

Proseminar: p -adic numbers

Prof. Dr. Gebhard Böckle

SS 2023

C.V. Sriram

Timings(Tentative): Tuesdays, 11 AM-1 PM; INF 205, Room: NN

Target Group: Bachelor students

Prerequisites: Knowledge of Analysis 1 and Linear Algebra 1 is expected.

Language: Talks are supposed to be in English.

About the proseminar: Real numbers \mathbb{R} are constructed from \mathbb{Q} , by choosing a *distance function*(or *absolute value*) $d : \mathbb{Q} \times \mathbb{Q} \rightarrow \mathbb{Q}$ sending $d : (x, y) \mapsto |x - y|$ and *completing* w.r.t to d .

There is another *class* of absolute values on \mathbb{Q} given by choosing a prime number p and defining $d_p : \mathbb{Q} \times \mathbb{Q} \rightarrow \mathbb{Q}$ where $d_p : (x, y) \mapsto p^{-ord_p(x-y)}$. If you are wondering whether a theory analogous to \mathbb{R} can be realized for these absolute values, then welcome to the world of *p -adic numbers!*

p -adic numbers \mathbb{Q}_p lie at the interface of algebra, analysis and number theory, with applications to problems like the *Fermat's last theorem*, and beyond mathematics, in computer science and physics.

This proseminar aims at studying this beautiful subject from the scratch. In the first half, we develop many novel ideas motivated from the theory of real numbers as well as some number theoretic tools of great importance like the *Hensel's lemma* and *local-global principle*. The second half of the proseminar will be based on p -adic analysis.

Successful participation in the proseminar will enable a student to pursue more advanced material on p -adic numbers.

Vorbesprechung: Tuesday, Feb 14, 2023, SR3 at 11:30 AM(s.t.)

Seminar homepage: <https://typo.iwr.uni-heidelberg.de/groups/arith-geom/members/sriramcv/p-adic-numbers>

For any queries, please contact sriram.chinthlagiri@iwr.uni-heidelberg.de