1106-51-1512 **Michael Knopf*** (mknopf@berkeley.edu), **Jesse Milzman** (jmm398@georgetown.edu), **Derek Smith** (smithder@lafayette.edu), **Dantong Zhu** (zhud@lafayette.edu) and **Dara Zirlin** (zirli22d@mtholyoke.edu). *Lattice Embeddings of Planar Point Sets.*

In the Euclidean plane, let S be a set of points whose pairwise distances are integers. If the area of each triangle with vertices in S is also an integer, it is not hard to find a congruent copy of S that embeds in $\mathbb{Q}^2$. It is more surprising that S also embeds in $\mathbb{Z}^2$, a result due to Fricke. Fricke's method relies on the unique factorization of the Gaussian integers $\mathbb{Z}[\sqrt{-1}]$.

If the area of some triangle in S is not an integer, by Heron's formula it will be of the form $q\sqrt{d}$, where $d \in \mathbb{Z}$ is square-free and $q \in \mathbb{Q}$. In fact, the area of every triangle in S will be of this form for the same value of d, called the "characteristic" of S. It is then natural to ask whether S embeds in $\mathbb{Z}[\sqrt{-d}]$. The equilateral triangle with side length 1 provides a counterexample for $d = 3$; but the triangle does embed in the maximal order $\mathbb{Z}[\omega]$ of Eisenstein integers, where $\omega = (1 + \sqrt{-3})/2$.

Our main result determines the values of d for which all S with characteristic d embed in the maximal order of the quadratic field $\mathbb{Q}(\sqrt{-d})$. We also provide similar results for point sets whose pairwise distances need only be square roots of integers. (Received September 13, 2014)