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The ABC's of the Mathematical Infinitology. Principles of the Modern Theory and Practice of Scientific-and-Mathematical Infinitology

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Abstract

The modern Science has now a lot of its branches and meanders, where are working the numerous specialists and outstanding scientists everywhere in the whole world. The theme of this article is devoted to mathematics in general and to such a new subsidiary science as the Cartesian infinitology (± ∞: x y and x y z) in a whole.

The young and adult modern people of our time, among them, in first turn, are such ones as the usual citizens, students or schoolchildren, have a very poor imagination about those achievements and successes that made by our scientists in the different parts and divisions of many fundamental sciences, especially in mathematics. This article is a short description of the numerous ideas of a new science that is named by its inventor as the mathematical infinitology.

The infinity as the scientific category is a very complicated conception and the difficult theme for professional discussing of its properties and features even by the academicians and the Nobelists as well. In spite of all problems, the author have found his own road to this Science and worked out independently, even not being a mathematician at all, the universal, from his point of view, and unusual theories and scientific methods, which helped him to find and name It as the mathematical infinitology, that may be now studied in rectangular system of Cartesian or other coordinates, in orthogonal ones, for example, as easy and practically as we study the organic chemistry or Chinese language at the middle school or in the University.

The mathematical infinitology, as a separate or independent science, has been never existed in the mathematics from the ancient times up to the 90-th years of the XX-th century. All outstanding mathematicians of the past times were able only approximately to image to themselves and explain to their colleagues and pupils in addition, what is an infinity indeed: the scientific abstraction or the natural mathematical science that can be not only tested by one's tooth or touched by hands, but study and investigate it in schools or the Institutions of higher learning too.

In summer 1993, such a specific mathematical object as the "cloth of Ulam", was occasionally re-invented by the article author without no one imagination, what it is indeed. Very long time working hours spent by the inventor with this mathematical toy or the simplest logical entertainment helped him to penetrate into the mysteries of this usual intellectual mathematical object and see in it the fantastic perspectives and possibilities as for science as for himself in further studying and it investigating. In a result of the own purposefulness and interests to the re-invented mathematical idea of the famous American mathematician S.M.Ulam, the new science was born in the World, and after long time experiments, it was named as the mathematical or Cartesian infinitology (±∞ : x y and x y z).

Keywords: Cartesian infinitology; Mathematical plus-minus infinity (±∞:xy and xyz); Cartesian coordinates; Natural prime and twins numbers; Theory of blank spaces; Sieve of Erathosfen; Ulam's spieral

Introduction

In any, praiseworthy hobby, business or the craft, being appeared at the human persons for a long time process of evolution, and thanks to the mental and creative abilities growth, sometimes among the advanced people were developed such high spheres of human knowledge or personal skills or intellectual abilities, that a lot of centuries and even the millenniums came or passed away, before some difficult scientific idea or the secrets of the craft could be at last found their final decisions or they were transformed by the human individuals into such form of the representation or embodiment, available for their natural perception by people, specialists or scientists, that a team of higher skilled experts could only recognize this or that decision as a perfect standard [1-8]. And, it isn't necessary to go far very much for the examples! The most ancient and the unresolved task is a secret of natural prime numbers, the cornerstone of the scientific theory of their knowledge and studying was put by Eratosphen Kirensky, the Ancient Greece mathematician, being lived in the III century B.C. The knowledge by the human persons of the Great truths of the World was always, from the time of immemorial destiny, the elite of possessing advanced thinkers being had a rich life experience. Such people-the unique just always were able and solved the various and most important tasks of their time, advancing thereby not only the era itself and its potential opportunities, but at the same time they were putting by own affairs and talents the progress and forward advance of Mankind on the evolution steps, un-looking on all difficulties and adversities of the daily occurrence, with their terrible wars, epidemics, personal problems and the natural cataclysms [9-15].

And here is already 21 century! It is now improbably interesting to look backward to compare the life of people, which were living at the very beginning of our era, with today's life of people that are living

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now in 2013 A.D. The huge abyss between these two eras is more than evident. Everything was changed considerably and up to beyond recognition! And though the different natural and technogenous misfortunes still annoy to people and their countries, the states and even the whole continents, but what, after all abundance, a huge variety of all forms, and views and types and everything in our civilization! The flights in space and the working Hadron collider became already our daily occurrence [15-21]. And there is already a future man's struggle against the asteroid danger. And the Cheliabinsk fire-ball has showed to the whole world how terrible and dangerous can it be to all living beings on the Earth. It is the most convenient time to think about the security of the Mankind, and its planet too, from the space stone travelers already today. And at soon the possible flights of people to Mars, Venus and other planets of Solar system will be begun. And the wide development of new opportunities of the Arctic and Antarctica areas with their infinite store rooms of minerals and sea bio-sources, in the nearest future! And the problem of shortage of food and drinking water consumption!!! And the catastrophic climate surprises which provoke high-speed thawing of the ice armor of the Earth! The life on the Earth became more unpredictable and dangerous. And in this very quickly changing world, it is difficult to the human person correctly and in due time to react to all misfortunes that are collapsing upon his head from the side of the natural disasters.

Being live rapidly and in the atmosphere of continuous changes, the modern human person, nevertheless, doesn't low his hands down and continues to create the material and intellectual treasures elsewhere on the Earth, and even in the outer space, making better, step by step, not only the created by him achievements but this very complicated World too, on the base of his own imperfections. The people constantly live in continuous creative search, solving the mass of tasks, for what they are sometimes encouraged morally or financially. For the sake of such bright perspectives of the personal wellbeing, the best minds start to look for the solution of the most difficult scientific tasks and other problems. And the valuable awards sometimes find the heroes! This work is a formal confirmation of the man's elementary inquisitiveness and how it helped him to make an interesting scientific invention in sphere of elementary mathematics [22-26].

The Ulam's Cloth or Spiral

Even some a few people among the today's schoolchildren and students know and can convincingly, even on fingers, explain what it is the "Eratosphen's sieve" and/or the "Ulam's spiral", and at least to tell elementarily about these objects, and what it is spoken about in principle. And not all mathematician will be also able to explain objectively and clearly to the ordinary fans of this science, what it is a "bestia" named as the spiral of Ulam, and what are the concrete advantages from it to the science itself, to the ordinary fellow citizens and, especially, to the modern educated people of the world as well [27-30]. If to judge on the single publications only, the mathematical idea of Mr. S. M. Ulam, the famous American mathematician and the Polish man in his original, is not be able to serve as a proof that our authors–educators and the legal distributors of the scientific-and-popular literature on mathematics among the population, have the elementary interest to this, in appearance, the childish mathematical occupation and these persons are not sure very much that they could be objectively and in details to tell for their readers, on the pages of the famous books, about the features of this idea. But what kind of the mathematical interest may have this childish mathematical entertainment at readers in fact?

