

New York Number Theory Seminar CUNY Graduate Center – Room 4419 Fall, 2024

INFORMATION

The New York Number Theory Seminar meets every Thursday on Zoom and at the CUNY Graduate Center. The formal lecture begins at 3:00 p.m. EDT (New York time). The schmooze session (to which everyone is invited) begins at 2:30 p.m. We often ask the speaker to explain what the talk is about before the talk begins.

All lectures and schmooze sessions are on Zoom. When the speaker is in New York, we also meet in person at the CUNY Graduate Center and we encourage everyone to attend.

ZOOM LOGIN

<https://lehman-cuny-edu.zoom.us/j/84066184717?pwd=dkZFbVdyQm5KMUJtcUhFcjMxV0J2QT09>

Meeting ID: 840 6618 4717 Passcode: 304403

SCHEDULE OF TALKS

- Date: Thursday, September 5 (in person and on Zoom)
Speaker: Mel Nathanson, Lehman College and CUNY Graduate Center
Title: Shnirel'man density and the Dyson transform
Abstract: A "hot topic" in the 1930s and 1940s was Khinchin's $\alpha + \beta$ conjecture for the Shnirel'man density of the sum of two sets of integers. This was solved by Henry B. Mann in 1942. The following year Emil Artin and Peter Scherk published a refinement of his proof. In 1945, Freeman Dyson introduced the "Dyson transform" of an n -tuple of sets of positive integers and extended Mann's result to rank r sums of n sets of integers. The goal of this talk to simplify Dyson's method and discuss some related open problems.
- Date: Thursday, September 12 (in person and on Zoom)
Speaker: Max Xu, NYU
Title: Two stories about multiplicative energy
Abstract: The multiplicative energy $E_{\times}(A)$ of a given set A is defined to be the number of solutions to the equation $a_1 a_2 = a_3 a_4$, where all a_i are in A . We show two recent applications of studying multiplicative energy. The first application is to study conjectures of Elekes and Ruzsa on the size of product sets of arithmetic progressions. The second story is about a recent popular topic, random multiplicative functions, and we show how multiplicative energy is involved. The talk is based on joint work with Yunkun Zhou and K. Soundararajan, respectively.

Date: Thursday, September 19 (in person and on Zoom)
Speaker: Mel Nathanson, Lehman College and CUNY Graduate Center
Title: Sums of lattice points, ordered groups, and the Hahn embedding theorem
Abstract: Extension of Shnirel'man's theorem to sums of sets of nonnegative lattice points and to other additive problems in ordered groups.

Date: Thursday, September 26 (in person and on Zoom)
Speaker: Mel Nathanson, Lehman College and CUNY Graduate Center
Title: Addition theorems in partially ordered nonabelian groups
Abstract: Shnirel'man's inequality and Shnirel'man's basis theorem are fundamental results in additive number theory. It is proved these results are order-theoretic and have natural extensions to partially ordered abelian groups and partially ordered nonabelian groups. An abelian application is an addition theorem for sums of sets of n -dimensional lattice points.

Date: Thursday, October 3 - NO SEMINAR

Date: Thursday, October 10 - NO SEMINAR

Date: Thursday, October 17
Speaker: Kevin O'Bryant, College of Staten Island and CUNY Graduate Center
Title: Visualizing the sum-product conjecture
Abstract: The Erdős sum-product conjecture states that, for every $\epsilon > 0$, there is k_0 such that if A is any finite set of positive integers with $|A| > k_0$, then $|(A + A) \cup (AA)| > |A|^{2-\epsilon}$. In other words, for sufficiently large sets either the sumset or the product set will be nearly as large as conceivable. We survey progress on this conjecture, and provide a visual representation of progress and counterexamples. There will be a few beautiful proofs (not the speaker's), several interesting examples, and scores of striking pictures.