



UNIVERSITÀ  
DEGLI STUDI DI MILANO-BICOCCA

## SYLLABUS DEL CORSO

### Matematica Elementare

2021-1-F4001Q084

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#### Learning objectives

To introduce several classical and elementary results in Number Theory and Geometry. Didactical aspects will be discussed as well as connections with other mathematical topics. The students will acquire skills related to several topics in number theory, geometry, calculus, numerical analysis, and, most of all, skills on several connections between the above topics. Since the course has very mild prerequisites, the students will be able to use part of it for high school teaching, and for their own aptitude and preparation for this job.

#### Contents

Integer points. Polyhedra. Riemann sums.

#### Detailed program

- Points, polygons and polyhedra.
- Primes, arithmetic functions and integer points.
- Integer points in polyhedra, Frobenius' coin problem.
- Simpson's paradox, Farey sequences and diophantine approximation.
- Pythagorean triples and sums of squares.
- Benford's law, uniform distribution of sequences, and normal numbers.
- Riemann sums and integrals.
- Appendix: remarks on Mathematics Education

## Prerequisites

"Elementary" does not mean "simple". It means that there are very mild prerequisites. Here the first two years of undergraduate Math are enough.

## Teaching methods

According to the Covid-19 emergency there will be regular lessons (in a classroom) or distance lessons, possibly in streaming.

## Assessment methods

Oral exam. The student will be requested to understand all the contents of the course and to hold a seminar. He/she will be evaluated considering her/his mastering of the contents of the course as well as the teaching skills he/she will exhibit through the seminar. Mark out of thirty, the exam is passed if the evaluation is at least 18/30.

According to the situation of the Covid-19 emergency, exams can be held via Webex on the e-learning page of Elementary Mathematics.

## Textbooks and Reading Materials

- Detailed notes will be provided during the classes.
- M. Beck, S. Robins, *Computing the continuous discretely. Integer-point enumeration in polyhedra*. Springer (2015).
- M. Bramanti, G. Travaglini, *Studying Mathematics: The Beauty, the Toil and the Method*, Springer (2018).
- J. Sally, P. Sally, *Roots to research. A vertical development of mathematical problems*. Amer. Math. Soc. (2007).
- G. Travaglini, *Number Theory, Fourier Analysis and Geometric Discrepancy*, Cambridge Univ. Press (2014).

## Semester

Second semester

## Teaching language

Italian (English in case of foreign students)

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