As it is well known today, Stanislav M. Ulam has invented this "cloth", or rather, a spiral, in 1963, being presented once upon a time at a very boring meeting of his colleges-scientists. To kill time and not to fall asleep with boredom, our hero began to draw on the page of his note-book in cell a symbolic chessboard for solution of etudes, but, occasionally, he has changed his intention and, instead of the chess figures drawing, he begun to fill in the center of this, a poor similarity of the chessboard, with the natural prime numbers in view of the points situated in square cells of the spiral-typed line, turning anticlockwise, that replaced such prime numbers as two, three, etc. As for me, I have made the same even not being introduced with this idea at all and its author in general [30-37]. Both Ulam and me have replaced the prime numbers with the points for simplification of the whole work. And at soon, the idea of the American mathematician, which was named as "the Ulam's cloth" by the scientists, was born and, by the time, it has possessed the right to live. Specialists of Los-Alamos laboratory, headed by Stanislav Martin Ulam, the author of this idea, did a huge work on detection the regularities of prime numbers distribution within this helicoid system, but the idea, as it is known, couldn't demonstrate itself in its entire beauty since it was needed a perfect modification a little. But just on this trifle, the time was absent at S.Ulam and his colleges. So it's a pity! Because Stanislav Martin Ulam and his friends in this laboratory have been on the threshold of the Great discovery in mathematics, and, as it is supposed by me, in sphere of the elementary number theory [38-44].

The spiral of Ulam

82 **81** 80 **79** 78 77 76 75 74 **73**

83 50 **49** 48 **47** 46 45 44 **43** 72

84 51 26 **25** 24 **23** 22 21 42 **71**

85 52 27 10 **09** 08 07 20 **41** 70

86 **53** 28 **11** **02** **01** 06 **19** 40 69

87 54 **29** 12 0**3** **04** 0**5** 18 39 68

88 55 30 **13** 14 15 **16** **17** 38 **67**

89 56 **31** 32 33 34 35 **36** **37** 66

90 57 58 **59** 60 **61** 62 63 **64** 65

91 92 93 94 95 96 **97** 98 99 **100**…→ ∞

Even such a small site of mathematical object under the name "Ulam's cloth" allows seeing the fine accurate chains of the natural numbers-points on the Figures 1-3 below and in the [LI]

Classification of the Natural Numbers in the "Spiral of Ulam"

I. 1,2,3,4,5,6,7,8,9,10,11,12,…--- the usual natural numbers consequence;

I.' 1,3,5,7,9,11,13,15,17,19,21 --- the odd natural numbers consequence,…

I." 2,4,6,8,10,12,14,16,18,20,…--- the even natural numbers consequence,

II. 2,3,5,7,11,13,17,19,23,31,…--- the natural prime numbers consequence;

III. 3-5,5-7,11-13,29-31,41-43,…--- the natural twin numbers consequence;

IV. 1,9,25,49,81,121,169,196,… --- the squares of the odd natural numbers consequence;

V. 4,16,36,64,100,144,196,… --- the squares of the even natural numbers consequence;

VI. 1,11,31,41,61,71,101,131,… --- the first kin type of prime numbers consequence;

VII. 3,13,23,43,53,73,83,103,… --- the second kin type of prime numbers consequence;

VIII. 7,17,37,47,67,97,107,127,… --- the third kin type of prime numbers consequence;

IX. 19,29,59,79,109,139,149,… --- the forth kin type of prime numbers consequence;

X. 1,3,11,13,23,31,41,43,53,… --- the fifth kin type of prime numbers consequence;

XI. 1,7,11,17,31,37,41,47,61,… --- the sixth kin type of prime numbers consequence;

XII. 1,11,19,29,31,41,59,61,71,…--- the seventh kin type of prime numbers consequence;

XIII. 3,7,13,17,23,37,43,47,53,… --- the eighth kin type of prime numbers consequence;

XIV. 3,13,19,23,29,43,53,59,73,…--- the ninth kin type of prime numbers consequence;

XV. 7,17,19,29,37,47,59,67,79,…--- the tenth kin type of the prime numbers consequence;

XVI. 1,3,7,11,13,17,23,31,37,41,…--- the eleventh kin type of prime numbers consequence;

XVII. 1,3,11,13,19,23,29,31,41,…--- the twelfth kin type of prime numbers consequence;

XVIII.1,7,11,17,19,29,31,37,41,… --- the thirteenth kin type of prime numbers consequence;

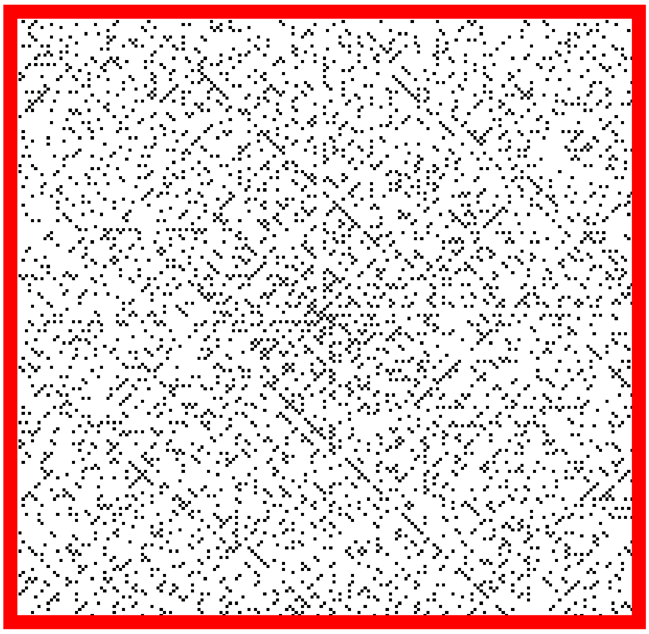

Figure 1: The mathematical rectangular spiral or "the table-cloth of Ulam" (fragment). (the black points are the symbol prime numbers on the white field)

XIX. 3,7,13,17,19,23,29,37,43,… --- the fourteenth kin type of prime numbers consequence;

XX. 11-13,41-43,71-73,101-103,…--- the 1-st kin of the twin prime numbers consequence;

XXI. 17-19,107-109,137-139,… --- the 2-nd kin of the twin prime numbers consequence;

XXII. 29-31,59-61,149-151,… --- the 3-d kin of the twin prime numbers consequence;

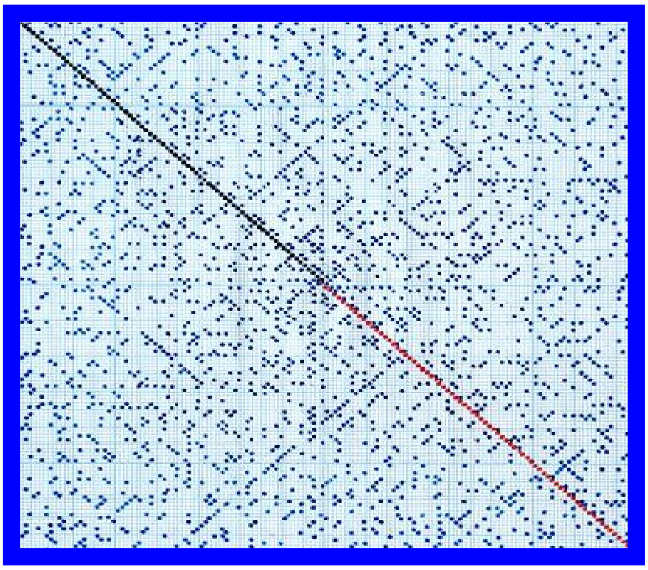

Figure 2: The mathematical rectangular spiral or "the table-cloth of Ulam" (fragment), (the white points are the symbol prime numbers on the black field).

