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SYNOPSIS

by *Cosmin Pohoaţă*

Almost everyone is familiar with the incircle of a triangle and the circumcircle of a triangle. These two circles never meet, as they live inside and outside of the triangle, respectively.

Pick two sides of the triangle and extend these sides to rays emanating from their common vertex. Now imagine that the incircle (confined as it is inside the triangle) becomes restless and that it starts to expand, but that as it expands it keeps in contact with the two rays of the extended sides. As the incircle expands in this way, it will eventually just touch the circumcircle, at which point it stops expanding. It has now become the *mixtilinear incircle* inside the angle between the two rays.

How does one locate the mixtilinear incircles of a triangle?

Here the author gives us not just one, but five different constructions for how to locate the mixtilinear incircles. Don't forget to pull out your compass and straightedge for this one!

Enjoy!!

This month's "free sample" is:

3424. *Proposé par Yakub N. Aliyev, Université d'Etat de Bakou, Bakou, Azerbaïdjan.*

Pour un entier positif m, soit σ la permutation de $\{0, 1, 2, \ldots, 2m\}$ définie par $\sigma(2i) = i$ pour $i = 0, 1, 2, \ldots, m$ et $\sigma(2i-1) = m+i$ pour $i = 1, 2, \ldots, m$. Montrer qu'il existe un entier positif k tel que $\sigma^k = \sigma$ et $1 < k \leq 2m + 1$.

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3424. *Proposed by Yakub N. Aliyev, Baku State University, Baku, Azerbaijan.*

For a positive integer m, let σ be the permutation of $\{0, 1, 2, \ldots, 2m\}$ defined by $\sigma(2i) = i$ for each $i = 0, 1, 2, \ldots, m$ and $\sigma(2i - 1) = m + i$ for each $i = 1, 2, \ldots, m$. Prove that there exists a positive integer k such that $\sigma^k = \sigma$ and $1 < k \leq 2m + 1$.