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# Number Theory

Northern Michigan University

Fall 2020

## Course Instructor

Daniel Rowe

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## Learning Outcomes

This is a course on the fundamentals of number theory. We will study the Euclidean algorithm and solving the general linear Diophantine equation. Then we will study many properties related to prime factorization: the fundamental theorem of arithmetic, the infinitude of primes (in arithmetic progressions), the prime number theorem, the Riemann hypothesis, the twin prime conjecture, the bounded gaps theorem, Goldbach's conjecture, probability of coprimality, divisor-sum functions, perfect numbers, and Mersenne primes. Then we will turn our focus towards fundamental properties of rational and constructible numbers. Finally we will study foundational theorems related to modular arithmetic: the Chinese remainder theorem, Lagrange's four-square theorem, modular inverses, Euler's totient theorem, Wilson's theorem, RSA encryption, quadratic residues, Zolotarev's lemma, and the law of quadratic reciprocity.

By the end of the class, students will be comfortable with and able to apply all of the above concepts and theorems.

## Course Meeting Times

ma483-01

MWF 14:00-14:50

live-stream: <https://nmu.zoom.us/j/91577016707> (pw: numthy2020)

WEST 1705

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## Course Webpage

[http://euclid.nmu.edu/~drowe/teaching/fall\\_2020/f20\\_ma483.html](http://euclid.nmu.edu/~drowe/teaching/fall_2020/f20_ma483.html)

## Textbook

· Martin H. Weissman, *An Illustrated Theory of Numbers*, AMS, 2017.  
{<http://illustratedtheoryofnumbers.com/>}

## Grade Categories and Weights

Problem Sets	40%
Tests	30%
Final	30%

Within these grade categories, each item may be graded out of different point totals, *i.e.* /42, /70, but they are immediately converted to grades /100 that are rounded up in your favor.

Below is an example of how to calculate your course grade somewhere early to mid semester.

Suppose you have the following raw scores: Problem Set 1 (34/42), Problem Set 2 (60/70), Problem Set 3 (24/35), Test 1 (36/50).

- Problem Set 1  $\rightsquigarrow$  81/100
  - Problem Set 2  $\rightsquigarrow$  86/100
  - Problem Set 3  $\rightsquigarrow$  69/100
  - Current *Problem Set* Grade: 236/300
  - Test 1  $\rightsquigarrow$  72/100
  - Current *Test* Grade: 72/100
  - Current *Course* Grade:  $(236/300) \times 40 + (72/100) \times 30 \approx 53.1$  out of 70 total points thus far, so a current course grade of  $\rightsquigarrow$  75.9% (C+).
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## Grade Scale

92-100%	A
90-91%	A-
86-89%	B+
82-85%	B
80-81%	B-
76-79%	C+
72-75%	C
70-71%	C-
66-69%	D+
62-65%	D
60-61%	D-
0-59%	F

## Late Policy

There will be a **zero tolerance** late policy for this class. All submissions of your work will be electronic, and they will have clear due dates and times.

## Accessibility

If you have a need for disability-related accommodations or services, please inform the *Coordinator of Disability Services* in the Dean of Students Office at 2001 C. B. Hedgcock Building (906-227-1737 or [disserv@nmu.edu](mailto:disserv@nmu.edu)). Reasonable and effective accommodations and services will be provided to students if requests are made in a timely manner, with appropriate documentation, in accordance with federal, state, and University guidelines.

## Mask Accommodation ADA Statement

Certain students may qualify for alternative face-covering accommodations due to a variety of health conditions. These students have gone through a qualifying process with the Office of Disability Services. Faculty have been notified of which students receive these accommodations in their class. If you have concerns regarding this topic please contact the faculty member outside of class. Please do not question or confront fellow students in the classroom who are using alternative or modified face coverings.

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