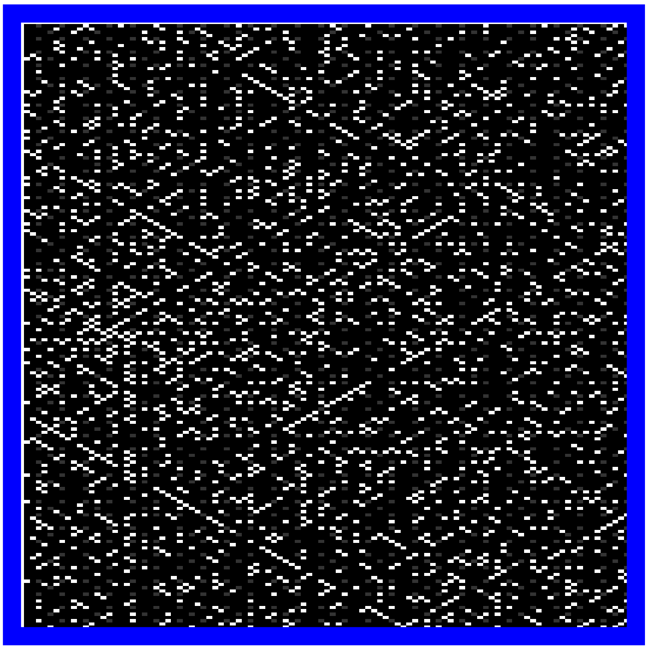

Figure 3: The generalized mathematical rectangular spiral or "the table-cloth of Ulam" (the dark-blue points are the symbol prime numbers; the green points are the symbol odd quadratic numbers; the red points are the symbol even numbers on the white field. The fig. was made by the Author of the article after careful number coordinates calculation).

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XXIII. 11-13,17-19,41-43,71-73,…--- the 4-th kin of the twin prime numbers consequence;

XXIV. 11-13,29-31,41-43,59-61,…--- the 5-th kin of the twin prime numbers consequence;

XXV. 17-19,29-31,59-61,107-109, --- the 6-th kin of the twin prime numbers consequence (Figure 1-3).

The "Ulam's cloth" accurate chains of the natural numbers and their analogs in view of sets of the same dots on the different color fields (white, light-blue and black)) are demonstrating the verible variants of regularity of the natural number distribution in the spiral of Ulam. But if to look at this peculiar roll from numbers indifferently, of course, it is nothing interesting will be found in this spiral. For those fifty years, which have passed from that day, when Stanislav Ulam has invented this "toy", which wasn't attracted only by it to check up one's intellect and satisfy one's vanity playing with this, in appearance, the usual ordinary numerical spiral! But nobody was able to see or understand it's most important and basic features [45-51]. May be this "cat in the bag" was "sitting" there up to the end of the times on a scientific shelf or in corner of the old store-room or a hose or rectangular "boa" rounded tightly and forgotten by everybody forever, if once upon a time, exactly twenty years ago, the author of these lines also decided but occasionally to solve one simple arithmetic problem. In the course of its decision, when all known methods were tried without results, suddenly the entertainment of my student's years came to my mind---a mathematical rectangular spiral, which sometimes should be drawn by me at very boring lectures. In my student years during the boring lectures, I created the spiral of natural numbers and marked the natural prime numbers situated in cells of it, on the page of my student's note-book exactly as it was made by Stanislav Ulam, (that I know much later, having looked through the mountains of mathematical literature). I have been already ready to end my empty occupations with this spiral. When I wanted to find the possible decision of my arithmetic task, when, at the last moment, I have noticed one strangeness, which strongly intrigued and surprised me: I noticed, that all squares of odd natural numbers at this spiral ideally correctly were situated on the diagonal leaving the center of this spiral and gone to the left corner, but the squares of even natural numbers---to the opposite side of the spiral (Figure 2) [52-59].

And then a great willing has come to my mind-to fulfill the graphical generalization of this elementary spiral. But to do so, one ought to me to make a huge volume of calculations and graphical works. And for the aim to receive a fine and interesting picture-beautiful and demonstrated one, it has been decided to mark the suitable natural numbers with the dots of the corresponded color. In a result, the natural prime and twin numbers have been coded with the dots of blue-dark color, the squares of the odd natural numbers have become the green and the squares of the even natural numbers and the null too-the red ones. Such simple color coding or marking of the natural numbers have made the powerful and strong basement for a new scientific idea and the future new mathematical science. And later, after deep studying of it, this idea has been named as the "Generalized spiral of Ulam". It is graphical interpretation is shown on the Figures 2 and 4.

82 **81** 80 **79** 78 77 76 75 74 **73**

83 50 **49** 48 **47** 46 45 44 **43** 72

84 51 26 **25** 24 **23** 22 21 42 **71**

85 52 27 10 **09** 08 0**7** 20 **41** 70

86 **53** 28 **11** **02** **01** 06 **19** 40 69

87 54 **29** 12 0**3** **04** 0**5** 18 39 68

88 55 30 **13** 14 15 **16** **17** 38 **67**

89 56 **31** 32 33 34 35 **36** **37** 66

90 57 58 **59** 60 **61** 62 63 **64** 65

91 92 93 94 95 96 **97** 98 99 **100**…→ ∞

Figure 4: Generalized "the table - cloth of Ulam".

"Generalized Spiral of Ulam"

Analogs and derivations of the generalized spiral of Ulam

At once and immediately, when was determined the main information about such a strange and even the mysterious scientific object as the spiral of Ulam, there were begun the longest searching of more detailed descriptions of such spiral in the suited editions, publications, and manuals on mathematics. But having reconsidered the hills of books and handbooks on the elementary and higher mathematics, I was not able to find the information about this neither the spiral nor the generalized analog of it. Having supposed that this idea has not even the elementary interest and attention at the mathematicians, I begun to study this "toy" independently, being made my own varieties of this spiral for differentiation of my own entertainment only. In a result of my interactivity, the most improbable compositions have begun to appear from the natural numbers, which, after replacement the natural numbers on the color dots, I have received their own names like these ones: triangular, trapeziform, zigzag, and so on. There are some types and kinds of such number compositions below, that have been created on the base of my big interest and my own version of the generalized spiral of Ulam too (Figures 5-10).

If to look attentively and carefully at the natural number compositions, we then will not be able to un-notice a new and very interesting feature --- the square powers of the odd and even natural numbers, as usual, have created again their special configurations and

21

22 7 20

23 8 **1** 6 19

24 **9** 2 3 **4** 5 18

25 1 11 12 13 14 15 **16** 17

26 27 28 29 30 31 32 33 34 35 **36**

Figure 5: Triangular spiral. {An}={n}.

50 **49**

51 26 **25** 48

52 27 10 **9** 24 47

53 28 11 2 **1** 8 23 46

54 29 12 3 **4** 5 6 7 22 45

55 30 13 14 15 **16** 17 18 19 20 21 44

56 31 32 33 34 35 **36** 37 38 39 40 41 42 43

Figure 6: Trapeziform spiral. {An}={n}.

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such a manner, that the noticed at the Generalized spiral of Ulam unordinal peculiarity to form their individual sets and subsets in view of the consequent chains of red and green dots, is nowhere broken in its new verities (Figures 3-9). Such a peculiarity is more persuasive than any words can say that perhaps a new and nobody known property of usual natural numbers is found in mathematics. The further investigations of this property, discovered at the natural numbers, allowed recognizing it as the universal low at them and at their algebraic-and-complex equivalents as well, and it has been officially registered in the State notary office, in the Murmansk Regional town center, situated on Kola Peninsula, in Russia.

