

## SOME MATH PROBLEMS

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### 1. CONCEPTUAL QUESTIONS

**Q 1.1.** *Explain how the cycle notation for permutations relates to orbits.*

### 2. STRAIGHTFORWARD PROBLEMS

**Q 2.1.** *Find a finite group in which the number of order 2 elements is a positive even number or show that such a group does not exist.*

**Q 2.2.** *Given group  $G = \langle a, b \mid a^9 = b^3 = 1, ab = ba^4 \rangle$ , identify  $G/Z(G)$  upto isomorphism, find  $|G'|$ , and find the number of conjugacy classes of  $G$ .  $Z(G)$  denotes the center of  $G$ , and  $G'$  is the commutator subgroup.*

### 3. TRICKY PROBLEMS

**Q 3.1.** *What is the number of derangements (permutations with no fixed point) of the alternating group  $A_n$ ?*