**Santilli’s Isoprime theory**

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**Abstract:** We establish the Santilli’s isomathematics based on the generalization of the modern mathematics. Isomultiplication , isodivision , where  is called an isounit, ,  inverse of isounit. Keeping unchanged addition and subtraction,  are four arithmetic operations in Santilli’s isomathematics. Isoaddition , isosubtraction  where  is called isozero,  are four arithmetic operations in Santilli’s new isomathematics. We establish Santilli’s isoprime theory of the first kind, Santilli’s isoprime theory of the second kind and isoprime theory in Santilli’s new isomathematics. We give an example to illustrate the Santilli’s isomathematics.

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**1. Introduction**

This is dedicated to the 30-th anniversary of hadronic mechanics.

Santilli [1] suggests the isomathematics based on the generalization of the multiplication × division ÷ and multiplicative unit 1 in modern mathematics. It is epoch-making discovery. From modern mathematics we establish the foundations of Santilli’s isomathematics and Santilli’s new isomathematics. We establish Santilli’s isoprime theory of both first and second kind and isoprime theory in Santilli’s new isomathematics.

**(1) Division and multiplican in modern mathematics.**

Suppose that

, （1）

where 1 is called multiplicative unit, 0 exponential zero.

From (1) we define division ÷ and multiplication ×

, （2）

 （3）

We study multiplicative unit 1

 （4）

 （5）

The addition ＋, subtraction －, multiplication × and division ÷ are four arithmetic operations in modern mathematics which are foundations of modern mathematics. We generalize modern mathematics to establish the foundations of Santilli’s isomathematics.

**(2) Isodivision and isomultiplication in Santilli’s isomathematics.**

We define the isodivision  and isomultiplication  [1-5] which are generalization of division ÷ and multiplication × in modern mathematics.

, （6）

where  is called isounit which is generalization of multiplicative unit 1,  expeoenential isozero which is generalization of exponential zero.

We have

, （7）

Suppose that

. （8）

From (8) we have

 （9）

where  is called inverse of isounit .

We conjectured [1-5] that (9) is true. Now we prove (9). We study isounit 

, （10）

 （11）

Keeping unchanged addition and subtraction,  are four arithmetic operations in Santilli’s isomathematics, which are foundations of isomathematics. When , it is the operations of modern mathematics.

**（3）Addition and subtraction in modern mathematics.**

We define addition and subtraction

 （12）

 （13）

 （14）

Using above results we establish isoaddition and isosubtraction

**（4）Isoaddition and isosubtraction in Santilli’s new isomathematics.**

We define isoaddition  and isosubtraction .

 （15）

 （16）

From （16） we have

 （17）

Suppose that ,

where  is called isozero which is generalization of addition and subtraction zero

We have

 （18）

When , it is addition and subtraction in modern mathematics.

From above results we obtain foundations of santilli’s new isomathematics



 （19）

 are four arithmetic operations in Santilli’s new isomathematics.

**Remark**, , From left side we have

, where  also is a number.

. From left side we have

, where  also is a number.

**It is satisfies the distributive laws. Therefore  and  also are numbers.**

It is the mathematical problems in the 21st century and a new mathematical tool for studying and understanding the law of world.

**2 Santilli’s isoprime theory of the first kind**

Let  be a conventional field with numbers  equipped with the conventional sum , multiplication  and their multiplicative unit . Santilli’s isofields of the first kind  are the rings with elements

 （20）

called isonumbers, where , the isosum

 （21）

with conventional additive unit ,  and the isomultiplications is

. （22）

Isodivision is

 （23）

We can partition the positive isointegers in three classes:

（1）The isouniti ;

（2）The isonumbers: 

（3）The isoprime numbers: .

**Theorem 1.** Twin isoprime theorem

. （24）

Jiang function is

 （25）

whre  is called primorial.

Since  there exist infinitely many isoprimes  such that  is an isoprime.

We have the best asymptotic formula of the number of isoprimes less than 

 （26）

where

.

Let . From (24) we have twin prime theorem

 （27）

**Theorem 2**. Goldbach isoprime theorem

 （28）

Jiang function is

 （29）

Since  every isoeven number  greater than  is the sum of two isoprimes.

