A Note on Subgroups of the Symmetric Group S5 and Some Lower Intervals of L (S5)

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ABSTRACT

The symmetric group S5 is the group of all permutations on the set containing 5 elements. Since the symmetric group of order n has n! elements, so there are 120 elements in the symmetric group S5.

We can list out all the subgroups of S5 according to their orders. As per Lagrange's theorem, the order of any non-trivial subgroup of S5 divides the order of S5. Obviously, the only subgroup of S5 of order 1 is the trivial group. Since there exist subgroups of orders. Consequently, there is an order 2 subgroup. Since 2 is a prime number, the subgroup is cyclic, and it is generated by the elements of order 2. Thus, there are 25 subgroups of S5 of order 2. Since, and $\nmid$, has a 3 – sylow subgroup of order 3. The number of 3 – Sylow subgroups are of the form, that is, The possible for k are 0, 1, and 3. Therefore the maximum number of 3 – Sylow subgroup of order 3 is 10 when k = 3.

The subgroup of S5 of order 4 contains the elements of order 1, 2, or 4. There are 15 subgroups of S5 of order 4 containing elements of order 4. If the subgroup contains an element of order 2, then it does not contain an element of order 4. Therefore, there are 20 subgroups of order 4 containing elements of order 2 only.

Keywords: Symmetric group, subgroups, Lattice theoretic properties

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