An Invitation to Research

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Mathematics as a Field of Study

The Mathematics Subject Classification is used to categorize items covered by two reviewing databases, *Mathematical Reviews* and *Zentralblatt MATH*. The current system is MSC2000.

00 General
01 History and biography
03 Mathematical logic and foundations
04 Set theory [deleted, see 03]
05 Combinatorics
06 Order, lattices, ordered algebraic structures
08 General algebraic systems
11 Number theory
12 Field theory and polynomials
13 Commutative rings and algebras
14 Algebraic geometry
15 Linear and multilinear algebra; matrix theory

16 Associative rings and algebras
17 Nonassociative rings and algebras
18 Category theory, homological algebra
19 K-theory
20 Group theory and generalizations
22 Topological groups, Lie groups
26 Real functions
28 Measure and integration
30 Functions of a complex variable
31 Potential theory
32 Several complex variables and analytic spaces
33 Special functions
34 Ordinary differential equations
35 Partial differential equations
37 Dynamical systems and ergodic theory
39 Finite differences and functional equations
40 Sequences, series, summability
41 Approximations and expansions

42 Fourier analysis
43 Abstract harmonic analysis
44 Integral transforms, operational calculus
45 Integral equations
46 Functional analysis
47 Operator theory
49 Calculus of variations and optimal control
51 Geometry
52 Convex and discrete geometry
53 Differential geometry
54 General topology
55 Algebraic topology
57 Manifolds and cell complexes
58 Global analysis, analysis on manifolds
60 Probability theory and stochastic processes
62 Statistics
65 Numerical analysis
68 Computer science

70 Mechanics of particles and systems
73 Mechanics of solids [deleted, see 74]
74 Mechanics of deformable solids
76 Fluid mechanics
78 Optics, electromagnetic theory
80 Classical thermodynamics, heat transfer
81 Quantum Theory
82 Statistical mechanics, structure of matter
83 Relativity and gravitational theory
85 Astronomy and astrophysics
86 Geophysics
90 Operations research, mathematical programming
91 Game theory, economics, social and behavioral sciences
92 Biology and other natural sciences
93 Systems theory; control
94 Information and communication, circuits
97 Mathematics education

Some Mathematical Journals

Mathematische Annalen (`www.springerlink.com/content/100442`) was founded in 1868 by Alfred Clebsch and Carl Neumann. It was continued by Felix Klein, David Hilbert, Otto Blumenthal, Erich Hecke, Heinrich Behnke, Hans Grauert, Heinz Bauer, Herbert Amann, Jean-Pierre Bourguigon and Wolfgang Lück.

Acta Mathematica (`www.actamathematica.org`) was founded by Gösta Mittag-Leffler in 1882. It is published by Institut Mittag-Leffler, a research institute of the Royal Swedish Academy of Sciences.

The Annals of Mathematics (`annals.princeton.edu`) was founded in 1884 by Ormond Stone of the University of Virginia, was transferred in 1899 to Harvard University, and in 1911 to Princeton University. Since 1933, the Annals has been edited jointly by Princeton University and the Institute for Advanced Study.

Some Mathematical Societies

The American Mathematical Society (`www.ams.org`) was founded in 1888 to further mathematical research and scholarship.

The Mathematical Association of America (`www.maa.org`), formed in 1915, is the largest professional society that focuses on mathematics accessible at the undergraduate level.

The National Council of Teachers of Mathematics (`www.nctm.org`) was created in 1920 with the major purpose of helping preserve mathematics in the public schools.

The Society for Industrial & Applied Mathematics (`www.siam.org`) was started in 1951 to build cooperation between mathematics and the worlds of science and technology.

South East Asian Mathematical Society (`seams.math.nus.edu.sg`) (1972?)
Mathematical Society of the Philippines (`www.mathsocietyphil.org`) (1973)

AdNU Has Hosted a Mathematics Conference

The Mathematical Society of the Philippines (MSP) held its 2005 Annual Convention at the Ateneo de Naga University (AdNU) on May 21–22, 2005.

