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Tri-Numbers of Odd Numbers and Pythagoras Theorem

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1. Introduction

Research is a careful and scientific inquiry into every subject, subject matter or area, which is an endeavor to discover valuable information which would be useful for further application. Thus, research is a process of a systematic and in-depth study or search of any specific are of investigation. The research would result in formulation of new theories, discovery of new techniques, an improvement in old concept of an exiting concept, theory, method or technique.

In this present research researcher has taken pure research related to mathematical formula. The aims of pure research or basic research are to unravel the mysteries of nature, acquire knowledge for its own sake and extend the frontiers of knowledge. The basic research of today may become the applied research of tomorrow. In our study of numbers, we have so far used whole numbers, fractional numbers, and rational numbers, positive and negative numbers. The natural numbers are sign less numbers which we use for counting and, of course, they from a sequence. The fractional numbers and rational numbers would correspond to lying between the points representing integers. The set of integers written in order is sequence. Each element in a sequence is called a term, and in general terms we say that the n^{th} term is n, where n can have values like 1,2, 3…..n. The natural numbers which we are use for counting and, of course, they from a sequence. If we examine this sequence of a natural numbers we will find the other sequence inside it, the most two obvious being the sequence of odd numbers and the sequence of odd numbers. If we examine the odd numbers, we can see that the sequence of odd numbers is odd to its position number. From this example mathematics is able to answer the question like what would be the 20^{th} term? The 25^{th} ? The 30^{th} ? The 50^{th}?. the n^{th}? It can be easy to understand the is meant by the general term. If we try to represent the odd numbers with the help of dot, it is noted that each number of the sequence has a rectangular dot pattern.

2. Arithmetic progression

A sequence is an arrangement of numbers in a definite order to some rule. An arithmetic progression is a sequence in which term increase or decrease regularly by the same constant. This constant is called the common difference of the progression (series). In other words, we can say that list of numbers in which the first term is given and each term is obtained by adding a fixed number to the preceding term.

3. Pythagoras theorem

Pythagoras theorem is as follows.
The square on the hypotenuse of a right-angled is equal to the sum of the squares on other two sides.
The triangle ABC is right-angled at C and the sides are enclosing the right-angled are the component of the vector which is the hypotenuse. If BC=a; CA=b and AC=c then
$AB^2 = BC^2 + CA^2$ and $C^2 = a2 + b^2$

4. Tri-Numbers of Odd Numbers and Pythagoras Theorem

In this, present research paper has tried to focus on the Tri-Numbers of Odd Numbers and Pythagoras Theorem by using the arithmetic progression and Pythagoras theorem by a new innovative formula.

5. Formula developed by the..

Formula developed by the investigator is given as under.

$$(2n+1)^2+(2n(n+1))^2=(2n^2+2n+1)^2$$

And $(2n+1)^2=(2n^2+2n+1)^2-(2n(n+1))^2$

Where n > 0

It can be represented by the Pythagoras Theorem is as follows.

$$(2n+1)^2=(2n^2+2n+1)^2-(2n(n+1))^2$$

Above two formulas can be understood by the given table.

Table: 1

Sr.	**Possible Progressive Odd Numbers**	$(2n+1)^2$ **First Side**	$(2n(n+1))^2$ **Hypotenuse**	$(2n^2+2n+1)^2$ **Second Side**
1	P(1)=3	3^2	4^2	5^2
2	P(2)=5	5^2	12^2	13^2
3	P(3)=7	7^2	24^2	25^2
4	P(4)=9	9^2	40^2	41^2
5	P(5)=11	11^2	60^2	61^2
6	P(6)=13	13^2	84^2	85^2
7	P(7)=15	15^2	112^2	113^2
8	P(8)=17	17^2	144^2	145^2
9	P(9)=19	19^2	180^2	181^2
N	P(n)=n+1	$(n+1)^2$	$(2n(n+1))^2$	$(2n^2+2n+1)^2$

From the table number 1 it is very easy to find out and predict about possibility of Odd numbers. It is also noted that the Perfect square tri-numbers can be determined by the given formula $(2n+1)^2=(2n^2+2n+1)^2-(2n(n+1))^2$; Where n > 0. Two formulas (given by the investigator) proved for the Pythagoras Theorem, when Odd number is (2n+2), then the hypotenuse is (n^2+2n+2) and the other side is (n^2+2n).

Prediction about perfect number of Tri-Numbers of Odd Numbers and Pythagoras Theorem (determined by the Investigator)

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Table: 2

Sr.	Possible Progressive Odd Numbers	Possibility Order $[P(n)+1]^2$	$(2n(n+1))^2$ First Side	$(2n^2+2n+1)^2$ Hypotenuse	Second Side
1	P(**1**)=3	3^2	$((3*1)+1)^2=4^2$	$((3*1)*(1+1))^2=5^2$	**1**
2	P(**2**)=5	5^2	$((5*2)+2)^2=12^2$	$((5*2)*(2+1))^2=13^2$	**2**
3	P(**3**)=7	7^2	$((7*3)+3)^2=24^2$	$((7*3)*(3+1))^2=25^2$	**3**
4	P(**4**)=9	9^2	$((9*4)+4)^2=40^2$	$((9*4)*(4+1))^2=41^2$	**4**
5	P(**5**)=11	11^2	$((11*5)+5)^2=60^2$	$((11*5)*(5+1))^2=61^2$	**5**
6	P(**6**)=13	13^2	$((13*6)+6)^2=84^2$	$((13*6)*(6+1))^2=85^2$	**6**
7	P(**7**)=15	15^2	$((15*7)+7)^2=112^2$	$((15*7)*(7+1))^2=113^2$	**7**
8	P(**8**)=17	17^2	$((17*8)+8)^2=144^2$	$((17*8)*(8+1))^2=145^2$	**8**
9	P(**9**)=19	19^2	$((19*9)+9)^2=180^2$	$((19*9)*(9+1))^2=181^2$	**9**
n	P(**n**)=n+1	$(2n+1)^2$	$(((n+1)*n)+n)^2= (2n(n+1))^2$	$((n+1)*n)*(n+1))^2= (2n^2+2n+1)^2$	**n**

From the above innovative research article it is conclude that-

1. Perfect square tri-numbers can be determined by the given formula given by the investigator.
   $(2n+1)^2 = (2n^2+2n+1)^2 - (2n(n+1))^2$
   Where n > 0
2. It can be represented by the Pythagoras Theorem is as follows.
   $(2n+1)^2 = (2n^2+2n+1)^2 - (2n(n+1))^2$
3. Above two formulas (given by the investigator) proved for the Pythagoras Theorem, when odd number is (2n+1); then the hypotenuse is (2n(n+1)) and the other side is $(2n^2+2n+1)$.
4. From the above table no.:2 it is evident that, for the right-angled triangle it is possible to predict perfect about the all three measures for the triangle. One of them is square of odd number and rests of others are square of odd number.
5. It is very easy to calculate and predict about the tri-numbers of triangle.

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