



iJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 4 Issue: VI Month of publication: June 2016

DOI:

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Special Rectangles and Narcissistic Numbers of Order 3 And 4

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Abstract— We search for infinitely many rectangles such that $x^2 + y^2 + 3A - S^2 + k^2 + SK = \text{Narcissistic numbers of order 3 and 4}$ respectively, in which x, y represents the length and breadth of the rectangle.

Also the total number of rectangles satisfying the relation under consideration as well as primitive and non-primitive rectangles are also present.

Keywords—Rectangle, Narcissistic numbers of order 3 and 4, primitive, non-primitive.

I. INTRODUCTION

The older term for number theory is arithmetic, which was superseded as number theory by early twentieth century. The first historical find of an arithmetical nature is a fragment of a table, the broken clay tablet containing a list of Pythagorean triples. Since then the finding continues.

For more ideas and interesting facts one can refer [1]. In [2] one can get ideas on pairs of rectangles dealing with non-zero integral pairs representing the length and breadth of rectangle. [3,4] has been studied for knowledge on rectangles in connection with perfect squares, Niven numbers and kepriker triples. [5-10] was referred for connections between Special rectangles and polygonal numbers, jarasandha numbers and dhuruva numbers

Recently in [11,12] special pythagorean triangles in connections with Narcissistic numbers are obtained.

In this communication, we search for infinitely many rectangles such that $x^2 + y^2 + 3A - S^2 + k^2 + SK = \text{Narcissistic numbers of order 3 and 4}$ respectively, in which x, y represents the length and breadth of the rectangle.

Also the total number of rectangles satisfying the relation under consideration as well as primitive and non-primitive rectangles are also present.

II. NOTATIONS

A-Area of the rectangle

S-Semi-perimeter of the rectangle

III. BASIC DEFINITIONS

Definition 1: Narcissistic Numbers

An n -digit number which is the sum of n^{th} power of its digits is called an n -narcissistic number. It is also known as Armstrong number.

Definition 2: Primitive Rectangle

A rectangle is said to be primitive if the generators u, v are of opposite parity and $\text{gcd}(u, v) = 1$, where

$$x = u + v; y = u - v \quad \text{and} \quad u > v > 0$$

IV. METHOD OF ANALYSIS

Let x, y be two non-zero distinct positive integers representing the length and breadth of a rectangle R . Let $k \geq 0$ be any given integer.

The problem under consideration is to solve the equation

$$x^2 + y^2 + 3A - S^2 + k^2 + Sk = \text{Narcissistic Number} \quad (1)$$

To solve (1), let us introduce the linear transformation $x = u + v$ and $y = u - v$ ($u > v > 0$) (2)

Therefore (1) reduces to

$$(u + k)^2 - v^2 = \text{Narcissistic Number} \quad (3)$$

Case 1:

Consider the 3rd order Narcissistic Number 153.

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Therefore (3) becomes,

$$(u + k)^2 - v^2 = 153$$

Applying the method of factorization, we have

| | | | |
|-----|----|----|----|
| u+k | 13 | 27 | 77 |
| v | 4 | 24 | 76 |

From the above mentioned values, the following results are observed.

TABLE I

| k | No.of Rectangles related to 153 | Observations |
|-----|---------------------------------|--|
| 0 | 3 | 2 rectangles are primitive and one is non-primitive. |
| 1,2 | 2 | For k = 1, both the rectangles are non-primitive. For k = 2, both the rectangles are primitive. |
| 3-8 | 1 | For k = 3,5,7,8, the rectangles are non- primitive. For k = 4,6, the rectangles are primitive. |

Case2:

Consider the 3rd order Narcissistic Number 371.

Therefore (3) becomes,

$$(u + k)^2 - v^2 = 371$$

Applying the method of factorization, we have

| | | |
|-----|----|-----|
| u+k | 30 | 186 |
| v | 23 | 185 |

From the above mentioned values, the following results are observed.

TABLE II

| k | No.of Rectangles related to 371 | Observations |
|-----|---------------------------------|---|
| 0 | 2 | Both the rectangles are primitive |
| 1-6 | 1 | For k = 1,3,5, the rectangles are non-primitive For k = 2,4,6, the rectangles are primitive. |

Case3:

Consider the 3rd order Narcissistic Number 407.

Therefore (3) becomes,

$$(u + k)^2 - v^2 = 407$$

Applying the method of factorization, we have

| | | |
|-----|----|-----|
| u+k | 24 | 204 |
| v | 13 | 203 |

From the above mentioned values, the following results are observed.

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TABLE III

| k | No.of Rectangles related to 407 | Observations |
|------|---------------------------------|--|
| 0 | 2 | Both the rectangles are primitive |
| 1-10 | 1 | For k = 1,3,5,7,9, the rectangles are non-primitive For k = 2,4,6,8,10, the rectangles are primitive. |

Case 4:

Consider the 4th order Narcissistic Number 8208.

Therefore (3) becomes,

$$(u + k)^2 - v^2 = 8208$$

Applying the method of factorization, we have

| | | | | | | | | | | | | |
|-----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| u+k | 92 | 93 | 103 | 127 | 132 | 183 | 237 | 348 | 517 | 687 | 1028 | 2053 |
| v | 16 | 21 | 49 | 89 | 96 | 159 | 219 | 336 | 509 | 681 | 1024 | 2051 |

From the above mentioned values, the following results are observed.