131

109 129

89 107 127

71 87 105 125

55 69 85 103 123

41 53 67 83 101 **121**

29 39 51 65 **81** 99 119

19 27 37 **49** 63 79 97 117

11 17 **25** 35 47 61 77 95 115

05 **09** 15 23 33 45 59 75 93 113

01 03 07 13 21 31 43 57 73 91 111

Figure 7: Zigzag spiral. {An}={2n – 1}

99 **100**

80 **81** 98 101

63 **64** 79 82 97 103

48 **49** 62 65 78 83 96 104

35 **36** 47 50 61 66 77 84 95 105

24 **25** 34 37 46 51 60 67 76 85 94 106

15 **16** 23 26 33 38 45 52 59 68 75 86 93 107

8 **9** 14 17 22 27 32 39 44 53 58 69 74 87 92 108

3 **4** 7 10 13 18 21 28 31 40 43 54 57 70 73 88 91 109

0 **1** 2 5 6 11 12 19 20 29 30 41 42 55 56 71 72 89 90 110

Figure 8: Serpentine spiral. {An}={n}.

223 221 219 217 215 213 211 209 207 205 203 201 199 197 195

225 143 145 147 149 151 153 155 157 159 161 163 165 167 193

227 141 119 117 115 113 111 109 107 105 103 101 99 **169** 191

229 139 **121** 63 65 67 69 71 73 75 77 79 97 171 189

231 137 123 61 47 45 43 41 39 37 35 **81** 95 173 187

233 135 125 59 **49** 15 17 19 21 23 33 83 93 175 185

235 133 127 57 51 13 7 5 3 **25** 31 85 91 177 183

237 131 129 55 53 11 **9** 0 **1** 27 29 87 89 179 181

Figure 9: Funnel-shaped (vortex) spiral. {An}={2n–1}.

Triangular structure

When, as it was seemed, the all possible variants and varieties of the Generalized spiral of Ulam were invented and compiled, it is naturally the idea has appeared to create a new natural number configuration in view e.g. of pyramid or isosceles rectangular triangle, standing on one of its sides (Figure 11). In a new variant one more variety of the Generalized spiral of Ulam, it suddenly has been discovered that the spiral of Ulam, written in such a manner, is principally differ from its previous variants on the external view and other parameters (i.e. red and green dots had other configurations at the schematic diagram). In this triangular structure were seen clearly the counters of the famous and well-known to everyone in mathematics the second order curve - the parabola itself (Figures 11 and 12).

Graph-and-Analytical Method

Standard variant

Let us write in common view the consequence of derivation

90

91

24 32 48 54 62 74 84 92

25 33 **49** 55 63 75 85 93

8 14 20 26 34 38 44 50 56 **64** 68 76 80 86 94 98

0 **9** 15 21 27 35 39 45 51 57 65 69 77 **81** 87 95 99

1 **4** 6 10 12 **16** 18 22 28 30 **36** 40 42 46 52 58 60 66 70 72 78 82 88 96 **100**

2 3 5 7 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101

Figure 10: "The New-York silhouette". (An}={n}.

01

02 03

04 05 06

07 08 **09** 10

11 12 13 14 15

16 17 18 19 20 21

22 23 24 **25** 26 27 28

29 30 31 32 33 34 35 **36**

37 38 39 40 41 42 43 44 45

46 47 48 **49** 50 51 52 53 54 55

56 57 58 59 60 61 62 63 **64** 65 66

67 68 69 70 71 72 73 74 75 76 77 78

79 80 **81** 82 83 84 85 86 87 88 89 90 91

92 93 94 95 96 97 98 99 **100** 101 102 103 104 105

106 107 108 109 110 111 112 113 114 115 116 117 118 119 120

121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136

137 138 139 140 141 142 143 **144** 145 146 147 148 149 150 151 152 153

Figure 11: Triangular stepped structureю. {An}={n}.

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1
x x
4 x x
x x 9 x
x x x x x
16 x x x x x
x x x 25 x x x
x x x x x x x 36
x x x x x x x x x
x x x 49 x x x x x x
x x x x x x x x 64 x x
x x x x x x x x x x x x
x x 81 x x x x x x x x x x
x x x x x x x x 100 x x x x x
x x x x x x x x x x x x x x x
121 x x x x x x x x x x x x x x x
x x x x x x x 144 x x x x x x x x x

Figure 12: Triangular stepped structure. {An}={n}.

of the second order line equation or the algebraic curve placed in Cartesian coordinates and going through the five coordinate points. When used with this method, one can calculate all types of polynomials and algebraic equations of all quadratic parabolas, the thin contours of which are formed by the sets of red, red-green and green dots on the plot [L1] of the natural numbers [{An}={n²}] - type consequence in the rectangular system of Cartesian coordinates [60-65].

The equation of the algebraic curve of the second order, that going through the five points: M_1 (x_1, y_1); M_2 (x_2, y_2); M_3 (x_3, y_3); M_4 (x_4, y_4) и M_5 (x_5, y_5), one can calculate it with the following method, that well-known in mathematics as the Method of determinants:

Let us write four determinants and their algebraic equalities:

$$M_1M_2\text{: } A(x, y)=\begin{vmatrix} x & y & 1 \\ x & y_1 & 1 \\ x & y_2 & 1 \end{vmatrix}=0$$

$A(x, y)=xy_1+x_2y+x_1y_2-x_2y_1-xy_2-x_1y$

$$M_2M_3\text{: } B(x, y)=\begin{vmatrix} x & y & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}=0$$

$B(x, y)=xy_2+x_3y+x_2y_3-x_3y_2-xy_3-x_2y$

$$M_3M_4\text{: } C(x, y)=\begin{vmatrix} x & y & 1 \\ x_3 & y_3 & 1 \\ x_4 & y_4 & 1 \end{vmatrix}=0$$

$C(x, y)=xy_3+x_4y+x_3y_4-x_4y_3-xy_4-x_3y$

$$M_4M_1\text{: } D(x, y)=\begin{vmatrix} x & y & 1 \\ x_4 & y_4 & 1 \\ x_1 & y_1 & 1 \end{vmatrix}=0$$

$D(x, y)=xy_4+x_1y+x_4y_1-x_1y_4-xy_1-x_4y$

Let us write the equation:

$$P.A(x, y)\cdot C(x, y)+Q.B(x, y).D(x, y)=0, \quad (1)$$

where P and Q – any real numbers that are not equal to zero simultaneously. Let us find such

a relation of P and Q that M_5 has become to belong to the line (1).

$$P: Q=[(-B)(x_5, y_5)\cdot D(x_5, y_5)] : [A(x_5, y_5)\cdot C(x_5, y_5)] \quad (2)$$

Let us find the meanings of P and Q and then insert these meanings in (1) and then we will try to decide this equation. After collecting like terms, we will have the algebraic equation of the second order line that going through the five known points [66,67].

In view of the practical example, let us calculate the equation of the second order line, the main points of which are situated in the negative area of the coordinate axis (–XoX+), having determined the meaning of coordinates of this curve with the help of the plot [L1], where we will find easily the first five green points of the furthest parabola, the symmetrical axis of which is parallel to the (–XoX+) coordinate line and combines with it.