There were four paper presentations from AdNU: two papers on mathematics education (Cesar Bermundo's "Test Checker and Item Analyzer," and Arnulfo Reganit and Rita Obsequio's "Attitudes Towards Learning Mathematics Among Freshman Students of the College of Education, Ateneo de Naga University, First Semester, SY 2004–2005") and two papers on mathematics (see next slide).

Some Problems on Decycling Graphs

Alfredo Fabay, AdNU

The decycling number $\nabla(G)$ of a graph G is the minimum number of vertices in a decycling set S, that is, a set of vertices whose deletion from G destroys all the cycles of G. This paper looks at two problems related to the components of $G-S$, namely: the decycling index $\partial(G)$ of G defined as the minimum of $\{\omega(G-S)|S$ is a decycling set of $G\}$ and the special case when the components of $G-S$ are all isomorphic.

Weight Enumerators of Dual Codes Over $\mathbb{Z}_2 \times \mathbb{Z}_2$ With Respect to 2×2 Binary Matrices

Bernardo Marquez, AdNU

An inner product is defined in $(\mathbb{Z}_2 \times \mathbb{Z}_2)^n$ using a 2×2 binary matrix. The definition naturally leads to the concept of dual codes over $\mathbb{Z}_2 \times \mathbb{Z}_2$ with respect to the inner product. A MacWilliams-type formula for codes over $\mathbb{Z}_2 \times \mathbb{Z}_2$ is then derived. The formula specifically provides a relationship between the Hamming weight enumerator of the dual of a code over $\mathbb{Z}_2 \times \mathbb{Z}_2$ and the complete weight enumerator of the code.

A Polynomial Formula for the Primes

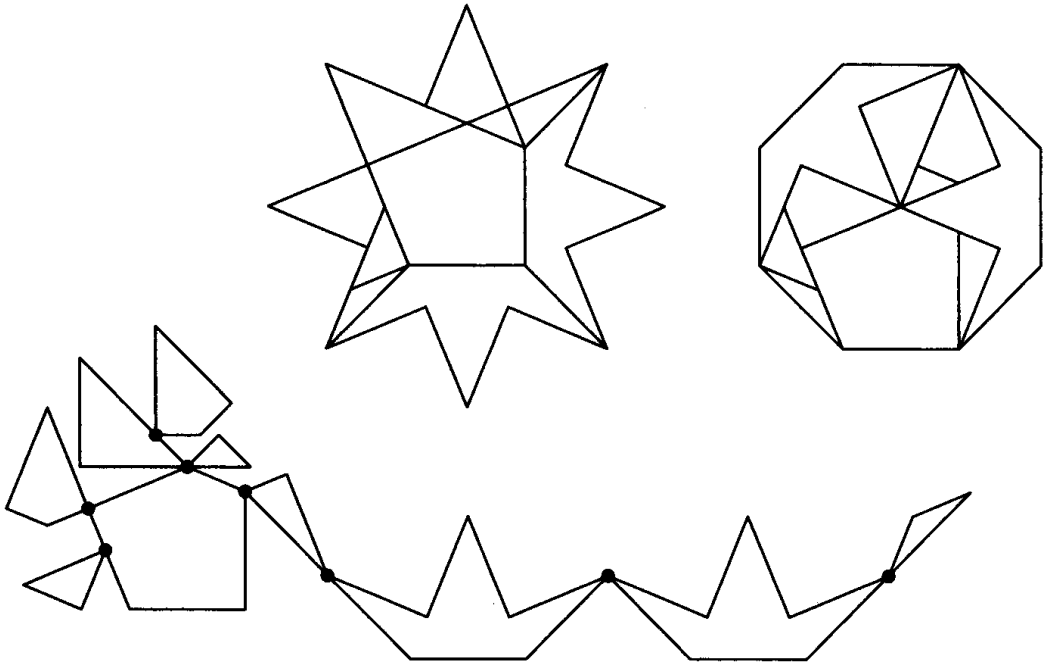
The set of prime numbers is identical with the set of positive values taken on by the polynomial

