + PR + PS = \frac{\sqrt{3}}{2} \end{aligned}$$

In general, let $A_1A_2A_3 \ldots A_n$ be a regular n-gon and h the distance from the center of the n-gon to a side. If P is any point inside the n-gon, then the sum of the distances from point P to each side of the n-gon is nh.

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