Pythagoras Theorem

Grades 6,7,8

The Philomath Club

Lesson 4-Pythagorean Theorem

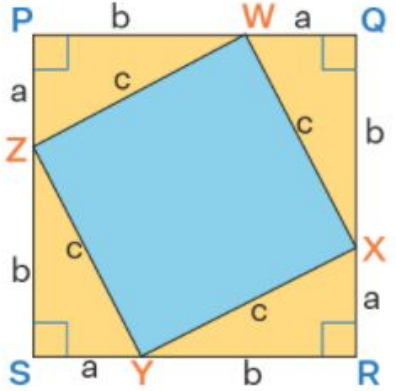
The Pythagoras theorem formula states that in a right triangle ABC, the square of the hypotenuse is equal to the sum of the square of the other two legs.

If AB and AC are the sides and BC is the hypotenuse of the triangle, then: BC^2 = AB^2 + AC^2.

In this case, AB is the base, AC is the altitude or the height, and BC is the hypotenuse.

Pythagoras theorem proof

Proof of Pythagorean Theorem Formula using the Algebraic Method.

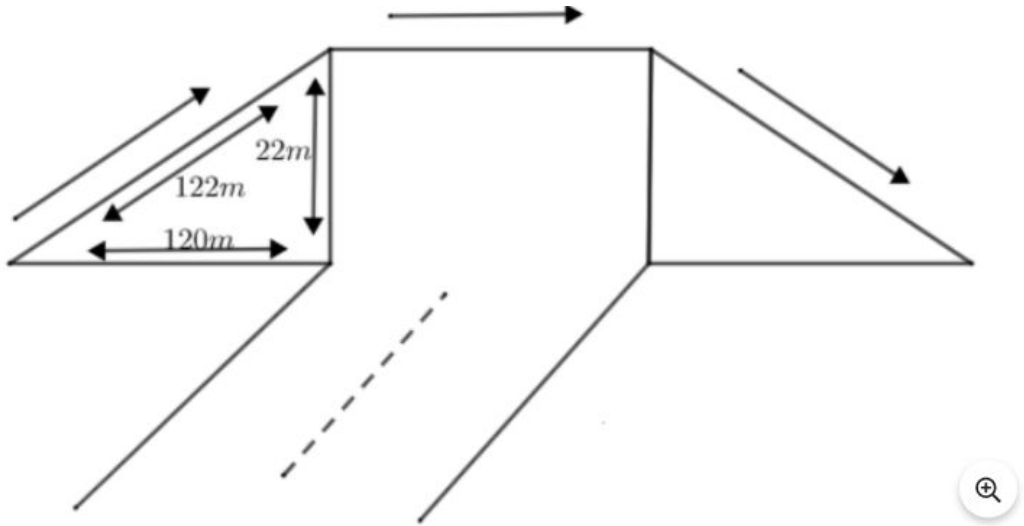


1. Arrange four congruent right triangles in the given square PQRS, whose side is a+b.
2. The four right triangles have b as the base, a as the height and, ' as the hypotenuse.
3. The 4 triangles form the inner square WXYZ, with c as the four sides.
4. The area of the square WXYZ by arranging the four triangles is c^2.
5. The area of the square PQRS with side (a + b) = Area of 4 triangles + Area of the square WXYZ with side c. This means (a + b)^2 = [4 × 1/2 × (a × b)] + c^2.This leads to a^2 + b^2 + 2ab = 2ab + Therefore, a^2 + b^2 = c^2. Hence proved.

Some problems!

1. In a right triangle, the lengths of the legs are given, a=6, b=8, find the length of the hypotenuse.
2. A ladder 3.7cm is placed against a wall in such a way that the ladder is 1.2m away from the wall. Find the height of the wall to which the ladder reaches.
3. In $\triangle ABC$, $\angle ABC = 100°$, $\angle BAC = 35°$ and $BD \perp AC$ meets side AC in D. If BD = 2 cm, find $\angle C$, and length DC.

4. The triangular sidewall of the flyover has been used for the advertisement. The sides of the walls are 122m, 22m, and 120m. The advertisement yields an earning of Rs 5000 per m^2 per year. The company hired one of its walls for 3 months. How much rent did it pay?



5.In a rhombus of side 10, one of the diagonals is 12 cm long. Find the length of the second diagonal.

6. A ladder 15m long reaches a window which is 9m above the ground on one side of a street. Keeping its foot at the same point, the ladder is turned to the other side of the street to reach a window 12m high. Find the width of the street.

7. Two poles of heights 6 metres and 11 metres stand vertically on a plane ground. If the distance between their feet is 12 metres, find the distance between their tops.

8. In a given quadrilateral ABCD, angle B=90 degrees. If AD^2=AB^2+BC^2+CD^2, prove that angle ACD= 90 degrees.

9. A man goes 80m due east and then 150m due north. How far is he from the starting point?