

Maths P2 2012 Common Test

Lucas–Lehmer primality test

*Lucas–Lehmer test for M_p from $O(p^3)$ to $O(p^2 \log p \log \log p)$ bit operations. Bruce, J. W. (1993). "A Really Trivial Proof of the Lucas–Lehmer Test". *The American**

In mathematics, the Lucas–Lehmer test (LLT) is a primality test for Mersenne numbers. The test was originally developed by Édouard Lucas in 1878 and subsequently proved by Derrick Henry Lehmer in 1930.

Wieferich prime

In number theory, a Wieferich prime is a prime number p such that p^2 divides $2^p - 1 - 1$, therefore connecting these primes with Fermat's little theorem

In number theory, a Wieferich prime is a prime number p such that p^2 divides $2^p - 1 - 1$, therefore connecting these primes with Fermat's little theorem, which states that every odd prime p divides $2^p - 1 - 1$. Wieferich primes were first described by Arthur Wieferich in 1909 in works pertaining to Fermat's Last Theorem, at which time both of Fermat's theorems were already well known to mathematicians.

Since then, connections between Wieferich primes and various other topics in mathematics have been discovered, including other types of numbers and primes, such as Mersenne and Fermat numbers, specific types of pseudoprimes and some types of numbers generalized from the original definition of a Wieferich prime. Over time, those connections discovered have extended to cover more properties of certain...

Derangement

For each of the $n - 1$ hats that P_1 may receive, the number of ways that $P_2, \dots, P_n$ may all receive hats is the sum of the counts for the two cases.

In combinatorial mathematics, a derangement is a permutation of the elements of a set in which no element appears in its original position. In other words, a derangement is a permutation that has no fixed points.

The number of derangements of a set of size n is known as the subfactorial of n or the n th derangement number or n th de Montmort number (after Pierre Remond de Montmort). Notations for subfactorials in common use include $!n$, D_n , dn , or n_i .

For $n > 0$, the subfactorial $!n$ equals the nearest integer to $n!/e$, where $n!$ denotes the factorial of n and $e \approx 2.718281828\dots$ is Euler's number.

The problem of counting derangements was first considered by Pierre Raymond de Montmort in his *Essay d'analyse sur les jeux de hazard* in 1708; he solved it in 1713, as did Nicholas Bernoulli at...

List of unsolved problems in mathematics

*Retrieved 2018-07-07. Bellos, Alex (2014-08-13). "Fields Medals 2014: the maths of Avila, Bhargava, Hairer and Mirzakhani explained". *The Guardian*. Archived*

Many mathematical problems have been stated but not yet solved. These problems come from many areas of mathematics, such as theoretical physics, computer science, algebra, analysis, combinatorics, algebraic, differential, discrete and Euclidean geometries, graph theory, group theory, model theory, number theory, set theory, Ramsey theory, dynamical systems, and partial differential equations. Some problems belong to more than one discipline and are studied using techniques from different areas. Prizes are often awarded for the solution to a long-standing problem, and some lists of unsolved problems, such as the Millennium Prize Problems, receive considerable attention.

This list is a composite of notable unsolved problems mentioned in previously published lists, including but not limited to...

Dart (programming language)

var p1 = Point(10, 10); print(p1.magnitude); var p2 = Point.origin(); var distance = p1.distanceTo(p2); print(distance); } Dart belongs to the ALGOL language

Dart is a programming language designed by Lars Bak and Kasper Lund and developed by Google. It can be used to develop web and mobile apps as well as server and desktop applications.

Dart is an object-oriented, class-based, garbage-collected language with C-style syntax. It can compile to machine code, JavaScript, or WebAssembly. It supports interfaces, mixins, abstract classes, reified generics and type inference. The latest version of Dart is 3.9.0 .

Effect size

$$h=2(\arcsin \{\sqrt{p_1}\}-\arcsin \{\sqrt{p_2}\})$$
 where p_1 and p_2 are the proportions of the two samples being compared and $\arcsin$ is the arcsine

In statistics, an effect size is a value measuring the strength of the relationship between two variables in a population, or a sample-based estimate of that quantity. It can refer to the value of a statistic calculated from a sample of data, the value of one parameter for a hypothetical population, or to the equation that operationalizes how statistics or parameters lead to the effect size value. Examples of effect sizes include the correlation between two variables, the regression coefficient in a regression, the mean difference, or the risk of a particular event (such as a heart attack) happening. Effect sizes are a complement tool for statistical hypothesis testing, and play an important role in power analyses to assess the sample size required for new experiments. Effect size are fundamental...

Block matrix

$$\begin{bmatrix} A_{11} & A_{12} & \cdots & A_{1q} \\ A_{21} & A_{22} & \cdots & A_{2q} \\ \vdots & \vdots & \ddots & \vdots \\ A_{p1} & A_{p2} & \cdots & A_{pq} \end{bmatrix}$$
 , where $A_{ij} \in \mathbb{C}^{m_i \times n_j}$

In mathematics, a block matrix or a partitioned matrix is a matrix that is interpreted as having been broken into sections called blocks or submatrices.

Intuitively, a matrix interpreted as a block matrix can be visualized as the original matrix with a collection of horizontal and vertical lines, which break it up, or partition it, into a collection of smaller matrices. For example, the 3x4 matrix presented below is divided by horizontal and vertical lines into four blocks: the top-left 2x3 block, the top-right 2x1 block, the bottom-left 1x3 block, and the bottom-right 1x1 block.

[
a
11...

Multimodal distribution

2042–2065. *arXiv:math/0602238*. doi:10.1214/009053605000000417. S2CID 36234163. Holzmman, Hajo; Vollmer, Sebastian (2008). "A likelihood ratio test for bimodality

In statistics, a multimodal distribution is a probability distribution with more than one mode (i.e., more than one local peak of the distribution). These appear as distinct peaks (local maxima) in the probability density function, as shown in Figures 1 and 2. Categorical, continuous, and discrete data can all form multimodal distributions. Among univariate analyses, multimodal distributions are commonly bimodal.

Finite element method

will be smooth if f is. P_1 and P_2 are ready to be discretized, which leads to a common sub-problem (3). The basic idea is to replace the

Finite element method (FEM) is a popular method for numerically solving differential equations arising in engineering and mathematical modeling. Typical problem areas of interest include

the traditional fields of structural analysis, heat transfer, fluid flow, mass transport, and electromagnetic potential. Computers are usually used to perform the calculations required. With high-speed supercomputers, better solutions can be achieved and are often required to solve the largest and most complex problems.

FEM is a general numerical method for solving partial differential equations in two- or three-space variables (i.e., some boundary value problems). There are also studies about using FEM to solve high-dimensional problems. To solve a problem, FEM subdivides a large system into smaller, simpler...

Quantitative genetics

(in lieu of C and D) to indicate that individuals P1 and P2 have both of their parents in common—that is they are full siblings. Individual Y is the result

Quantitative genetics is the study of quantitative traits, which are phenotypes that vary continuously—such as height or mass—as opposed to phenotypes and gene-products that are discretely identifiable—such as eye-colour, or the presence of a particular biochemical.

Both of these branches of genetics use the frequencies of different alleles of a gene in breeding populations (gamodemes), and combine them with concepts from simple Mendelian inheritance to analyze inheritance patterns across generations and descendant lines. While population genetics can focus on particular genes and their subsequent metabolic products, quantitative genetics focuses more on the outward phenotypes, and makes only summaries of the underlying genetics.

Due to the continuous distribution of phenotypic values, quantitative...

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