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Computational Approach for Finding Pythagoras Nonagon Using Programming Language MATLAB

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ABSTRACT
In this paper, using computer programming language MATLAB, for any natural number n, we determine the Pythagoras nonagon (a, b, c, d, e, f, g, h, i) where h denotes the length of the hypotenuse and is ≤ k, when one of a, b, c, d, e, f, g or h is given, thereby the number of such Pythagoras nonagons are also known.

Keywords: Pythagoras Theorem, Nonagon, Pythagoras Nonagon, Natural Numbers, Programming Language

I. INTRODUCTION

In [1, 2, 3, 4, 5, 6], we found the remaining side lengths of the Pythagoras triangle, quadrilateral, pentagon, hexagon, heptagon and octagon if one of the side lengths is known. Now in this paper, we exhibit all possible Pythagoras nonagons, knowing only one side length that is not hypotenuse. For example, suppose we take the length of one side of length n as 5 and the maximum limit k as 8 then all the possible Pythagoras nonagons are (1, 1, 1, 2, 2, 2, 3, 5, 7) , (1, 1, 1, 3, 3, 3,3, 5, 8) , (1, 1, 2, 2, 2, 3, 4, 5, 8) , (1, 1, 1, 1, 1, 3, 5, 5, 8) . Because the above all combinations satisfies extension of Pythagoras theorem. This process is very difficult if one side length is sufficiently large and n is also large. Now our aim is to find the number of Pythagoras nonagons using programming language

II. MAIN RESULT

A. Algorithm

Step-1: START.
Step-2: Enter the length of one side of Pythagoras nonagon n.
Step-3: Read ‘n’ value.
Step-4:Enter the maximum limit of hypotenuse of Pythagoras nonagon ‘k’.
Step-5: Read ‘k’ value.
Step-6: Initialize the variables a, b, d, e, f, g, h, I , k ,p.
Step-7: Give p value as 0.And assign n to a.
Step-8: If ((k>0) &&(n>0)) go to step 9 else go to Step 23
Step-9:if k>n go to step 10 else go to step 24.
Step-10: Initialize a for loop with condition i=4, i<=k, i increases by 1; If condition fails, go to step 21
Step-11:if (n*n +7 <= i*i) go to step 12 else go to step 10.
Step-12: Initialize for loop with condition h=1, h<=i, increment a by1; If condition fails, go to step 10.
Step-13: Initialize for loop with condition g=1, g<=h, increment b by1; If condition fails, go to step 12.
Step-14: Initialize for loop with condition f=1, f<=g, increment d by1; If condition fails, go to step 13
Step-15: Initialize for loop with condition e=1, e<=f, increment e by 1; If condition fails, go to step 14
Step-16: Initialize for loop with condition d=1, d<=e, increment f by1; If condition fails, go to step 15.
Step-17: Initialize for loop with condition c=1, c<=d, increment g by1; If condition fails, go to step 16.
Step-18: Initialize for loop with condition b=1, b<=c, increment b by1; If condition fails, go to step 17.
Step-19:If $a^2+b^2+c^2+d^2+e^2+f^2+g^2+h^2=i^2$ go to step 20, else, go to step 18.

Step-20: increment value of p by 1, display values of a, b, c, d, e, f, g, h, i in ascending order and go to step 18

Step-21: end for loops.

Step-22: Display number of possibilities p and go to step 25.

Step-23: display "length should be positive" and go to step 25.

Step-24: Display "side length can't exceed maximum limit" and go to step 25

Step-25: STOP

III. RESULTS AND DISCUSSION

We are required to display all the possible combinations of a Pythagoras nonagons by taking one side as parameter which is not a hypotenuse. This can be achieved by the following steps.

Step-1: Write all the possible combinations that are possible to form a Pythagoras Nonagon by keeping a maximum limit to the hypotenuse.

Step-2: Arrange the side lengths in the combinations in ascending order and count the number of combinations and display all the combinations and count.

We will represent the outputs for different values in following section

A. **Outputs**

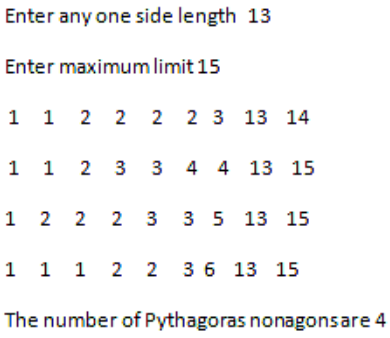

Fig 1. One side length=13, maximum limit=15

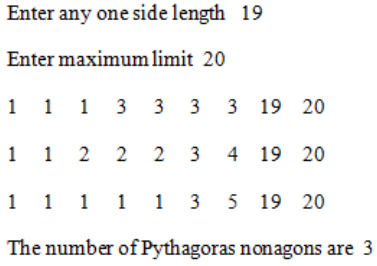

Fig 2. One side length=19, maximum limit=20

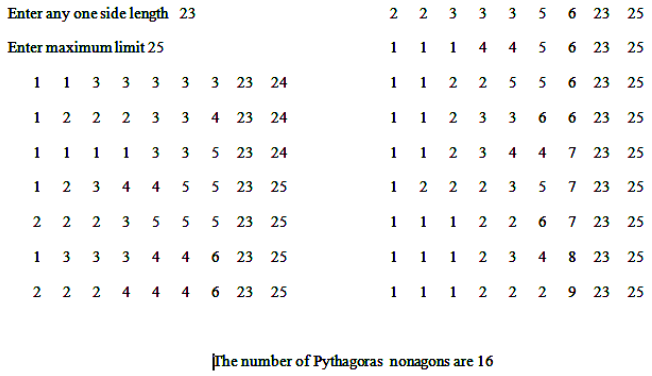

Fig 3. One side length=23, maximum limit=25

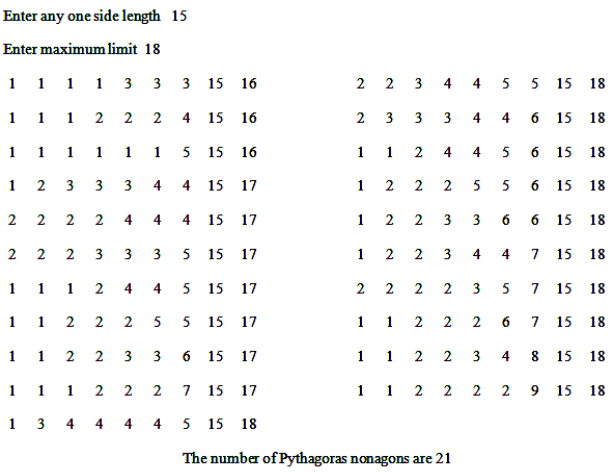

Fig 4. One side length=15, maximum limit=18

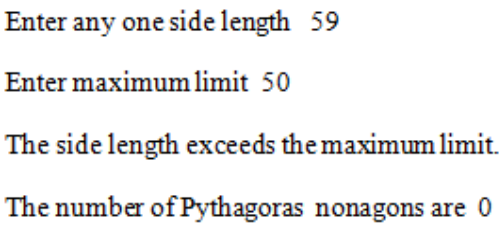

Fig 5. One side length=59, maximum limit=50

IV.CONCLUSION

By using this program, we can easily find the number of Pythagoras nonagons that can be formed when only one of the sides' length and maximum limit of hypotenuse is known using MATLAB. In future, we are planning to extend this idea to find number of n Pythagoras polygon that can be formed when only one of the sides' length and maximum limit of hypotenuse is given.

V. REFERENCES

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