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SPECIAL PYTHAGOREAN TRIANGLES AND KEPRICKER NUMBER

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ABSTRACT

Pythagorean triangles, each with a leg represented by a Kepricker number are obtained. A few interesting results are given.

Keywords: Pythagorean triangles, Kepricker number

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INTRODUCTION

The fascinating branch of mathematics is the theory of numbers where in Pythagorean triangles have been a matter of interest to various mathematicians and to the lovers of mathematics, because it is a treasure house in which the search for many hidden connection is a treasure hunt. For a review of varies problem on Pythagorean triangles, one may refer [1-15]. A careful observer of patterns may note that there is a one to one correspondence between the polygonal numbers and the number of sides of the polygon. In [16-19], some fascinating patterns of numbers, namely, Jarasandha numbers, Nasty numbers and Kepricker numbers have been presented.

In [20-22], special Pythagorean triangles connected with polygonal numbers and Nasty numbers are obtained. Recently in [22], special Pythagorean triangles in connection with Hardy Ramanujam number 1729 are exhibited. In [24], Pythagorean triangles in connections with 5 digit Dhuruva numbers are presented. In this communication our objective is to find the Pythagorean triangles in connections with the kepricker number 6174.

BASIC DEFINITONS:

Definition 2.1: The ternary quadratic Diophantine equation given by $x^2 + y^2 = z^2$ is known as Pythagorean equation where x, y, z are natural numbers. The above equation is also referred to as Pythagorean triangle and denote it by T(x,y,z). Also, in Pythagorean triangle T(x,y,z) : $x^2 + y^2 = z^2$, x and y are called its legs and z its hypotenuse.

Definition 2.2: Most cited solution of the Pythagorean equation is $y = m^2 - n^2, x = 2mn, z = m^2 + n^2$, where $m > n > 0$. This solution is called primitive, if m,n are of opposite parity and gcd(m,n)=1.

METHOD OF ANALYSIS:

Consider the Kepricker number $N = 6174$.

To start with, it is noted that 6174 cannot be represented either as the difference of two squares or as the sum of two squares. Therefore the leg y and hypotenuse z of the Pythagorean triangle T(x,y,z) are not represented by N respectively,

Now, consider $x = N \Rightarrow 2mn = 6174$

which is a binary quadratic Diophantine equation. Solving the above equation for m, n we get 6 integer solutions and thus, we have 6 Pythagorean triangles, each having the leg x to be represented by the Kepricker number $N = 6174$ as shown in the table below:

M	n	X	y	z	A	P
3087	1	6174	9529568	9529570	29417776416	19065312
1029	3	6174	1058832	1058850	3268614384	2123856
441	7	6174	194432	194530	600211584	395136
343	9	6174	117568	117730	362932416	241472
147	21	6174	21168	22050	65345616	49392
63	49	6174	1568	6370	4840416	14112

Note that there are 6 non-primitive triangles. Also the expression $\frac{4A}{P} - y + z$ represents the Kepricker number 6174 for each of the above Pythagorean triangles, where A and P represent the area and perimeter of the Pythagorean triangle.

In a similar manner, it is seen that there are 24 Pythagorean triangles wherein, each of the following expressions $\frac{2A}{P}, \frac{1}{2}(y + x - z)$ represents 6174 as shown in the table below.

m	n	x	Y	z	A	P
6175	1	12350	38130624	38130626	235456603200	76273600
3089	2	12356	9541917	9541925	58949963226	19096198
2061	3	12366	4247712	4247730	26263603296	8507808
1035	6	12420	1071189	1071261	6652083690	2154870
889	7	12446	790272	790370	4917862656	1593088
695	9	12510	482944	483106	3020814720	978560
455	14	12740	206829	207221	1317500730	426790
361	18	12996	129997	130645	844720506	273638
315	21	13230	98784	99666	653456160	211680
189	42	15876	33957	37485	269550666	87318
175	49	17150	28224	33026	242020800	78400
161	63	20286	21952	29890	222659136	72128
161	98	31556	16317	35525	257449626	83398
175	126	44100	14749	46501	325215450	105350
189	147	55566	14112	57330	392073696	127008
315	294	185220	12789	185661	1184389290	383670
361	343	247646	12672	247970	1569085056	508288
455	441	401310	12544	401506	2517016320	815360
695	686	953540	12429	953621	5925774330	1919590
889	882	1568196	12397	1568245	9720462906	3148838

1035	1029	2130030	12384	2130066	13189145760	4272480
2061	2058	8483076	12357	8483085	52412685066	16978518
3089	3087	19071486	12352	19071490	117785497536	38155328
6175	6174	76248900	12349	76248901	470798833050	152510150

Note that there are 4 primitive and 20 non-primitive triangles.

Also, it is observed that there are 12 Pythagorean triangles wherein each of the expressions $y-\frac{2A}{P}, \frac{1}{2}(z+y-x)$ is represented by 6174 as shown in the table below:

m	n	x	y	z	A	P
6174	6173	76224204	12347	76224205	470570123394	152460756
3087	3085	19046790	12344	19046794	117556787880	38105928
2058	2055	8458380	12339	8458389	52183975410	16929108
1029	1023	2105334	12312	2105370	12960436104	4223016
882	875	1543500	12299	1543549	9491753250	3099348
686	677	928844	12267	928925	5697064674	1870036
441	427	376614	12152	376810	2288306664	765576
343	325	222950	12024	223274	1340375400	458248
294	273	160524	11907	160965	955679634	333396
147	105	30870	10584	32634	163364040	74088
126	77	19404	9947	21805	96505794	51156
98	35	6860	8379	10829	28739970	26068

Note that there are 2 primitive and 10 non-primitive triangles.

CONCLUSION

In this paper, we have presented the relations between special Pythagorean triangles and Kepricker number. To conclude, one may search for the relations between Pythagorean triangles and other number patterns.

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