M_1 (– 130½; 4½); M_2 (– 126½; 3½); M_3 (– 123½; 2½); M_4 (– 121½; 1½); M_5 (– 120½; ½)

Let us find the mediate equations and suited coefficients for derivation of the desired algebraic equation or the second order line, going through the five given points.

$$M_1M_2\text{: } A(x, y)=\begin{vmatrix} x & y & 1 \\ (-261/2) & 9/2 & 1 \\ (-253/2) & 7/2 & 1 \end{vmatrix}=0$$

$A(x, y)=(9/2)x-(253/2)y-1827/4+2277/4-(7/2)x+(261/2)y$

$\rightarrow 2x+8y+225=0$

$$M_2M_3\text{: } B(x, y)=\begin{vmatrix} x & y & 1 \\ (-253/2) & 7/2 & 1 \\ (-247/2) & 5/2 & 1 \end{vmatrix}=0$$

$B(x, y)=(7/2)x-(247/2)y-1265/4+1729/4-(5/2)x+(253/2)y$

$\rightarrow x+3y+116=0$

$$M_3M_4\text{: } C(x, y)=\begin{vmatrix} x & y & 1 \\ (-247/2) & 5/2 & 1 \\ (-243/2) & 3/2 & 1 \end{vmatrix}=0$$

$C(x, y)=(5/2)x-(243/2)y-741/4+1215/4-(3/2)x+(247/2)y$

$\rightarrow 2x+4y+237=0$

$$M_4M_1\text{: } D(x, y)=\begin{vmatrix} x & y & 1 \\ (-243/2) & 3/2 & 1 \\ (-261/2) & 9/2 & 1 \end{vmatrix}=0$$

$D(x, y)=(3/2)x-(261/2)y - 2187/4+783/4 - (9/2)x+(243/2)y$

$\rightarrow 6x+18y+702=0$

6.1.6. Let us write the desired equation:

$$P(2x+8y+225)(2x+4y+237)+Q(x+3y+116)(6x+18y+702)=0 \quad (3)$$

Let us find such a relation of P:Q that the $M_5(-120½;½)$ point became to belong to this line:

$x+3y+116=0$ $(-241/2)+3/2+232/2=(-3)$

$6x+18y+702=0$ $(-1446/2)+18/2+1404/2=(-12)$

$2x+8y+225=0$ $(-241)+4+225=(-12)$

$2x+4y+237=0$ $(-241)+2+237=(-2)$

$(P/Q)=[-(-3)(-12)]/[(-12)(-2)]$ $(P/Q)=(-3)/2$

$P=(-3)$ $Q=2$

Let us open the brackets in the equality (3) and then collect like terms with taking into account the meaning of the P and Q coefficients:

$(-3)(2x+8y+225)(2x+4y+237)+2(x+3y+116)(6x+18y+702)=0$

$-12x^2 - 72xy - 2772x - 96y^2 - 8388 - 159975=0$

$+\{12x^2+72xy+2796x+108y^2+8388+162864=0$

$$12y^2+24x+2899=0 \quad (4)$$

Let us determine the coordinates of M_0 top of the parabola (4). Let us $y_0=0$.

$12 \cdot 0+24x+2889=0$ $24x=-2889;\ x_0=-120\ ⅜\ y_0=0$

By turning the X and Y axes on (± 90°) and (±180°) around the null-point of the Cartesian coordinates, we then will have four main quadratic equations:

$12y^2 \pm 24x+2889=0\ y=\pm(½x^2+120\ ⅜)$

Offered here calculation presents the famous method of determining the polynomials of those classical or created by the mathematical Nature of idea itself of the algebraic equations, the assemblage of coordinate points of which forms the interminable two-color dotted plot [L1] of the $\{A_n\}=\{n^2\}$-type natural numbers consequence in the rectangular system of Cartesian coordinates in the given scale and intervals alongside the X and Y axes and far from them on the unlimited fields of the rectangular system of Cartesian coordinates [68].

Universal Classifier of the Natural Numbers and Its Varieties

For successful continuation of the natural numbers studying and investigation them in the limits of this idea, the necessity has suddenly appeared how to find or invent independently the universal and simplest method of the natural numbers classification. After very long and difficult seeks, it was invented at last such a numerical clepsydra or mathematical sieve that was able to characterize any natural number in view of its simplest parameters like these ones: evenness, oddness, simplicity, divisibility, etc. The universal mathematical natural numbers detector has been invented at last in the mathematical science.

In fact, the Universal classifier itself is a usual table in view of the right isosceles triangle that is widened to its horizontal side, and where the natural numbers are consequently roomed in cells from the point of their division on all possible whole devisors. It is the Universal classifier of the natural numbers that now allows to decide all simplest tasks on the any natural numbers parameterization. The Universal classifier itself and its varieties are placed below. When analyzing the Classifier structure and its principles of working, one can easily to see and understand the real Classifier's advantages in comparison with the analogical mathematical tables and schematic diagrams. It is a natural mini-mathematical Encyclopedia under ones hand.

In all times, there were people that tried to classify all and everything in the World. In a result, all people's achievements have begun to undergo to the common and the all-world classification. Each branch or direction of the human activity were analyzing by their pioneers or outstanding scientists. The Mankind, thanks to such clever persons, has possessed a dozen of sciences and their numerous meanders. All things, even the tiniest elements of them, have now their shelf, place or cell in the Great archives, created by the people [69,70].

As for our ideas and methods of classification the rules and lows for creating the correct different dotted color illustrations, pictures and plots (graphs) in Cartesian coordinates, this science or mathematical infinitology requires the strong and ideal classification of all aspects and ideas in this huge scientific sphere. Having constructed the powerful base for such a complicated science like the mathematical infinitology, we must be sure that our system of rules, axioms, classifications and scientific imaginations, will be strong and undestroyed forever (Figures 13-16).

After a successful creating of three dotted multi-colored graphs and plots in the rectangular system of Cartesian coordinates, the most unusual and interesting idea has born suddenly as "Eureka !" at Archimedes. It suddenly dawned upon me and the main result of such a premonition, presented here like the Classification table, was the idea of creating the dotted scientific illustration, the mathematical interpretation or close similarity to it would be a formula {An}={n}, where the "n" is any natural number, marked in a view of the dot having the only possible color for this figure. But because of the absence of the axioms and the already written rules on the natural numbers color coding, this idea has taken me unawares, and I was needed, by all means, to find, invent or work out such method of natural number color coding at once, immediately and independently.

Later, in a result of the purposefulness and own interest, this difficult task was decided in the shortest time and much enough successfully. To be more specific, any natural number in the endless consequence of them, one can code (mark) now with the only color, and as for any figure color marking, it will be needed only seven "paints" of the rainbow spectrum for these purposes. The rules of color natural number coding is presented here in the Classification table below, taking, of course, in our mind, that each figure on the picture or a plot is represented there in a view of the suited color dot. Let us introduce with the elementary color coding rules of the natural numbers and their complex-and-algebraic equivalents as well [71-75].

Classification Table

1. Any odd natural number, arisen in "() ^2" or any other "() ^2n" power, is coded in view of the green dot(s), e.g.: $1^2=1$, $3^2=9$, $5^2=25$, etc. The same but the negative odd numbers (-1, -9, -25, etc.) must be marked in such a manner, i.e. in view of the green dot(s) on the plot or graph, created in the Cartesian coordinates.
2. Any even natural number, arisen in "() ^2" or any other "() ^2n" power, is coded in view of the red dot(s), e.g.: $2^2=4$, $4^2=16$, $6^2=36$, etc. The same but the negative even numbers (-4, -16,

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0																			
1	1																		
2	1	2																	
3	1	–	3																
4	1	2	–	4															
5	1	–	–	–	5														
6	1	2	3	–	–	6													
7	1	–	–	–	–	–	7												
8	1	2	–	4	–	–	–	8											
9	1	–	3	–	–	–	–	–	9										
10	1	2	–	–	5	–	–	–	–	10									
11	1	–	–	–	–	–	–	–	–	–	11								
12	1	2	3	4	–	6	–	–	–	–	–	12							
13	1	–	–	–	–	–	–	–	–	–	–	–	13						
14	1	2	–	–	–	–	7	–	–	–	–	–	–	14					
15	1	–	3	–	5	–	–	–	–	–	–	–	–	–	15				
16	1	2	–	4	–	–	–	8	–	–	–	–	–	–	–	16			
17	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	17		
18	1	2	3	–	–	6	–	–	9	–	–	–	–	–	–	–	–	18	
19	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	19

Figure 13: Elementary classifier of the natural numbers.

