Quadratic forms, closed geodesics, and periods

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Quadratic forms have been studied from many points of view. We will see how equivalence of quadratic forms and solving certain Pell's equations connects to the geometry of the hyperbolic plane and the geodesics of the simplest hyperbolic surface, which has fundamental group $SL(2,\mathbb{Z})$.

The study of the lengths of such closed geodesics presents analogies with the Prime Number Theorem. We will survey some recents developments in this direction and its relation to modular symbols and additive twists of L-functions.