$$(k+2)(1-(wz+h+j-q)^2-((gk+2g+k+1)\cdot(h+j)+h-z)^2-(2n+p+q+z-e)^2-(16(k+1)^3\cdot(k+2)\cdot(n+1)^2+1-f^2)^2-(e^3\cdot(e+2)(a+1)^2+1-o^2)^2-((a^2-1)y^2+1-x^2)^2-(16r^2y^4(a^2-1)+1-u^2)^2-(((a+u^2(u^2-a))^2-1)\cdot(n+4dy)^2+1-(x+cu)^2)^2-(n+l+v-y)^2-((a^2-1)l^2+1-m^2)^2-(ai+k+1-l-i)^2-(p+l(a-n-1)+b(2an+2a-n^2-2n-2)-m)^2-(q+y(a-p-1)+s(2ap+2a-p^2-2p-2)-x)^2-(z+pl(a-p)+t(2ap-p^2-1)-pm)^2)$$

as the variables range over the nonnegative integers.

Jones, J., Sato, D., Wada, H. and Wiens, D. (1976). Diophantine representation of the set of prime numbers. *American Mathematical Monthly*, *83*, 449–464.

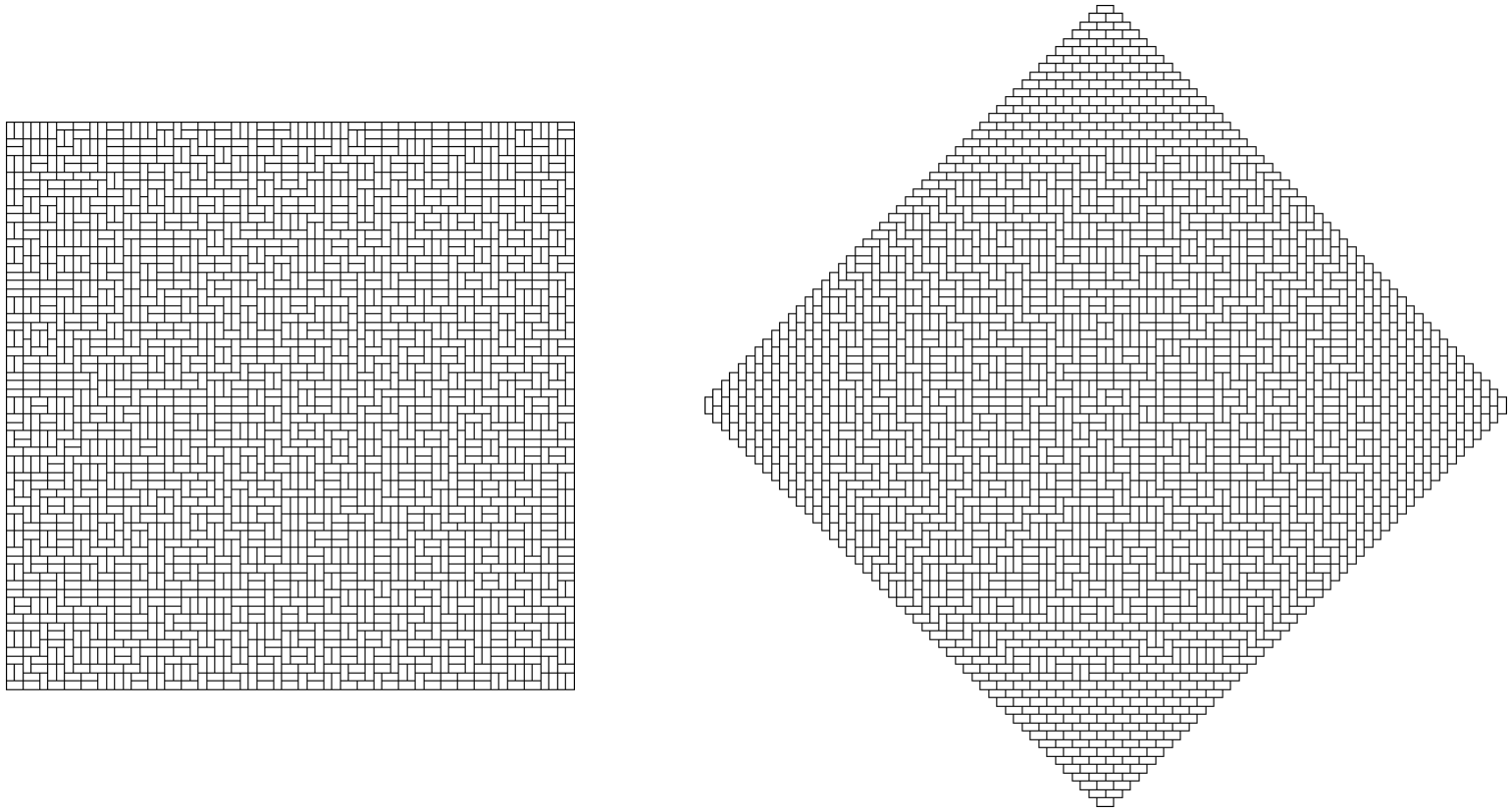