0																														
2	1	2																												
4	1	2	–	4																										
6	1	2	3	–	–	6																								
8	1	2	–	4	–	–	–	8																						
1	1	2	–	–	5	–	–	–	–	1																				
0										0																				
1	1	2	3	4	–	6	–	–	–	–	–	1																		
2												2																		
1	1	2	–	–	–	–	7	–	–	–	–	–	–	1																
4														4																
1	1	2	–	4	–	–	–	8	–	–	–	–	–	–	–	1														
6																6														
1	1	2	3	–	–	6	–	–	9	–	–	–	–	–	–	–	–	1												
8																		8												
2	1	2	–	4	5	–	–	–	–	1	–	–	–	–	–	–	–	–	–	2										
0										0										0										
2	1	2	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	2								
2											1											2								
2	1	2	3	4	–	6	–	8	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	2						
4												2												4						
2	1	2	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	2					
6													3												6					
2	1	2	–	–	–	–	7	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	2		
8														4														8		
3	1	2	3	–	5	6	–	–	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3
0										0					5															0

Figure 14: Elementary classifier of the even natural numbers.

0																		
1	1																	
3	1	3																
5	1	–	5															
7	1	–	–	7														
9	1	3	–	–	9													
11	1	–	–	–	–	11												
13	1	–	–	–	–	–	13											
15	1	3	5	–	–	–	–	15										
17	1	–	–	–	–	–	–	–	17									
19	1	–	–	–	–	–	–	–	–	19								
21	1	3	–	7	–	–	–	–	–	–	21							
23	1	–	–	–	–	–	–	–	–	–	–	23						
25	1	–	5	–	–	–	–	–	–	–	–	–	25					
27	1	3	–	–	9	–	–	–	–	–	–	–	–	27				
29	1	–	–	–	–	–	–	–	–	–	–	–	–	–	29			
31	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	31		
33	1	3	–	–	–	11	–	–	–	–	–	–	–	–	–	–	33	
35	1	–	5	7	–	–	–	–	–	–	–	–	–	–	–	–	–	35

Figure 15: Elementary classifier of the odd natural numbers.

00																		
01	01																	
03	01		03															
06	01	02	03			06												
09	01		03						09									
12	01	02	03	04		06						12						
15	01		03		05										15			
18	01	02	03			06			09								18	
21	01		03				07											21
24	01	02	03	04		06		08				12						
27	01		03						09									
30	01	02	03		05	06				10					15			
33	01		03								11							
36	01	02	03	04		06			09			12					18	
39	01		03										13					
42	01	02	03			06	07							14				21
45	01		03		05				09						15			
48	01	02	03	04		06		08				12				16		

Figure 16: Elementary classifier of the {An}=3n view natural numbers.

-36, etc.) must be marked in such a manner, i.e. in view of the red dot(s) on the plot or graph, created in the Cartesian coordinates.

3. Any natural prime or twin numbers must be coded in view of the blue dot(s), e.g.: 2=2, 3=3, 5=5, etc. The same but the negative numbers (-2, -3, -5, etc.) must be marked in such a manner, i.e. in view of the blue dot(s) on the plot or graph, created in the Cartesian coordinates.
4. Any odd natural number, arisen in "() ^3" or any other "() ^(2n-1)" power, is coded in view of the dark blue dot(s), e.g.: $3^3=27$, $5^3=125$, $7^3=343$, etc. The same but the negative numbers (-27, -125, -343, etc.) must be marked in such a manner, i.e. in view of the dark blue dot(s) on the plot or graph, created in the Cartesian coordinates, excluding the natural (negative) numbers, which fall under the condition of the item No.1 of this Classification, e.g.: $9^3=[(3^2)]^3$, etc.
5. Any even natural number, arisen in "() ^3" or any other "() ^(2n-1)" power, is coded in view of the violet dot(s), e.g.: $2^3=8$, $6^3=216$, 2^9=512, etc. The same but the negative numbers (-8, -216, -512, etc.)must be marked in such a manner, i.e. in view of the violet dot(s) on the plot or graph , created in the Cartesian coordinates, excluding the natural (negative) numbers, which fall under the condition of the item No. 2 of this Classification, e.g.: $4^3=[(2^2)]^3$, etc.
6. All other odd natural (negative) numbers are coded in view of the yellow dot(s), e.g.:15, 21, 33, 35, 39, 45, 51, 55, etc., when created the plot or graph in Cartesian coordinates.
7. All other even natural (negative) numbers are coded in view of the orange dot(s), e.g.: 6, 10, 12, 14, 18, 20, 22, 24, etc., when created the plot or graph in Cartesian coordinates.

Such a simple method of any natural number color classification in a view of the dot, having the own color among the seven paints of the rainbow spectrum, will allow to create for us not only the most unusual scientific and art "pictures" but even the fantastic dotted illustrations and compositions in the rectangular system of Cartesian coordinates in the vicinity of its "null"-point and at any distance from it. The modern programmable media products such ones of them as MAPLE, MathCAD, MATHEMATICA, MATLAB, WOLFRAM, etc., will help to strength the opportunities for our scientists-mathematicians and specialists in sphere of IBM PC programming up to the endless indeed.

And, probably, some new scientific inventions will be made as in mathematics as in physics, chemistry, astronomy and other famous sciences and their branches. And, may be, at last, the mathematical or Cartesian plus-minus infinity (± ∞ : x y and x y z) will tell to its investigators all secrets of the prime numbers, twin numbers, proof the conjunction of Riemann B and explain a lot of other outstanding scientific and mathematical problems of the past centuries and modern ones additionally.

Combinatorics

Variants of color coding of natural numbers and formed by them consequences

After working out the principles of natural numbers color coding in the limits of this idea, it has appeared the possibility to make and create as manually as electronically the most variable, dependent on their chromaticity and color compositing the dotted illustrations and pictures or scientific dotted - colored graphs of the natural numbers and formed by them consequences in the rectangular system of Cartesian coordinates.

One – color graphs:

1. Green (gr) 2. Red (rd) 3. Blue (bl) 4. (c) Light blue (lb) 5. Violet (vt) 6. Yellow (yl) 7. Orange (rn)

C=7!/[1! (7 – 1) !] C=7

Two-color graphs:

1. 1-2	2. 1-3	3. 1-4	4. 1-5	5. 1-6	6. 1-7	7. 2-3
8. 2-4	9. 2-5	10. 2-6	11. 2-7	12. 3-4	13. 3-5	14. 3-6
15. 3-7	16. 4-5	17. 4-6	18. 4-7	19. 5-6	20. 5-7	21. 6-7

C=7!/[2! (7 – 2) !] C=21

Three-color graphs:

1. 1-2-3	2. 1-2-4	3. 1-2-5	4. 1-2-6	5. 1-2-7	6. 1-3-4	7. 1-3-5
8. 1-3-6	9. 1-3-7	10. 1-4-5	11. 1-4-6	12. 1-4-7	13. 1-5-6	14. 1-5-7
15. 1-6-7	16. 2-3-4	17. 2-3-5	18. 2-3-6	19. 2-3-7	20. 2-4-5	21. 2-4-6
22. 2-4-7	23. 2-5-6	24. 2-5-7	25. 2-6-7	26. 3-4-5	27. 3-4-6	28. 3-4-7
29. 3-5-6	30. 3-5-7	31. 3-6-7	32. 4-5-6	33. 4-5-7	34. 4-6-7	35. 5-6-7

