

## $\Gamma$ -supermagic labeling of some regular graphs with dihedral groups

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Let  $G = (V, E)$  be a simple finite undirected graph with  $p$  vertices and  $q$  edges, and let  $\Gamma$  be a group of order  $q$ .

A bijection  $f : \Gamma \rightarrow E$  is called a  $\Gamma$ -*supermagic labeling* of  $G$  if for every vertex  $x_i \in V$  there exists an ordering  $x_{i_1}, x_{i_2}, \dots, x_{i_k}$  of the neighbors of  $x_i$  such that the product of labels of all edges incident with every vertex of  $G$  (called the *weight* of the vertex) is the same element  $\mu$  of  $\Gamma$ . In other words, for a vertex  $x_i \in G$ , we define its weight as

$$w(x_i) = \prod_{x_i x_{i_j} \in E} f(x_i x_{i_j})$$

and say that  $f$  is a  $\Gamma$ -supermagic labeling if there exists  $\mu \in \Gamma$  such that for every  $x_i \in G$ ,

$$w(x_i) = \mu.$$

A graph  $G$  admitting a  $\Gamma$ -supermagic labeling is then called a  $\Gamma$ -*supermagic graph*. The labeling is also sometimes called a *vertex-magic edge*  $\Gamma$ -*labeling*.

Until recently, all results on  $\Gamma$ -supermagic labelings we are aware of dealt with Abelian groups. Two years ago at this conference, we presented some preliminary results on labelings of Cartesian products of two cycles with dihedral groups  $D_n$ . This time, we expand the results to other classes of regular graphs.

Keywords:  $\Gamma$ -supermagic labeling,  $\Gamma$ -supermagic graph, vertex-magic edge  $\Gamma$ -labeling