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Pythagorean Triangle with 2*A/P as Gopa Numbers Of The Second Kind

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Abstract - *This study deals with the problem of obtaining Pythagorean triangles where, in each Pythagorean triangle, the expression* $\frac{2*Area}{Perimeter}$ *is represented by Gopa numbers of the second kind. Also, we present the number of primitive and non-primitive Pythagorean triangles and some of the relations among them.*

***Key Words*: Pythagorean triangles, primitive Pythagorean triangle, Non-primitive Pythagorean triangle, Gopa numbers of the second kind.**

1. INTRODUCTION

It is well known that there is a one-to-one correspondence between the polygonal numbers and the sides of polygon. In addition to polygon numbers, there are other patterns of numbers namely Nasty numbers, Harshad Numbers, Dhuruva Numbers, Sphenic Numbers, Jarasandha Numbers, Armstrong Numbers and so on. In particular, refer [1-18] for Pythagorean triangles in connection with each of the above special number patterns. The above results motivated us for searching Pythagorean triangles in connection with a new number pattern. Thus, this paper exhibits Pythagorean triangles such that each Pythagorean triangle with two times the ratio Area/Perimeter is represented by a number known as Gopa numbers of the second kind. A few illustrations with the number of primitive and Non-primitive Pythagorean triangles and some of the properties involving the sides of the Pythagorean triangle are also given.

2. DEFINITIONS

1. Nasty number

Let N be a non-zero positive integer such that N= a*b=c*d
Where a, b ,c ,d are non-zero distinct integers. If the relation

a+b=c-d or a-b=c+d

holds, then, the integer N is referred as nasty number.

2. Gopa numbers of the Second kind

Let N be a non-zero positive integer such that $N = P \times Q$,where P and Q are distinct primes.
If the relation
Sum of the divisors of N = Product of the sum of the divisors of P, Q
= square multiple of smallest nasty number
holds ,then, the integer N is referred as Gopa number of the second kind

Examples: 14,34,62,142,781,1067,1819

3. METHOD OF ANALYSIS

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

$$x = 2pq,\ y = p^2 - q^2,\ z = p^2 + q^2,\quad p > q > 0 \quad (1)$$

Denote the area and perimeter of $T(x, y, z)$ by A and P respectively.
The problem under consideration is

$$\frac{2*A}{P} = \alpha,$$

Gopa numbers of the second kind (2)

which is equivalent to solving the binary quadratic equation given by

$$q(p-q) = \alpha \quad (3)$$

Given α, it is possible to obtain the values of p and q satisfying (3). Knowing $p, q$and using (1), one obtains different Pythagorean triangles, each satisfying the relation $\frac{2*A}{P} = \alpha$, Gopa numbers of the second kind. A few illustrations are presented in the Table 1 below:

$\frac{2*A}{P}=\alpha$

Table 1: **,Gopa numbers of the second kind.**

α	q	p	x	y	z	$\frac{2*A}{P}$
14	1	15	30	224	226	14
	2	9	36	77	85	
	7	9	126	32	130	
	14	15	420	29	421	
142	1	143	286	20448	20450	142
	2	73	292	5325	5333	
	71	73	10366	288	10370	
	142	143	40612	285	40613	
781	1	782	1564	611523	611525	781
	11	82	1804	6603	6845	
	71	82	11644	1683	11765	
	781	782	1221484	1563	1221485	
1067	1	1068	2136	1140623	1140625	1067
	11	108	2376	11543	11785	
	97	108	20952	2255	21073	
	1067	1068	2279112	2135	2279113	
1819	1	1820	3640	3312399	3312401	1819
	17	124	4216	15087	15665	
	107	124	26536	3927	26825	
	1819	1820	6621160	3639	6621161	
34	1	35	70	1224	1226	34
	2	19	76	357	365	
	17	19	646	72	650	
	34	35	2380	69	2381	

Observations:

1. For even Gopa numbers of the second kind, one obtains, 4 Pythagorean triangles out of which, two are primitives and two are non- primitives.
2. For odd Gopa numbers of the second kind, one has 4 primitive Pythagorean triangles.
3. $4\frac{A}{P}-x+4(z-y)$ is a square multiple of 6.
4. $\left(4x-16\frac{A}{P}\right)(z-y)$ fourth power of an even integer.

4. CONCLUSION

In this paper, we have presented primitive and Non-primitive Pythagorean triangles, where, in each Pythagorean triangle $\frac{2 * Area}{Perimeter}$ is represented by Gopa numbers of the second kind with 2, 3 and 4 digits . To conclude one may research for special Pythagorean triangles in connection with higher order Gopa numbers of the second kind.

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BIOGRAPHIES

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