# Proofs of Theorems and Glossary of Terms

**Glossary of terms associated with theorems**

| | |
|---|---|
| ***Axiom:*** | An axiom is a statement which is assumed to be true and is used as a basis for developing a system.<br>*Example: Axiom 1 - There is exactly one line through any two given points.* |
| ***Converse:*** | The converse of a theorem is formed by taking the conclusion as the starting point and having the starting point as the conclusion.<br>*Example: The converse of Theorem 2 states 'If two angles are equal, then the triangle is isosceles'.* |
| ***Corollary:*** | A corollary follows after a theorem and is a proposition which must be true because of that theorem. |
| ***Implies:*** | Implies indicates a logical relationship between two statements, such that if the first is true then the second must be true. |
| ***Proof:*** | A proof is a sequence of statements (made up of axioms, assumption and arguments) leading to the establishment of the truth of one final statement. |
| ***Theorem:*** | A theorem is a statement which has been proved to be true. |

# Menu

Just Click on the Proof Required

**Theorem 4** **Three angles in any triangle add up to 180°.**

**Theorem 6** **Each exterior angle of a triangle is equal to the sum of the two interior opposite angles**

**Theorem 9** **In a parallelogram opposite sides are equal and opposite angle are equal**

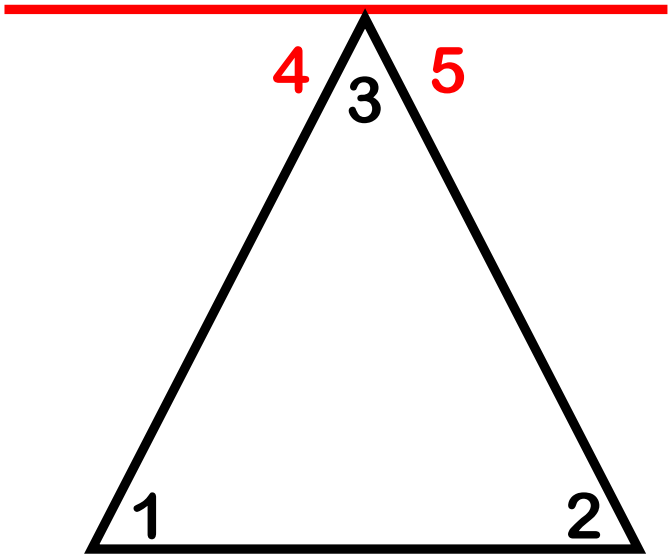
**Theorem 14 Theorem of Pythagoras : In a right angle triangle, the square of the hypotenuse is the sum of the squares of the other two sides**

**Theorem 19** **The angle at the centre of the circle standing on a given arc is twice the angle at any point of the circle standing on the same arc.**

Go to JC Constructions

**Theorem 4:** **Three angles in any triangle add up to 180°C.**

Use mouse clicks to see proof




**Given:** Triangle

**To Prove:** $\angle 1 + \angle 2 + \angle 3 = 180^0$

**Construction:** Draw line through $\angle 3$ parallel to the base

**Proof:** $\angle 3 + \angle 4 + \angle 5 = 180^0$ Straight line

$\angle 1 = \angle 4$ and $\angle 2 = \angle 5$ Alternate angles

$\Rightarrow$ $\angle 3 + \angle 1 + \angle 2 = 180^0$

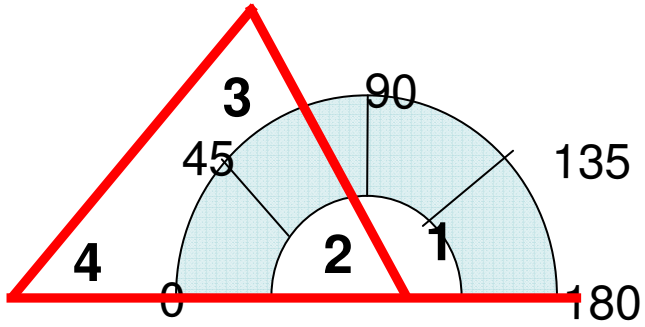
$\angle 1 + \angle 2 + \angle 3 = 180^0$

Q.E.D.

Constructions Menu Quit

**Theorem 6:** **Each exterior angle of a triangle is equal to the sum of the two interior opposite angles**

Use mouse clicks to see proof




**To Prove:** $\angle 1 = \angle 3 + \angle 4$

**Proof:**

$\angle 1 + \angle 2 = 180^0$ ..... Straight line

$\angle 2 + \angle 3 + \angle 4 = 180^0$ ..... Theorem 2.

$\Rightarrow \quad \angle 1 + \cancel{\angle 2} = \cancel{\angle 2} + \angle 3 + \angle 4$

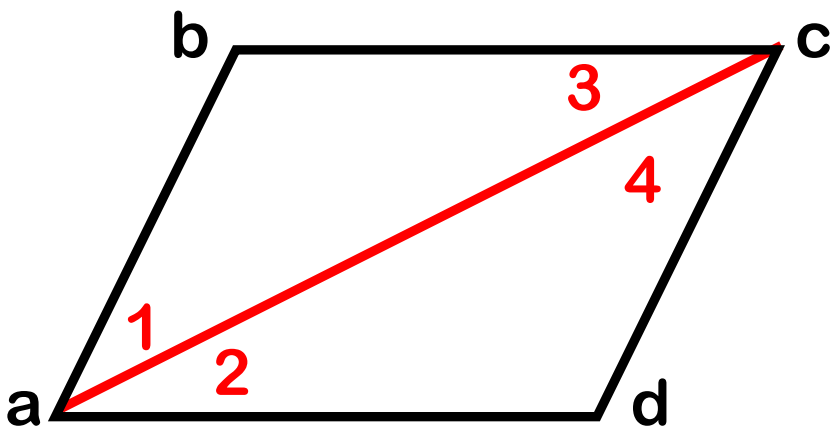
$\Rightarrow \quad \angle 1 = \angle 3 + \angle 4$

