JAPANESE THEOREM: A LITTLE KNOWN THEOREM
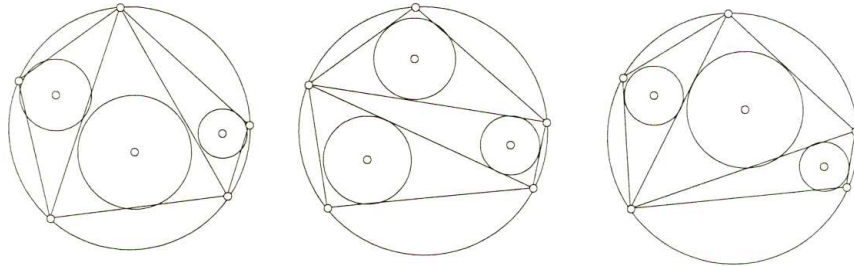# WITH MANY PROOFS – PART I

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[Note: (A), (U), (M) refer to the authors' names. The pronoun I always means (A).]

Japanese Theorem. Triangulate a cyclic polygon by lines drawn from any vertex. The sum of the radii of the incircles of the triangles is independent of the vertex chosen.

1. Background. I (A) found this theorem in a 1993 article [5], where the author Nick Mackinnon wrote " . . . I have used the above theorem as a starter for course work, not expecting a proof of the theorem (I can't even prove it myself) . . . " It was the author's remark in parenthesis that intrigued me. In fall 1995 I assigned this theorem as a problem to Cathy, a Masters Degree student. By spring 1996 both Cathy and I had a proof of the theorem [3]. But one question remained: Why is it called the Japanese Theorem? My long search for the answer ended when I received a 15-page fax in English, French, and Japanese from Professor Yoshida of Kyoto University.

The theorem (Quadrilateral case) had originated in China [6]. So, when it came to Japan around 1900, it was known as the "Chinese Theorem" [4]. Later, when Y. Mikami generalized it from a quadrilateral to a polygon, the name remained the "Chinese Theorem". So, who coined the term "The Japanese Theorem"? This theorem, without a name, appeared in a 1906 article entitled, "Japanese Mathematics" [2]. We believe this led the later authors to call it the "Japanese Theorem".

This theorem is displayed on a wooden tablet in a Shinto shrine. The hanging of such tablets showing mathematical theorems was a common custom in Edo era