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The Pythagorean Theorem and Its Converse

Unit 8 Lesson 1

THE PYTHAGOREAN THEOREM AND ITS CONVERSE

Students will be able to:

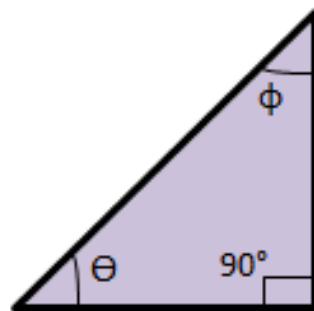
Study the Pythagorean theorem and its converse
and use it to identify right triangles

Key Vocabulary:

- Right triangle
- Pythagorean theorem
- Converse of Pythagorean theorem

THE PYTHAGOREAN THEOREM AND ITS CONVERSE

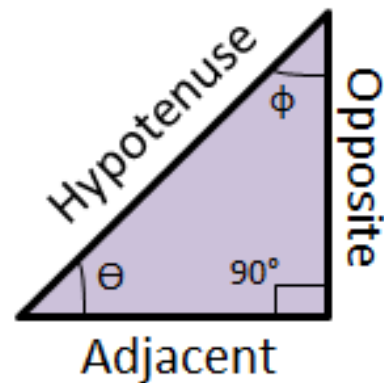
A **Right-angled triangle**(named as **right triangle**) is a triangle which has one of its angles equal to 90 degrees.



THE PYTHAGOREAN THEOREM AND ITS CONVERSE

There are properties associated with a right triangle.

- A **hypotenuse** is the line segment opposite to the right-angle.
- An **opposite** is the line segment opposite to the angle Θ .
- An **adjacent** is the line segment next to the angle Θ .
- The sum of three angles is 180°
i.e. $\Theta + \phi + 90^\circ = 180^\circ$



THE PYTHAGOREAN THEOREM AND ITS CONVERSE

Pythagorean Theorem

In a right-triangle, the sum of the squares of the lengths of adjacent and opposite is equal to the square of the length of hypotenuse.

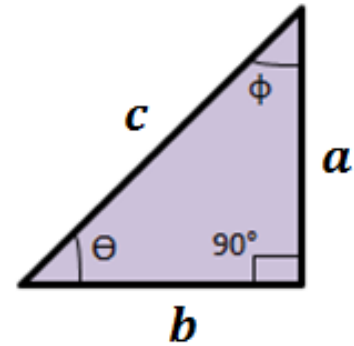
$$c^2 = a^2 + b^2$$

Where,

$c = \textit{Hypotenuse}$

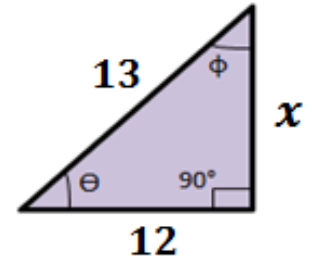
$a = \textit{Opposite}$

$b = \textit{Adjacent}$



THE PYTHAGOREAN THEOREM AND ITS CONVERSE

Problem 1: Find the unknown length x in the right triangle shown.



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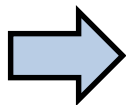
By Pythagorean theorem,

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

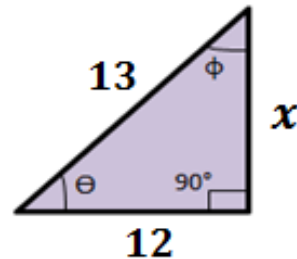
$$13^2 = x^2 + 12^2$$

$$x^2 = 169 - 144$$

$$x^2 = 25$$



$$x = 5$$

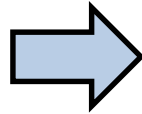


THE PYTHAGOREAN THEOREM AND ITS CONVERSE

Converse of Pythagorean Theorem

If the sum of the squares of the lengths of adjacent and opposite is equal to the square of the length of hypotenuse, then the triangle is a right triangle.

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



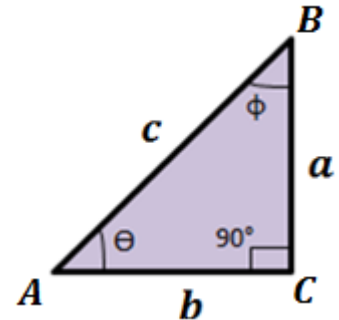
$\triangle ABC$ is a right triangle

Where,

$c = \textit{Hypotenuse}$

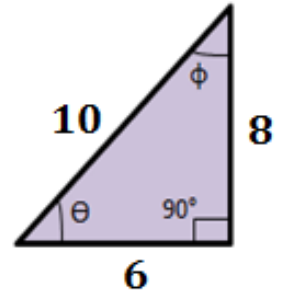
$a = \textit{Opposite}$

$b = \textit{Adjacent}$



THE PYTHAGOREAN THEOREM AND ITS CONVERSE

Problem 2: Identify if the triangle shown is a right triangle or not.



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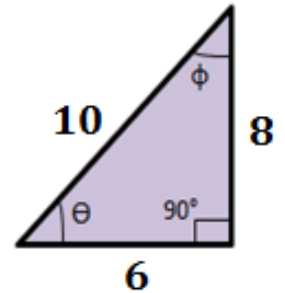
To show if the triangle is a right triangle, we need to check whether its lengths satisfy the Pythagorean theorem:

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

$$10^2 = 8^2 + 6^2$$

$$100 = 64 + 36$$

$$100 = 100$$



So, the triangle is a **right triangle**.