**Q.E.D.**

Constructions Menu Quit

**Theorem 9:** **In a parallelogram opposite sides are equal and opposite angle are equal**

Use mouse clicks to see proof




**Given:** Parallelogram abcd

**To Prove:** |ab| = |cd| and |ad| = |bc|

and ∠abc = ∠adc

**Construction:** Draw the diagonal |ac|

**Proof:** In the triangle abc and the triangle adc

∠1 = ∠4 ..... Alternate angles

∠2 = ∠3 ..... Alternate angles

|ac| = |ac| ..... Common

⇒ The triangle abc is congruent to the triangle adc ..... ASA = ASA.

⇒ |ab| = |cd| and |ad| = |bc|

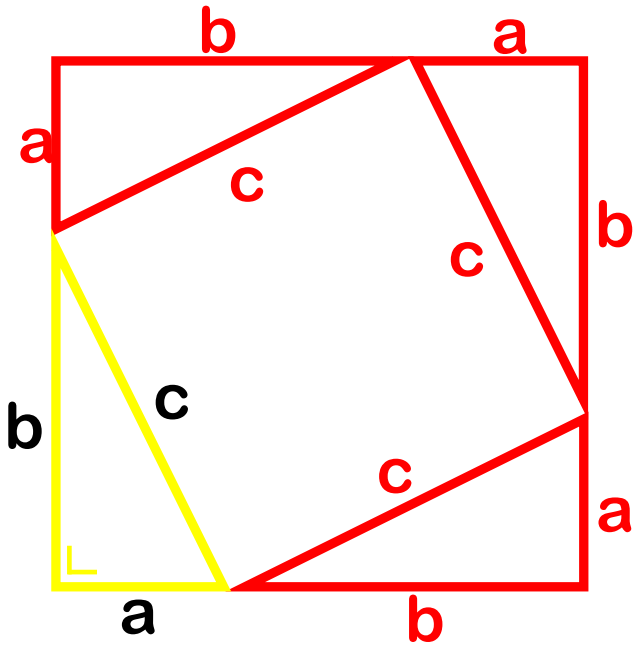
and ∠abc = ∠adc

Q.E.D

Constructions Menu Quit

**Theorem 14:** **Theorem of Pythagoras : In a right angle triangle, the square of the hypotenuse is the sum of the squares of the other two sides**

Use mouse clicks to see proof




**Given:** Triangle abc

**To Prove:** $a^2 + b^2 = c^2$

**Construction:** Three right angled triangles as shown

**Proof:** ** Area of large sq. = area of small sq. + 4(area Δ)

$(a + b)^2 = c^2 + 4(\frac{1}{2}ab)$

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

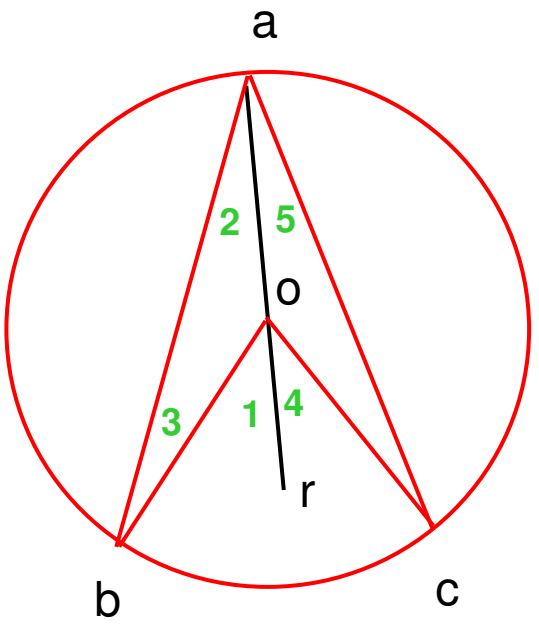
$a^2 + b^2 = c^2$

Q.E.D.

Constructions Menu Quit

**Theorem 19:** **The angle at the centre of the circle standing on a given arc is twice the angle at any point of the circle standing on the same arc.**

Use mouse clicks to see proof




**To Prove:** $|\angle boc| = 2|\angle bac|$

**Construction:** Join a to o and extend to r

**Proof:** In the triangle aob

$|oa| = |ob|$ ..... Radii

$\Rightarrow$ $|\angle 2| = |\angle 3|$ ..... Theorem 4

$|\angle 1| = |\angle 2| + |\angle 3|$ ..... Theorem 3

$\Rightarrow$ $|\angle 1| = |\angle 2| + |\angle 2|$

$\Rightarrow$ $|\angle 1| = 2|\angle 2|$

Similarly $|\angle 4| = 2|\angle 5|$

$\Rightarrow$ $|\angle boc| = 2|\angle bac|$ Q.E.D

Constructions Menu Quit