The Algebra Seminar

Unless stated otherwise, the seminar meets Tuesdays in room WH-100E at 2:50 p.m. There will be refreshments served at 4:00 in room WH-102.

Organizers: Ben Brewster and Fernando Guzmán

To receive announcements of seminar talks by email, please join the seminar's mailing list.

Spring 2017

- **January 24**
  Ben Brewster (Binghamton University)
  The Frattini subgroup

  Abstract: The Frattini subgroup of group G (denoted Fr G) is defined as the intersection of all the maximal subgroups of G. If G has no maximal subgroups, the standard device is that G = Fr G. This talk will be concerned primarily with non-trivial finite groups and so this standard device is not relevant.
  - The Frattini subgroup is called by the name of its originator in 1885. It is analogous to the Jacobson radical in ring theory and it can be generalized to various posets.
  - I will present some examples and basic results about the Frattini subgroup. It has many different uses in Group theory. I will choose a few and give some examples, but then tackle the question of which groups G can be Fr H for some H.
  - Speaking now about finite groups, it turns out the Frattini subgroup is nilpotent, every finite abelian group is isomorphic to the Frattini subgroup of an abelian group, but no non-abelian group of order p^3 is isomorphic to the Frattini subgroup of any group.
  - I am unaware of the classification of groups G such that G is isomorphic to Fr H for some H.

- **January 31**
  Speaker (School)
  Title

  Abstract:

- **February 07**
  Matt Evans (Binghamton University)
  Title A Structure Theorem for BCK-algebras

  Abstract: BCK-algebras were introduced in the 1960's as models for set difference and implicational calculus. In this talk I will define BCK-algebras and provide some examples before I restrict to the variety of bounded

commutative BCK-algebras. Then I will classify all finite bounded commutative BCK-algebras (up to isomorphism).

- **February 14**
  Speaker (School)
  Title

  Abstract:

- **February 21**
  Dikran Karagueuzian (Binghamton University)
  Title : Randomness of Polynomials over Finite Fields

  Abstract: A polynomial over a finite field may be compared to a random map from the finite field to itself. The extent to which this comparison is valid comes up in the analysis of some primality testing algorithms. Martins and Panario have results on the validity of the comparison for generic polynomials, and we are able to generalize some of these results, including specifically their result on the coalesence, to non-generic polynomials. This is joint work with Per Kurlberg.:

- **February 28**
  Joe Cyr (Binghamton University)
  Title A Structure Theorem for Entropic Quandles

  Abstract: Entropic Quandles form a large subclass of binary modes. In this talk I will introduce this algebra and develop a representation of them using a blend of affine structures.

- **March 07**

  Winter Break

- **March 14**
  Adam Allan (C.C.S.U.)
  Symmetry of Endomorphism Algebras

  Abstract: In this talk we will consider the problem of determining whether the endomorphism algebra of a prescribed module is symmetric. In particular,we will focus on the examples of indecomposable modules for the dihedral 2-groups. :

- **March 21**
  Speaker (School)
  Title

  Abstract:

- **March 28**
  Hung Tong-Viet (Kent State University)
  Derangements in permutation groups

  Abstract: A **derangement** (or fixed-point-free permutation) is a permutation with no fixed points. One of the

oldest theorems in probability, the Montmort limit theorem, states that the proportion of derangements in finite symmetric groups $\textrm{S}_n$ tends to e^{-1} as n approaches infinity. A classical theorem of Jordan implies that every finite transitive permutation group of degree greater than 1 contains derangements. This result has many applications in number theory, game theory and representation theory. There are several interesting questions on the number and the order of derangements that have attracted much attention in recent years. In this talk, I will discuss some recent results on primitive permutation groups with some restriction on derangements (joint with T.C. Burness).

- **April 04**
  Eran Crockett (Binghamton University)
  Nilpotence vs supernilpotence

  Abstract: In universal algebra there are two different notions of nilpotence that happen to coincide for groups. I will describe the relation between the nilpotence class of an algebra and the maximum supernilpotence class of the algebra's congruences.

- **April 11**

  Spring Break

- **April 18**
  Phillip Wesolek (Binghamton University)
  Elementary Groups

  Abstract : In the study of totally disconnected locally compact (tdlc) groups, groups “built by hand” from compact groups and discrete groups frequently arise. In particular, such groups arise as obstructions to general theorems. To isolate these groups, we consider the class of elementary groups: The smallest class of tdlc groups which contains the profinite groups and discrete groups and is closed under the elementary operations.In this talk, we explore this class, showing that it is very robust. We conclude by posing several open questions, including a conjectural connection with elementary amenable groups.

- **April 28**
  Dikran Karagueuzian (Binghamton University)
  Title : Randomness of Polynomials over Finite Fields (2)

  Abstract: This is a continuation of the talk earlier this semester with the same title. A polynomial over a finite field may be compared to a random map from the finite field to itself. The extent to which this comparison is valid comes up in the analysis of some primality testing algorithms. Martins and Panario have results on the validity of the comparison for generic polynomials, and we are able to generalize some of these results, including specifically their result on the coalesence, to non-generic polynomials. We will discuss the proof of the coalescence formula stated in the previous talk. This is joint work with Per Kurlberg.

- **May 2**
  Ben Steinberg (C.C.N.Y.)
  Title : Homological finiteness properties for one-relator monoids and related monoids

  Abstract: In 1932 Magnus proved the word problem was decidable for one-relator groups. Algebraists,

particularly in the Soviet Union, then began to study the analogous question for other algebraic structures. Despite intensive work, particularly by Adian and his collaborators, the word problem for one-relator monoids remains open. In the nineties, Kobayashi asked whether one-relator monoids admit a finite complete rewriting system. This would imply decidability of the word problem, but is much stronger. The Anick-Squier-Groves theorem implies that a monoid with a finite complete rewriting system satisfies the homological finiteness condition FP_{∞}. With this in mind, Kobayashi asked whether all one-relator monoids are of type FP_{∞}. Lyndon had proved all one-relator groups are of type FP_{∞}. Kobayashi proved all one-relator monoids are of type FP_3 and that many are of type FP_4. The first class of one-relator monoids for which Adian solved the word problem is that of special one-relator monoids (those with a one-relator presentation of the form $w=1$); special monoids in general (ones with a finite presentation in which all relations are of the form $w_i=1$) were studied in the sixties by Adian and Makanin. They also form a base case for the results of Kobayashi. Our main result is that special one-relator monoids are of type FP_{∞} and, more generally, that the homological finiteness properties of a special monoid are determined by those of its group of units. The techniques are topological in nature and rely on a self-similar tree-like structure in the Cayley graph of special monoids and a generalization of a result of Ken Brown on homological finiteness properties of groups acting on contractible CW complexes in terms of those of the cell stabilizers. This is joint work with Robert Gray (University of East Anglia).

- **May 9**
  John Brown (Binghamton University)
  Title : Classifying finite hypergeometric groups, height one balanced integral factorial ratio sequences, and some step functions.

  Abstract: In this talk we will discuss some connections between hypergeometric series, factorial ratio sequences, and non-negative bounded integer-valued step functions. We will start with a finiteness criterion for hypergeometric groups by Beukers and Heckman, then show how this leads to the classification by Bober of integral balanced factorial ratio sequences of height one, and thus a proof that a conjectured classification of a certain class of step functions by Vasyunin is complete.

- Pre-2014 semesters
- Fall 2014
- Spring 2015
- Fall 2015
- Spring 2016
- Fall 2016