# Definition: Triangle

A **triangle** is a polygon with three vertices and three sides. It is one of the fundamental shapes in geometry, formed by connecting three non-collinear Points.

#### Formal Definition

A triangle  $\triangle ABC$  consists of: - Three distinct points A, B, C (vertices) that are not collinear - Three line segments  $\overline{AB}$ ,  $\overline{BC}$ ,  $\overline{CA}$  (sides) - Three Angles  $\angle BAC$ ,  $\angle ABC$ ,  $\angle BCA$  (interior angles)

#### Classification

# By Side Lengths

• Equilateral: All three sides have equal length

• Isosceles: At least two sides have equal length

• Scalene: All three sides have different lengths

#### By Angles

• Acute: All interior angles are less than 90°

• Right: One interior angle equals 90°

• Obtuse: One interior angle is greater than 90°

### **Fundamental Properties**

• The sum of interior angles equals 180° (see Angle Sum of a Triangle)

• The sum of any two sides is greater than the third side (triangle inequality)

• The area can be calculated using various formulas:

– Heron's formula:  $A = \sqrt{s(s-a)(s-b)(s-c)}$  where  $s = \frac{a+b+c}{2}$ 

- Base-height formula:  $A = \frac{1}{2}bh$ 

#### Important Elements

• Centroid: Intersection of medians

• Circumcenter: Center of circumscribed circle

• Incenter: Center of inscribed circle

• Orthocenter: Intersection of altitudes

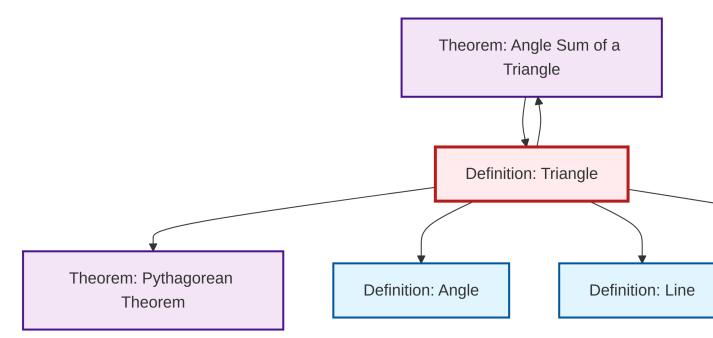
# Related Concepts

• Pythagorean Theorem applies to right triangles

• Congruence and similarity of triangles

• Trigonometric ratios defined using right triangles

# Dependency Graph



Local dependency graph