We have

. （30）

Let . From (28) we have Goldbach theorem

 （31）

**Theorem 3**. The isoprimes contain arbitrarily long arithmetic progressions. We define arithmetic progressions of isoprimes:

（32）

Let . From （32） we have arithmetic progressions of primes:

 （33）

We rewrite （33）

 （34）

Jiang function is

, （35）

 denotes the number of solutions for the following congruence

 （36）

where 

From （36）we have

. （37）

We prove that there exist infinitely many primes  and  such that  are all primes for all .

We have the best asymptotic formula



. （38）

**Theorem 4**. From (33) we obtain

 （39）

Jiang function is

 （40）

 denotes the number of solutions for the following congruence

 （41）

where 

Frome (41) we have

. （42）

We prove there exist infinitely many primes ,and  such that  are all primes for all .

We have the best asymptotic formula





（43）

The prime distribution is order rather than random. The arithmetic progressions in primes are not directly related to ergodic theory, harmonic analysis, discrete geometry and combinatorics. Using the ergodic theory Green and Tao prove there exist arbitrarily long arithmetic progressions of primes which is false [6,7,8,9,10].

**Theorem 5**. Isoprime equation

. （44）

Let  be the odd number. Jiang function is

. （45）

Since , there exist infinitely primes  such that  is a prime.

We have

. （46）

**Theorem 6**. Isomprime equation

. （47）

Let  be the odd number. Jiang function is

, （48）

where



If , there infinitely many primes  such that  is a prime. If , there exist finite primes  such that  is a prime.

**3 Santilli’s Isoprime theory of the second kind**

Santilli’s isofields of the second kind  (that is,  is not lifted to ) also verify all the axioms of a field.

The isomultiplication is defined by

. （49）

We then have the isoquotient, isopower, isosquare root, etc.,

. （50）

**Theorem 7**. Isoprime equations

 （51）

Let . From （51）we have

, （52）

Jiang function is

, （53）

where  and  denote the Legendre symbols.

Since , there exist infinitely many primes  such that  and  are primes.

 （54）

Let . From (51) we have

. （55）

Jiang function is

. （56）

Since , there exist infinitely many primes  such that  and  are primes.

We have

. （57）

Let . From (51) we have

 （58）

We have Jiang function

. （59）

There exist finite primes  such that  and  are primes.

**Theorem 8**. Isoprime equations

. （60）

Let . From (60) we have

 （61）

Jiang function is

. （62）

Since , there exist infinitely many primes  such that  and  are primes.

We have

. （63）

Let  be the odd prime. From (60) we have

. （64）

Jiang function is

. （65）

If ;  otherwise.

Since , there exist infinitely many primes  such that  and  are primes.

We have

. （66）

**Theorem 9**. Isoprime equation

. （67）

Let  Jiang function is

, （68）

where  if ;  otherwise.

Since , there exist infinitely many primes  and  such that  is also a prime.

The best asymptotic formula is

. （69）

**Theorem 10**. Isoprime equation

 （70）

Let  Jiang function is

 （71）

where  if ;  otherwise.

Since , there exist infinitely many primes  and  such that  is also a prime.

The best asymptotic formula is

. （72）

**Theorem 11**. Isoprime equation

. （73）

Let . Jiang function is

 （74）

Since , there exist infinitely many primes  and  such that  is also a prime.

The best asymptotic formula is



. （75）

**4 Isoprime theory in Santilli’s new isomathematics**

**Theorem 12**. Isoprime equation

. （76）

Suppose . From (76) we have

. （77）

Jiang function is

. （78）

Since , there exist infinitely many primes  and  such that  is also a prime.

We have the best asymptotic formula is

. （79）

**Theorem 13**. Isoprime equation

. （80）

Suppose  and . From (80) we have

 （81）

Jiang function is

. （82）

Since , there exist infinitely many primes  and  such that  is also a prime.

We have the best asymptotic formula is

. （83）

**5 An Example**

We give an example to illustrate the Santilli’s isomathematics.

Suppose that algebraic equation

 （84）

We consider that (84) may be represented the mathematical system, physical system, biological system, IT system and another system. (84) may be written as the isomathematical equation

. （85）

If  and , then .

Let  and . From (85) we have the isomathematical subequation

. （86）

Let  and . From (85) we have the isomathematical subequation

. （87）

Let  and . From (85) we have the isomathematical subequation

. （88）

From (85) we have infinitely many isomathematical subequations. Using (85)-(88),  and  we study stability and optimum structures of algebraic equation (84).

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