A different approach to Pythagoras Theorem

1Dr. Isaac Devakumar
1AP Calculus Teacher
1Aiton High School

Abstract - **The length of the hypotenuse of any right triangle can be calculated easily by an ancient Indian method. In this method the squaring and square roots are not used, instead just the four basic arithmetic operations such as addition, subtraction, multiplication and division only have been used.**

keywords - **Pythagoras Theorem**

Introduction
In this article we will prove the ancient alternate method for Pythagoras Theorem.
Chapter:1
Pythagoras Theorem is a basic fundamental theorem in Mathematics which states that the area of the square whose side is the hypotenuse (the side opposite to the right angle) is equal to the sum of the areas of the squares on the other two sides. This theorem is also can be written in terms of the sides a, b and c.
$$a^2+b^2=c^2$$
where c is the length of the hypotenuse and a and b are the lengths of the other two sides of the right triangle. This theorem is discovered by the Greek Philosopher Pythagoras, who was born around 570 BC. This theorem has been proved many times by many authors in different ways. In fact all the proofs are diverse, including both geometric proofs and algebraic proofs with some dating back thousands of years. Moreover Pythagoras lived in 5th century. It is said that Pythagoras derived this theorem with the guidance of ancient Tamil Mathematicians from Tamilnadu, India. This evidence was given by

Apolonius.(Evidence: கடலடியில்   தமிழர்   நாகரீகம் - உலக தமிழாராய் ச் சி நிறுவன வெளியீடு – Page:40)

According to this article, Tamil poet Kothaiyanar (கே·ாதையனார்   ) had written this theorem in the form of a poem 1500 years before Pythagoras was born, as follows:

”ஓடிய நீளந் தன் னை ஒரெட்   டு கூறாக் கி

கூறதில் ஒன் றதை தள் ளி

கூன் றத் தில்   பாதி சேர் த் தால்

நீடிய கர் ணந் தானே!”

The meaning of this poem is, It is obvious that, we get the length of the hypotenuse, when we subtract one eight of the longer leg from the whole longer leg and add the half of the shorter leg.
For example:
Consider the following right triangle:
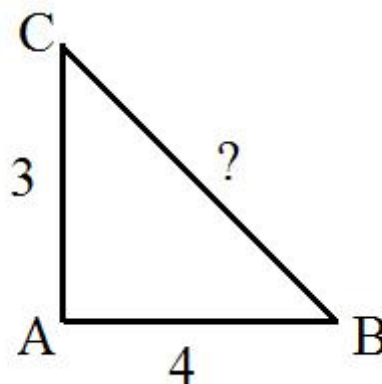
Let's calculate the length of the hypotenuse BC by the ancient Tamilian (the people belong to Tamilnadu, India) method.
Here the length of the longer leg is 4 and the length of the shorter leg is 3.

Therefore,

The length of the hypotenuse=[4-(1/8)(4)]+[(1/2)(3)]

$$= [4-1/2]+(0.5)(3)$$
$$= [4-0.5]+1.5$$
$$= 3.5+1.5$$
$$= 5$$

This method gives exact answers for most of the right triangles with different lengths of their legs, but in some cases it gives the approximate nearest answers.

For example:

Consider the following triples 7, 24 and 25 where 7 and 24 are lengths of the two legs and 25 is the length of the right triangle

Now

The length of the hypotenuse=[24-(1/8)(24)]+[(1/2)(7)]

$$= [24-3]+(0.5)(7)$$
$$= 21+3.5$$
$$= 24.5$$

which is approximately equal to 25.

Therefore, in general this method works for all the right triangles.

Reference:

[1] Online article by Mr. Manjaivasanthan.

[2] Online article from Thirikadugam

[3] Evidence: கடலடியில்   தமிழர்   நாகரீகம்   - உலக தமிழாராய்   ச்   சி நிறுவன வெளியீடு – Page:40)