Pythagoras Octagon with Natural Numbers using Programming Language

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Abstract— In this paper, using computer programming C language, we determine the Pythagoras octagon for any seven natural numbers p, q, r, s, t, u, v and this Pythagoras octagon satisfies the extension of the Pythagoras theorem i.e the sum of the squares of the first seven side lengths is equal to the sum of the square of the remaining side length.
Key words: Pythagoras theorem, Pythagoras octagon

I. INTRODUCTION

In [1, 2, 3, 4] we can form an extension of a Pythagoras theorem for a polygon of 4, 5, 6 and 7 side lengths. But in this paper, we will find the extension of Pythagoras theorem for octagon. For example, if we give any seven natural numbers p, q, r, s, t, u, v we can find the 7 side lengths of the heptagon with the help of the formulae

$$\left(\left|p^2-q^2-r^2-s^2-t^2-u^2-v^2\right|,\ 2*p*q,\ 2*p*r,\ 2*p*s,\ 2*p*t,\ 2*p*u,\ 2*p*v,\ p^2+q^2+r^2+s^2+t^2+u^2+v^2\right)$$

The above 8 side lengths satisfy the extension of Pythagoras theorem.

This process is very difficult if the numbers of our selection are considerably large. Now our aim is to find the Pythagoras octagon using programming language.

II. MAIN RESULT

A. Algorithm

- Step 1: Start
- Step 2: Read any seven natural numbers
- Step 3: Initialize any eight natural numbers to zero
- Step 4: Assign one natural number to one of the expression $\left|\mathbf{p^2-q^2-r^2-s^2-t^2-u^2-v^2}\right|$ in order to obtain the length of first side of the heptagon.
- Step5: Assign another natural number to the expression $\mathbf{2*p*q}$ for finding the length of second side of the hexagon.
- Step6: Assign another natural number to the expression $\mathbf{2*p*r}$ for finding the length of third side of the hexagon.
- Step 6: Assign another natural number to the expression $\mathbf{2*p*s}$ for the length of the fourth side of the hexagon.
- Step 7: Assign another natural number to the expression $\mathbf{2*p*t}$ for the length of the fifth side of the hexagon.
- Step 7: Assign another natural number to the expression $\mathbf{2*p*u}$ for the length of the sixth side of the heptagon
- Step 8: Assign another natural number to the expression $\mathbf{2*p*v}$ for the length of the sixth side of the heptagon
- Step 8: The length of the eighth side of the octagon will be obtained by the expression $\mathbf{p^2+q^2+r^2+s^2+t^2+u^2+v^2}$ which will satisfy the Pythagoras theorem for the octagon.

III. RESULT ANALYSIS

We have to display the side lengths of the octagon using extension of the Pythagoras theorem that are formed by assuming any seven natural numbers. For that the following steps should be involved.

- Step1: Assume any seven natural numbers.
- Step2: Apply and assign the formulae for the seven side lengths.
- Step3: The length of the eighth side of the octagon is obtained by the sum of the squares of the each side.
- Step4: The lengths of the eight sides will satisfy the Pythagoras theorem.

The above procedure can be explained by taking any six natural numbers of your wish.

1) Let the numbers be 2, 7, 9, 4, 8, 3, 1
2) Take seven variables as a, b, c, d, e, f, g, h and assign the formulas for the each side of the octagon
3) The side lengths will be obtained as (216, 28, 36, 16, 32, 12, 4, 224).
4) Here the sum of the squares of the lengths first seven sides is equal to the square of the length of eighth side. So it is a Pythagoras octagon.

We can represent this result in outputs

IV. OUTPUTS

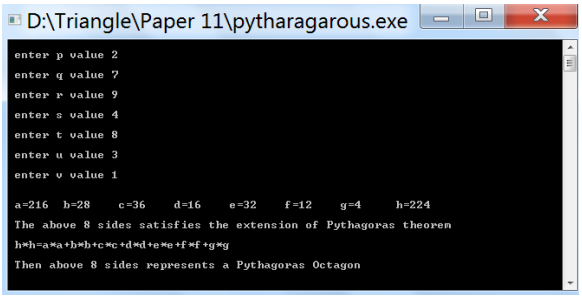

Fig. 1: p=2, q=7, r=9, s=4, t=8, u=3, v=1

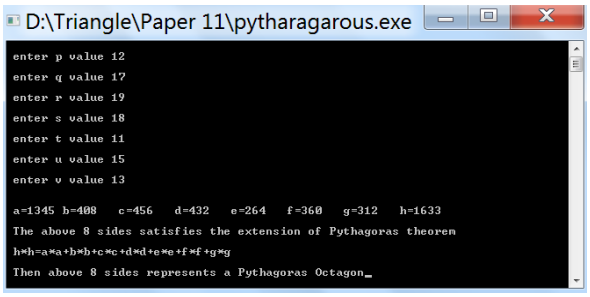

Fig. 2: p=12, q=17, r=19, s=18, t=11, u=15, v=13

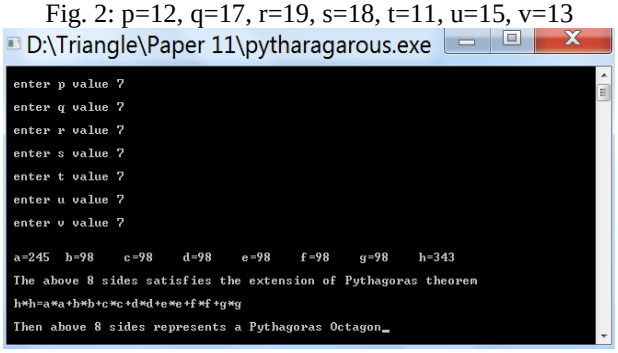

Fig. 3: p=7, q=7, r=7, s=7, t=7, u=7, v=7

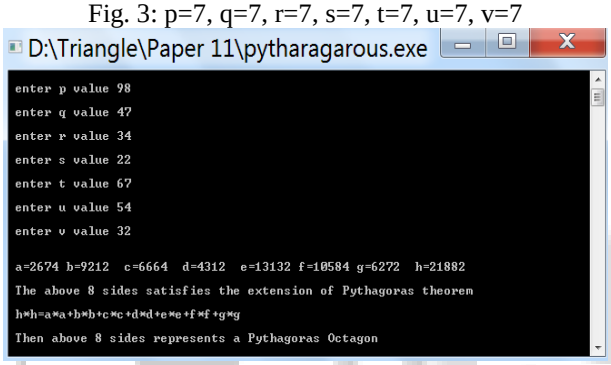

Fig. 4: p=98, q=47, r=34, s=22, t=67, u=54, v=32

V. CONCLUSION

The process of finding Pythagoras octagon manually is very difficult. So using C-language, the process of finding Pythagoras octagon for given any seven natural numbers becomes very easy. In future we will try to extend this Pythagoras theorem for n-sided polygon.

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