Pythagoras Theorem – Video 1

## I**ntroduction to The Contents**

Hello my name is Dr. Rita Scully and I am a Lecturer in Limerick Institute of Technology in Ireland.

This is the first of two videos on the Pythagorean Theorem or Pythagoras Theorem.

I will introduce and explain the Pythagoras Theorem and I will demonstrate 2 proofs of the theorem

In Video 2 I will demonstrate how to apply the Pythagoras theorem to solve unknown lengths of sides in a right-angle triangle.

## What You Know

To help you understand Pythagoras Theorem it would help to review some information on: Formula, Equations and Triangles.

* Formula - a concise way of expressing information symbolically.
* Equation: an equation is a statement that says the equality of two expressions
* Triangle: It is a plane figure with three straight sides and three angles.

It would also assist to review equiangular and similarity in triangles.

## Key Words

There are some key words that we use in this video.

Pythagoras Theorem provides the relationship between the sides in a right-angle triangle.

Right-angle triangle consists of two legs and a hypotenuse.

The two legs meet at a 90° angle or right-angle.

Hypotenuse is the longest side of the right-angle triangle and is opposite the right angle.

## I**ntroduction**

The Theorem tells us that the relationship in every right-angle triangle is:

$$a^{2}+b^{2}=c^{2}$$

Pythagoras theorem is normally stated as “In a right-angle triangle the square of the hypotenuse is equal to the sum of the squares of the other two sides”.

## Main Body

Pythagoras theorem has numerous proofs. In this video I will demonstrated 2 proofs.

Proof 1 – the area of the squares

Proof 2 – equiangular triangles

**Proof 1**

If a triangle has a right angle and you make a square of each of the three sides, then the biggest square has the exact same area as the other two sides put together.



So, the square of a (a²) plus the square of b (b²) is equal to the square of c (c²)

The basis of this proof can be expanded into the more established proof.

***Proof 2***

If we draw a perpendicular |BD| onto the side |AC|

We know that the △ADB ~ △ABC

The ratio of $\frac{|AD|}{|AB|}=\frac{|AB|}{|AC|}$ because of the Condition for Similarity

We can write this as, |AB|2= |AD| × |AC| **(1)**

Also, △BDC ~△ABC

The ratio of $\frac{|CD|}{|BC|}=\frac{|BC|}{|AC|}$ because of the Condition for Similarity

This can be written as |BC|2= |CD| × |AC| **(2)**

Adding these equations together **(1)** and **(2)** we get the equation,

|AB|2 + |BC|2 = |AD| × |AC| + |CD| × |AC|

This can be re-written as

|AB|2 + |BC|2 = |AC| x (|AD| + |CD|)

Since, |AD| + |CD| = |AC|

We can re write this equation as, |AC|2  = |AB|2+ |BC|2

Hence, the Pythagoras theorem is proven.

## What You Have Learned

Pythagoras Theorem is one of the best known mathematical theorems.

It provides the relationship between the sides of a right-angle triangle.

A right-angle triangle consists of two legs and a hypotenuse.

The hypotenuse is the longest side of the right-angle triangle and is the side opposite the right angle. $a^{2}+b^{2}=c^{2}$

It is stated as “In a right-angle triangle the square of the hypotenuse is equal to the sum of the squares of the other two sides”.

## Glossary

angle: this is the figure formed by two lines, sharing a common endpoint. It is usually measured in degrees 1

equation: an equation is a statement that says the equality of two expressions 2

formula: a formula is a concise way of expressing information symbolically, as in a mathematical formula or a chemical formula 3

hypotenuse: This is the longest side of the right-angle triangle and is opposite the right angle 1

legs: A leg of a triangle is one of its sides 1

Pythagoras Theorem: Also called the Pythagorean Theorem which tells us the relationship in every right-angle triangle 1

Pythagorean Theorem: This is a mathematical theorem that tells us the relationship in every right-angle triangle 1

right-angle triangle: A right triangle or right-angled triangle is a triangle in which one angle is a right angle or 90 degrees 1

right-angle: is an angle of exactly 90 degrees 1

side: A triangle has 3 sides or legs 1

square root: a number which produces a specified quantity when multiplied by itself 3

triangle: It is a plane figure with three straight sides and three angles.It is one of the basic shapes in geometry 1