C=7 !/[3! (7 – 3) !] C=35

Four-color graphs:

1. 1-2-3-4	2. 1-2-3-5	3. 1-2-3-6	4. 1-2-3-7
5. 1-2-4-5	6. 1-2-4-6	7. 1-2-4-7	8. 1-2-5-6
9. 1-2-5-7	10. 1-2-6-7	11. 1-3-4-5	12. 1-3-4-6
13. 1-3-4-7	14. 1-3-5-6	15. 1-3-5-7	16. 1-3-6-7
17. 1-4-5-6	18. 1-4-5-7	19. 1-4-6-7	20. 1-5-6-7
21. 2-3-4-5	22. 2-3-4-6	23. 2-3-4-7	24. 2-3-5-6
25. 2-3-5-7	26. 2-3-6-7	27. 2-4-5-6	28. 2-4-5-7
29. 2-4-6-7	30. 2-5-6-7	31. 3-4-5-6	32. 3-4-5-7
33. 3-4-6-7	34. 3-5-6-7	35. 4-5-6-7	36. 0-0-0-0

C=7!/[4! (7 – 4)!] C=35

Five-color graphs:

1. 1-2-3-4-5	2. 1-2-3-4-6	3. 1 -2-3-4-7	4. 1-2-3-5-6
5. 1-2-3-5-7	6. 1-2-3-6-7	7. 1-2-4-5-6	8. 1-2-4-5-7
9. 1-2-4-6-7	10. 1-2-5-6-7	11. 1-3-4-5-6	12. 1-3-4-5-7
13. 1-3-4-6-7	14. 1-3-5-6-7	15. 1-4-5-6-7	16. 2-3-4-5-6
17. 2-3-4-5-7	18. 2-3-4-6-7	19. 2-3-5-6-7	20. 2-4-5-6-7
21. 3-4-5-6-7	22. 0-0-0-0-0	23. 0-0-0-0-0	24. 0-0-0-0-0

C=7!/[5! (7 – 5)!] C=21

Six-color graphs:

1. 1-2-3-4-5-6	2. 1-2-3-4-5-7	3. 1-2-3-4-6-7	4.1-2-3-5-6-7
5. 1-2-4-5-6-7	6.1-3-4-5-6-7	7. 2-3-4-5-6-7	8. 0-0-0-0-0-0

C=7!/[6! (7 – 6)!] C=7

Seven-color graphs:

1. 1 - 2 - 3 - 4 - 5 - 6 -7

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C=7!/[7! (7 – 7)!] C=1

In a result of our elementary calculations with using the formulas, that well-known in combinatorics, we have received at last exactly 127 different compositions of the seven color-coded consequences of the natural numbers. Such a big quantity of combinations between the numbers and seven main colors allows to the makers of color illustrations "to draw" the natural mathematical Hermitage, consisting of the infinitely huge quantity of the scientific illustrations, borne by the theory of dot-color coding of the natural numbers on the immense spaces of the Cartesian or mathematical plus - minus infinity (± ∞: xy and xyz) (Mathematical rose in Figure 17).

Conclusion

Represented here in this article a new scientific method of graphical visualization of the natural numbers and consequences, forming by them, in view of chains of the colored dotes and sets in 2D Cartesian coordinates became possible, when the Author of this article salved the nonstandard mathematical task, having united the "Ulam's spiral" and own invention with the rectangular system of Cartesian coordinates. The bright and very impressive illustrations were appearing in a result, as if someone has correctly distributed the confetti on the surface of the magic field, and even their Inventor himself was surprised very much observe his "drawings". Looking at my graphs and plots, the thought was born that no one in the World can create such "pictures" but Mr. Benoit B. Mandelbrot, the famous American mathematician that used in his mathematical creativity the complex numbers, his own fantasy and the simplest IBC PC programmable media products as well. The results of Mandelbrot's work are known to everybody, but new graphs and plots made by me are known to nobody to my big regret.

Many centuries ago, the French scientist R. Descartes has invented the method of representation the suited information in view of mathematical lines, curves and the schematic diagrams in a symbol net, where two lines were crossing under the angle of 90° forming a zero-point as the beginning of this system. But the most interesting illustrations in this system, named letter in honor of R. Descartes,

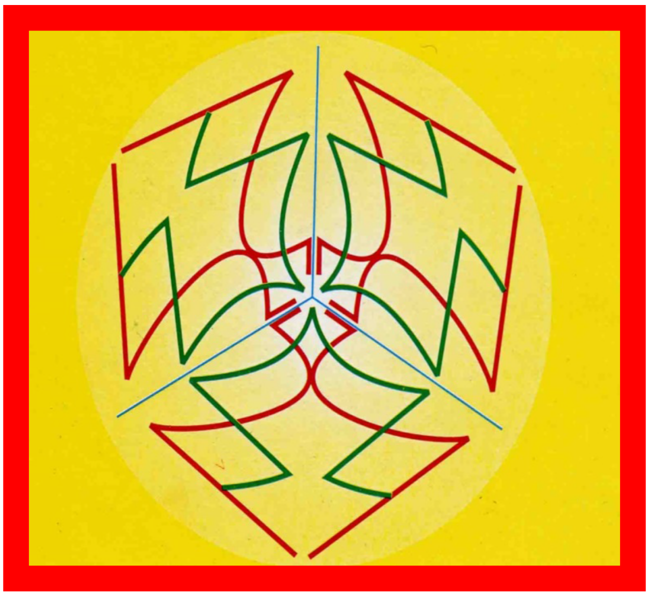

Figure 17: Mathematical rose.

were appearing when the mathematicians dissolved graphically the equations and different functional dependences like $y=x^2$, $y=x^3$ and a lot of others. Now, almost four century later from the invention of Cartesian coordinates system, this great idea of the French academician has become the first media in many sciences for decision of different mathematical tasks that can now decide any educated person from the school pupils and ending the Nobel Prize laureates.

When the first natural numbers plots were created by me in the Cartesian coordinates, it has been noticed that the investigated idea has relation not only to a method of studying the natural numbers and their complex-algebraic equivalents but, how strange it may be, to the mathematical or Cartesian plus-minus infinity, the perfect theory of its studying and representing is worked by no one scientists up to this day. The graphic-and analytic method of visualization of natural numbers presented in this article opens widely the doors and gates for all and any persons, who will introduce with the main principles of this idea. And everything that it is needed for this work --- the elementary interest to this new idea in mathematics. Thanks to this method, one can make in the rectangular system of Cartesian coordinates some beautiful color dotted "photo portrait" of any natural number, for example, 1, 2, 3, 5, and 17. 35 etc., or the "picture" any, formed from them, consequence, such ones as the prime numbers, twin-numbers, Fibonacci numbers and etc.

In this article, special attention is paid to the specific rules and methods of calculation and creating the prime numbers graphs and other plots in Cartesian coordinates, having provided them preliminarily with a mathematical tables, where are listed all necessary information to create with their help the main mathematical "photos" of these consequences in the rectangular system of Cartesian coordinates. The method allows making the same illustrations in axonometric projection when the three axis are under the angle of 120° to one another. It is also existing the method of programming the Cartesian system with the help of the correspondence basic modules-stencils that can create the initial variant of the future colored - dotted mathematical illustrations that will allow to convert this idea into the huge interminable scientific kaleidoscope or mathematical casket with dozens of drawings and illustrations for further professional studying the natural numbers, their complex-algebraic equivalents themselves, and their colored graphics and the mathematical infinity as well.

