

MATHEMATICS 3370
INTRODUCTORY NUMBER THEORY

A perfect number is one which is equal to the sum of its factors, other than itself; for example, $6 = 1 + 2 + 3$, $28 = 1 + 2 + 4 + 7 + 14$. How can one classify the even perfect numbers? Are there any perfect numbers that are odd? How can one prove that a prime number that has a remainder of one when divided by four can be written as the sum of squares of two integers? These are some of the questions asked in a first course in number theory, *Queen of all the Sciences*.

Number theory is concerned with questions related to the ordinary integers $1, 2, 3, \dots$. It is by far the best subject area to teach what constitutes a mathematical proof and how to construct proofs. For many students, learning how to write proofs is the hardest part of mathematics. One of the main objectives of this course is to attempt to overcome this difficulty.

Text. Books used recently are *Pure Mathematics 3370 Course Notes* by Donald E. Rideout and *Elementary Number Theory* by Kenneth H. Rosen (Addison Wesley).

Marks. While the exact formula may vary from semester to semester, it is typical to assign 60% of the final grade to a final examination, 30% to a midterm exam and 10% to homework.

Calendar description. **3370 Introductory Number Theory** examines perfect numbers and primes, divisibility, Euclidean algorithm, greatest common divisors, primes and the unique factorization theorem, congruences, cryptography (secrecy systems), Euler-Fermat theorems, power residues, primitive roots, arithmetic functions, Diophantine equations, topics above in the setting of the Gaussian integers.
Prerequisite: Mathematics 2320.

Offered. Fall