Geometry Info Sheet #34

Pythagorean Theorem and Pythagorean Inequality Theorem

Definitions

Acute Triangle: A triangle with interior angles that are all acute

Obtuse Triangle: A triangle that contains an obtuse interior angle

Right Triangle: A triangle that contains a right interior angle

Pythagorean Triple: Any three positive integers a, b, and c such that $a^2 + b^2 = c^2$

A **primitive Pythagorean triple** is a Pythagorean triple in which no factor (other than 1) is common to all three integers. For example, 3-4-5, 5-12-13, 7-24-25, 8-15-17, 9-40-41, and 20-21-29 are all primitive Pythagorean triples, but 6-8-10, 9-12-15, 10-24-26, 14-48-50, and 21-72-75 are <u>not</u> primitive triples.

Theorems

Pythagorean Theorem: For any right triangle, the sum of the squares of the lengths of the legs is equal to the square of the length of the hypotenuse.

Converse of Pythagorean Theorem: If the square of the length of one side of a triangle is equal to the sum of the squares of the lengths of the other two sides, then the triangle is a right triangle.

For $\triangle ABC$, with c as the length of the longest side, if $c^2 = a^2 + b^2$, then m∡$C = 90°$, and $\triangle ABC$ is right.

For $\triangle ABC$, with c as the length of the longest side, if $c^2 < a^2 + b^2$, then m∡$C < 90°$, and $\triangle ABC$ is acute.

For $\triangle ABC$, with c as the length of the longest side, if $c^2 > a^2 + b^2$, then m∡$C > 90°$, and $\triangle ABC$ is obtuse.

Formulas

Distance d in a coordinate plane **between two points** (x_1, y_1) and (x_2, y_2): $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$