2018 Diversity in Mathematics: Undergraduate Summer School

August 6-17, 2018

University of British Columbia, Vancouver

Prof. Karen Yeats, University of Waterloo

Exploring an intersection of graph theory, number theory, and physics

Feynman diagrams describe particle interactions in quantum field theory and their Feynman integrals contain number theoretically interesting numbers such as multiple zeta values. We will explore these objects using a graph theoretical and more broadly discrete mathematical perspective. Students do not need any background in physics. Students should ideally have first year calculus and linear algebra along with a basic introduction to graph theory.

Prof. Sara Maloni, University of Virginia

A journey through Hyperbolic Geometry and its applications in the real world

Hyperbolic geometry is an example of a non-Euclidean geometry, that is a space in which Euclid's parallel postulate fails. One way to state the parallel axiom is that for every line L, and point P not on L, there is a unique line L' through P which does not meet L. The study of hyperbolic geometry is related to the study of spaces of constant negative curvature. Hyperbolic geometry is closely connected to many other parts of mathematics (differential geometry, complex analysis, topology, dynamical systems, number theory, geometric group theory, Riemann surfaces, Teichmuller theory) and to many other fields (biology, art, physics, cosmology, social networks, crystals, neuroscience). Hyperbolic space has many interesting features; some are similar to those of Euclidean geometry but some are quite different. In this class we will define and study this less known geometry: its models, its isometries, examples of spaces endowed with this geometry and some examples of applications.

Prerequisites: Linear Algebra, Calculus III. Suggested: Abstract algebra, Topology.