

# Review of: "NSE Characterization of the Orthogonal group $O_7(3)$ "

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Overall, the article titled "NSE Characterization of the Orthogonal Group  $O_7(3)$ " by Maryam Jahandideh presents a detailed investigation into characterizing the orthogonal simple group  $O_7(3)$  over  $GF(3)$  using the concept of element orders and the associated set  $nse(G)$  of element orders in a group  $G$ . The main theorem of the paper claims that if a group  $G$  has the same  $nse$  as  $O_7(3)$ , then  $G$  is isomorphic to  $O_7(3)$ .

The paper begins with an introduction outlining relevant notations and background information, including Thompson's Problem and previous theorems related to characterizing groups by their element orders and  $nse$ . Lemmas are then presented, providing the necessary groundwork for the proof of the main theorem. The proof of the main theorem is structured around analyzing various cases based on the prime divisors of the order of the group. Each case is meticulously examined, considering the possible orders of Sylow subgroups and using lemmas to derive contradictions when necessary. The proof demonstrates a thorough understanding of group theory concepts and employs a systematic approach to eliminate possible scenarios, ultimately leading to the conclusion that  $G$  is isomorphic to  $O_7(3)$  if it shares the same  $nse$ . The article is well-structured and presents a rigorous proof of the main theorem. The use of lemmas and detailed case analyses enhances the clarity of the argument presented. However, the paper could benefit from some improvements in terms of clarity of exposition and organization, particularly in the presentation of equations and lengthy calculations, which could be broken down into smaller steps for easier comprehension.

In conclusion, the article provides valuable insights into the characterization of groups using element orders and  $nse$ , particularly focusing on the orthogonal group  $O_7(3)$ . The thorough analysis and systematic approach taken in the proof contribute to the strength of the paper's argument. With some minor improvements in presentation, the article would be a valuable contribution to the field of group theory.