List of Illustrations

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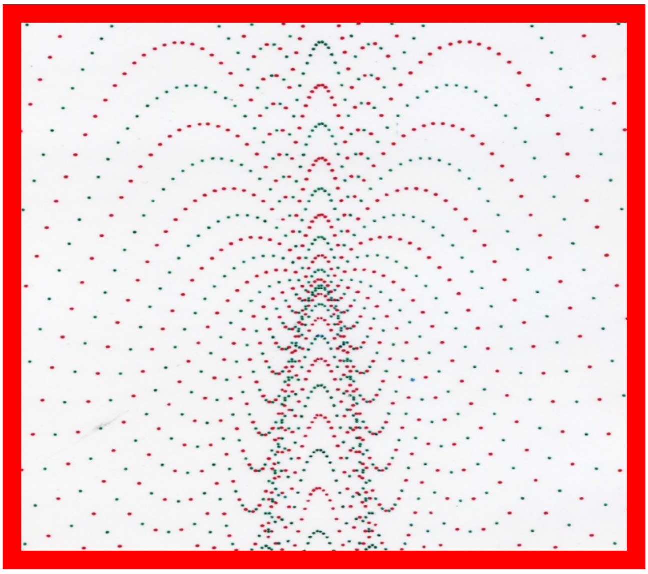
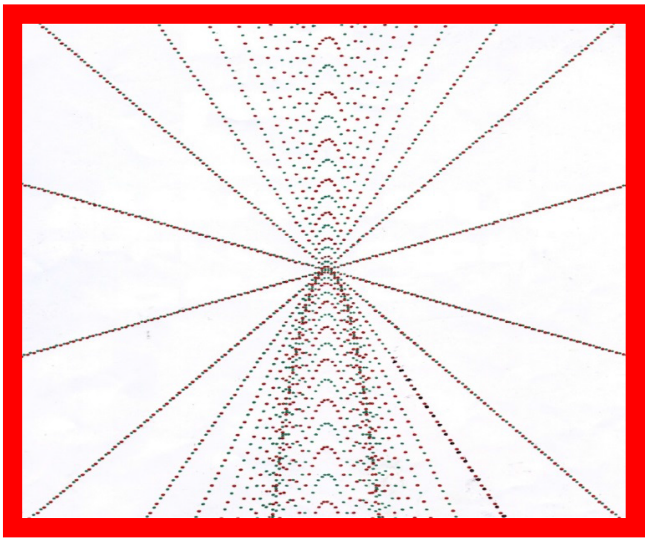
List of Illustrations



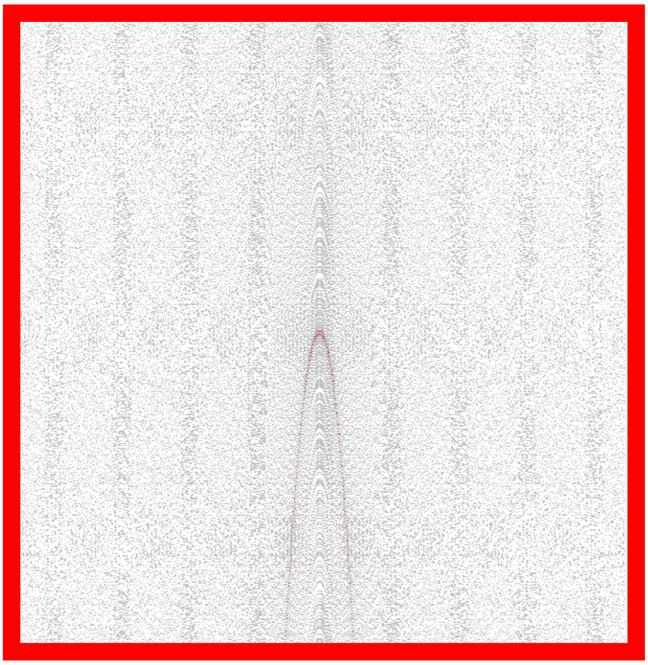
1. {An} = {n²}

Figure 18: Fragment of the interminable red-green dotted plot of the Natural numbers consequence in Cartesian coordinates.



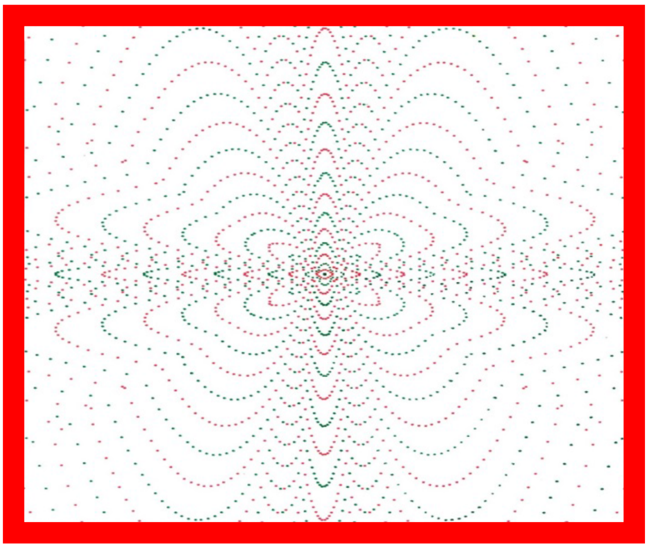
3. {An} = {(2n - 1)² U (4n²)}

Figure 20: Fragment of the interminable red-green dotted plot of the Natural – odd-even – numbers consequence in Cartesian coordinates.



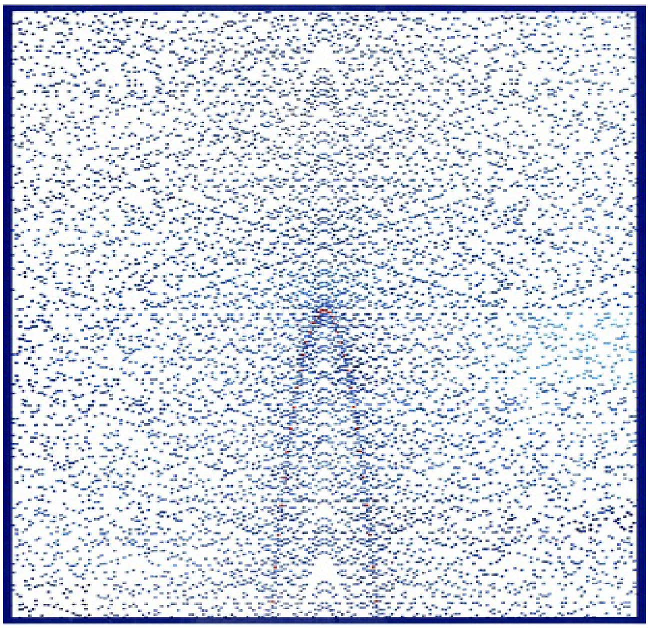
2. {An} = {πn}

Figure 19: Fragment of the interminable red dotted plot of the Natural prime numbers consequence in Cartesian coordinates.



4. Big Bang

Figure 21: Fragment of the interminable red-green dotted plot of the Natural numbers consequence view or Big Bang.



5. {An}={πn}

Figure 22: Fragment of the interminable dark-blue dotted plot of the Natural twin numbers consequence in Cartesian coordinates.

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