UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Elementary Mathematics

2425-1-F4001Q084

Aims

The aim of this course is to present some elementary results in Number Theory, Topology, Geometry, and Combinatorics. The term "elementary" should be interpreted to mean that no particular prerequisites are required. The presentation of these results is progressive, emphasizing how the introduction of the topics and preliminary problems can be easily understood by high school students. Subsequently, these same problems are developed to reach a deep and modern level of mathematics.

This progression also serves to demonstrate examples of topics that can be presented and understood by a class of high school students, without neglecting a thorough exploration of mathematics for a more complete treatment.

Contents

Prime numbers, combinatorics, topology.

Detailed program

1. Prime numbers: density, Bertrand postulate, Basel postulate, Willans' formula,
2. Ramsey theory: applications in combinatorics, geometry and analysis,
3. Applications of topology,
4. Results from geometry, as Minkowski's lemma, to solve questions on integers: sum of squares,
5. Problems arising from probability,
6. Polya enumeration method.

Prerequisites

The prerequisites are the undergraduate courses. Observe, that the word "elementary" should not be understood as simple. The topics are simple and easily understood by anyone and a first analysis of the problems and arguments is also simple.

Teaching form

In-person, lecture-based teaching. In particular, the teaching includes lectures with expository instruction conducted in person. The lectures will be recorded, and the recordings will be made available on the course's e-learning page.

Textbook and teaching resource

Notes of the course given during the lectures.
P.Cameron, Combinatorics, topics, techniques, algorithms, Cambridge university press,
G. Travaglini, Numbers and Figures, American Mathematical Society (2023).
M. Bramanti, G. Travaglini, Studying Mathematics: The Beauty, the Toil and the Method, Springer (2018).

Semester

First semester

Assessment method

The exam consists of a 45-60 minute seminar on a topic chosen by the student and approved by the instructor. The choice of the topic is free, but it must be compatible with the subjects covered during the course. Additionally, it should present the same gradual increase in difficulty as presented in the lectures.

The clarity of the presentation and the knowledge of the material will be evaluated.

The exam grade is on a scale of thirty, with a minimum passing grade of 18/30. There are no partial exams.

Office hours

by appointment

Sustainable Development Goals

QUALITY EDUCATION