1070-53-149 **Marisa C Zemsky*** (MCZems11@holycross.edu). *Isometries Of Geometric Spaces.*

With attempts to prove the parallel postulate in Euclidean geometry, ideas emerged about the existence of non-Euclidean geometries such as spherical geometry and hyperbolic geometry. Professor Cecil and I studied the isometry groups in the Euclidean plane, the sphere, and the hyperbolic plane. In order to understand the group of isometries, we first studied how geometry on the Euclidean plane is defined using linear algebra. Then we studied transformations that can be obtained as a product of a finite number of reflections: the identity transformation, reflections, translations, rotations, and glide reflections. We proved that in the $E^2$, every isometry, i.e., an onto mapping $T$ from $E^2$ to itself that preserves distance, must be one of these types of transformations.

We continued our research by analyzing spherical geometry. Using our knowledge of $E^2$ we were able to study transformations on the sphere as well. Similar transformations to those in the Euclidean space are defined on the sphere. We proved our main theorem in $S^2$: For every isometry $T_0$ of $S^2$ there is an orthogonal transformation $T$ coinciding with $T_0$ on $S^2$. By proving this we were also able to prove that every isometry of $S^2$ is one of the five transformations we studied. (Received February 07, 2011)