

Research Interests and Problems

My research interest is in the areas of groups, rings, group rings and combinatorial number theory. The group ring of a group G over a commutative ring K is the ring KG of all formal finite sums: $\alpha = \sum a_g g$, and is an attractive object of study. Here group theory, ring theory, commutative algebra and number theory come together in a fruitful way, and moreover the study of group rings has important applications in coding theory. My recent research work has thrown light on structures of group rings and their unit groups. I am also interested in studying homological properties of modules and rings. In addition, I investigate the interplay between rings and their graphs (such as zero-divisor and annihilating ideal graphs). A few years ago, I started a new exciting research initiative and extended my research interest into the additive number theory by investigating a few combinatorial problems (e.g. zero-sum problems) in that field. Some of my on-going research projects are listed below:

1. Zassenhaus conjectures and related problems.
2. The normalizer problem and Coleman automorphisms.
3. Generators of large subgroups of (central) unit groups of group rings.
4. Index of a sequence of a finite cyclic group.
5. The Erdős-Ginzburg-Ziv Theorem and its improvement.
6. Morphic groups and related problems.
7. Zero-divisor (annihilating ideal) graphs of (group) rings.
8. Morphic and reversible group rings.
9. Combinatorial problems in group theory and ring theory.
10. Injectivity of modules and related topics.