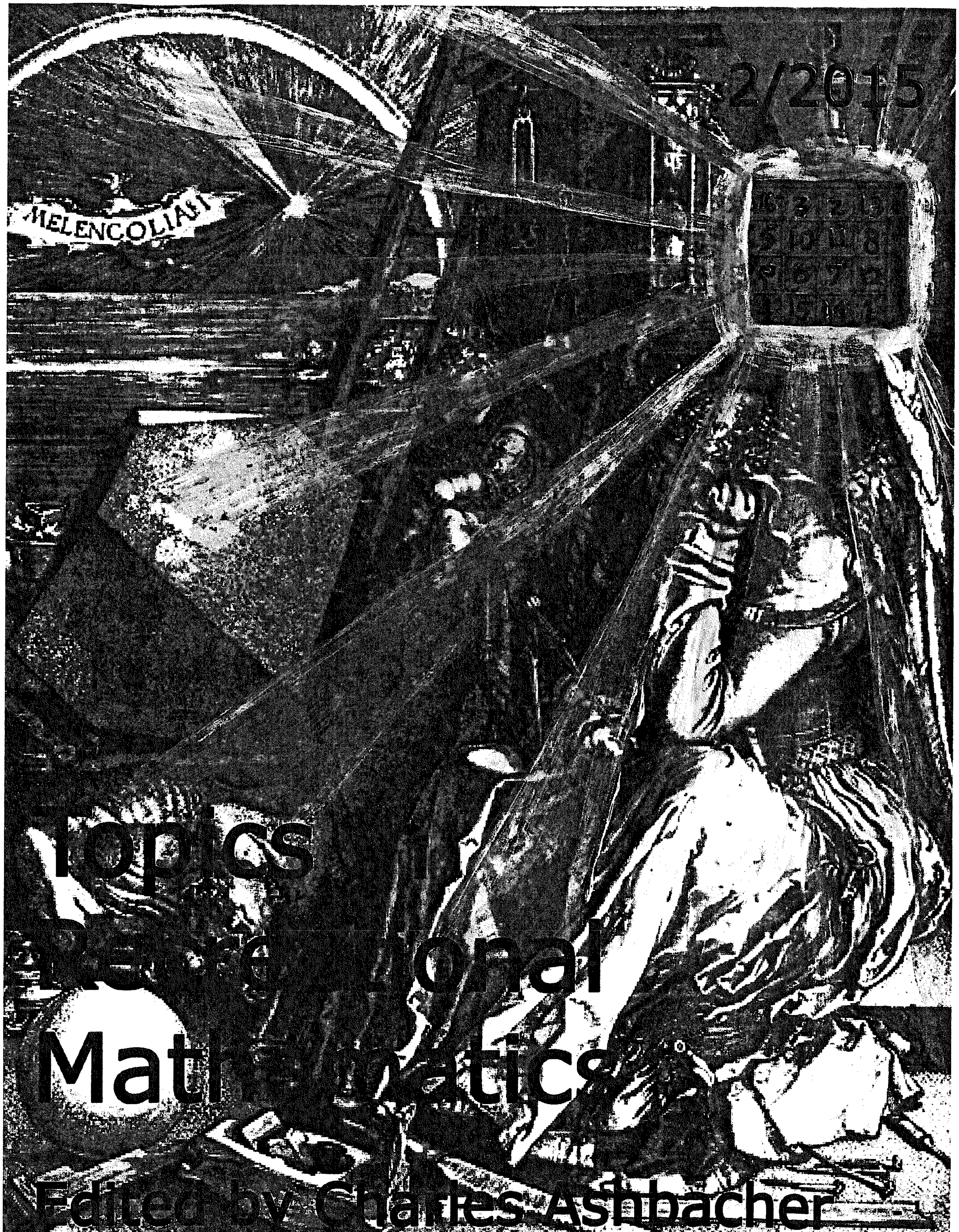
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MELENCOLIA I
Topics
Recreational
Mathematics
Edited by Charles Ashbacher

Contents

SOME UNSOLVED PROBLEMS IN NUMBER THEORY

Taken from **Only Problems, Not Solutions!**, by Florentin Smarandache, Chicago, 1991, 1993.

1) A number is *pseudo-prime* if some permutation of its digits, including the identity permutation, is a prime. Of course all primes are pseudo-primes.

For example 14 is a pseudo-prime since a permutation of its digits, 41, is a prime.

Now let's consider the infinite sequence of primes and perform the same non-identity permutation of digits for each prime of two or more digits. Does that sequence contain an infinite number of primes?

2) A number is a *pseudo-square* if some permutation of its digits, including the identity permutation, is a square. Of course all squares are pseudo-squares.

For example 52 is a pseudo-square since a permutation of its digits, 25, is a square.

Now let's consider the infinite sequence of squares and perform the same non-identity permutation of digits for each square of two or more digits. Does that sequence contain an infinite number of squares?

3) Consider the following *binary sieve*:

Start with the set of natural numbers

1, 2, 3, 4, 5, . . .

a) Remove every second number from this list

b) Remove every fourth number from what remains

c) Remove every eighth number from what remains

. . . .

i) Remove every 2^k number from what remains

Repeat to infinity

It is clear that there will be an infinite number of numbers remaining when this process is complete. The question becomes:

Are there infinitely many primes in this sequence?

You can download free e-books of number theory from the **Digital Library of Science**: http://www.gallup.unm.edu/~smarandache/eBooks-otherformats.htm