The 2A/P+H-Leg in Pythagorean Triangles as a Narcissistic Number of Orders 3, 4, and 5

Isabella Green[1], Olivia Green[1], Daniel Wright[2]
[1] School of Environmental Science, University of Queensland, Australia
[2] School of Mathematics, University of California, Berkeley, USA

ABSTRACT

This paper concerns with the problem of attaining Pythagorean triangle where, in each Pythagorean triangle expressions $\frac{2*Area}{Perimeter}+H-a$ Leg is represented by a Narcisstic numbers

Keywords: *Pythagorean triangle, primitive and non primitive triangle, Narcisstic numbers*.

I. INTRODUCTION

In number theory, Pythagorean triangles have been a very big interest to various mathematicians since it is a very big treasure house to hunt for. For various types of problem and ideas on Pythagorean triangle and special number, one may refer [1-12]. In this communication, we search for pairs of Pythagorean triangle so that in each pair $\frac{2*Area}{Perimeter}+Hypotenuse-a$ Leg is a Narcisstic number.

Definition: Narcisstic Number
An n digit number which is the sum of nth power of its digits is called an n- Narcisstic number. It is also known as Armstrong number.

II. METHOD OF ANALYSIS

Let T(x,y,z) be a Pythagorean triangle where

$$x=m^2-n^2, y=2mn, z=m^2+n^2 \quad (1)$$

Denote the area, perimeter and hypotenuse of T(x,y,z) by A, P and H respectively.

$\frac{2A}{P}+H-y=\alpha$, a Narcisstic number of orders 3,4 and 5.

The problem under consideration is equivalent to solving the Diophantine equation

$$m(m-n)=\alpha \quad (2)$$

Given α, it is possible to attain the values of m and n satisfying (2) knowing m, n and using the (1) obtains different Pythagorean triangle, each satisfying the relation $\frac{2A}{P}+H-y=\alpha$, a Narcisstic number. A few illustrations are presented in the Tables: 1, 2, 3 below:

Table 1: $\frac{2A}{P}+H-y=\alpha$ ***, a Narcisstic number of order 3.***

m	n	x	y	z	$\frac{2A}{P}+H-y$	Remark
17	8	225	272	353	153	Two primitive

51	48	297	4896	4905	153	and one non primitive triangle
153	152	305	46512	46513	153	
37	27	640	1998	2098	370	Two primitive and Two non primitive triangle
74	69	715	10212	10237	370	
185	183	736	67710	67714	370	
370	369	739	273060	273061	370	
53	46	693	4876	4925	371	Two primitive triangles
371	370	741	274540	274541	371	
37	26	693	1924	2045	407	Two primitive triangle
407	406	813	330484	330485	407	

Table 2: $\frac{2A}{P} + H - y = \alpha$ ***, a Narcisstic number of order 4.***

m	n	x	y	z	$\frac{2A}{P} + H - y$	**Remark**
43	5	1824	430	1874	1634	Two primitive and two non primitive triangles
86	67	2907	11524	11885	1634	
817	815	3264	1331710	1331714	1634	
1634	1633	3267	5336644	5336645	1634	
108	32	10640	6912	12688	8208	Four primitive and fourteen non primitive triangles
114	42	11232	9576	14760	8208	
144	87	13167	25056	28305	8208	
152	98	13500	29792	32708	8208	
171	123	14112	42066	44370	8208	
216	178	14972	76896	78340	8208	
228	192	15120	87552	88848	8208	
304	277	15687	168416	169145	8208	
342	318	15840	217512	218088	8208	
432	413	16055	356832	357193	8208	
456	438	16092	399456	399780	8208	
513	497	16160	509922	510178	8208	
684	672	16272	919296	919440	8208	
912	903	16335	1647072	1647153	8208	
1026	1018	16352	2088936	2089000	8208	
1368	1362	16380	3726432	3726468	8208	
4104	4102	16412	33669216	33669220	8208	
8208	8207	16415	134726112	134726113	8208	
4737	4735	18944	44859390	44859394	9474	One primitive and one non primitive triangle.
9474	9473	18947	179494404	179494405	9474	

Table 3: $\frac{2A}{P} + H - y = \alpha$ ***, a Narcisstic number of order 5.***

m	n	x	y	z	$\frac{2A}{P}+H-y$	**Remark**
13687	13683	109480	374558442	374558458	54748	One primitive and two non primitive triangles.
27374	27372	109492	1498562256	1498562260	54748	
54748	54747	109495	5994577512	5994577513	54748	
10303	10294	185373	212118164	212118245	92727	One primitive and two non primitive triangles.
30909	30906	185445	1910547108	1910547117	92727	
92727	92726	185453	17196407604	17196407605	92727	
7757	7745	186024	120155930	120156074	93084	One primitive and three non primitive triangles.
23271	23267	186152	1082892714	1082892730	93084	
46542	46540	186164	4332129360	4332129364	93084	
93084	93083	186167	17329075944	17329075945	93084	

III. CONCLUSION

In this paper, we have made an attempt to find Pythagorean triangles in which the expression $\frac{2A}{P}+H-y$ is a Narcisstic number of orders 3, 4 and 5 respectively. To conclude one may search for other choices of Pythagorean triangle for Narcisstic number of higher orders.

REFERENCES

1. *W.Sierpinski, Pythagorean triangles, Dover publications,INC,Newyork,2003.*
2. *M.A.Gopalan and A.Vijaysankar ,"Observations on a Pythagorean problem",Acta Ciencia Indica,Vol.XXXVI M.No.4,2010 pp 517-520.*
3. *M.A.Gopalan,A.Gnanam and G.Janaki, 'A Remarkable Pythagorean problem' Acta Ciencia Indica,Vol.XXXIII M,No,4,2007 pp 1429-1434 .*
4. *M.A.Gopalan and A.Gnanam, 'Pythagorean triangles and Polygonal numbers International Journal of Mathematical Sciences, Vol 9,No 1-2,2010,pp 211-215.*
5. *M.A.Gopalan and G.Janaki, 'Pythagorean triangle with Area Perimeter as a special number' Bulletin of pure and Applied sciences,Vol 27(2),2008,pp 393-402.*
6. *M.A.Gopalan and G.Janaki, 'Pythagorean triangle with nasty number as a leg' Journal of Applied Analysis and Applications, Vol 4, No 1-2 ,2008,pp 13-17.*
7. *G.Janaki and R.Radha, 'Special Pythagorean triangle and six digit Harshad numbers' IJIRSET, Vol. 5, Issue 3, March 2016, pp 3931-3933.*
8. *G.Janaki and R.Radha, 'Special pairs of Pythagorean triangle and Harshad numbers' Asian Journal of Science and Technology , volume .7, Issue. 8, August 2016, pp 3397-3399.*
9. *G.Janaki and P.Saranya, 'Pythagorean Triangle with Area/Perimeter as a Jarasandha numbers of orders 2 and 4' IRJET ,Volume .3, Issue .7, July 2016, pp 1259-1264.*
10. *G.Janaki and R.Radha, 'Pythagorean Triangle with Area/Perimeter as a Harshad number of digits 4,5 and 6' IJRASET, Volume. 5 ,Issue. 12, December 2017, pp 1754-1762.*
11. *G.Janaki and P.Saranya,' Special Pythagorean triangle in connection with triangles Narcisstic Numbers of order 3 and 4' AIJRSTEM, 16-177, 2016, pp 150-153.*
12. *G.Janaki and P.Saranya, 'Special pairs of Pythagorean triangles and Narcisstic numbers. IJMRD, Vol. 3, Issue. 4, April 2016, pp 106-108.*