Hinged Dissections



A set of hinged polygons can be 'folded up' into both an eight-pointed star and a regular octagon.

Frederickson, G. (2002). *Hinged dissections: Swinging and twisting*. Cambridge University Press.

Random Domino Tilings

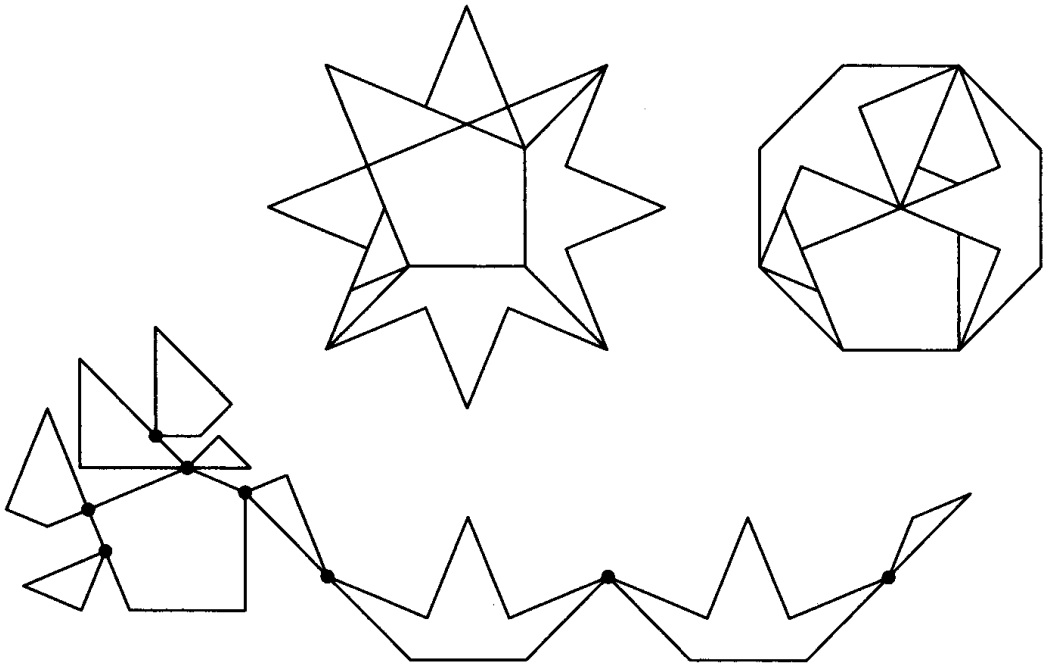


Random domino tilings of a square and an Aztec diamond

Cohn, H., Kenyon, R., and Propp, J. (2001). A variational principle for domino tilings. *Journal of the AMS*, *14*, 297–346.

An Invitation to Research

A Talk for the Mathematics Cluster



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July 4, 2007, 4:40 PM–5:15 PM, Phelan Hall, Room 211