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*A Proof of The First Main Theorem for the Two Dimensional Modular Representation of  $C_p$ .*

This is the first of two talks at this meeting on the vector invariants of the 2-dimensional indecomposable representation of  $C_p$  in characteristic  $p > 0$ . That is,  $C_p$  acts diagonally on the  $2m$ -dimension representation  $mV_2 = V_2 \oplus V_2 \oplus \dots \oplus V_2$ . The action of  $C_p$  on  $mV_2$  naturally induces an action of  $C_p$  on the symmetric algebra (or co-ordinate ring)  $S^*(mV_2)$ . Hughes and I gave a set of generators for the ring of invariants  $S^*(mV_2)^{C_p}$  of this representation for all  $m$ . Our proof confirmed a conjecture of David Richman and showed that the Noether number (the maximal degree of a generator occurring in any generating set) is  $m(p - 1)$ . The proof itself is difficult and relies upon a deep result of Wilson concerning the rank of various 0-1 matrices in characteristic  $p$ .

I will set the stage and describe my proof with Hughes. If time permits I will go on to describe "periodicity" in the symmetric algebra. Following my talk, David Wehlau will give a new proof of this result, joint work of myself, Jim Shank and David Wehlau. (Received September 10, 2007)