

Diagonal groups, diagonal graphs and related combinatorial structures

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Diagonal groups are one of the classes of finite primitive permutation groups occurring in the conclusion of the O’Nan-Scott theorem. Several of the other classes have been described as the automorphism groups of geometric or combinatorial structures such as affine spaces or Cartesian decompositions, but such structures for diagonal groups have not been previously studied.

The main purpose of this talk is to describe and characterise such structures for the diagonal groups. One example of such a structure is the diagonal graph whose automorphism group coincides with the diagonal group, analogously to Hamming graphs whose automorphism groups coincide with wreath products in product action. Diagonal graphs have many interesting graph theoretical properties that make them worthy of further study.

Another structure preserved by the diagonal group is the diagonal semilattice which can be viewed as an analogue of the Cartesian decomposition concept for wreath products in product action.