

TSINGHUA MATHCAMP 2014 COURSE: NUMBER THEORY COURSE DESCRIPTION

MICHAEL E. ZIEVE, INSTRUCTOR

Number theory is one of the oldest and most honored branches of mathematics, sometimes called “The Queen of Mathematics”. It originated in the study of integer solutions of equations like $x^2 - 2y^2 = 1$. Over the years the perspective has broadened, as mathematicians have realized that a thorough understanding of such equations requires one to move outside the realm of the integers, and apply techniques from geometry and analysis. At the same time, number theory has been applied all across mathematics as well as in physics, chemistry, engineering, and as the foundation of modern secure encryption.

In this course we will discuss some classical topics in number theory, including integer solutions of polynomial equations, congruences, and approximating irrational numbers by rational numbers. Often these topics will need to be developed in other systems besides the integers, in order to provide the tools needed to solve problems involving integers. Students are expected to play an active role in class, through their questions and suggestions.

The only pre-requisites are high school algebra and curiosity. Homework problems will be assigned throughout the course, and a collection of research projects will be presented at the end of the first week. After each class, students will meet with the two Coaches, Zhan Jiang and Zhiwei Zheng, both from Tsinghua University, for guidance about the material. Also Mathcampers are highly encouraged to work with each other.