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Sam P Ruth* (s-ruth@northwestern.edu), 124 Gum St, New Lenox, IL 60451, **Arran Christopher Hamm** (hammac3@wfu.edu), 7619 Amherst Road, Waynesfield, OH 45896, and **Sarah Renee Bockting** (sb128@evansville.edu), 4346 W 500 S, Huntingburg, IN 47542.

Normal Subgroups of a Wreath p -Group and Corresponding Doubly-Invariant Vector Subspaces: Preliminary Report. Preliminary report.

Our project was part of a REU program at the University of Akron. Before our work began, our project advisor, Dr. Jeff Riedl, had previously established a correspondence between the normal subgroups of a finite wreath product p -group and certain matrix subspaces that are invariant under two specific linear transformations. These transformations can be thought of as two partial derivative operators on a function space from $\mathbb{Z}/p\mathbb{Z} \times \mathbb{Z}/p\mathbb{Z}$ to $\mathbb{Z}/p\mathbb{Z}$. When thought of as transformations on matrix spaces, there is an exhaustive procedure for finding all the doubly-invariant subspaces. We investigated the $p=5$ case in order to discover both the number and the form of these subspaces, which is equivalent to counting and describing the normal subgroups of these wreath products. The first step in tackling this problem was to split it into cases, based on the number and arrangement of standard basis matrices contained in each doubly-invariant subspace. This splits the general problem into $2p$ choose p cases, which for $p=5$, is 252. Some of these cases are quite trivial to work with, while others are quite complicated. We will illustrate the general algorithm used for working through the different cases and discuss examples that display the range of this problem. (Received July 24, 2006)