

AREA FORMULAE FOR NON-EUCLIDEAN POLYGONS

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The Heron formula (c. 60 BC) relates the area of an Euclidean triangle to its side lengths. Indian mathematician and astronomer Brahmagupta, in the seventh century, gave the analogous formulas for a convex cyclic quadrilateral. German mathematician Carl Bretschneider (1842) related the area of an arbitrary Euclidean quadrilateral to its side lengths and the sum of two opposite angles. Several non-Euclidean versions of the Heron theorem are known for a long time.

In this lecture we consider a convex hyperbolic quadrilateral inscribed in a circle, horocycle or one branch of equidistant curve. This is a natural hyperbolic analog of the cyclic quadrilateral in the Euclidean plane. We find a few versions of the Brahmagupta formula for such quadrilaterals and consider some generalizations of the Bretschneider theorem for hyperbolic and spherical cases.

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