TABLE IV

| k | No.of Rectangles related to 8208 | Observations |
|-------|----------------------------------|--|
| 0,1 | 12 | For k = 0 , all the rectangles are non-primitive For k = 1 , all the rectangles are primitive |
| 2,3 | 11 | For k = 2 , all the rectangles are non-primitive For k = 3 , there are 5 primitive and 6 non-primitive rectangles |
| 4,5 | 10 | For k = 4 , all the rectangles are non-primitive For k = 5 , there are 8 primitive and 2 non-primitive rectangles |
| 6,7 | 9 | For k = 6 , all the rectangles are non-primitive For k = 7 , all the rectangles are primitive |
| 8-11 | 8 | For k = 8,10 all the rectangles are non-primitive For k = 9 , there are 3 primitive and 5 non-primitive rectangles For k = 11 all the rectangles are primitive |
| 12-17 | 7 | For k = 12,14,16 all the rectangles are non-primitive For k = 13,17 all the rectangles are primitive For k = 15, there are 3 primitive and 4 non-primitive rectangles |
| 18-23 | 6 | For k = 18,20,22 all the rectangles are non-primitive For k = 19,23 there are 5 primitive and 1 non-primitive rectangles For k = 21, there are 3 primitive and 3 non-primitive rectangles |
| 24-35 | 5 | For k = 24,26,28,30,32,34 all the rectangles are non-primitive For k = 25,29,31,35 all the rectangles are primitive For k = 27, there are 3 primitive and 2 non-primitive rectangles For k = 33, there are 2 primitive and 3 non-primitive rectangles |
| 36,37 | 4 | For k = 36, all the rectangles are non-primitive For k = 37, there are 3 primitive and 1 non-primitive rectangles |
| 38-53 | 3 | For k = 38,40,42,44,46,48,50,52 all the rectangles are non-primitive For k = 41,43,49,53 all the rectangles are primitive |

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| | | |
|-------|---|--|
| | | For $k = 39,45,47,51$ there are 2 primitive and 1 non-primitive rectangles |
| 54-71 | 2 | For $k = 54,56,58,60,62,64,66,68,70$ all the rectangles are non-primitive For $k = 55,59,61,67,71$ all the rectangles are primitive For $k = 57,63,65,69$ there are 1 primitive and 1 non-primitive rectangles |
| 72-75 | 1 | For $k = 72,74$ the rectangles is non-primitive For $k = 73,75$ the rectangles is primitive |

V. CONCLUSION

To conclude, one may search for the connections between the rectangles and Narcissistic numbers of higher order and other number patterns.

REFERENCES

- [1] Dickson L. E., (1952) History of Theory of Numbers, Vol. 11, Chelsea Publishing Company, New York.
- [2] J. N. Kapur, Dhuruva numbers, Fascinating world of Mathematics and Mathematical sciences, Trust society, Vol 17, 1997.
- [3] M. A. Gopalan and A. Vijayasankar, "Observations on a Pythagorean problem", Acta Ciencia Indica, Vol.XXXVI M, No 4, 517-520, 2010.
- [4] M. A. Gopalan, A. Gnanam and G. Janaki, "A Remarkable Pythagorean problem", Acta Ciencia Indica, Vol.XXXIII M, No 4, 1429-1434, 2007
- [5] M. A. Gopalan and A. Gnanam, "Pythagorean triangles and Polygonal numbers", International Journal of Mathematical Sciences, Vol 9, No. 1-2, 211-215, 2010
- [6] M. A. Gopalan and G. Janaki, "Pythagorean triangle with perimeter as Pentagonal number", Antartica J. Math., Vol 5(2), 15-18, 2008
- [7] M. A. Gopalan and G. Janaki, "Pythagorean triangle with nasty number as a leg", Journal of Applied Mathematical Analysis and Applications, Vol 4, No 1-2, 13-17, 2008
- [8] G.Janaki and S.Vidhya, "Rectangle with area as a special polygonal number", International Journal of Engineering Research, Vol-4, Issue-1, 88-91, 2016
- [9] G.Janaki and C.Saranya, "Special Pairs of Pythagorean Triangles and Jarasandha Numbers", American International Journal of Research in Science, Technology, Engineering & Mathematics, issue-13, 118-120, Dec 2015-Feb 2016
- [10] M. A. Gopalan, Vidhyalakshmi.S and Shanthi, "A connection between rectangle and dhuruva Numbers of digits 3 and 5", International Journal of Recent Scientific Research Vol. 7, Issue, 2, pp. 9234-9236, March, 2016
- [11] G.Janaki and P.Saranya, "Special pairs of Pythagorean triangles and narcissistic number", International Journal of Multidisciplinary Research and Development, Volume 3; Issue 4; April 2016; Page No. 106-108
- [12] G.Janaki and P.Saranya, "Special Pythagorean Triangles in Connection with the Narcissistic Numbers of Order 3 and 4", American International Journal of Research in Science, Technology, Engineering & Mathematics, Volume-2, Issue 14, March-May 2016.



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