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SYNOPSIS

In the problem of the month [1999 : 106], one was to prove that

$$\sqrt{a+b-c}+\sqrt{b+c-a}+\sqrt{c+a-b} \;\le\; \sqrt{a}+\sqrt{b}+\sqrt{c}\,,$$

where a, b, c are sides of a triangle.

It is to be noted that this inequality will follow immediately from the Majorization Inequality.

Read on !

A solution to the inequality (1996 Asian Pacific Mathematical Competition)

$$\sqrt{a+b-c}+\sqrt{a-b+c}+\sqrt{-a+b+c} \leq \sqrt{a}+\sqrt{b}+\sqrt{c} \quad (1)$$

where a, b, c are the sides of a triangle, appeared in Crux [1999 : 106]. It starts with the substitution $a = x + y$, $b = y + z$, $c = z + x$ $(x, y, z > 0)$.

This substitution is referred to as the "Ravi Substitution" and reported to be known by this name, at least in Canadian IMO circles.

It seems that this awkward credit for the substitution diffused to wider circles. The same inequality (1) appears in a French problem solving book from 1999 [1, p. 146]. Although the solution proposed in [1] is different, it starts with the same substitution which, amazingly, is called there too the "Ravi Substitution". Further, [1] includes several other mentions and applications of the "Ravi Substitution" [1, pp. 130, 146, 147, 155, 237].

Read on !

References

1. T.B. Soulami. Les Olympiades de mathématiques ; Réflexes et stratégies. Ellipse, Paris (1999).

This month's "free sample" is :

2715. *Proposé par Toshio Seimiya, Kawasaki, Japan.*

Soit O le centre du cercle inscrit à un quadrilatère convexe $ABCD$. Si E et F sont respectivement les centres des cercles inscrits aux triangles ABC et ADC, montrer que A, O et le centre du cercle circonscrit au triangle AEF sont sur une droite.

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Suppose that the convex quadrilateral $ABCD$ has an incircle with centre O. Let E and F be the incentres of $\triangle ABC$ and $\triangle ADC$, respectively.
Prove that A, O and the circumcentre of $\triangle AEF$ are collinear.